

Germanischer Lloyd

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nonstop

The Magazine for Customers and Business Partners

Environment

Clean Machines

Acoustics Silent Ship Windows

Shipbuilding Safe Structures

Wind Energy Strong Screws



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Dear Readers,

Rising oil prices and impending environmental regulations are now presenting us with the golden opportunity of being able to build and operate ships that are more economical and more ecological at the same time. Although the main focus for naval architecture has traditionally been on ship safety and cargo hold optimization, the aspect of energy efficiency is steadily gaining in importance. Considering the increasing fuel costs, investments in enhancing the efficiency of the propulsion plant and improving the hull and its hydrodynamic resistance will pay off well before the end of a ship's 25-year life cycle.

For Germanischer Lloyd, this new situation gives rise to a whole string of challenges. Besides supporting our ship-owner customers in the economical operation of their fleets with our wide-ranging technical expertise, we also inform our shipyard customers on design-related measures offering appreciable potential for savings. In view of future emission limits and the substitution of heavy fuel oil decided by the IMO, another key objective will be to investigate the relevance of alternative fuels. Energy sources such as diesel and natural gas will play a major role over the medium term. Exactly what significance hydrogen and fuel cell technology will attain is still unforeseeable at present. However, Germanischer Lloyd is already setting standards for alternative propulsion and green solutions in the field of efficiency enhancement.



Dr Joachim Segatz

In this issue of nonstop, we report for, example, on the use of hydrogen in shipping (page 14 ff). Recently, a small passenger boat with a fuel-cell drive commenced service in Hamburg – certified by GL. The background here is that Germanischer Lloyd is the first classification society worldwide to have developed guidelines for the implementation of fuel cells on waterborne craft. For seagoing ships, fuel cell technology is currently only imaginable as a supply of auxiliary energy – in contrast to the Air Cavity System, for which the first freighter is being converted at a Polish yard. With this approach, air is pumped into a chamber below the hull to reduce the frictional resistance (page 19 ff).

The oil and gas industry is exhibiting a trend towards longer pipelines with ever larger diameters. Protective coatings are becoming one of essential technologies for maintaining these installations. Our partners from Advantica give you an overview of the requirements and describe the procedures used for the field-joint coating of pipelines (page 49 ff).

The Industrial Services business segment of Germanischer Lloyd is enjoying strong growth. In September 2008, the technical advisory firm Material Consulting Services (MCS), based in Houston (USA), also became a member of the GL Group. MCS offers support with inspections and quality assurance for the oil and gas industry, thus broadening our spectrum of technical services in the areas of drilling technology, pipelines and inspection services. When will you be making use of the range of our expertise in this field as well?

Yours sincerely,

Dr Joachim Segatz
Member of the Executive Board
Germanischer Lloyd

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Photo: Corbis

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Photo: Fehrmann

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Cover photo: David Pu/CORBIS

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Two Plus Two

Abu Dhabi, United Arab Emirates, 50 centigrade: Alaa Fathi Ahmed, GL's Station Manager Abu Dhabi (r.), and Constantin Ciortan, GL Romania, are supervising the installation of cargo tanks on the M/V "GASCHEM RHONE" at the GSME yard. The vessel, a semi-pressurized liquefied gas tanker type 2G, was ordered by shipowner Hartmann Reederei and built with GL class at Severnav S.A., Drobeta Turnu Severin in Romania. The tanks were manufactured and finally installed in Abu Dhabi.

Challenging Tasks. The maiden voyage from Romania to the United Arab Emirates a challenge – the vessel sailed with a tack welded only, deck which was completely removed in Abu Dhabi together with the gas plant in order to install the cargo tanks. Another demanding task was the lifting and installation of the 14.8 m diameter, 32.7 m long tanks into the floating hull.

Photo: Premod Mondiale

news



GL SHIPMANAGER

New Version, More Support

For ship operators and managers, the administrative overheads involved in ensuring compliance with industry requirements and regulations keep accumulating. Many companies have expressed the need for a more workflow-oriented software tool to help them reduce the associated time and effort. GL ShipManager delivers exactly that kind of support.

Wide Support. This ship and/or fleet management system helps a ship's crew as well as the Designated Person Ashore to respond appropriately to ISM-related occurrences or non-con-

formities as well as observations made during vetting inspections, port state control, class surveys and self-assessments.

The tool assists users in the process cycle of recording, analysing, acting on, and documenting incidents and their effects. "GL ShipManager is based on the work of a focus group that included three of Germany's largest shipping companies," reports Heiko Hofmann, Managing Director at Ms Logistik Systeme, a subsidiary of Germanischer Lloyd that developed the GL ShipManager software.

NEW DESIGN. A startup screen shot (left) of the GL ShipManager Board system showing the "new look" of GL ShipManager 2.0 and the quick overview screen displaying summary information on tasks to be executed.

AGENDA. On the report view screen (centre) the "S." column shows the status of each task (different symbols and colours represent different statuses); colour-coded symbols in the "C." column tell the user where modifications have been made; and the "A." column shows a paper-clip symbol where attachments are included.

INCIDENT MANAGEMENT MODULE. The "homepage" shows the to-do list, or list of open tasks. It provides a quick overview of all open tasks per report per ship, as well as the status of each task and the respective due dates.



Photo: Michael Bergmittl

GL

Norbert Kray Becomes New Chief Surveyor

Germanischer Lloyd's new Chief Surveyor is Norbert Kray (42). He will be taking on the professional support of the classification society's 1,000 surveyors in over 77 countries.

In future, the qualified naval architect and marine technology expert will appoint new technical surveyors, monitor their work and further develop new rules for the construction and operation of ships. As Chief Surveyor, he will be responsible for the regular technical inspection of the fleet in service of at present over 6,600 vessels.

In addition, Kray will monitor the inspection processes for ship newbuildings, as well as materials and components. To this end, he decides on the deployment of the task force headed by him. Since 1 August 2008 he has

also been in charge as Deputy Head of Region Europe/Middle East/Africa.

Knowledge Management. A further focus of Norbert Kray's field of activity is to systematically enhance the training of the surveyors. The training and qualification of the surveyors has been individualized through the introduction of a comprehensive training concept, the Surveyor Excellence Network (SEN), in order to meet the training requirements of each individual to an even greater extent. Norbert Kray, who moved to GL in 1997, succeeded Ehrhardt Arndt who retired after 19 years with GL.

For further information: Norbert Kray, Deputy Head of Region Europe/Middle East/Africa, Phone: +49 40 36149-203, E-Mail: norbert.kray@gl-group.com

DYNAMICS. No powerboat has circumnavigated the globe faster than Earthrace.

TECHNICAL COMMITTEE

Risk-Based and Profitable

The new “Technical Committee on Risk Management” of Germanischer Lloyd was established to respond to the growing significance of risk-based approaches for the maritime industry. Its main objective is facilitation and consolidation of industry’s needs related to the application of risk-based methods for future profitable maritime business.

Expert panel. The new committee comprises representatives from all stakeholders of the maritime industry, namely shipowners and operators, shipbuilders and maritime systems’ suppliers, insurance and engineering service providers. Guido Schulte, Head of Concept Design and R&D Department at Aker Yards, was elected chairman; further members of the committee are Dr S. Gerhard (Allianz), Mr M. Guenther (Hamburg Süd), Mr M. Johnson (Advantica), Mr M. Müller (Hapag Lloyd), Dr S. Timmermann (MAN).

Germanischer Lloyd’s Senior Vice President for Strategic Research and Development, Dr Pierre C. Sames, is secretary to the committee. The constituent meeting took place in mid-July.

For further information: Dr Pierre C. Sames, Head of Division, Strategic Research and Development, Phone: +49 40 36149-113, E-Mail: pierre.sames@gl-group.com

WORLD SPEED RECORD

Earthrace: Around the World in 61 Days

The goal has been reached: Earthrace broke the world speed record for a powerboat to circumnavigate the globe on 27 June. The journey was completed in only 60 days, 23 hours and 49 minutes and knocked almost 14 days off the previous record. When the world’s fastest eco-boat crossed the finish line in Sagunto, Spain, it had travelled around 24,000 nautical miles fuelled by biodiesel.

Low Emission. Earthrace is a 24-metre wavepiercer trimaran built in New Zealand, which has a speed

of up to 45 knots. Powered by low emission engines, coated with biocide-free antifouling paint and equipped with solar-driven electronics, the Earthrace also has an efficient hull shape.

GL also contributed to the success: the team around Hasso Hoffmeister, Special Craft, and Ould El Moctar, Head of Fluid Dynamics, had carried out reconstructive calculations of the structural integrity as well as fluid dynamics simulations for the futuristic powerboat.

www.earthrace.net

PRESSURIZED EQUIPMENT

TPED Accreditation for GL

The transport of hazardous substances in pressurized containers requires stringent safety measures. The EU Transportable Pressure Equipment Directive 1999/36/EC (TPED) defines safety rules for the design, manufacture, testing and certification of pressurized transport equipment.

Full Range. In May 2008, Germanischer Lloyd was accredited as a testing and certification institute and is now authorized to issue the π -label for gas cylinders and tank containers, including UN tanks for gas transport.

Germanischer Lloyd has been accredited for testing and certifying pressure containers pursuant to the Pressure Equipment Directive (PED) for quite some time and is now authorized to offer a full range of testing and certification services for gas cylinders and tanks based on both directives.

One Stop. Certified containers may be moved from an on-shore filling station to a ship to be connected to the internal safety systems of the vessel. Testing and certification are handled by the same institution.





GROUP PICTURE. GL's Executive Dr Hermann J. Klein (front row: 7th f. l.) and Dr Volkmar Wasmansdorff, Head of Region Asia/Pacific (8th f. r), joined the Korean Industry Committee.

4TH KOREAN INDUSTRY COMMITTEE MEETING

All-time Record on New Orders

More than 40 members of the Korean maritime supply industry met for Germanischer Lloyd's 4th Korean Industry Committee meeting in Gyeongju, South Korea. Committee Chairman Seung-Nam Yoo welcomed representatives from the industry manufacturing engines, anchor chains, insulation material and rudders. The programme focused on the industry's current challenges: environmental requirements, quality assurance, ship recycling and inspections for the offshore industry were on the agenda.

GL Class Preferred. In 2007, new orders secured by Korean ship-

builders recorded a historic high of 707 ships with 23.6 million CGT, which is a huge share surge of 45.2 per cent in 2006.

In addition, Korean shipbuilders increased their market share for new orders to 40 per cent from 38 per cent a year earlier. This is due to their comparative advantage in technology as well as the continued boom in the shipping market.

In 2007, 12.8 million CGT were delivered with GL class from Korean shipyards. This makes Korea the country with the largest number of GL-classed deliveries in the past year.

BROCHURE

The Favorites of Port State Control

Ensuring that vessels meet international safety and environmental standards; this is the daily business of port state control (PSC). What do the inspectors focus on? And what can shipowners do to avoid the most common shortcomings? Germanischer Lloyd has reviewed the figures of the latest port state control findings.

Main Focus. The recently published new edition of GL's booklet "The Top Ten PSC Findings" shows the top ten deficiency areas. It outlines the main deficiencies found by PSC and shows which parts of the inspected ships PSC focused on in the last two years.

By taking special care of these particular areas, owners can reduce the risk of being detained by Port State Control and avoid problems in ports.

The new edition of the booklet "The Top Ten PSC Findings" can be downloaded here: www.gl-group.com/brochurepdf/OE035.pdf



WORKSHOP. In Taipei, representatives of the Taiwanese shipping and shipbuilding community and GL experts discussed technical alternatives in connection with cutting fuel costs.

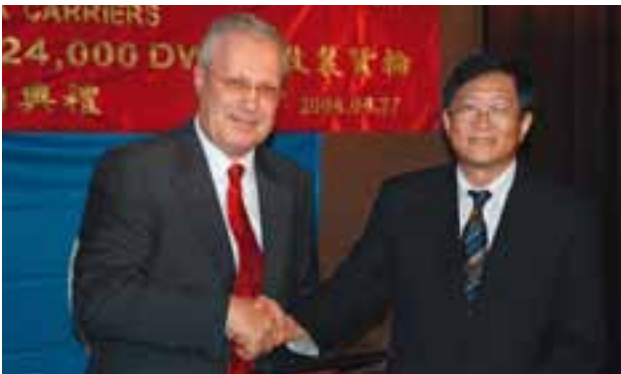
FUEL COSTS

Maritime Workshop in Taiwan

Cutting Fuel Costs by Improving Ship Design and Operation" – this was the leitmotiv of Germanischer Lloyd's first maritime information workshop in Taipei. Representatives of the Taiwanese shipping and shipbuilding community and GL experts discussed current challenges facing the maritime industry.

Dr Volkmar Wasmansdorff, Head of Region Asia/Pacific, gave an overview of current trends in the shipping market. Soaring ship fuel prices and regulatory pressures power the trend towards more energy-efficient ship designs. The ship of the future will be more economical and more environment-friendly. "This development will further strengthen the top position of shipping as the most environment-friendly mode of transport," he pointed out.

High-Performance Software. Further workshop topics were GL's operational CO₂ index for shipping, the Hull Lifecycle Programme and the new "Performance Standard for Protective Coatings" (PSPC) in ballast water tanks.



CONTRACT. GL-Director Dr Volkmar Wasmansdorff (left) and Wisdom Marine Lines' Chairman James C. S. Lan.

TRANSFER OF CLASS

Wisdom Marine Lines: Strengthening Ties in Japan

Taiwanese shipping company Wisdom Marine Lines has transferred the classification of five new bulk carriers to Germanischer Lloyd. The 24,000-dwt vessels are currently being built at a Japanese shipyard.

Successful Partnership. James C. S. Lan, Chairman of Wisdom Marine Lines (right), and Dr Volkmar Wasmansdorff, Senior Vice President and Head of Region Asia/Pacific of Germanischer Lloyd, signed the contract at a customer event in Taipei.



TANKERS

Powerful Partnership

TRIPLE COOPERATION: Representatives from Benelux Overseas Inc. and STX Korea Shipyards met with Dr Hermann J. Klein, Member of the GL Executive Board (third from left), and Torsten Schramm, COO and Head of Region Europe/Middle East/Africa (left), to celebrate a fruitful partnership. All parties put their signatures to the design contract of three 9,000-CBM LPG/AMMONIA/VCM tankers. The vessels will be delivered for Benelux Overseas, classed by Germanischer Lloyd.

VIETNAM

First GL-Classed Vessel Delivered to Foreign Owner

Doi Moi” (Change and Modernization) is the motto of Vietnam’s economic reforms. The nation’s admission to the World Trade Organization in January 2007 and the ensuing record-high export and foreign direct investment figures are owed to the new, liberalized economic policy of the Vietnamese government.

Turning over a New Leaf. The strong focus on international markets is especially successful in the shipbuilding indus-

try: in July, “MV Erria Vietnam” was the first Vietnam-built, GL-classed vessel to be delivered to a foreign owner.

Germanischer Lloyd had supervised the work at the yard of Saigon Shipbuilding, a subsidiary of the state-owned company Vinishin, to ensure the Danish owner’s high expectations would be met.

“MV Erria Vietnam” is one of over 20 GL-classed new-buildings under construction at six yards throughout the country.



PREMIERE. “MV Erria Vietnam” was delivered in July 2008. The work at the yards of Saigon Shipbuilding was supervised by GL.



NEWBUILDING. "Histria Tiger" is a modern oil/chemical tanker.

ROMANIA

Traditional-Style Ship Naming

Special events for extraordinary moments: newbuilding number ten of oil/chemical tanker design 37 K was named "Histria Tiger" in July. The tanker was built by Şantierul Naval Constanța Shipyard Romania with GL class. "Histria Tiger" is nearly 180 metres long, 32 metres wide and the gross tonnage is about 25,864.

Metropolitan. The naming ceremony was held in traditional Romanian

style: the ship was not only christened by its godmother Katie Varnavides, wife of the Bank of Scotland representative, but also by an Orthodox Church patriarch. One of the shipyard's employees read out a self-written poem about how the vessel was constructed.

In addition, nine ships of the design PCT 50 K oil/chemical tanker were ordered by the Histria Group, which will all be classified by GL.

HAMBURG

V.E.R.A. Drills Underground Tunnel



Photo: Hochbahn

GIGANTIC. The shield tunnelling machine for Hamburg's new underground line U4.

Length of 74 m, a weight of 650 t and a diameter of 6.57 m: those are the impressive dimensions of the shield tunnelling machine for Hamburg's new underground line U4. The building contractor asked GL to examine the operational soundness and safety of the tunnel driving behemoth called V.E.R.A. (abbreviation of the German phrase "From the Elbe to the Alster").

The contract comprises certain expert tests required before the machine

can be commissioned, specifically, tests of the pressured air lock inside the machine and the mobile therapy pressure-chamber system. The pressured air lock allows maintenance staff to enter the space around the cutter head for repair works.

For this purpose, the entire machine moves backwards, and the cutter head space is filled with compressed air. To enter or leave this space, workers must pass through an air lock to adapt to the pressure of the respective other side. If a worker is hurt in an accident and in need of medical attention, he is moved from the pressured air lock to the therapy chamber.

Security Check. Before the tunnelling machine can be operated, the pressured chambers must be tested under pressure to ensure all instruments, equipment and safety devices work properly. These tests are conducted by the GL Department of Materials and Products, Steam Boilers and Pressure Equipment.

ANNIVERSARY

"Cuauhtémoc" Honoured

Couples who have been married for 25 years celebrate their silver wedding anniversary. "Cuauhtémoc", a training sailing ship of the Mexican navy, was awarded a "25-Year Ambassador of Mexico on the Seven Seas" GL plaque.

Fast Racer. "Cuauhtémoc" was built in Spain in 1982 and has been serving mainly as a training ship for naval officers. She is a regular and successful participant in regattas. Fritz Grannemann, GL's Head of Region Americas, presented the plaque to the shipmaster in Acapulco. "Cuauhtémoc" subsequently set out on a voyage along the east coast of the USA and Canada, before heading towards Europe.



TRIBUTE. Fritz Grannemann (GL) and captain Mario Carbajal Ramírez.



GL AWARD 2008

Germanischer Lloyd Decorated Graduates of Russia's State Marine Technical University

Ha Manh Thang, Vladimir Jakimov, Oleg Tarovik and Maxim Vlasiev are the winners of the GL Award 2008. They are all graduates of the Faculty of Naval Architecture and Ocean Engineering at the State Marine Technical University of St. Petersburg (SMTU).

Brilliant Achievement. Professor Vladimir Tryaskin had recommended

the graduate thesis to the jury, which consisted of SMTU and GL members. The excellent performance of the graduates and the quality of their work convinced the jury.

The University of St. Petersburg and GL have been collaborating closely since September 2007 to foster the exchange of technical expertise.

CEREMONY. Guido Försterling, Country Manager Russia, together with proud winner Ha Manh Tang.

NEWBUILDING

Shipowner Ahrenkiel Hoists Flag

In early summer, the long-standing shipowning company Ahrenkiel moved into its new building located at its new and at the same time old address, "An der Alster 45" in Hamburg. Around 150 employees from the ship operation, liner services, crew and ship-management divisions as well as Fondshaus now work in the newly styled office premises with a floor space of 1,900 square metres.

Maritime Character. The architecture of the building is in the tradition of the Kontor buildings of the Hanseatic League: functionality and simplicity set the tone of the ensemble from the outside. On the inside, when you come in through the main entrance, the spacious lobby provides an inspiring central feature with maritime

elements such as a gangway and bow-shaped hallway, and there are even roof terraces "on deck". In the same vein, the outdoor grounds are fitted with a wooden deck reminiscent of a jetty with mooring bollards.

In addition to its head office in Hamburg, the Ahrenkiel Group also has branches in Switzerland and Cyprus; these are shareholdings rather than fully owned subsidiaries. The shipowning company currently has 51 ships in service, employing around 1,000 seamen. Fourteen bulk carriers are currently being built for Ahrenkiel at Chinese and Korean shipyards.

www.ahrenkiel.de

HEADQUARTERS. Traditional front of Hamburg-based shipowner Ahrenkiel's new office building.

Photo: Ahrenkiel



OKEANOS

International Workshop: Noise Control for Marine Mammals

Communicating, navigating, finding food and mates as well as detecting predators: blue whales are acoustic specialists and depend on sound for survival. Marine mammals produce intense infrasonic songs that can be heard over an entire ocean, while humpback songs can be heard over many hundreds of miles. With the advent of modern shipping, ocean noise in the low-frequency range (10–300 Hz) has been doubling approximately

every decade, drastically reducing these ranges.

Global Action. Experts in the fields of underwater acoustics, naval architecture, marine engineering, ship building, marine mammal bioacoustics, marine operations, and noise control, as well as in international maritime and environmental law and policy met in Hamburg, Germany, this April to discuss shipping noise and its effect on marine mammals. The goal of

the workshop organized by Okeanos: to reduce the amount of incidental underwater noise from shipping to mitigate or eliminate the impacts of noise on marine mammals. To achieve this they called for initial global action that would reduce the contributions of shipping to ambient noise energy in the 10–300 Hz band by 3 dB in 10 years and by 10 dB in 30 years relative to current levels.

www.okeanos-stiftung.org

Clean Energy

Zero emissions: hydrogen as a fuel is also gaining ground in connection with ships – yet so far only to a lesser extent. For larger vessels, gas already provides an environment-friendly and cost-effective alternative

No CO₂, sulphur dioxide or noise emissions – soon many seagoing vessels will be able to operate on such environmentally friendly terms. This is made possible by the use of hydrogen propulsion systems. With its high energy content and low environmental impact during the use, H₂ offers not only an energy-efficient alternative to conventional fuels, but, owing to high oil prices, also an economic one.

Worldwide efforts to limit CO₂ emissions are beginning to have an impact. Gas, which has a low carbon content compared to mineral oils, is becoming increasingly popular as a marine fuel. An additional factor is the establishment of sulphur emission control areas (SECAs) in the North and Baltic Sea and the English Channel. From 2015 the percentage of sulphur in marine fuels will have to be reduced from 1.5 per cent to 0.1 per cent. This regulation will come

into effect in California in July 2009, and it already applies there for auxiliary engines. The timing is perfect: investments that would have been seen as uneconomical just a few years ago are now economically viable.

“Alsterwasser” Under Way

In Hamburg the idea of an emission-free ship is a reality already. “FCS Alsterwasser” was recently launched and now sails on the river Alster in Hamburg’s city centre. There is room for approximately 100 passengers on this eco-friendly tour boat. According to Jens Wrage, the former managing director of the shipping company ATG, “This is the first passenger ship of its size anywhere in the world to run on fuel cells.” The fuel used is pure hydrogen. Each of the two fuel-cell modules has a power output of 48 kW (64 hp) – the same amount of power required by a bus. The engine →

The Projects

Reykjavík: Elding I

In April 2008 the "Elding I" was inaugurated with a first test trip. The whale-watching ship received a hydrogen auxiliary power unit in addition to the regular diesel engine. With its two viewing levels and the third deck, the boat allows all passengers to watch the whales in their natural habitats. The intention is to shut down the main engine when the boat has met with whales out at sea and offer the guests to see and hear the animals and to allow an even closer encounter with them.

The experience, owner Vignir Sigursveinsson said, had been marred in the past by the rumble of the diesel auxiliary engine below. "When we have the hydrogen engine, the boat will be completely soundless, which will make it a great experience of seeing the whales in their natural habitat," said Sigursveinsson.

"Elding I", originally built in Iceland as a rescue ship, is a 125-tonne cruiser with a capacity to carry 150 passengers. It is

Photo: Elding

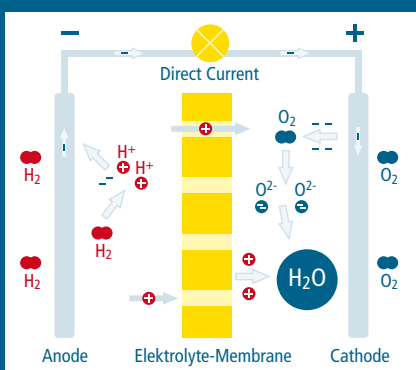


SILENT. On the "Elding I", the hydrogen auxiliary power unit replaces the diesel – to the delight of the whales.

part of the "SMART-H₂" project which is a demonstration project testing various types of hydrogen-fuelled equipment for vehicles and vessels. SMART-H₂ began in March 2007 and will extend until 2010.

GL's experts carried out the necessary studies and research to certify the fuel-cell system installed on board "Elding I". The certification comprises the assessment of the safety system, fuel-cell components,

and electrical equipment, as well as pressure testing and explosion protection. The ship's auxiliary power unit (APU) consists of a fuel-cell operated by compressed hydrogen providing electricity for the ship operation. In April, the certification was issued. "This project demonstrates for the first time the use of fuel cell systems on a commercial seagoing vessels," said Dr Würsig.



Fuel-Cell Technology

Just like a battery, a fuel cell is a device that directly converts chemical energy, for example from hydrogen and oxygen, into electrical energy. Hydrogen and oxygen are brought into contact with electrodes. They then bond in a process of reverse electrolysis, "cold combustion", to form water. This creates a direct conversion of the chemical energy to electrical energy. Because the conver-

sion is direct, the electrical efficiency of a hydrogen fuel cell is very high. It can be up to 60 per cent. Most fuel cells use the oxygen available in the ambient air, so, of the two elements required for the reaction, only hydrogen must be carried as a fuel.

The principle of the fuel cell was discovered in 1839 by Friedrich Schönbein and Sir William Robert Grove.

→ was developed by Proton Motor for the EU research project Zemships and delivered by articulated lorry to the SSB Shipyard in Oorthkaten near Hamburg in mid-July.

The six fuel-cell stacks are pooled as an assembly of the fuel-cell system in an aerated capsule, completed with the control panel, air compressor, sound absorbers and cooling system. The hybrid system consists of fuel cell and battery. The greatest power output is required when the boat docks and casts off. During the voyage the battery is recharged by the fuel-cell engine. This system can therefore be optimally adapted to the vessel's load profile. The fuel cells are supplied with 350 bar from twelve pressure tanks. Refuelling takes place at a hydrogen refuelling station in Barmbek, a district of Hamburg.

For many years, the power output of fuel cells was so low that they "only" supplied energy for the on-board electrical devices, but not for the propulsion system. This is no longer the case. According to Dr Gerd Würsig, the fuel-cell expert at Germanischer Lloyd, "Fuel cells now deliver from

ten to 250 kilowatts (kW)." The more the better: One of the findings of the 2004 fuel-cell feasibility study FCSHIP was that modules with an available power capacity of approximately 500 kW are needed for marine applications. "That's enough to drive small ferries and sports boats," says Dr Würsig. However, the energy requirement of larger ferries, tug boats and port authority vessels is at least one megawatt. The power capacities that will be available in the fore-

ECO-STEAMER. On the tour boat "Alsterwasser" (photo: the cockpit) the fuel-cell engine guarantees environment-friendly transport of passengers.



Amsterdam: Fuel-Cell Boat

The fuel-cell boat is expected to sail on the canals of Amsterdam from early 2009. A Dutch consortium composed of the companies Alewijnse, Integral, Linde Gas, Marine Service North and the shipping company Lovers is currently developing a hydrogen-powered boat for canal tours. Like "MS Alsterwasser" in Hamburg, this boat will carry approximately 100 passengers. It is being built at the Bodewes Shipyard in Haselt, Netherlands.

This vessel will be in operation for up to twelve hours a day. 2,000-kilogramme batteries will act as a back-up to ensure



Photos: Fuel Cell Boat b.v.



peak performance. The fuel-cell system is undergoing certification from Germanischer Lloyd. Even the fuel is to be produced in an environmentally friendly way. Electricity from the Shell-Nuon/Q7 wind park in the North Sea will be used in the electrolysis process that produces hydrogen. The first commercial client has already signed on.

Shell Amsterdam will use the fuel-cell boat to transport 600 of its employees daily to and from their place of work on the opposite bank of Lake IJ – between Amsterdam Central Station and Shell's new technology centre (NTC). The project is being co-funded by the Dutch Ministry of Economic Affairs.



Photo: H2 Yacht

Hamburg: H₂Yacht

Even the traditional "Tuckerboot" or launch is being fitted with a hybrid motor. In normal operation the boat is powered by electricity generated in the fuel cells. The buffer batteries mitigate heavy load changes. "The H₂Yacht 675 is intended for mass production and would thereby be the first commercial sports boat with fuel-cell propulsion," says Dr. Walter Pelka, Managing Director at H₂ Yacht. With a length of 6.75 metres and design category C it is intended for inland water-

ways and coastal voyages. The boat can accommodate eight passengers.

The hull is being manufactured from fibreglass-reinforced plastic at a Hamburg boatyard, while the 2 x 1.2 kW PEM fuel cells were developed by the Centre for Solar Energy and Hydrogen Research Baden-Württemberg (ZSW). Hydrogen is stored on board in metal hydride containers. The power capacity can be adjusted to the route of the boat and the refuelling options. This boat and its propulsion system are also undergoing certification by Germanischer Lloyd.

Photo: H2 Yacht



Photo: Zebotec

Lake Constance: COBALT 233 ZET

In November 2005 the first fuel-cell sports boat was unveiled by zebotec. Swiss company Brunnert-Grimm and South German zebotec are currently fitting a mass-produced sports boat with a hybrid propulsion system composed of electrical engine, batteries and fuel cells. This 2 x 12-kW propulsion system is undergoing certification by Germanischer Lloyd.

seeable future are still too low. That's why the use of fuel cells in marine navigation will initially be limited to auxiliary functions. Dr Gerd Würsig predicts: "The first fuel-cell applications in marine vessels beyond those of a pilot or demonstrational character won't appear until after 2015."

GL has certified the fuel-cell system of "FCS Alsterwasser" according to its "Guidelines for the Use of Fuel-Cell Systems on Board of Ships and Boats" (VI-3-11). Since the

mid-1980s GL has been involved in developing ships, storage and transfer facilities for hydrogen. As the world's first classification society, it has developed its own guidelines for the use of fuel cells in watercraft. These not only cover fuel cells and fuel systems but also standards for the materials used, ventilation systems, firefighting equipment, explosion protection and other safety systems. They also contain precise guidelines on testing the fuel-cell system.

On Board, It's Safety First

Germanischer Lloyd certified the fuel-cell drive of the open passenger ship "Hydra" in 2000. Three years later it certified the "CoolCell" fuel-cell propulsion system developed by MTU Friedrichshafen for the yacht "No. 1". Other fuel-cell projects include the 160-kW demonstration model for sea-going vessels that was developed together with HDW Fuel-Cell Systems (HFCS) and the unmanned research submarine "DeepC". Together with several renowned part- →



Gas as a Marine Fuel

Compared to oil, natural gas has clear environmental advantages – high efficiency and good environmental properties. Until now the use of gas as a marine fuel in international shipping was forbidden by the International Maritime Organization (IMO) for safety reasons. According to SOLAS, only fuels with a flashpoint of over 60 °C may be used on vessels. That is why kerosene is also prohibited. So far the one exception to this rule has been LNG tankers, which are allowed to burn the “burn-off gas” that is produced for technical reasons.

“Gas is not dangerous per se,” explains Dr Gerd Würsig from Germanischer Lloyd. The IMO has also come around to this point of view. Its sub-committee on Bulk Liquids and Gases (BLG) is currently working on provisional guidelines to meet present demands for safety standards in the use of natural gas as a marine fuel. The sub-committee is expected to submit these guidelines to the Marine Safety Committee (MSC) for approval in 2009. If all goes well, from 2010 there will be a legal basis for using natural gas as a marine fuel in combination with combustion engines in international shipping. “This

EXCEPTION. LNG tankers are allowed to use “boil-off gas” that is produced during the transport.

will lead to greater confidence in planning,” comments Dr Würsig, who is also a member of the BLG working group.

It is vital to consider the specific properties of gas when planning to use it as a marine fuel. According to Dr Würsig, “gaseous fuels are difficult to transport.” Tanks for liquefied gases or pressure tanks are needed instead of regular fuel tanks. In any case, the volume required is greater – a ship would not get far on one pressure-tank load. Extensive infrastructure for fuel supply is not yet in place. It’s therefore obvious where the best place would be to start using gas – on ferries or liner feeder vessels with short voyages.

The demand is enormous. Emission reduction requirements in Europe have increased once again following the MEPC meeting in April 2008. A study conducted by GL showed that a gas-powered vessel would not only reduce emissions but costs as well. Under certain conditions a container feeder with 1,500 TEU, 8,750 kW and a speed of 16 knots could actually be more economical than a conventional freighter.

The experts from GL took the following parameters into account in their calculations: higher costs of 1.5 per cent for fuel with a lower sulphur content, a CO₂ levy of US\$ 25 per tonne, income reduction due to the loss of approximately 50 container slots because the gas tanks require considerably greater volume, and investment costs for the gas tanks. The surprising result of their calculations was that after 15 years of operation the cumulative costs of a gas-powered propulsion system would be about one million US dollars lower than those of a conventional propulsion system. The general rule they established was that the higher oil prices rise and the higher the actual CO₂ levy is, the greater will be the cost savings. GL is currently working out the operative details of this model in a pilot project together with partners.

GL’s Head of Division Strategic Research and Development, Dr. Pierre C. Sames, is convinced: “Gas will definitely be used as a marine fuel. This will make a major contribution to optimal fuel usage and reduction of CO₂ emissions.”



CONTAINER FEEDER. Gas as a frugal fuel.

GAS OPERATED FEEDER

Spec. cons.:	7,550 kJ/kWh
Fuel costs:	\$ 14.2/GJ
Consumption/voyage:	219 t
LSF surcharge:	0
CO ₂ emissions/voyage:	642 t
Total costs/voyage:	\$ 171,000
Loss of income:	\$ 200,000/year

CONVENTIONAL FEEDER

Spec. cons.:	0.18 kg/kWh
Fuel costs:	\$ 600/t
Consumption/voyage:	260 t
LSF surcharge:	\$ 30/t
CO ₂ emissions/voyage:	809 t
Total costs/voyage:	\$ 184,000
Loss of income:	0

Advantage of gas: one million dollars*

* Basis: 15 operating years

→ ners, GL has been working for years to extend the benefits of this technology to additional applications. For example Airbus is also involved in joint projects with GL to develop safety standards for fuel-cell systems on board aircraft.

Prototype Ready for Mass Production

The Zemships project cost approximately five million euros, which included the ship, its drive system and fuelling station. Just the fuel cell with battery and tanks alone cost two million euros. “If you were to buy the system now it would only cost 300,000 euros,” explains Anno Mertens, Project Manager at the fuel-cell expert Proton Motor.

A comparable diesel motor costs between 60,000 euros and 70,000 euros, but it is important to remember that these have been in mass production for much longer. At present, mass production of fuel cells has not yet begun. “The application gives you access to industrial production. Once you have achieved that, the fuel cell is commercially competitive”, Mertens says. ■ SNB

UPCOMING EVENTS

22–23 October 2008
International Conference and Trade Fair on Hydrogen and Fuel-Cell Technologies
 CCH – Congress Center Hamburg
Lecture on “Approval of Marine Hydrogen Applications”
 by Finn Vogler, Germanischer Lloyd, on 23 October at 3:00 p.m.

23 October 2008
Zemships Conference

CCH – Congress Center Hamburg; Dr Würsig of Germanischer Lloyd will chair the afternoon lectures. **Lecture on “Safety and Classification of Fuel-Cell Vessels”** by Finn Vogler, GL, on 23 October at 2:00 p.m.

Related links
www.zemships.eu
www.elding.is/elding
www.fuelcellboat.nl
www.h2yacht.com
www.zebotec.de

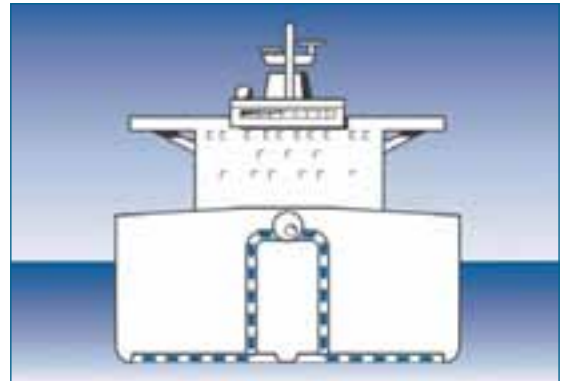
Ships on a Magic Carpet

The Dutch DK Group is turning a bold vision into reality. To show the world that large ships can save energy by floating on a cushion of air, they have converted a cargo vessel at great expense. Now the aim is prove that this airy technology really floats the boat

An elegant suit, a glittering silver chain, a dynamic appearance: Jørn Winkler is a charismatic man with a mission that has caused quite a stir: he intends to get ships to sail on a cushion of air, thus saving a lot of fuel.

Air has always played a big role in Jørn Winkler's life. For years he worked as a pilot in Africa, North America and Russia. Now he wants to put a breath of fresh air into the international shipping scene. With this in mind, he founded the DK Group and developed the Air Cavity System (ACS). The friction between the steel hull and watery medium is reduced to a minimum; the fuel consumption can be reduced by about 15 per cent.

To show the seafaring world that his ideas are not just hot air, he intends to present test results from reputable institutes. For this measurement campaign, he bought a ship that had been built to GL class many years ago. "Shipping is a business in which the people need to have something they can touch," says Christoph Witte, who is manag- →



Photos: DK Group/Jakob Bøesrup

AIR CUSHION. Compressed air is pumped through holes in the bottom of the ship. A "carpet" of air builds up beneath the hull, reducing friction as it passes through the water. The air is dispersed to either side of the propeller.

TEST. A coaster built in 1975 is being retrofitted with the Air Cavity System.



→ ing the project for GL. A Sietas built vessel old vessel is destined to become the demonstrator of modern fuel-saving techniques. With a length of 83 metres and a price tag of 850,000 euros, the requirements of the DK Group have been well met: it is classified and has the right size, the right draught and a large, flat bottom.

Gigantic Potential

But the old lady is still lying high and dry in Szczecin. Dock workers have opened up her belly with flame-cutters. With great effort, they have removed the total double bottom from engine room bulkhead to forward of cargo hold and installed new material. Instead of a smooth bottom, the “surgically enhanced” ship now has deep grooves subdividing the hull lengthwise into chambers. When under way, these cavities will be filled air from large compressors. Winkler and his team are keeping the exact details to themselves for the time being. They fear that, although the patent applications are already through, some competitors may study the concept a little too closely at this early stage. A number of companies before the DK Group have already tried the idea of air lubrication; all but a few failed. “Everyone comes and talks about bubbles,” says Witte. “But there is only one huge bubble in each chamber,” is all he is willing to reveal. The innovator’s sights are set on the jumbo ships – container vessels and tankers – that burn



Photo: Hautmann

RESOLVED. Christian Eyde Møller, DK’s Chief Executive Officer.

hundreds of tonnes of fuel oil every day. Saving 15 per cent here means saving millions of dollars. More than that, it means preventing an enormous amount of noxious emissions. By pushing out gigantic quantities of sulphur, carbon dioxide and nitrogen

oxide, shipping is increasingly coming under fire. Urgent action is needed. And so a company offering a solution that is both clean and cost-cutting is really popping up at the right time.

ABS for Your Car, ACS for Your Ship

The idea’s potential is judged by Jørgen Clausen, responsible at the DK Group for day-to-day operations, as simply colossal: “More than 1,000 ships in present orderbook could be equipped with ACS”, and that is a potential market of 100 billion US dollars. Clausen is more than positive about the idea of putting ships on a magic carpet. ABS is now universal for cars, and ACS will be the same for ships. “Just as almost all vessels have a bulbous bow nowadays, they will also sail with ACS in future.” That the system will function as planned is something nobody at DK Group doubts. “We have taken eight years to get where we are today,” says Christian Eyde Møller, DK’s chief executive officer, standing at the Remontowa yard in Szczecin in front of the feverish work progressing on the 83-metre ship, which has already been painted with its new name “ACS Demon-

DYNAMIC. The founder of the DK Group, Jørn Winkler, on board of the “ACS Demonstrator”. He is confident of the project’s success.



Photo: Hautmann

Photo: DK Group/Jakob Boserup

STRUCTURE. At the Remontowa shipyard in Szczecin, workers subdivided the hull lengthwise into chambers. When under way, these cavities will be filled with air from large compressors.



strator” – in light blue, the corporate colour. The second maiden voyage is not far off.

Before they purchased the ship, Winkler and his team commissioned various institutes to conduct model basin tests. Different models of tankers, cargo ships and bulk carriers were built. Their underwater hulls were cut open in various configurations and small compressors pumped air into the chambers. Then trials in the tank were carried out to see which hull shapes offered the best results. Some of the models exhibited a reduction in frictional resistance. This is backed up by Uwe Hollenbach of the Hamburg Ship Model Basin (HSVA): “I can confirm that we were able to demonstrate considerable savings.”

Success in the model basin is expected to function equally well on the seven seas. But, like the Skysails kite system, ACS is also meeting with its fair share of disbelief. Not only could waves destroy the air cushion, water col-

lecting in the cavities may slow down the ship or cause it to roll excessively. Moreover, there is also the opinion that the compressors pushing the air into the chamber will need enormous amounts of energy. These arguments are met by Winkler and the naval architect, Johannes Johannesson, with a knowing smile: the generator producing the electrical power for the compressors consumes only a tiny amount of energy since very little air is lost when sailing. After all, they are building the demonstrator to convince the last naysayers that the concept is indeed viable.

A Multitude of Sensors

Whether the promised results are really obtained will be seen in the not too distant future. In September, the “ACS Demonstrator” will put out to sea under the supervision of GL. On board, there will be a multitude of sensors, cameras, measuring instruments and computers to analyse, →



SYMBOL.
The experimental vessel is called “ACS Demonstrator”.

Photo: Hautmann

→ monitor and document every conceivable situation. “We want to collect as much input as possible,” says Johannes Johannesson, DK’s chief engineer. And he is certainly getting it. No less than 14 cameras have been installed. Including the conversion and measurement technology, the ship is now worth 5.5 million euros. No doubt about it, Winkler and his team are serious about the project. “This is no normal conversion,” Johannesson points out, “everything is brand-new here.” In every single air cavity, there are wave sensors measuring the distance from the cavity ceiling to the water surface by radar. In addition, there is a level sensor that automatically controls the height of the air cushion. Naturally, the heeling of the ship is also monitored; the greater the heel angle, the higher the probability that air could escape abeam from one cavity into the adjacent one. Other measurements include the speed and engine output – the two parameters that will be of the greatest interest to the customers.

In order to have a sound basis for comparison, the ship was surveyed before conversion. During the sea trial, the thrust power was recorded with due consideration for the wave action and ocean currents. Buoys in the water were used as reference points. Now, after a conversion period lasting almost a year, improved performance figures are expected. The ship will be operated in comparable conditions, i.e. a similar sea state and similar drift – as far as the conditions allow. GL experts will also be on board, having

been tasked with certifying the correctness of the measurement results.

Assuming that all goes well, there will be no more obstacles in Winkler’s path towards making his bold vision a reality. His customers will have to reckon with two to three per cent of the newbuilding price for ACS. With a large containership, such an investment should pay off within 1.5 years. One client has already been won over and is having four bulk carriers fitted with ACS. But ultimately, Jørn Winkler is aiming to achieve much more: he intends to build his company up to be a provider of all-round solutions. By combining a number of other technologies, the total fuel savings are to add up to at least 30 per cent. ■ DH

GERMANISCHER LLOYD IN POLAND

Germanischer Lloyd has been represented in Poland since the end of the 1970s – initially only with an outpost of the Berlin branch. After the fall of the Berlin Wall in 1991, three local surveyors were hired and the official founding of Germanischer Lloyd Polen Sp. z o.o. followed a year later.

Today, GL is present at three locations: Szczecin, Gdansk and Katowice (in total 51 employees). In addition, in the Division Training Center in Szczecin new staff members find their feet on the way to become surveyors.

INTERVIEW



Photo: Hautmann

PROJECT MANAGER. Christoph Witte is promoting the project on GL’s behalf.

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“The Effort Expended Here Is Absolutely Unique”

nonstop: Mr Witte, you are Head of the Special Projects Department. What is so special about the Air Cavity System?

Christoph Witte: ACS is an exceptional project, in that the work progressing over the past few years on its development and optimization was conducted in close cooperation with testing institutes and engineering offices. What is more, the company made an appreciable investment in its own experimentation platform, the “ACS Demonstrator”, in order to obtain conclusive proof that the system is completely viable and seaworthy and does not function “only” under equivalent conditions in a model basin. The effort being expended here is not just unusual, it is to my knowledge absolutely unique.

nonstop: What tasks did you and your team carry out for the DK Group?

Witte: For the conversion of the “ACS Demonstrator”, we here in Hamburg examined the hull design and the structural plans to ensure that they complied with the construction rules of Germanischer Lloyd. In addition, we subjected the stability documents to a detailed

analysis, because the hydrostatic behaviour of the ship had been changed. Our colleagues in Szczecin supervised and surveyed the conversion work at the repair yard to ensure that GL standards were maintained. Germanischer Lloyd is also contributing its measurement expertise for the sea trials in Oslo Fjord, providing the equipment, performing the necessary power measurements, and thus ensuring an objective evaluation of the system and the savings it offers.

nonstop: Will you continue your work on ACS in the future?

Witte: Definitely. We are currently working with the DK Group and other partners on the design for a 200,000-dwt bulk carrier. For this newbuilding project, the focus will not be solely on air lubrication. Various innovations, such as slow-running propellers, exhaust-gas scrubbers, optimized steering gear and improved lines are also to be included. By applying all the possible technical and commercial innovations, we hope to save about 30 per cent of the fuel with this new design.

NEW EDITION. Shipyards benefit from the guidelines for building containerships.

Photo: Andrey Voznjuk / Fotolia.com

Safe Ship Operation

Technical complexity. Design and propulsion. With a new, revised edition of its classification rules, Germanischer Lloyd supports shipyards and owners in building containerships

Few had anticipated this triumphant victory: but containershipping did revolutionize the entire transport industry. Within 40 years, traditional, small ocean freighters were replaced by the panamax and post-panamax giants we know today.

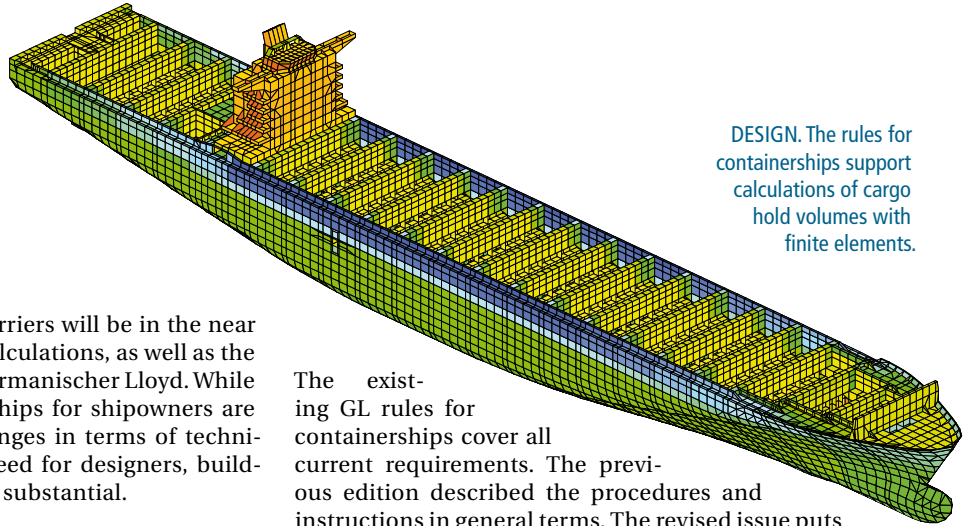
The steady containerization of global cargo traffic has boosted the demand for ever larger containerships. The first generation of newly-built container vessels, designed for 700 TEU, were commissioned in 1968, soon followed by a second generation, more than twice that size with a capacity of 1,500 TEU. Economies of scale pushed the construction of even larger containerships in the 1980's, eventually leading to the panamax (1985) and finally, the post-panamax (1988) class, the latter capable of carrying between 4,000 and 5,000 TEU.

The limiting factors defining the maximum size of a commercial ship until the late 80's were the dimensions of the Panama Canal. A panamax ship is up to 294.13 metres long and 32.25 metres wide. This limit was broken as early as 1988, however. It is estimated that by 2011, nearly 40 per

cent of the world's containership fleet will be too large for the current size of the Panama Canal locks. The decision of the Panama Canal Authority to build a third set of locks, which is scheduled for completion in 2014, has heralded in a new era: vessels of up to 12,000 TEU will be able to navigate the canal. But even these dimensions have been surpassed today: ships of the Emma Maersk series, currently the biggest containerships in the world, carry up to 13,000 TEU. In December 2008, Samsung Heavy Industries will deliver several 13,000-TEU ships to shipowner MSC. And as early as May of this year, South Korean STX Shipbuilding presented a basic design for a 22,000-TEU containership at the Posidonia shipping trade fair in Athens.

Technical Challenges

From the very beginning, Germanischer Lloyd accompanied the technological progress, the size development and the design of containerships. With a joint, innovative design study for a 13,000-TEU containership, GL and Korean yard Hyundai Heavy Industries (HHI) demonstrated in →



DESIGN. The rules for containerships support calculations of cargo hold volumes with finite elements.

→ 2005 just how big container carriers will be in the near future. All essential supporting calculations, as well as the design review, were handled by Germanischer Lloyd. While the economic benefits of larger ships for shipowners are indisputable, the resulting challenges in terms of technical sophistication, design and speed for designers, builders and classification societies are substantial.

New Rules for New Containerships

Classification rules are developed to guarantee the structural strength and integrity of essential parts of a ship's hull and superstructure. Furthermore, these rules assure the reliability of the propulsion and steering systems as well as the power-generation system, which supplies electricity for essential on-board services, thereby ensuring safe operation of the ship.

GL classification rules draw upon the expertise of leading members of the industry, such as shipbuilders and containership owners whose experts are actively involved in the technical committees of Germanischer Lloyd. The experience accumulated by Germanischer Lloyd in classifying containerships since the emergence of containershipping in the 1950's has contributed substantially to the society's know-how on this technologically complex ship type.

With a new, revised edition of its classification rules, Germanischer Lloyd supports shipyards and owners in building containerships. All requirements are now compiled in one concise, user-friendly document. The new edition is scheduled for release at the Hamburg maritime trade fair, SMM, in September.

The existing GL rules for containerships cover all current requirements. The previous edition described the procedures and instructions in general terms. The revised issue puts a stronger focus on details, providing more specific instructions on procedures such as cargo hold calculations. The section "Structural Fire Protection on Board Seagoing Ships" incorporates new requirements based on the IMO Fire Test Procedure Code.

New recommendations are given for strengthening shell plates and profiles to minimize propeller-induced vibrations. Avoiding deckhouse vibrations – including those affecting the cantilever navigation bridge wings as well as the radar mast located on the compass deck – is a concern addressed by a set of new recommendations.

As for the deck area, the revised edition contains new requirements regarding the arrangement of strengthened insert plates. This also concerns openings within and close to insert plates. The requirements for breakwaters have been updated in terms of loads, sizes and dimensions for plates, stiffener and girders. ■ AH

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EVOLUTION. Until 2005, Hapag-Lloyd's "Colombo Express", rated 8,750 TEU, was the world's largest containership.

Photo: Hapag-Lloyd

PANAMA CANAL

The maximum usable dimensions of the new locks:

LOA: 427 m (1400 ft)
 beam: 55 m (180 ft)
 depth: 18.3 m (60 ft)

Max. permitted vessels dimensions:

Max. length: 366.0 m (1200.787 ft)
 Max. beam: 49.00 m (160.761 ft)
 Max. draft: 15.24 m (50 ft)

The draft of the new "Panama Canal - Vessel Requirements" will not be available until January 2010.

For the time being, the Panama Canal Authority is offering a preliminary review service for engineering drawings of new Panamax ships.

PANORAMIC WINDOW. Generous areas of glass offer the right outlook on superyachts like the "Lady Moura".

Clear Insights into Noisy Windows

The glass surfaces on passenger ships are becoming larger than ever. They constitute a huge radiating surface and can therefore cause increased noise levels within the ship. A new approach makes it possible to calculate the sound radiation of window systems with a high degree of accuracy

Photo: Fehrmann

The acoustic emission of ship windows is one of the more exotic subjects to be found in naval architecture. Nevertheless, the high level of sound that may be radiated by these components can cause considerable discomfort for the guests on a cruise liner. The glass surfaces on passenger ships are getting increasingly larger. "For this reason, an early analysis of the contribution made by the windows towards the overall sound level is becoming more and more important," says Dr Christof Weißenborn of the Acoustics Department at Germanischer Lloyd.

Up until now, only a coarse appraisal – if at all – of the possible effects was conducted during the ship design phase, within the scope of an acoustic consultation. Calculations of sound radiation are still a rarity: when the design drawings are examined and approved by a classification society, this aspect is not relevant for the rules at all. However, the proper basis for achieving low sound radiation

levels can only be achieved in the concept phase. Once the windows have been installed, there are very few structural possibilities that are still open to the manufacturers and yards in abating the noise emitted by the windows.

Unwanted Sound Radiation

The mechanical vibrations produced by shipboard sources of noise, such as the main engine, propellers, auxiliary diesels, and air conditioning, and then introduced into the steel structure, i.e. hull, stiffeners, pipelines and ventilation ducts, propagate throughout the entire ship as structure-borne noise. The sound is then radiated by the floors, ceilings, walls and windows into the rooms and cabins as air-borne noise. →

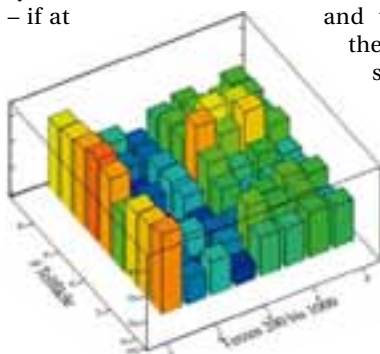
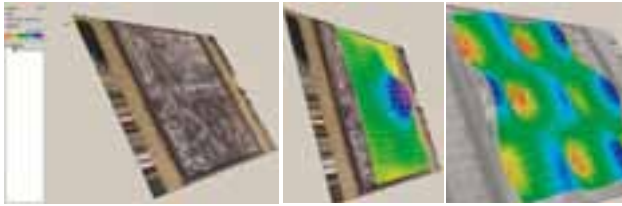


DIAGRAM. Measurements using a sound intensity probe reveal the distribution of the radiated air-borne sound over the surface of the window.



TEST. GL expert Dr Christof Weibenborn at the window test stand, which emulates the acoustic characteristics of ship structures. The surface velocity of the glass pane under test is measured by means of a scanning laser vibrometer.



IMAGERY. The integrated video recording module makes it possible to visualize the vibration data. The video images provide a vivid impression of the vibration mode of the radiating pane.

→ Noise radiation primarily becomes a problem with large glass surfaces. For floors, walls and ceilings, a number of acoustic countermeasures are available to limit the transformation of structure-borne noise to its air-borne counterpart. Mineral wool, attenuation layers as well as interior wall and ceiling partitioning systems are common and proven solutions. Unfortunately, they cannot be used for windows.

Bad Vibrations

Window panes in the usual dimensions and thicknesses for shipboard applications often exhibit their first natural frequencies within the range of the main excitation frequencies. These include, for example, the propeller blade frequencies. As a result, the propulsion-induced vibration

in the ship stimulates resonance in the windows. To make matters worse, the glass panes act like loudspeaker membranes in the frequency range from 100 Hz to 1,000 Hz, owing to their low internal damping. Until now, there was no way of forecasting the windows' share in the noise level within a particular space.

For this reason, GL has developed a computation procedure to help predict, for a known scenario of structure-borne noise, the level of sound radiation into the surrounding steel structure by the window system (frames, mounting, glass package).

If the distribution of structure-borne noise in the steel structure is known – as calculated with the aid of the GL NoiseFEM software, for example – then GL's newly developed and validated computation procedure can be applied to predict the acoustic power radiated by the glass surfaces.

Demanding Yacht Customers

In Fehrmann Metallverarbeitung GmbH, an innovative manufacturer of high-quality ship windows, GL has found the ideal cooperation partner. A proposal for the fitting-out of a megayacht provided a suitable opportunity for the Hamburg-based window maker.

The shipyard demanded that vendors submit empirically verified data on the acoustic properties of their windows as a prerequisite to being accepted as suppliers for the project.

INTERVIEW

“Sophisticated Structures”

Henning Fehrmann, Managing Director of the Hamburg-based company Fehrmann GmbH, a leading manufacturer of high-quality ship windows, talks about his joint venture with Germanischer Lloyd



GL PARTNER. Henning Fehrmann makes sure the glass acoustics are good.

nonstop: What is so special about this project with GL?

Fehrmann: It really is a pioneering venture. Thus far, no validated software has been available for calculating the structure-borne noise on ships. Now we and GL are setting new standards, from which the owners of superyachts, pilot boats and hotel ships stand to benefit.

nonstop: What is your connection to GL?

Fehrmann: A long-standing and successful collaboration. Whether it concerns the certification of ship windows, prototype tests or the approval of our company as a welding workshop – for all such matters, GL is a competent point of contact for us. In addition, we work together in the interest group of the

ISO WG responsible for the windows of large yachts.

nonstop: What priorities are you setting in the development and manufacture of windows?

Fehrmann: We concentrate on tailor-made, technically sophisticated window, door and glass structures, such as electrical sliding windows and doors, and also spherically curved window elements. A key aspect of our developments is to fulfil the design requirements while meeting the technical standards. That is our primary goal.

nonstop: What plans do you have for the future?

Fehrmann: Recently, we have enjoyed strong growth. Our aim now is to strengthen our position as a premium manufacturer of windows and glass doors for ships, and also to gain a foothold in new markets.



SOUND MEASUREMENTS. The investigations at the window test stand yielded fresh insights, with which sound radiation levels can now be reduced.

In this way, more and more yards are tying window suppliers into the system responsibility, and sound level limits are also being included in the contracts.

In June 2007, a cooperation agreement was concluded between GL and Fehrman. Work progressed jointly on a concept for the validation of the measurement and calculation procedures as well as a special window test stand, with which the sound radiation of ship windows excited by structure-borne noise (representing the typical situation) could be verified under conditions equivalent to those prevailing on board. The calculation approach was validated on the basis of the newly developed measurement procedure. In addition to an experimental deckhouse, the window test stand was set up at Bundeswehr Technical Centre 71 in Kiel to provide full-scale emulation of ship structures.

Innovative Test Stand

The test stand is six metres in length, with a width and height of three metres. It imitates a single typical room, comparable to an outer cabin, also with a length of 6 m, width of 3 m and height of 3 m. The surface velocity of a pane was measured with the aid of a contactless scanning laser vibrometer. The glass pane to be tested was excited through the steel structure by a typical noise pattern, with the vibrational energy being introduced with the aid of an electrodynamic exciter, or “shaker”.

Thanks to the integrated video recording module, the data could also be visualized dynamically. Thanks to this approach, an image of the vibration mode was obtained for the radiating pane. “By using a sound intensity probe, the radiated acoustic power was then determined together with its frequency and distribution over the window surface,” explains Stefan Semrau, who provided support as a specialist for acoustic measurement technology.

The examinations conducted over the past twelve months provided a wealth of new insights, which were instrumental in gaining a better grasp of the very complex physics of sound radiation by ship windows. It is now possible to choose the combination of glass package and frame structure in such a way that the acoustic power radiated into the room is attenuated by a factor of three.

When further measurement campaigns with five additional window sizes are concluded by the end of 2008, a fully validated calculation procedure will be available. Germanischer Lloyd will then be offering window manufacturers a new advisory service for calculating the sound radiation of ship windows that will consider the acoustic conditions typical for ships. Ship windows manufacturer Henning Fehrman is confident: “We and GL are setting new standards from which the owners of superyachts, pilot boats and hotel ships stand to benefit.” ■ OM

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GLOSSARY

Structure-borne noise: mechanical vibration of solid bodies in the audible range from 20 Hz to 20 kHz

Air-borne noise: periodic pressure variations of the air perceived by the human ear, i.e. in the audible range

Radiation: transformation of structure-borne noise to air-borne noise

Radiation factor or radiation index: indicates how well a surface is able to convert forced vibration into air-borne noise

Great Success for Cautious Strategy

In the face of rising steel prices and partly doubtful market prospects, the Taiwanese shipyard CSBC is on course for further success. The fourth largest builder of containerships in the world trusts in quality, a conservative business profile and good relations with its customers

Steel prices play a significant role in the overall calculation of ship prices. Unexpected price hikes can curtail margins from newbuilding contracts or force shipyards to recalculate and add escalating clauses to existing contracts to offset soaring construction costs. Prices for heavy steel plate have increased by more than 20 per cent in the last twelve months. While this seems to be a new phenomenon not witnessed before in the shipbuilding industry – it has been more common in aircraft construction – it has prompted shipyards to double their efforts to improve productivity. In the case of Taiwanese CSBC Corporation, the cost of steel accounts for a quarter of the yard's production costs, according to Dr Chih-Cheng Li, President of CSBC Corporation.

Nonstop had the opportunity to speak with Dr Li about his assessment of the shipping market and his plans for CSBC. Considering the company's brimming orderbook, an obvious question to ask was: "What is the secret of your success?" Dr Li does not hesitate to reveal how challenging the past years were: "Basically our cautious approach has helped us a lot in manoeuvring through these dynamic times. We were not too aggressive and kept a conservative business profile. Today our orderbook is filled until the year 2012."

Having said this, his predictions for the future are nevertheless restrained: "Today I can only give you a 'guesstimate' – prospects are good and the current situation is an excellent basis for our forthcoming strategy to expand our shipbuilding activities."

Focus on Containerships

CSBC is a shipyard with an excellent reputation for high-quality vessels. The Taiwanese "box ship specialist" CSBC has a large number of national as well as international customers. Today, CSBC is the fourth largest builder of containerships in the world and the island's only large shipbuilder. By the end of 2008, CSBC intends to present its own design for a 12,600-TEU containership, which could attract even more clients.

"We have been concentrating on containerships. We have gained substantial knowledge about this vessel type and enjoy a certain competitive advantage," explains Dr Li. The reason for focusing on this sophisticated ship type can be found in the maritime market environment. "While bulk carriers follow the rules on the tramp market, containerships are ordered by liner companies, which operate in a stable business environment."



"The current situation is an excellent basis for our forthcoming strategy to expand our shipbuilding activities."

Dr Chih-Cheng Li, President of CSBC Corporation



GIANT. CSBC is primarily specialized in containerships such as the 335-metre-long “Yang Ming Uberty” (8,200 TEU).

Photos: CSBC



HARD WORK. Crane system at the ultra-modern shipyard grounds of CSBC in Kaohsiung in the southwest of Taiwan.

Containership owners are especially quality-minded. “We deal with national and international clients. Some sixty per cent of our newbuilding tonnage is ordered by Taiwanese shipping lines. And we are proud to have Peter Döhle, ZIM and CSAV, to name just a few, among our good and loyal clients.”

Asked how CSBC attracts the attention of international shipping lines, Dr Li explains the evolution of his company’s marketing strategy over time: “While we used brokers in former times, we are now in the comfortable position of negotiating directly with our clients. We like to deal with the ‘end user’ rather than a charterer.”

Given the volatility of the shipping market, Dr Li prefers good and loyal clients because they reduce the credit risks

of the shipyard. Speaking of financial matters, the CSBC president mentions the forthcoming initial public offering at the Taiwan Stock Exchange on 22 December. The state-owned shipbuilder is scheduled for privatization four days before selling 51 per cent of its shares to the public.

Dr Li is confident that privatization will provide a solid framework for giving his organization a new structure and making it even more competitive. Going public will promote further differentiation as well as market segmentation. Dr Li expects cost advantages due to higher efficiency, resulting in further quality improvements. Without going into any detail, he mentions the necessity to push innovation in post-sales services.

He knows a shipyard has a number of options to keep its customers satisfied. “Quality control is not cheap, but CSBC will continue to focus on quality and service,” is his clear message. Regarding his strategic perspective, Dr Li emphasizes the option of vertical diversification: “We are not going to expand into unrelated sectors. Our core business is shipbuilding!” ■ OM

Photo: CSBC



PROFILE: CSBC

CSBC Corporation, Taiwan (literally “Taiwan International Shipbuilding”), CSBC for short, formerly known as China Shipbuilding Corporation, is a state-owned enterprise and the only large shipbuilder in Taiwan. It was established 1973.

With headquarters in Kaohsiung and shipyards in Kaohsiung and Keelung, CSBC produces ships for civilian and military use.

The Philippines are well on the way to becoming one of the most important shipbuilding countries of the world. Germanischer Lloyd is supporting the shipyards with engineering services on site

Philippine Perspectives

NEWCOMER.
Welding work
at a Philippine
shipyard.

Very soon, the Philippines could assume fourth place in the ranking of shipbuilding nations: this July, Hanjin Heavy Industries & Construction Philippines (HHIC-Phil) delivered the first cargo vessel constructed in the Philippines. The trailblazing ship was built at the new yard in Subic Bay, situated in the western part of the main island of Luzón – a three-hour drive from the country's capital, Manila. The orderbooks of the Korean yard are bursting: 43 ships are to be built in the Philippines by 2013 for eight different customers. The first 4,300-TEU ship marks the beginning of a new era.

At present, there are 2,261 ships sailing under the Philippine flag – making up a total of just over 8 million GT. The orderbook currently reflects 13 ships with 235,667 GT. In the past, shipbuilding in the Philippines was dominated by Tsuneishi Holdings Corporation, a Japanese investment company operating a shipyard on Cebu island. The yards of Keppel and FBMA Marine are also located there. Keppel, an investor from Singapore, has other yards in Subic and Batangas on Luzón. Activities were limited to repairs and the building of ships smaller than 4,300 TEU.

Herma Shipyard is the largest Philippine-owned yard, situated in Mariveles, 60 kilometres west of Manila. Its spectrum of services includes ship design and construction up to 6,000 dwt as well as ship repairs for tankers, self-propelled barges, passenger and commercial vessels, as well as ship transport vessels and military vessels up to 10,000 dwt. Besides Manila and Cebu, the most important Philippine ports are Davao and Zamboanga, both on Mindanao island. In

INTERVIEW



MARKET MAVEN.
Country Manager
Dr Holger Manzke.

nonstop: Earlier this year you were able to inspect the new HHIC shipyard on the Philippines. What was your impression?

Dr Manzke: I was quite surprised. What has emerged on the Philippines within a very short period of time is nothing less than one of the world's largest, most advanced shipyards. Its production organisation and material handling are state-of-the-art. Situated at a protected, natural deepwater bay, the shipyard has a highly motivated, English-speaking, low-cost workforce. Hanjin Heavy Industries & Construction Philippines considers itself a direct competitor of the well-established Korean shipyards. Indeed, it is in an excellent position to face any competition.

nonstop: How long has GL been in the Philippines? What services are offered to the customers there?

2006, HHIC expanded from South Korea to the Philippines, and is now investing in the construction of two new yards. In addition to Subic Bay, another Hanjin yard is being built in Misamis Oriental in the north of Mindanao.

HHIC is now turning to the Philippines because of the capacity constraints affecting docks in South Korea. Thanks to its 35 years of experience with infrastructure and construction projects here, the company knows the country well and is aware of the advantages it has to offer. Because the average age of the population is less than 23 years, there are many young workers on the labour market. What is more, the standard of education is very high and English is the second official language. Approximately 8 million of the 91 million Filipinos are permanently employed overseas. New work prospects are now opening up for Filipinos in their own country: 10,000 workers are currently already employed at the first HHIC shipyard; another 5,000 are still working parallel to these on the construction of the shipyard. In 2009, the number of people employed at the yard is to increase to 20,000. The second yard will eventually offer employment for 45,000 people.

Ambitious Expansion Plans

At the end of 2006, Philippine President Gloria Macapagal Arroyo approved a five-year plan for shipbuilding that had been drawn up by the Maritime Industry Authority (MARINA). As an agency of the Philippine government, MARINA is responsible for the development and regulation of the maritime industry. The aim of the five-year plan is to promote the expansion of the shipbuilding industry. This includes the investment by HHIC: the first yard cost over 1.6 billion US dollars, while the investment volume of the second is to exceed 2 billion US dollars.

These activities represent a golden opportunity for the Philippines, as the country could soon belong to the world's leading shipbuilding nations after South Korea, China and Japan. According to Lloyd's Register – Fairplay, the Philip-

PROFILE: PHILIPPINES

Archipelago in the western Pacific, Southeast Asia; about 7,100 islands; 860 of these are inhabited; eleven main islands

Form of government: presidential republic, 16 regions

Head of state and government: President Gloria Macapagal Arroyo

Capital: Manila

Official language: Filipino, English

Area: 300,000 km²

Population: 91,077,287 (298.2 per km²)

Currency: Philippine Peso (PHP)



ppines already ranked fourth on the country list of orders received in global shipbuilding at the end of 2007: 65 ships with 3.5 million GT and 1.9 per cent market share. A good result that is capable of further improvement.

The large Hanjin yard in Subic is currently building its first vessels to GL class: a total of six 4,300-TEU units for NSC Schiffahrtsgesellschaft in Germany. Eight more ships with 12,800 TEU are currently in the orderbook; the first steel is to be cut in November. Germanischer Lloyd is represented in the Philippines with its Country Office in Manila. Dr Holger Manzke has been the Country Manager since 1 January 2008. He predicts "a rosy future for shipbuilding in the Philippines" (see interview). ■ AN

For further information: Dr Holger Manzke, Country Manager Philippines, Phone: +63 2 8937720, E-Mail: holger.manzke@gl-group.com

Dr Manzke: GL opened its first station on the Philippines early in the nineties. Its core business was attendance to the ships under way, but we also had some newbuilding projects. We started with only one surveyor. Nowadays, we offer our full spectrum of services – from plan approval through to company audits and the certification of components. In former times, we concentrated on the ships in service, but in future our focus will be on newbuildings.

nonstop: How does the work of GL on the Philippines differ from that in China or Vietnam?

Dr Manzke: We certify the shipyard and do our work just as in any other country. With our know-how, we are providing valuable support for the yards during their build-up phase. Our task is to help improve the current quality standard of the Philippine yards. We started into the job with a high level of momentum, so that now the entire set of quality

standards can be applied. A large number of Philippine surveyors have been hired and are presently undergoing their training. Plan approval, which aims to support the yards and also assists with technical questions, will be carried out at a central point in Korea for the new yards in the Philippines and the existing HHIC yard in Korea.

nonstop: Can you outline what GL may expect on the Philippines in future?

Dr Manzke: If you consider the Philippines together with the yards of Hanjin, Keppel, Aboitiz and Tsuneishi, and if HHIC-Phil realized the plans concerning the second yard, the Philippines will become the number four shipbuilding nation". If the country continues along its present trajectory, then we have a rosy future for shipbuilding. It is planned that a total of twelve surveyors will be on site for GL by early 2009. Assuming that the Philippines succeeds in attracting more investors and follows the develop-

ment of Korea, for example, I am eager to see where this dynamic country will be in only five or ten years' time. It would be a positive development if the supply industry could gain a firm foothold here – that would give the country an enormous boost.

nonstop: What are your personal aims as Country Manager Philippines?

Dr Manzke: To start of with, I would like to put our everyday operations on the right course. But there are two other matters of importance for me. Firstly, I would like to have GL strategically positioned in the Philippines in such a way that every member of staff can be proud of the result. And secondly, our employees should understand that you also have to take on responsibility when working in another country.

The cooperation between Korea and the Philippines is very important from my viewpoint, and I think that it will be most productive in the next few years.

Four Cylinders to Power the Future

More efficient, less impact on the environment: with its new research engine "RTX 4", Wärtsilä promotes the development of low-speed two-stroke engines

A muffled swooshing noise, abruptly followed by a roar – and the gigantic shaft slowly begins to turn. It is running! It – that is, Wärtsilä's new research engine, logging its test hours in the Swiss city of Oberwinterthur, far removed from the seven seas.

It took about two years to develop the engine. Finally, on 30 May, the engineers of Wärtsilä were able to reap the benefits of their efforts: Ole Johansson, President and CEO of Wärtsilä Corporation, pushed the start button of the research engine "RTX 4". "Our customers expect nothing less than miracles from us," says Johansson as he puts his finger on the button. Customers want environment-friendly engines that work efficiently and are capable of burning a variety of fuel qualities. "We want to spread the message that we are taking the topic seriously. The research engine is an important milestone," says Johansson. The expense is immense: in 2007 the company invested roughly 120 million euros in research and development.

Of course, two-stroke-engine market leader MAN Diesel is also operating a test engine at its Copenhagen R&E centre. "In essence, the situation in our facility is not unlike that at Wärtsilä's," says Michael Melzer, head of MAN Diesel Corporate Communications. The two-stroke engine RTX 4 presented so extravagantly by the Swiss "Diesel Technology Centre" is not the first test motor the Finns have built. Its predecessor, the RTX 3 logged roughly 5,000 hours of operation over 12 years. Compared to an engine's life at sea, that may not be much; installed in the belly of a vessel, the engine would have had to survive 200,000 hours. But a research engine is not a series engine. Nearly every single part on this design is replaceable. While exchanging all the piston rings in every cylinder is a process that takes a number of days, the injector nozzles can be

Photo: Wärtsilä

ENGINE LAB. Wärtsilä's "Diesel Technology Centre" in Oberwinterthur, Switzerland.



NEW FOR OLD: RESEARCH ENGINES

	RTX 4	RTX 3
Year of manufacture:	2007	1995
Cylinders:	4	4
Cylinder bore (mm):	600	580
Volume per cylinder (litre):	636	636
Piston displacement (mm):	2,250	2,416
Piston speed (m/s):	8.6	8.5
Nominal speed (rpm):	114	105
Max. cylinder pressure (bar):	168	150
Output power (kW):	10,160	8,500
Dimensions (l x w x h, m)	11 x 9,7 x 10,8	9,1 x 8,3 x 10,8
Weight (tonnes):	ca. 200	ca. 230



Photo: Wärtsilä

Photo: Wärtsilä



“The new research engine is the backbone of our development efforts.”

Klaus Heim,
Vice President Global R&D Wärtsilä

replaced within a few hours. Being able to exchange individual components allows the researchers to test various part designs. This way they can gather information on the best approaches to optimizing parameters such as piston ring geometry or cylinder sleeves.

But there are limits to what a lab situation can show. “Contrary to a lab machine, a real-life ship engine must handle low fuel quality and frequent fuel quality changes, unique vibration conditions within the ship’s structure as well as on the shaft and propeller, longer continuous operating times, and in many cases, a lower skill level among the engine room personnel. All these are factors that cannot be simulated realistically in a lab,” says Klaus Heim, Vice President, Global Research and Development at Wärtsilä.

The requirements for ship diesel engines have become tougher, calling for improved operational safety, longer service intervals, lower fuel consumption, the ability to burn a variety of fuels, and lower exhaust gas emissions. This is what prompted Wärtsilä to have the new research engine built. Manufactured jointly with 3. Maj Shipbuilding Industry Ltd., Croatia, the new engine weighs over 200 tonnes and puts out 10,160 kW. “This new research engine is the backbone of our development efforts,” said Heim.

Thousands of Sensors Take Readings

“We didn’t want to use a series engine,” says Heim. The fully electronic engine control system makes it possible to influence the injection, exhaust-valve actuation, cylinder lubrication and compressed-air starting functions separately. The engine is designed to allow for further power increases, i.e. it can handle greater loads and moments if necessary. Injection, charging and cooling can be adjusted. “The need for further increases of output power is a result of market pressures to make engines more efficient (in terms of cost per kW) and more compact,” Heim explains.

The scientists take measurements wherever possible. “We have installed thousands of sensors,” says Heim. They read exhaust gas emissions, fuel consumption, pressures and temperatures. The engine can burn a variety of fuels, even biofuels not yet available on the market. “This enables realistic testing,” Heim continues. For Heim, the fuel of the future is definitely not black: “Ten years from now we will be burning natural gas, even in two-stroke engines.”

Emissions are a special focus of the Swiss scientists’ efforts. Of course, even the engine cannot reverse the laws of physics. “CO₂ is a result of efficiency,” Ole Johansson concedes. And he is aware of the fact that growth in the shipping business will eventually reach its limits. This is why Wärtsilä makes every effort to make engine operation more environment-friendly. The exhaust gas of the RTX 4 laboratory engine passes through a catalytic converter (SCR system) that filters out more than 90 per cent of the nitrogen oxides. Of course, the plant is set up to test a variety of alternate exhaust gas treatment systems. ■ DH

Photos: Wärtsilä



Doing Your Maths Right Will Make the Difference

The Common Structural Rules will certainly enhance safety at sea. With the right expertise, higher building costs, increased steel weight and a loss in daily payload the task can be managed

When the Common Structural Rules (CSR) for oil tankers (OT) and bulk carriers (BC), drawn up by the International Association of Classification Societies (IACS), came into force on 1 April 2006, the response from the industry was muted. How much heavier would the vessels become as a result? How much payload would be lost in daily business? What would be the overall costs?

Germanischer Lloyd was actively involved in the IACS Joint Bulker Group, which developed the CSR-BC regulations. The first GL-certified bulk carriers built according to these new regulations are now sailing. Some initial upgrading projects for a pre-CSR bulk carrier design have been completed successfully.

One of the biggest challenge is to minimize the additional amount of steel required. "It will take a major effort and some advanced engineering," says Arne Schulz-Heimbeck, CSR-BC expert with GL. He also represents the classification society in the IACS CSR-BC maintenance group. "We are talking about adding roughly 5 per cent of steel weight

to existing bulk carrier designs, depending on the size of the vessel and the way the new CSR-BC is applied."

Multi-purpose Software

As a tool designed to optimize steel distribution and weight, GL's POSEIDON ND offers ship architects a cost-effective software application for steel design and approval.

POSEIDON ND is a sophisticated, powerful computer-based tool for designing and analysing hull structures for all types of vessels and cross sections. It automatically determines the scantlings of all structural components based on rule requirements for vessel parameters, class notation, global bending, cargo loads and external sea pressure. Transverse and longitudinal member scantlings are determined interactively, accounting automatically for static and dynamic loads, structural geometry and allowable stress, fatigue and buckling-strength factors.

The user can easily alter the structural arrangements and scantlings to optimize weight and strength. And last but

Photo: Stockphoto

applied previously by GL. “We worked in-house to ensure close cooperation between our shipbuilding experts and the IT specialists,” says Schulz-Heimbeck. The ease of use, the familiar graphical user interface and the programme structure have been maintained so users can focus on design issues without having to learn new software functionality.

Challenges Worth Accepting

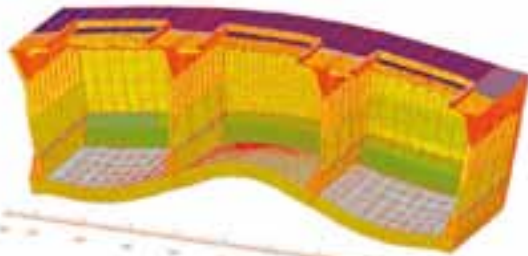
“The CSR rules have a significant impact on ship design. Initially our customers had a hard time familiarizing themselves with the rules and their implications. The demand for training and consulting services rose sharply,” reports Jan Rude, Ship Type Manager for the Bulk Carrier Section at GL.

But Rude is not complaining. He is firmly convinced that the advantages of the CSR rules by far outweigh any cost-related disadvantages. “What the toughened fatigue criteria, increased scantlings and greater steel-weight mean for the shipowner, apart from improved safety, is that a well-maintained ship built to the new rules will cause fewer structural problems and require fewer repairs and steel replacements during its service life. Shipyards and ship design offices will achieve long-term savings in terms of both money and time. Once a design is finished, it will work for all IACS classification companies.”

The CSR regulations eliminate the possibility of optimizing structural scantlings based on all the different sets of rules that have been around in the marketplace. But in no way does that mean classification societies are going to lose their individuality. “Each vessel is unique, even with CSR,” Jan Rude points out. The CSR regulations actually make your choice of the right classification society even more critical as customer service and support are becoming ever more important. GL assists its customers in handling the complex task of developing a well-balanced compromise between minimizing added ship weight and costs on one hand, and maintaining the commercial and operational competitiveness of the vessel on the other.

The Common Structural Rules are undergoing a dynamic evolutionary process. Feedback from the industry as well as from the CSR project teams will drive continuous improvements and updates. “The CSR rules require substantial support in the form of consulting services,” says Jan Rude. “This is the case now, and it won’t change in the future.” ■ NL

3-HOLD CARGO HOLD MODEL. Deformations for alternate loading condition.

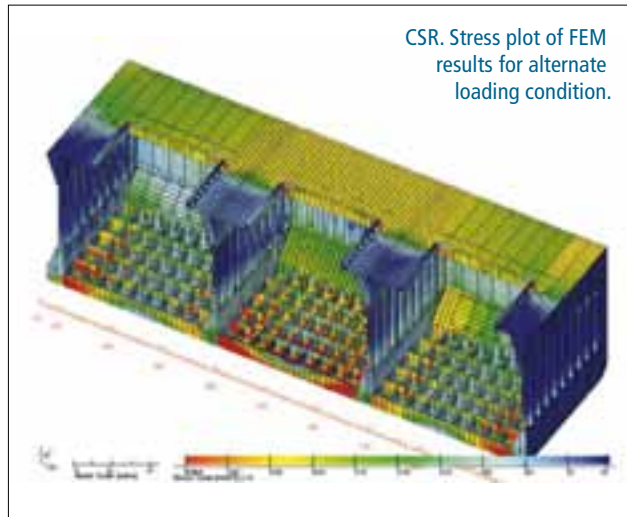


not least, POSEIDON ND automatically generates a finite element (FE) model for a ship’s structure as defined during the modelling and scantling phases. “POSEIDON ND is an outstanding tool for naval architects,” emphasizes Schulz-Heimbeck. The shipbuilding software POSEIDON has been extended to reflect the new body of rules. “The new release comes with two new integrated modules CSR-BC and CSR-OT,” says Schulz-Heimbeck. These modules can be activated upon the customer’s request. “We want to provide our customers with guidance regarding the application and interpretation of the complex Common Structural Rules and the use of POSEIDON,” explains Schulz-Heimbeck.

To offer the best possible support, GL provides POSEIDON software training to customer design personnel at their own sites. “We believe this kind of support will help our customers understand and implement CSR-BC while reducing their time and cost investment.” Programming the new software modules was a challenge. The new rules and regulations are very complex and differ fundamentally from those

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Free trial version: www.gl-group.com/poseidon

CSR. Stress plot of FEM results for alternate loading condition.





COMPETENCE.
70 engineers
research and
develop for the
RSHI group.

Photo: MAN

“We Want to Be China’s Premier Shipyard”

Less than three years on the market, but already one of China’s leading shipyards: Chen Qiang, President of Jiangsu Rongsheng Heavy Industries Co. Ltd. (RSHI), explains the corporate strategy of the successful Chinese Newcomer to *nonstop*

Its history is short but successful. Chinese Jiangsu Rongsheng Heavy Industries Co. Ltd. (RSHI), established less than three years ago, is a typical “greenfield shipyard” and a relatively new player in the shipbuilding industry. The company proves there are still ways for newcomers to succeed in this highly competitive market. Located on Changqingsha Island in Rugao City near Nantong, the shipyard covers an area of about four square kilometres with a 3.7 kilometre water frontage.

RSHI is a large and highly integrated heavy industry group whose main business units cover shipbuilding, ship repair, steel structures and engine manufacture. The yard is being set up to build a wide variety of ship types, including panamax-size and larger bulk carriers, tankers with sizes ranging from aframax to VLCC, LPG and LNG carriers, and

containerships of various sizes. Today, the yard employs more than 10,000 workers and has an orderbook of 90 vessels. Upon final completion in 2010, the yard will have a staff of 30,000 and an output of ten million dwt.

Strong Customer Focus

For a shipyard, it is of vital importance to understand future trends in global shipping. The worldwide shipbuilding market is headed towards overcapacity. “We are focusing on mass production. Thus our costs are lower compared to smaller shipyards,” Dr Chen Qiang explained his business approach at the China Committee meeting of Germanischer Lloyd in Shanghai two months ago.

With RSHI’s four dry docks of different sizes ready to build many different ship types, Dr Chen Qiang is promot-

CAPACITY. RSHI has with four dry docks of different sizes ready to build many different ship types..

Photo: Rongsheng

ing a varied product portfolio so the company will be prepared for an eventual decline in orders. Dr Chen is confident that offering high-quality vessels for international and national owners will allow the shipyard to prosper in the future. The company plans to go public on the Hong Kong stock exchange soon.

“Quality and customer orientation are our strengths,” says Dr Chen Qiang, who places great emphasis on meeting his customers’ expectations in every respect. His research and development department of 70 engineers is based in Shanghai. Dr Chen is contemplating possible ways of moving his best engineers closer to his customers, wondering whether Hamburg would be a good place for an office in Europe. Without doubt, Germany’s maritime centre has some unique selling points compared to cities like London or Athens.

Finding qualified employees is a challenge not only for RSHI but for the entire maritime industry. Dr Chen Qiang is networking closely with maritime universities and institutes in China. His contacts with Shanghai Jiaotong University and Harbin Engineering University are very helpful in identifying young potentials. As a naval architect and marine engineer he knows what it takes to build good ships. He also knows that having powerful facilities and a well-defined production process in place is a competitive advantage.

Asked for an example, Dr Chen Qiang doesn’t hesitate: RSHI owns an impressive dry dock measuring 540 m x 139.5 m and equipped with a 1200 t gantry crane – the largest dry dock currently found in China. RSHI can build containerships with a beam of up to 102 m and a length of up to 530 m. This infrastructure enables the shipbuilder to operate at maximum efficiency and adhere to tight production schedules. RSHI currently has a series of



6,500-TEU container vessels under construction. Two additional container vessel types with a capacity of 7,200 TEU and 8,500 TEU, respectively, are on the drawing board.

Sophisticated Software

Three additional dry docks allow fast processing times, greater flexibility and options for increasing the output further. The company plans to deliver at least 50 to 60 vessels annually in the future. Within a year’s time RSHI will deploy sophisticated simulation software to optimize the production process and cut dry dock time by 30 to 70 days. A special department is exclusively devoted to improving processes, work schedules and quality assurance. The yard builds panamax-sized and larger vessels. The current orderbook of Jiangsu Rongsheng Heavy Industries Co. Ltd. lists some forty suezmax oil tankers, 29 capesize bulk carriers, six 6,500-TEU containerships and twelve Panamax bulk carriers.

In addition to its land-based shipyards, RSHI is building an offshore yard covering an area of about 1.7 square kilometres with one large dry dock for building FPSO (floating production, storage and offloading) vessels as well as other offshore structures. Furthermore, RSHI is constructing a new low-speed-engine manufacturing plant in Hefei, Anhui Province, China. The factory is designed to build engines with a combined output of five million brake horsepower (3,600 MW) per year, which is equivalent to roughly 189 diesel engines.

Considering the gigantic effort involved in the construction of the shipyard, one wonders what might be the motives that drive people to accept such challenges. Dr Chen tells us about his vision: “We want to be China’s premier shipyard.” Having signed a co-operation agreement with Germanischer Lloyd recently, RSHI is certainly well on its way to making this dream come true. ■ OM



PARTNERS. Recently, Chinese Jiangsu Rongsheng Heavy Industries Co. Ltd. and Germanischer Lloyd agreed on a co-operation. GL’s Executive Dr Hermann J. Klein (r.) and Dr Chen Qiang (centre), President of RSHI signed the contract. Left: Jan-Olaf Probst, GL’s Head of Division Ship Newbuilding.

“Loreley, the famous rock and its fairy, is a location by the Rhine river near the town of Bingen where boatmen used to twist their necks in search of a blonde beauty, only to sink and drown. We change. So do the boatmen. The Rhine has been regulated and dammed up. Times pass. Today, people don’t die ‘passing water’ just because of a blonde woman combing her hair incessantly”

Erich Kästner

It was probably for poetic reasons that German author Erich Kästner, who wrote these humorous lines, omitted another reason why there are fewer inland waterway accidents today: detailed regulations. As in the world of ocean shipping, nearly every aspect of inland shipping, from engine power to crew numbers, is regulated.

The GL Academy seminar “National and International Regulations for Inland Waterway Shipping” offers a detailed overview of the relevant bodies of rules and regulations. Special emphasis is placed on technical requirements, in particular, the German Rhine Vessel Inspection Regulation (RheinSchUO) and the EU Regulation for the Carriage of Dangerous Substances on the Rhine (ADNR). “These regulations detailing technical requirements form the basis of most other regulations in force in Europe today,” says seminar instructor Torsten Dosdahl, an expert for the Special Craft department at GL.

Both RheinSchUO and ADNR were developed by the Central Commission for Navigation on the Rhine (CCNR) in Strasbourg, which includes all nations bordering on the Rhine plus Belgium. Carrying roughly 200,000 ships per year, the Rhine is Europe’s busiest waterway. In Germany alone, the Rhine accounts for 623 kilometres of the country’s 7,500 km of navigable waterways.

Technical Regulations

The RheinSchUO is currently the most important basis for technical regulations. It provides safety-relevant requirements for ship approval as well as for engine and rudder systems. In addition, it defines standards for strength, stability and equipment along with requirements for a ship’s stopping and manoeuvring properties. Furthermore, this regulation contains various special rules, such as conditions an ocean-going vessel must meet in order to navigate the Rhine. Ships longer than 110 m are covered in a special chapter. 110 metres used to be the maximum allowable length of any ship travelling the Rhine. With the advent of container shipping, that limit was extended to 135 m.

There are efforts underway at the European Union to implement consistent technical standards for all inland waterways across the EU. At the end of 2008, the existing EC directive 82/714/EEG will be replaced by 2006/87/EC. This new directive adopts the technical requirements of the RheinSchUO. An EC certificate not claiming any exceptions will then be sufficient for navigating the Rhine. However, since most Danube ships, among others, will not comply fully with the EU directives, it is unlikely that ships from Eastern Europe or other distant countries will be crowding the Rhine soon. Much like the RheinSchUO, the ADNR



Photo: Felix Koenig

We Change. So Do the Boatmen

International organizations are working to harmonize regulations for Europe’s inland waterways. Classification societies have rules of their own. A seminar offered by the GL Academy helps to get matters straight

is in a transitional stage. While primarily drafted for Rhine shipping, it applies to all waterways in all the countries bordering on the Rhine. Its coverage has been extended to include all national inland waterways by adoption into national regulations. In the case of Germany, the relevant code is the Ordinance on the Transportation of Dangerous Goods on Inland Waterways (GGVBinSch).

The ADNR defines technical and operational requirements for approving and operating inland vessels transporting hazardous goods. A list of hazardous goods that may be transported onboard inland ships is also includ-



HUB. The harbour of Duisburg is Europe’s biggest inland port.

Photo: von Kaler/Duisport



ed in the ADN. For the first time, the upcoming revision, ADN 2009, will provide additional information on the specific environmental hazards associated with each substance listed. "As a consequence of this, more and more substances will have to be transported in double-hull tanker vessels in the future," Torsten Dosedahl comments.

Yet Dosedahl expects the ADN to lose its significance in the long term. The Strasbourg working group in charge of further developing the ADN has been disbanded, he says. A new standard is in preparation, mostly based on the ADN: The European Provisions Concerning the International Carriage of Dangerous Goods by Inland Waterway (ADN). ADN Parts one through nine correspond to sections one to nine of the ADN. The ADN was developed by the Geneva-based UN Economic Commission for Europe (UNECE) for European inland waterways. It came into force in February 2008.

Class-Specific Regulations

All tanker vessels covered by the ADN, as well as fast inland ships as defined by the RheinSchUO, are subject to mandatory classification. Germanischer Lloyd has been accredited as a classification society for inland waterway ships by the countries bordering on the Rhine as well as Belgium. Whether inland tanker, solid-bulk barge, ferry or container vessel, Germanischer Lloyd offers a comprehensive array of engineering services for inland shipping. GL classifies all ship types subject to mandatory classification as well as vessels classified on a voluntary basis. Germanischer Lloyd also issues newbuilding certificates. The inland waterway fleet overseen by GL currently comprises 783 ships with a combined carrying capacity of 1,526,850 tonnes. The bigger part of these vessels sail under the German and Dutch flag. Most of the classified inland ships are oil or gas tankers; meanwhile the number of classified passenger ships is rising steadily.

GL, while applying its own rules, always stays abreast of new developments by virtue of its active involvement in various committees. GL has updated its rules for inland ships, incorporating the requirements of the most important international regulations such as RheinSchUO, ADN and ADN. The classification rules came into effect on 1 August 2006 and apply to all inland waterway vessels classed by Germanischer Lloyd, provided their newbuilding contract was signed on or after that date. In addition, the rules

Photo: Felder/Duisport



RHINE TRAFFIC. The container boom is an important growth factor for Europe's inland waterway shipping.

cover existing ships that are technically up to the standards of the rules.

The rules catalogue is divided into four sections: Classification and Survey; Ship Structure; Engine and Electrical Systems; and Additional Requirements for Class Notations. The rules essentially define the surveying criteria for class assignment, as well as engineering requirements for state-of-the-art inland waterway ships. The provisions for push-barge convoys, double hulls and hazardous cargo have been updated to reflect current technology. "While the rules were being developed, one major concern was to adequately account for advanced inland vessel designs," recalls Dosedahl.

Among the more revolutionary innovations, he adds, is the application of the Net Scantling Concept during the design and engineering process. This approach takes the corrosion additions into account directly instead of incorporating them into the formulae indirectly as used to be the case. All dimensions in the rules are net dimensions without corrosion additions. This allows design engineers to define corrosion addition individually, based on certain minimal limits provided by the rules.

"In the coming months and years, we should expect rapid and substantial changes in inland waterway shipping," says Dosedahl. GL's experts will assist their customers in the process by providing valuable advice. ■ NL

RELATED LINKS

www.ccr-zkr.org Central Commission for Navigation on the Rhine
www.elwis.de Electronic Waterway Information System providing information on inland and ocean shipping
www.bam.de German Federal Institute for Materials Research and Testing, Berlin
www.bmvbs.de German Federal Ministry of Transport, Building and Urban Affairs

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Photo: Yuri Arcurs/dreamstime

Always Up-to-Date

The shipping and maritime industries are changing rapidly. To help the affected staff members keep up with current developments, the GL Academy is continuing to expand its seminar programme

Demystifying technology, presenting new rules and regulations, refreshing the existing skills: only with the right advanced training and tuition measures can an enterprise manage to keep its personnel up to date with current trends and developments – an indispensable prerequisite for productive growth and competitive advantage.

The shipping and maritime industries, in particular are subject to permanent change. People working in these sectors constantly have to come to terms with new topics. Owing to the acute lack of expert personnel, companies are focusing on attracting career changers and qualifying them with suitable training measures. This is where the Germanischer Lloyd Academy comes in, with its wealth of expertise and worldwide support. "The modular structure makes it easier for the companies to find the appropriate offers

or to build up on the existing skill base," says Hans-Ulrich Schulze, Head of the GL Academy.

Broad Spectrum, Deep Content

The seminar programme has been extended with the topic headings "Finance, Insurance and Taxation", "Ship Operation" and "Management System DIN EN ISO 28000:2007" – while practice-oriented course content such as "Navigating in Adverse Weather Conditions" is intended specifically for shipboard personnel. "We have stocked up our offering by a total of 34 topics – with a main focus lying on the topic of ship technology," says Hans-Ulrich Schulze. ■ US

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NEW SEMINARS – SELECTION				
Title	Shipbuilding Basics	Navigating in Adverse Weather Conditions	Medium Voltage Installations on Seagoing Ships I – Basics	Basics in Ship Finance
Content	From design through the construction and operation of ships up to scrapping	Weak and strong points of modern ships in severe weather conditions; weather phenomena; how to handle the vessel to prevent damages and losses	Training in the use of MV installations with working voltages exceeding 1,000 V; raising awareness for accident risks, responsibilities for work activities, etc.	Basic structures of shipping finance and an explanation of the most important instruments of financing, on the basis of case studies
Course objective	Understanding of ship design and production; overview of the shipbuilding industry	Refreshing and deepening the knowledge necessary for handling the vessel according to the rules of good seamanship	Imparting of ■ basic principles of MV supply ■ functions of MV equipment ■ operational requirements and accident prevention regulations ■ particular risks	Gaining a basic knowledge of the financing of seagoing ships
Emphasis	■ Ship types ■ World market ■ Design ■ Construction ■ Ship and society (accidents, environment, responsibility)	■ Development of the weather over the past decades ■ Naval architecture ■ Weather phenomena ■ Responsibility of the master, officer of the watch, ship- owner/manager and charterer	■ Network design ■ Various faults in MV networks ■ MV components ■ Work procedures ■ Safety rules in operation ■ Responsibility for work activities and electrical installation ■ Particular risks	■ Structuring a shipping finance project ■ Instruments of financing with equity and debt ■ Closed-end ship funds (German KG model) ■ Commercial bank ship loans
Target groups	Employees in the maritime industries (except naval architects and crew), new staff and lateral hires	Masters, nautical officers and shore personnel concerned with familiarizing, training and auditing ships' officers	Crew such as ship's electrician, ship's electro-technician, chief engineer, 1st/2nd engineer; (electrical) superintendents; companies supplying MV systems, etc.	Newly employed and laterally hired personnel in the shipping industry without any formal qualifications in this field; refresher training
Requirements	Interest in ships and the maritime industries	Certificate of Competency (nautical)	Electrical basics	Basic maritime knowledge, or participation in the course "Shipping Basics"
Duration	1 day	0.5 days	1 day	1 day

What's Sprouting in Brussels?

Photo: European Community 2007

Booming container traffic, bigger ships: Europe's ports are struggling with bottlenecks, congestion and delays. Massive investment is needed to expand port and terminal capacities. Plans for a new EU directive are meeting with scepticism

To date, there has been no EU secondary legislation on service concessions for ports and other terminal facilities. That is quite all right: following a one-year consultation process among industry stakeholders, the EU Commission's Directorate-General Transport agreed in 2007 to continue applying the general competition rules of the EU Treaty.

But a new initiative threatens to introduce regulations through the backdoor: the Directorate-General Internal Market wants a possible EU directive on concessions to be applied to ports, as well. Port authorities and terminal operators are anticipating legal uncertainty.

Unresolved Issues

The EU Commission is urging the creation of an internal market in the services sector governed by the fundamental principles of equal treatment, transparency and proportionality. The EU Commission considers port services generally as public service contracts. It wants to enforce an open, transparent process for granting concessions. The EU Commission is currently conducting an impact assessment, a precondition for any legislative initiative. Two issues are highly controversial:

- **Methods of awarding concessions:** The EU Commission might impose mandatory tendering of service concessions in ports. A tendering procedure is a tedious, time-consuming process – disproportionately so for small-scale concessions, as some would argue. Also, rejected bidders going to court could stall the process.
- **Duration and extension of concessions:** The EU Commission holds that upon expiration, concessions must be advertised anew. Port business stakeholders disagree, saying that the resulting inflexibility would bring new investments to a halt. This in return would compromise productivity, competition and employment in the port sector. The duration of concessions, critics say, must be proportional to the depreciation of investments, allowing a reasonable return on investment while maintaining the risk inherent in exploitation.

Critical Voices

The port sector unanimously demands flexibility. Most stakeholders have joined calls for the EU Commission to



LOBBYIST.
Dr Mary Papaschinopoulou.

exclude port concessions from the envisioned directive.

FEPOR (Federation of European Private Port Operators) prefers either no provisions on concessions at all, or precise legislation allowing long concession durations that foster large private investments in a secure legal framework. Other demands – besides predictability – are expansion options and adequate connecting infrastructures.

ESPO (European Sea Ports Organisation) believes that terminal-awarding arrangements are very useful governance tools for European public port authorities to ensure intra-port competition. Port managing bodies view concessions as a strong instrument against powerful international terminal operators.

ESPO fears that the globalization of shipowners and terminal operators will marginalize port authorities as the only remaining local player. ESPO urges any EU legislative initiative to allow port authorities to stipulate the selection criteria for concessions as they deem appropriate.

ESCA (European Community Shipowners' Association) wants sufficient port capacity and hinterland connections as well as a competitive environment. Shipowners therefore oppose any interference on the European level, including strict EU rules on concessions.

For **ESC** (European Shippers' Council), avoiding service provider monopolies through competition is a key issue. Shippers demand that a tendering procedure should be mandatory if any limitations on service providers are imposed. Concession terms should encourage investments and competition.

CLECAT (European Association for Forwarding, Transport, Logistic and Custom Services) believes that mandatory tendering would ensure non-discriminatory access to the operation of port facilities. However, concession durations should be long enough to encourage investments and allow a proper return.

ETF (European Transport Workers' Federation) supports the terminal operators in their demand for long-term concessions including extension clauses to avoid repeated awarding processes and protect employment.

The legislative proposal of the EU Commission is expected for 2009. The same year a newly-elected European Parliament and a new European Commission will take charge. With some member states opposing a directive on concessions, the future of the proposal is entirely open. ■ MP

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service

Dates at a Glance

SEPTEMBER

23.09. – 24.09.2008
Hamburg Offshore Wind Conference
Hamburg, Germany
www.gl-group.com/how

23.09. – 26.09.2008
SMM
Hamburg, Germany
www.hamburg-messe.de/smm

OCTOBER

15.10. – 16.10.2008
Workshop Cool Pharma
Brussels, Belgium
www.coolchain.org

23.10. – 24.10.2008
3. European Conference on

Production Technologies in Shipbuilding
Stralsund, Germany
www.ecpts.de

27.10. – 28.10.2008
Container Shipping Conference
Amsterdam, Netherlands
www.lrfairplayevents.com

NOVEMBER

01.11. – 04.11.2008
UDT Pacific
Sydney, Australia
www.udt-pacific.com

05.11. – 08.11.2008
Shipport China
Dalian, China
www.shipport.com.cn

26.11. – 28.11.2008
Inmex China
Guangzhou, China
www.inmexchina.com

DECEMBER

02.12. – 03.12.2008
Exponaval
Vina Del Mar, Chile
www.exponaval.cl

03.12. – 05.12.2008
Workboat Show
New Orleans, USA
www.workboatshow.com

14.12. – 16.12.2008
Seatrade Middle East
Dunai, UAE
www.seatrademiddleeast.com

14.12. – 16.12.2008
Boat India
Kochin, India
www.boatindia08.com

APRIL 2009

22.04. – 23.04.2009
Welding in Shipbuilding and Civic Engineering
Hamburg, Germany
Registration: tagung-schweissen@gl-group.com

27.04. – 28.04.2009
SAFEDOR Final Conference
London, UK
www.safedor.org

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 > Client Support > Rules & Guidelines

I – Ship Technology

Part 1 – Seagoing Ships

Chapter 1

Hull Structures 2008-06-01

Chapter 2

Machinery Installations 2008-06-15

Chapter 6

Liquefied Gas Carriers 2008-07-01

Chapter 7

Chemical Tankers 2008-07-01

III – Naval Ship Technology

Part 2 – Sub-Surface Ships

Chapter 1

Submarines 2008-06-01

IACS Common Structural Rules and GL Complementary Rules

Bulk Carriers

Volume 1

Common Structural Rules 2008-07-01

Volume 2

Complementary Rules 2008-06-01

Double Hull Oil Tankers

Volume 1

Common Structural Rules 2008-07-01

Volume 2

Complementary Rules 2008-06-01

CD-ROMs

GL Rules and Programs 10.0

Selected Rules & Guidelines incl. Programmed Hull Structural Rules for Specific Ship Types 2008

Poseidon ND 8.0

Strength Assessment Tool for Hull Structures of Seagoing Ships 2008

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Staff Changes

David Brown, Lead Quality Representative for the Europe/Middle East/Asia region, now also holds the position of Quality Representative for the North-East Europe area.

David Lister Brown is the new Managing Director of Advantia's Spadeadam test site.

Robison Chennappillil has been promoted to Regional Inspection Coordinator and Head of Inspection for Industrial Services.

Miguel da Costa has been appointed Country Manager Portugal.

Yu Han is the new Station Manager Nantong (China). His predecessor **Ma Jianmin** is now Training Coordinator at the TC Shanghai.

Torben Jørgensen takes over the management of the Country Office Denmark, in addition to his other positions.

Abdelkrim Lasari is the new Station Manager in Algiers.

Mathias Steck has been Department Manager for Regenerative Energies in the Asia region since August.

GL Academy

Selected Seminars (in English): information and registration: academy@gl-group.com

OCTOBER

07.10. – 08.10.2008
Implementation and Internal Auditing of an Environmental Management System in Shipping
Limassol, Cyprus

09.10. – 10.10.2008
Designated Person Ashore (DPA) Training Course
Shanghai, China

13.10. – 15.10.2008
ICETRAIN Course for Deck Officers
Helsinki, Finland

16.10. – 17.10.2008
Designated Person Ashore (DPA) Training Course
Singapore, Singapore

17.10.2008
Methods of Technical Risk Analysis in Shipbuilding
Busan, Korea

20.10. – 21.10.2008
Application of Risk Assessment in TMSA
Taipei, Taiwan

22.10.2008
Practical Aspects of Corrosion Protection for Shipping Companies and Shipyards
Piraeus, Greece

22.10.2008
Ballast Water Management
Taipei, Taiwan

23.10.2008
Methods of Technical Risk Analysis in Shipbuilding
Shanghai, China

24.10.2008
Ballast Water Management
Hong Kong, China

28.10.2008
Damages to Machinery and Repairs
Busan, Korea

29.10.2008
Damages to Hull and Equipment
Busan, Korea

29.10.2008
Practical Aspects of Corrosion Protection for Shipping Companies and Shipyards
Limassol, Cyprus

30.10.2008
Damages to Machinery and Repairs
Haiphong, Vietnam

30.10.2008
Insurance for Ship Operation
St. Petersburg, Russia

30.10. – 31.10.2008
Handling and Transportation of Dangerous Goods
Tokyo, Japan

31.10.2008
Damages to Hull and Equipment
Haiphong, Vietnam

NOVEMBER

03.11.2008
Damages to Machinery and Repairs
Mumbai, India

03.11. – 04.11.2008
Handling and Transportation of Dangerous Goods
Busan, Korea

03.11. – 04.11.2008
Designated Person and ISM Basics
Colombo, Sri Lanka

04.11.2008
Damages to Hull and Equipment
Mumbai, India

05.11.2008
Damages to Machinery and Repairs
Singapore, Singapore

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news

MANAGEMENT SYSTEMS

New Requirements for ISO Certifiers

Certification agencies for management systems must be accredited. The international requirements for accreditation have been revised and harmonized. The new standard, DIN EN ISO/IEC 17021, will come into effect on 15 September 2008.

It defines the requirements for organizations that audit and certify management systems, replacing the existing ISO/IEC Guide 62:1996 and ISO/IEC Guide 66:1999, among other standards.

The Changes

The certification audit for management systems is subdivided into two partial audits: the Phase-I Audit assesses the initial situation at the customer facility, while the Phase-II Audit is the actual certification audit.

Pure ISO Certification

The initial follow-up audit must be conducted no later than twelve months and no sooner than nine months after the first

audit (initial audit). The renewal audit, along with the certification decision by the certification body's office, must occur within three months before expiry of the valid ISO certificate. However, the renewal audit must be held within twelve months after the most recent audit.

Combined ISM/ISO Certification

The surveillance audit must be conducted within the valid time window of the annual ISM office audit. However, the renewal audit, including the certification decision of the certification body's office, must occur within the last three months before expiry of the valid ISO certificate.

Due to the shortened follow-up auditing cycles, it will be essential to schedule and conduct audits at an early time. Failure to adhere to the time limits will cause the certificate to be suspended. To reinstate a suspended certificate, the customer has to undergo recertification, normally.



WIND ENERGY

Technical Note for Fire

How can fires on wind turbines be extinguished or, even better, prevented entirely? The first units belonging to the German offshore wind farm "alpha ventus" in the North Sea are due to be installed in 2009. In the years to come, twelve plants will generate enough electricity for 50,000 households. Any failure of one of these plants, e.g. through fire, would lead to considerable expense.

At the "Husum Wind" trade fair in September 2008, Germanischer Lloyd



DEAL. GL took over the vendor- and site- inspection company MCS. The company was established in 2000.

ACQUISITION

Germanischer Lloyd Joins Forces with MCS

US-based "Material Consulting Services, Inc." (MCS) is the latest addition to the Germanischer Lloyd Group. With the acquisition of the vendor- and site-inspection company based in Houston, Texas, the GL Group yet again expands its service portfolio for the oil and gas industry.

High-Quality Supplier. "With MCS, the GL Group adds significant expertise in the tubular and downhole equipment sector to its offer of services," said Pekka Paasivaara, Member of GL's Executive Board. "In addition, the GL Group is increasing its scope in the

global third-party inspection business." MCS provides quality-assurance and quality control services to the oil and gas industry. The company focuses on the upstream sector and is a renowned specialist in downhole equipment and tubular goods. Experience includes projects in the USA and the Gulf area, the Middle East and South East Asia.

MCS operates from their headquarters in Houston and further locations in Lafayette, Muskogee and Dubai. Together with Advantica and PV Inspection, MCS will operate from the GLO skills base in Houston.

WIND FARM.
Effective fire
protection systems
minimize the risks.

CANADA

Helimax: Strategic Network

Wind resource assessment; harvesting of wind energy; wind energy in electrical power systems and techno-economic models and optimization: these topics are on the agenda of the new strategic wind-energy research and development network that has recently been created with the financial support of the Natural Sciences and Engineering Research Council (NSERC).

Concentrated Competence. With financing over five years, this network brings together 16 Canadian universities, federal (including NRCan and EC) and provincial (including Hydro-Quebec and Manitoba Hydro) agencies, institutional partners of the wind sector (including CanWEA and the CORUS Centre) as well as Helimax as representative of the private sector.

This new research network's objective is to affirm and reinforce Canadian wind energy expertise on the international level. The network will help train 153 students and ensure the transfer of know-how and technological advances to the wind industry.

Protection Systems

presented its Technical Note for Fire Protection Systems. This document allows manufacturers, owners, operators, investors and underwriters to minimize risk and to initiate corrective measures in good time.

Reliable Protection. It addresses the topic of fire protection systems and the corresponding requirements for manufacturers. Safety concepts and tests, condition monitoring and regular inspections are also examined. The Technical Note sets out uniform

requirements regarding effective and reliable fire protection systems for wind turbines and the certification of such systems. In addition, it includes methods for the certification of fire protection systems.

Germanischer Lloyd will be happy to send you a copy of the new Technical Note for Fire Protection Systems.

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MEXICO

Supervising 5,000 Petrol Stations

Petróleos Mexicanos (PEMEX) has been a client of GL for over 20 years. Throughout this period, GL has certified more than 600 onshore installations, some 100 marine offshore platforms and 18,000 kilometres of pipeline for Mexico's national petroleum company. Now GLO has accepted the responsibility of supervising 5,002 PEMEX petrol stations in Mexico for compliance with the highest technical standards for safety, ecology, service and operation.

Frequent Inspections. The three-year contract covers five of the eight geographical regions of PEMEX's nationwide network of filling stations. Each station

will have to be inspected three times a year. This means that 28 inspectors of GLO Mexico will have to handle a total number of 51,210 site visits.

The audits must take place during the maintenance hours of the stations. This allows the inspectors to check the operation of all equipment and accessories, such as pumps, nozzles, quick-acting valves, emergency systems, dispenser-pump sensors and storage tanks along with inventory control and electronic leak detection systems.

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CONTRACT. Three times a year, Germanischer Lloyd will inspect about 5,000 PEMEX petrol stations.



FLANGE. The advanced technology of SUPERBOLT® makes it possible to preload bolts with greater precision.

Photo: P&S

Tight Connections

Bolted connections are quintessential in wind turbine engineering. The tower, the rotor, the gearbox and the generator all have to withstand the severest weather conditions. But nuts and bolts aren't all the same

A semi-centennial squall comes once every 50 years – statistically speaking. With a bit of luck, a wind turbine with its average 20-year life expectancy will never have to withstand such forces of nature. Yet if a gust of wind presses against a turbine with full force, there shouldn't be any grinding, let alone cracking.

This is why wind turbines are designed from the drafting board stage for that maximum blast. Experts use sophisticated computer software to calculate all conceivable load conditions. Or they test components in the lab, if necessary all the way to their fracture. Bolted joints – a wind turbine has thousands of them – play a key role in the load bearing capacity of the entire unit. Over the years, bolted connections must withstand enormous loads.

Various Forces

Bolted connections are separable joints holding two or several parts together by applying pressure, thus increasing friction as well. They are exposed to numerous influences, from freezing cold to sizzling heat, from rain to snow and ice. Then there are various mechanical forces, such as centrifugal, gyroscopic and weight forces. "What makes matters more complicated," says GL expert Fabio Pollicino, "is the fact that wind doesn't simply approach the turbine in a uniform manner, sort of like a wall of wind."

In fact, wind blows with various strengths at different heights, causing different concurrent loads. A rotor blade passing through the highest point of its trajectory may be facing entirely different loads and wind directions than a blade passing through the lowest position. Of course, the idea for the engineer is to convert as much of these loads as possible into electric energy. But some of the load is always lost, acting instead on the structure and, in particular, on the bolted connections. Relatively speaking, the foot of a wind turbine tower has to bear the greatest loads. Large turbines of the multi-megawatt class therefore have more than one hundred M36-size bolts and bigger anchored in the foundation to firmly root the power plant, which may be up to 120 m tall, in the base.

The bolt type used most frequently is the metric hexagonal head bolt. A nut accounts for the required preloading force. Nuts are usually tightened using hydraulic tools. During the tightening process, the bolt stretches somewhat.

In doing so, it acts like a spring, compressing the materials it clamps together. This is why bolt torque is of pivotal importance. The bolted connection will be unable to perform as expected unless the prestress is applied exactly as calculated. But influencing factors such as conditions of lubrication can cause errors. Using clean and defined lubricated hardware is therefore essential.

But even perfect lubrication cannot prevent some variation of the torque, and thus, the prestressing of the bolt. "In typical bolted joints, we often have a variation range of roughly 20 per cent," says Pollicino. "Being able to fine-tune the preloading precisely will improve the connection," he adds. Recently, Germanischer Lloyd examined an advanced technology for preloading bolts with greater precision, called "SUPERBOLT®".

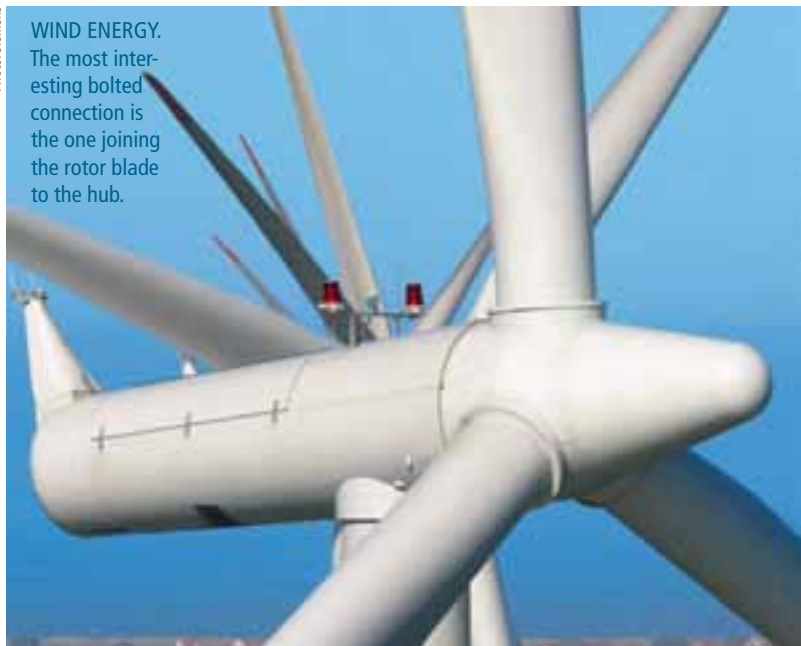
The Supernut

The special nut developed by Swiss company P&S Vorspannsysteme AG might more aptly be called a "preloading device". Installed into the face of the nut are many small screws in a circular arrangement. They all push against a pressure plate, jointly applying the same physical force as one large screw – with one important difference: it is much easier to tighten many small screws than one big one. Such preloading devices have been in use in the industry for quite some time, keeping the shafts of large presses or cranes in position, for example.

Recently the "SUPERBOLT®" technology was certified by Germanischer Lloyd for windpower applications, as well. "Obtaining this certification was a first step. In the near future we intend to have the 'tightening factor' aspect type approved, as well," says Reto Rieder, head of the P&S engineering department. Piezo elements offer another pos- →

Photo: Siemens

WIND ENERGY.
The most interesting bolted connection is the one joining the rotor blade to the hub.





SUPERBOLT®. Arranged in a circle on the face of each nut, the small pressure screws generate the desired prestress within the large bolt. The pressure screws can be tightened much more easily.

the right hardware, the GL engineers use their simulation software to survey the chosen bolt size necessary to withstand even the strongest gusts. "These calculations take into account the full range of wind and equipment-related parameters," Pollicino explains.

The most interesting bolted connection, according to Pollicino, is the one joining the rotor blade to the hub. The rotor blades, made of fibre composites, for example must be fitted with steelthreaded inserts that will receive the mounting bolts. These inserts are bonded into the blade root.

An excessive bolt torque may damage the rotor blade. The bearing between the rotor blade and hub makes it even more difficult due to possible deformation.

One Billion Load Changes

The sheer number of load changes affecting a wind turbine during its lifetime is stunning. A comparison with an automobile reveals different worlds: An average wind turbine operates for approximately 170,000 hours during its lifecycle. A typical passenger car has to survive no more than 5,000 operating hours. The number of load changes the structure of a wind turbine has to withstand is similarly gargantuan: roughly one billion, compared to about 100,000 in the case of a car. But load changes aren't all the same. "Greater alternating loads have more dramatic effects," Pollicino points out. To illustrate this, he uses the example of a piece of wire: the more often you bend it forwards and backwards, the sooner it will break. The same principle applies to a wind turbine tower – except that you would have to bend it several billion times to make it break. ■ DH

→ sibility of measuring the forces acting on bolted connections. These devices can be used to monitor bolt length by ultrasound, possible even during operation. They can detect the overstressing of a bolt beyond its yield strength, for example. "This technology enables a comparatively exact measuring of the bolt's pre-load and is therefore ideally suited for condition monitoring systems too," Pollicino explains.

Section by Section

Let us take a look at the example of a wind turbine tower. Towers are manufactured in sections to facilitate transport. These sections are bolted together at the destination site. In most cases, the cylindrical, rolled-steel sections have welded L-type flanges at each end. These flanges feature drilled bolt holes. As the pipe sections are assembled on top of each other, the bolts are inserted. Even during the manufacturing stage, certain tolerances occur with respect to flange flatness. When transported the section may be further deformed. Quite frequently these gigantic steel parts arrive at the construction site with their original manufactured precision compromised to some extent. Technicians must add thin steel shims between flanges to correct for the resulting alignment errors. This avoids wasting the strength of the bolts on merely holding the structure together, preserving it instead for resisting wind loads.

Once the wind turbine has been installed, it is ready to face the wind. Given the cylindrical cross section of the tower, the bolted joints arranged in a circular pattern are never loaded evenly. "The external force partially exceeds the prestress," says Pollicino. The bolts located on the wind-facing side of the tower are stretched while the bolts on the opposite side are relieved. The tower sections tilt away from the wind, rocking the flanges and creating a virtual "gap" on the windward side. Of course, there isn't a real gap that you could see through. But the bolts are stressed longitudinally to the extreme. Depending on the type, bolts can have different elastic properties. But all elasticity ends when the bolt reaches its yield point. If the yield point is exceeded, the bolt suffers a lasting, plastic deformation, compromising the design strength of the bolted connection.

So the goal is to avoid reaching the yield point. To accomplish this, engineers call for properly dimensioned bolts and tightening torque values to provide the necessary preload. To make sure the technicians assembling the turbine will use

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THE SCIENCE OF NUTS AND BOLTS

Nuts and bolts are standardized. They are assigned to one of several strength categories. Their key properties are minimum tensile strength and yield strength. The value is embossed onto the bolt head, such as 8.8 or 10.9. The first number multiplied by 100 the minimum tensile strength (e.g. 10.9 \cong 10x100), one-tenth of the second number multiplied by the first result indicates the minimum yield strength (e.g. 10.9 \cong 0.9x1000), both in Newtons per square millimetre (N/mm²). In addition there are differences in the way bolts are manufactured. The biggest screw used in a wind turbine is an M64.



DRUDGERY. In 1942, 16 of these 88 kg heavy bolts were used for the construction of a 75,000 kW generator as part of the Grand Coulee Dam (USA).

What Weak Link? – Field-Joint Coating Options

by Ian Thompson, Senior Consultant, Advantica Ltd.

Background

1 Background

Pipelines are accepted as the most efficient and safe means of transporting liquids and gases over long distances. Today, ever increasing demands for longer, larger-diameter onshore pipelines and deeper water offshore pipeline construction has seen the pipeline protection industry at the forefront of the technology needed to maintain the integrity of these structures.

The operating temperatures of some current and many future developments are pushing anti-corrosion coatings to their limit forcing operators into un-chartered territory with regard to the long-term behaviour of these materials. As mainline coatings have been developed to accommodate the ever increasing demands due to higher temperature service and the requirement for improved mechanical properties, requirements for field-joint coatings have also increased.

Significant Experience

This article describes the field-joint coatings currently used in the pipeline industry and information generated as a result of Advantica's significant experience over the past 25 years in the development, testing, application and in-service performance monitoring of these materials.

Selecting the correct coating material is essential for long-term protection of pipelines and for providing a cost-effective solution to corrosion protection. Corrosion protection is afforded to a pipeline by a combination of coatings and cathodic protection (CP), and the requirements for the coating system will vary depending on:

- Method of installation
- Service temperature
- Construction methods
- Operating conditions

It is desirable, where possible, to match the properties of the field-joint coating (FJC) with those of the mainline coating. In addition, the FJC process must accommodate the rapid production cycle times demanded during pipe spooling and pipe-lay operations.

Mainline Coatings



FIGURE 1. Induction heating coil and powder spray units.

2 Mainline Coatings

Although historically, coal tar enamel, bitumen and 2-layer polyethylene (PE) coatings have been used for pipeline protection, in more recent times the use of single and dual layer fusion-bonded epoxy (FBE), and 3-layer polyethylene (PE) or polypropylene (PP) coatings have predominated – 3-layer polyolefin coatings consist of an FBE primer, an intermediate copolymer layer and of a thick outer layer of PE or PP.

The focus of this article will be on field-joint coating systems used in conjunction with FBE and 3-layer polyolefin mainline coatings.

Field-Joint Coating Options for FBE Mainline Coatings

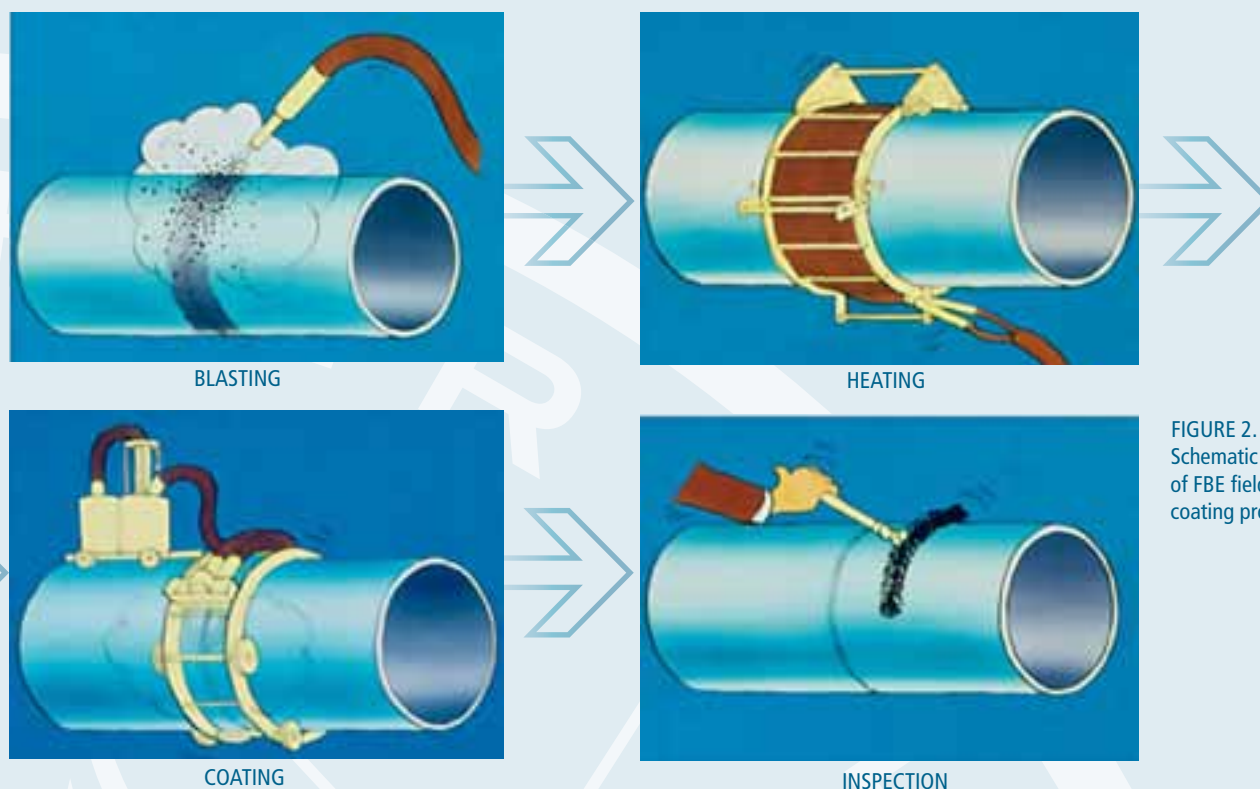


FIGURE 2. Schematic drawing of FBE field-joint coating process.

3 Field-Joint Coating Options for FBE Mainline Coatings

3.1 Fusion-Bonded Epoxy

Fusion-bonded epoxy is the preferred field-joint coating material where FBE mainline coatings have been employed. The process utilizes semi-automated equipment (Figures 1 and 2) to replicate, in the field, the mainline coating process. FBE application to field-joints allows coating cycle times of the order of 6–10 minutes to be achieved facilitating rapid production.

In order to achieve rapid heating of the field-joint and hence application of the FBE powder, induction heating coils are employed. Experience within Advantica has shown that the arrangement of the coil is crucial to the

success of the process. If the induction coil is not concentric with the pipe, and the coil windings not equally spaced, significant axial and radial temperature variations will occur. This can lead to foaming within the FBE film in excessively hot areas and undercure in colder regions of the field-joint. Procedure trials, to qualify the FJC process prior to production coating, are an essential part of any FJC contract.

Some FBE coatings are more susceptible to water absorption than others and, if stored for long periods prior to construction, may absorb excessive amounts of water into their film. During the induction-heating stage of the field-joint coating process, this water will be driven from the film.

Problems of Heating

Due to the high heating rate (~100 °C/min), the water cannot escape in a controlled manner, →

Field-Joint Coating Options for FBE Mainline Coatings

FIGURE 3. Heat blistering of FBE coating during field-joint preheating.



FIGURE 4. Blistering due to mismetering or inefficient mixing of MCLs.



→ often resulting in blistering of the mainline coating (Figure 3). The problem is often more severe on thin-wall pipe, which tends to heat more quickly. Test methods developed by Advantica have allowed operators to identify and avoid the use of FBE mainline coatings that are susceptible to heat blistering.

Changes in the Mechanical Properties

There is increasing interest within the industry in the use of high-strength steels for the transportation of gas. Where FBE field-joint coatings are to be employed, an operator must be aware of the potential for changes in the mechanical properties of the steel as a result of the heating stage of the FJC process.

Before these higher-strength materials (typically grades greater than X80) are adopted, it is important that a good understanding of the effects of induction heating, both as part of the mainline and field-joint coating process, is established. Of particular interest to Advantica are:

- The effects of FBE application temperatures on the mechanical properties of high strength steels
- The availability of lower-temperature curing FBEs which will avoid the use of high preheat temperatures
- The ability to achieve the recommended FBE coating thickness at these lower application temperatures both in the coating mill and in the field

- The effect of lower application temperatures on the ultimate properties of the FJC

3.2 Multi-Component Liquids (MCLs)

Multi-component liquids (MCL) – two-pack polyurethane, epoxy urethane, novalac and phenolic coatings – are frequently employed to protect the field-joints of FBE-coated pipe. They can be applied using manual or automated spray equipment or by hand (roller/brush/trowel).

When automated spray equipment is employed, fast cycle times can be achieved. Because the drying/curing times of these materials are dictated by temperature, in colder climates preheating/post heating may be required to accelerate cure and to reduce the cycle times between coating and ditching the pipeline.

The most frequently encountered problem with MCLs occurs through incorrect metering or inefficient mixing of the base and curing agent. This may prevent the coating from curing or may result in blistering (Figure 3 and 4). In many instances, blisters may not develop until after the pipe is buried.

Rapid Reaction

When excess curing agent is present in the mix of a polyurethane coating, it reacts with moisture in the air to form carbon-dioxide gas. The pressure created within the film causes the

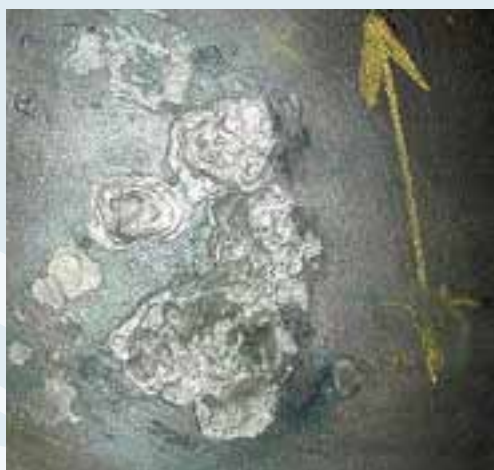


FIGURE 5. Microbially influenced corrosion that has occurred under a disbanded coating.

coating to blister. The reaction is more rapid at elevated temperature, and exposure to sunshine during the period subsequent to application may accelerate blistering.

Heat-blister testing, performed as part of the quality control process, may alert an applicator to metering/mixing problems. Where hand application is employed mismetering should be less of a problem as the two components of the MCL are supplied in pre-metered containers.

Experience within Advantica has shown that liquid coatings can provide comparable performance to FBE mainline coatings, if correctly applied, and production rates as high as 350 joints per day are possible.

3.3 Heat Shrink Sleeves (HSSs)

Heat Shrink Sleeves (HSSs) have been extensively used to protect the field-joints on FBE-coated pipe. On large diameter pipe it is difficult to achieve uniformity of heating and hence consistency of application. The use of induction heating coils helps alleviate this problem but will increase cost due to the associated equipment required to power these coils.

Although HSSs are claimed to be applicable to manually-prepared substrates, it is the view of the author that application should always take place over a grit-blasted surface. There is a greater tendency for HSSs to disbond when applied over mechanically prepared substrates and once disbonded, it may shield CP

current and allow conditions to generate under-film that can be conducive to microbially influenced corrosion (Figure 5) or near-neutral stress corrosion cracking.

Sensitive Sleeves

Due to their thermoplastic nature, sleeves will be more sensitive to soil stressing – as →



FIGURE 6. Wrinkling of HSS under the influence of soil loading and stressing.

Field-Joint Coating Options for 3-Layer PE and PP Coatings

FIGURE 7. Soil stressing of an HSS at elevated temperature service.



→ a consequence of drying high-shrinkage clays (Figure 6) during temperature variations e.g. downstream of compressor stations (Figure 7). For elevated temperature service (> 80 °C) polypropylene sleeves, based on hot melt adhesives, rather than mastics, may provide greater resistance to soil stressing. Heat shrink sleeves are a very convenient method of protecting field-joints and facilitate rapid reeling and pipe lay.

4 Field-Joint Coating Options for 3-Layer PE and PP Coatings

Heat shrink sleeves have tended to become the standard field-joint coating for 3-layer polyolefin mainline coatings.

The difficulty achieving uniformity of heating on large-diameter pipe, and deterioration in the adhesion of the 3-layer coating due to the preheat temperature employed during application of the sleeve, can compromise the performance of the field-joint and mainline coatings.

4.1 Multi-Component Liquid (MCL)

Multi-component liquid (MCL) coatings are frequently employed to protect the field-joints of 3-layer coated pipe. Although they provide excellent performance when applied directly to steel, the greatest challenge is to achieve good intercoat adhesion between the MCL and the 3-layer mainline coating. One way to overcome this problem is to apply the 3-layer coating with an FBE tail (Figure 8) which then forms the primary overlap region.

The overlap of the MCL onto the outer polyolefin layer of the 3-layer coating then acts as a secondary bond. Other methods of promoting adhesion between the 3-layer and FJC involve the use of pre-treatments which encourage chemical bonding between the two materials and heat treatment of the polyolefin overlap region.

Adequate Flexibility

Because of the thermoplastic nature of polyolefins, and the thermosetting nature of the MCL, it is essential that the FJC process promotes adequate cure and hence flexibility of

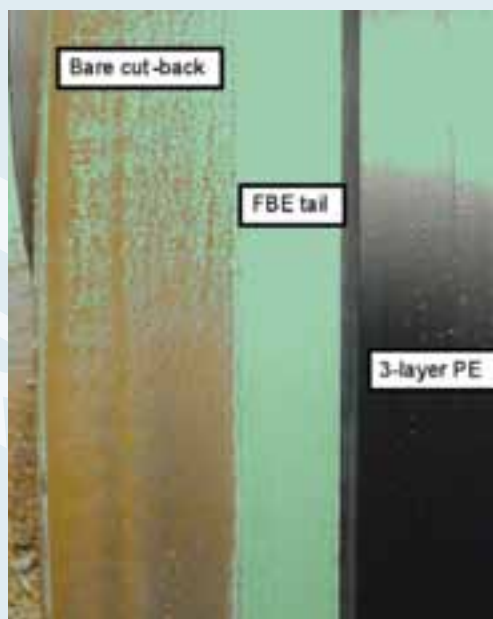


FIGURE 8. FBE tail to facilitate adhesion of MCL field-joint coating.

the MCL. Failure to achieve this criterion may result in cracking at the overlap region of the mainline and FJC.

4.2 Sintered PE or PP Copolymers

Sintered PE or PP copolymers can be used to protect the field-joints of 3-layer PE or PP coated line pipe. The process involves flock spraying (a technique of propelling small particles of powder onto a hot substrate using a jet of compressed air) the copolymer after application of the FBE layer.

The residual heat in the joint causes the copolymer to melt and coalesce. The time delay between application of the FBE and copolymer is critical in terms of the intercoat adhesion; this is often helped by the use of FBEs with extended gel time.

The process of induction-heating the field-joint may disrupt the adhesion of the mainline coating. An adhesion weakness may also exist at the overlap region between the factory and joint coating. Due to the low thermal conductivity of the polymer the coating thickness is self-limiting (< 1 mm) and the outer layer tends to be porous.

4.3 PE or PP Tape Wrap

PE or PP tape wrap is the most recent development for protection of field-joints on 3-layer polyolefin mainline coatings. After applying an FBE and copolymer layer, the tape is applied by a heat-assisted spirally-wrapped tape application machine.

The major advantage of this technique is that it is claimed to produce no discernable interface at the overlap region of the mainline and field-joint coating. It is important that the material properties of the polyolefin layer of the mainline and field-joint coatings are as closely matched as practical.

4.4 Flame Spraying

Flame spraying can be used to replicate the 3-layer PP mainline coating at the field-joint (Figure 9, next page).

After applying the FBE and copolymer layers, PP powder is propelled through a flame spray gun using an inert gas (nitrogen) to achieve the required coating thickness. The main problem with this application technique is that it is extremely difficult to control the parameters →

Conclusions

FIGURE 9.
Flame spray
application
of PP.



→ that most influence the performance of the individual layers. FJCs of this type require highly-skilled applicators and are extremely time consuming to apply on larger-diameter pipe thus making the overall application expensive.

4.5 Injection Moulding

Injection moulding can be used to apply the final PP layer in a 3-layer field-joint coating. This process is similar to that described above for flame spraying, the only exception being that the final PP layer is extruded rather than flame sprayed. The injection moulding process is claimed to weld the factory and field-joint coatings together. Field-joints made using this technology are likely to be more consistent, but still have the disadvantage of being restrictive in terms of size and are slow and expensive to produce.

4.6 Co-Extruded Polypropylene Sheet

Co-extruded polypropylene sheet provides a field-joint coating with similar properties to a 3-layer PP mainline coating. Prior to application of the co-extruded sheet, FBE and polypropylene co-polymer are applied by flock spray. The co-extruded polypropylene sheet

needs to be preheated, prior to application, to reduce its inherent stiffness.

The sheet is sealed to the factory coating along the longitudinal and horizontal edges by extrusion welding using polypropylene. Although a significant number of field-joints have been coated using this technique, there is some evidence that cracking in the PP welds occurs in service.

5 Conclusion

Experience has shown that there is no reason why field-joint coatings should be the weak link within the overall pipeline-coating process. Field-joint coating techniques are currently available suitable for all commonly-used mainline coating systems, to apply field-joint coatings which will equal the performance of the mainline coating. It is essential, however, that independent procedure qualification trials are conducted before production coating commences to eliminate any application problems and to optimize the performance of the field-joint-coating.



PROFILE: ADVANTICA

Advantica is a global engineering consultancy providing a range of technical expertise, engineering services and software solutions designed to enhance safety and performance in the energy and water sectors. Areas of expertise include: planning and design, operational performance, safety and integrity, and testing and certification. Advantica is a GL company.

For further information: www.advanticagroup.com

Top Marks for Medical Products

MEDCERT, specializing in testing and certifying medical devices, marks the inauguration of an industry partner group in China and the opening of a new office in Beijing

Blood-pressure monitors, infusion pumps, heart valves: the demand for specialized medical devices continues to rise. The reasons are obvious: In the western hemisphere, the average age of the population is steadily increasing. At the same time, an ever larger number of people around the world have access to advanced medical care. Naturally, the growing demand is a boost for the supply side.

Today, medical equipment and special devices are developed and manufactured in many countries around the globe. But they must all be able to convince both patients and doctors that they are reliable, safe and clean. Before they can be sold legally, these products must be checked for compliance with national regulations. "The demand for registration and certification services is growing," says Klaus-Dieter Ziel, Managing Director of MEDCERT, a subsidiary of Germanischer Lloyd specializing in testing and certifying medical equipment and devices.

World-Wide Exports

In China, interest in the service offerings of the GL subsidiary has been especially strong. At the inaugural meeting of the "MEDCERT Partner Expert Club" (MPEC) in Shanghai in April, medical experts along with government and industry representatives discussed possible ways for Chinese manufacturers to obtain CE certification for their medical devices. CE certification is a prerequisite for marketing medical devices in Europe. "It is a challenge for medi- →

MEDICAL TECHNOLOGY. Certification of medical equipment and devices is an area with plenty of growth potential.

Photo: iStockphoto



Photos: Medcert

LEADERSHIP. MEDCERT Country Manager Peggy Wang Li and Frank Wilmerstädt, Director of Certification, at the MPEC inaugural meeting in Shanghai.

→ cal equipment manufacturers to keep up with the large number of different market-specific requirements. Sharing this knowledge is one of the objectives of the newly-established MPEC here in China,” says MEDCERT Managing Director Ziel.

China is the fourth largest medical device market in the world, following the United States, Europe and Japan. Within five to seven years, the country is expected to surpass Japan and take third place. The manufacturing industry is concentrated in the Pearl River and Yangtze River deltas as well as the Circum Bohai Sea region. All of these areas offer conditions favourable to industrial growth, such as a strong local technology base, a large talent pool, a relatively solid clinical medical foundation and preferential treatment by the government. The combined output and sales volumes of these three regions account for over 80 per cent of the national total.

Gaining Access to the European Market

The factors that make CE certification desirable are quite obvious: the CE label is mandatory for medical products sold in Europe, a market serving more than 500 million consumers. In addition, Australia, New Zealand and Egypt also accept CE certification as a substitute equivalent to their respective national certification programmes. “If a manufacturer passes CE, it can enjoy many added benefits around the world,” says Ziel. As early as August 1994, MEDCERT was accredited as a certification body for the 93/42/EEC directive by the EU Commission in Brussels. “We were among the first bodies accredited in Europe,” remembers Ziel. He and his team are serving the medical industry in more than 30 countries, providing certification services for CE, ISO 13485 and MDD 93/42/EEC.

In China MEDCERT, headed by Country Manager Peggy Wang Li, operates from offices in Shenzhen, Shanghai as well as a new office in Beijing that opened in May 2008. MEDCERT is a regular exhibitor at the China International



PRESENTATION I. MEDCERT Managing Director Klaus-Dieter Ziel explains the new requirements of the revised CE directive.



EXPERTS. Chinese medical-equipment manufacturers are targeting Europe.

CE-MARKING



The CE label is a mandatory proof of conformity required on many products sold on the common market within the European Economic Area (EEA). “CE” is an acronym for the French term “Conformité Européenne” (“European Compliance”). It certifies that a product meets the relevant EU safety requirements to ensure consumer safety.

Photos: Medcert



DISCUSSION. The members of the “MEDCERT Partner Expert Club” explored the benefits of obtaining European certification for medical devices.



PRESENTATION 2. About 3,000 Chinese companies manufacture medical devices for export.



COUNTRY MANAGER. Peggy Wang’s intimate familiarity with the market makes her an excellent point of contact at MEDCERT for Chinese manufacturers.



INTERNATIONAL. The team of MEDCERT Managing Director Klaus-Dieter Ziel are serving the medical industry in more than 30 countries.

Medical Equipment Fair, Asia’s most important exhibition for medical technology. MEDCERT experts frequently appear as lecturers in educational sessions during the fair. In July 2007, MEDCERT completed the first CE certification for a Class IIb product. By the end of that year, 20 manufacturers had requested certification services from MEDCERT. 3,000 Chinese medical device manufacturers sell products abroad. The interest in independent certification is therefore considerable. “Because of the high demand, certification now takes place directly in China,” says Wang Li. MEDCERT is one of only six accredited notified bodies to certify medical devices according to CE, ISO 13485 and MDD 93/42/EEC.

The CE regulation was revised in 2007. Members of the MEDCERT Partners Expert Club have been eager to hear about the changes. Development of the CE regulation continues as past experience is gathered and incorporated. For the consumer, this ongoing process translates into enhanced safety levels.

Applicable Standards

“It makes a difference whether a medical device is in contact with intact skin or inside the body,” explains Wang. Medical equipment is assigned to any of several different risk classes depending on its invasiveness into the human body, the duration of its uninterrupted contact, or the nature of its contact with human tissue. In most cases, Quality System Certification is the basis for CE labelling. ISO 13485 in conjunction with AC:2007 is recognized internationally as a standard. CE-labelled products must be tested against the applicable standards and demonstrate compliance through test reports. The so-called “Technical File” prepared by the manufacturer comprises product data, risk analyses and clinical data as well as the Declaration of Conformity (DOC) and the general description of the device. During a certification process, the technical file is reviewed by MEDCERT.

MEDCERT’s brochure “A simplified Guide for non-European Manufacturers to CE marking of Medical Devices according to Directive 93/42/EEC” gives a general conspectus of this process. It is available from MEDCERT. ■ SNB

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SYMBOL. In Southeast Asia, the gecko is traditionally deemed to be a mojo.

Photo: Chris Schmid | Dreamstime

A Lucky Charm in Southeast Asia

Is Malaysia the place to be for the oil and gas industry? The management of Talisman Energy thinks so. Germanischer Lloyd supports the company with engineering services

Jonathan Wright is ambitious. “We call Southeast Asia the ‘Third Leg of the Stool’ and it is the third largest operating area of Talisman. So of course our goal is to make it the largest.” The VP of Talisman Energy’s Southeast Asia operations heads more than 600 people in the Kuala Lumpur area. “A little friendly competition never hurts,” he says of the growth aspirations of the Talisman Southeast Asia teams. It seems he has a sound basis for his optimism: in Malaysia, Talisman produces roughly 80,000 barrels a day from their own operations. After the share of partners Petronas and PetroVietnam, Talisman’s net is about half of that.

“In the region, Malaysia represents our biggest short term production increase. We have a production growth of 30+ per cent planned in the next year and a half,” Wright explained at a meeting in May. “We are currently building and installing the four platforms that are going to obtain that growth.” They are for the Bunga Orkid Project in the Northern Fields, east of West Malaysia, “You are just catching us in the middle of a project,” Jonathan Wright said. All wellhead platforms have been installed and two drilling rigs are currently active on the initial 52 development wells. Gas was scheduled to come on stream in the middle of this year and in July Talisman announced that this had been achieved. Full field-development oil production is to commence in the first quarter 2009.

Asia’s Appeal

Southeast Asia is undergoing an unprecedented period of growth caused by urbanization, industrialization, and increasing population. As a result, primary energy demand growth has been ten per cent per annum in recent years with typical GDP growth of five to seven per cent across

Photo: Shutterstock



LOCATION. A Talisman project in the South China Sea.

Photo: Talisman Energy



STRATEGIST. Jonathan Wright is Vice President of Talisman Malaysia Limited. The mechanical engineer has been with Talisman since 1995. The Canadian national has been in Malaysia for almost two years.

the region. The oil and gas fields in that region are not as mature as in other parts of the world. In turn, many resources are yet to be found. Countries are eager to attract foreign investment and also seek foreign technology and technical capability to access these resources. Foreign companies are required to partner with government entities to share investments, learning and profits. “We are continually looking at ways to access business opportunities,” says Jonathan Wright explaining Talisman’s strategy. “Our typical history is we will bid for new exploration land, we will swap properties, we will acquire properties for cash. As long as the base opportunity of oil and gas prospect looks material enough and looks to be a good technical and financial prospect it is worth looking at.”

In Malaysia, petroleum is the main mineral resource. Petroleum and natural gas discoveries in oil fields off Sabah, Sarawak and Terengganu have contributed much to the Malaysian economy. On 1 January 2007, Petronas reported that oil and gas reserves in Malaysia amounted to 20.18 billion barrels of oil equivalent. The government estimates that at current production rates Malaysia will be able to produce oil for up to 18 years and gas for 35 years.

On a thin strip of waters half way from Malaysia to Vietnam, oil and gas exploration is operated jointly by both countries. “Vietnam and Malaysia were able to agree →

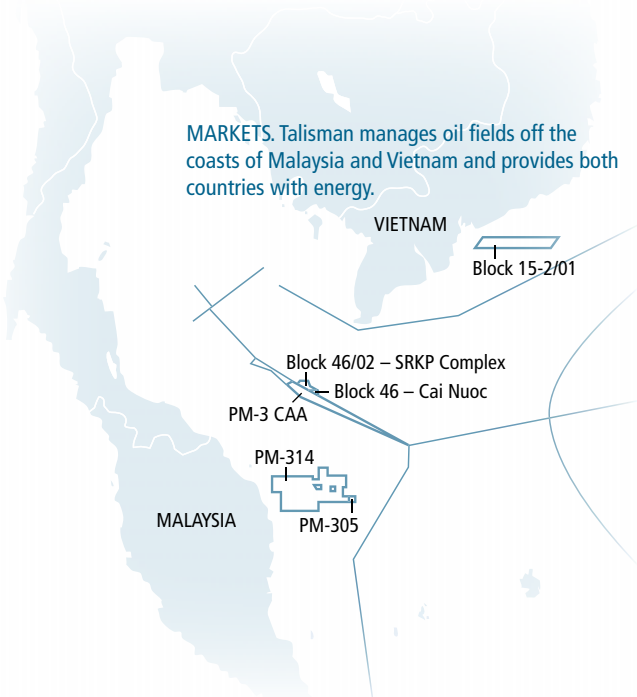


Photo: Mayumi Terao/Stockphoto

DOUBLE YIELD. LNG production and oil platforms.

→ on a split at the border and that is why we partner with both Petrovietnam and Petronas,” Wright describes his operating scenario.

In the PM-3 Commercial Arrangement Area, the Northern Fields are fairly new. Talisman has been developing the Southern Fields complex and producing since 2003. “Talisman supplies energy to both countries.” Oil is exported via a floating storage tanker and gas is sold equally between the large markets on Peninsular Malaysia and the new power plant complex at Cau Mau in Vietnam.

A Long History

In the recent development of the Northern Field, Talisman has been contracting Germanischer Lloyd for certification. But cooperation goes back even further. “We have a long history with GL,” says Wright. Talisman bought the assets of Lundin Malaysia, a Swedish-Malaysian company. Germanischer Lloyd had already been working for them since 2001 from their office in Kuala Lumpur, head office for the oil and gas business in the Asia-Pacific region.

How do they benefit from Germanischer Lloyd’s expertise? “They are ‘eyes on the ground’ for us. GL helps us on site, catching things early and ensuring personnel are following procedures,” says Wright. The certification body has provided certification, design review and examined the engineering process. The work is about compliance with standards in the design phase, monitoring manufacture of new installations and taking material samples. Also deliveries are checked against the order lists. “We have peace of mind,” Wright summarizes.

Vietnam Ventures

What about Vietnam? “Small production with a very, very big future!” says Wright. The main prospects are oil, he is convinced, but gas can be explored as well. “Our Vietnamese operation is our smallest one, but the fastest growing in this region. Production is about to begin, at a field called Song Doc.” Here, Talisman will be working in partnership with PetroVietnam under the joint operating companies Thang Long and Truong Son. In January, the company successfully tested the Hai Su Den exploration well offshore Vietnam. The result: the second oil discovery, after Hai Su Trang in 2007. Recognizing the tremendous opportunities in Vietnam in exploration, development, and cooperation

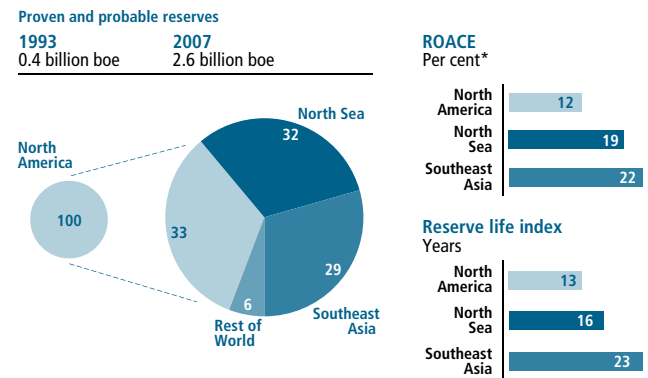
the country will remain a key location in Talisman’s global growth strategy.

From the office in Jakarta, Talisman runs some operating and largely non-operated production. Much of it is land-based. “But we have some good deep-water drilling leases in Indonesia. Deep-water exploration starts next year, so we have good prospects for exploration opportunities there. It’s higher risk but high impact,” Wright is confident. In the so-called Corridor Block on the island of Sumatra, Talisman has a huge gas field still being drilled in partnership with operator ConocoPhillips. Talisman also signed a memorandum of understanding with Pertamina, the national oil company, which provides the opportunity to evaluate and participate in two enhanced oil recovery projects. The investment is rather long-term. “It probably takes five to seven years to develop new ideas, redevelop, and actually bring the structures into production.” Talisman estimates that roughly 75 per cent of yet to be found resources in Asia sit in the extensive under-explored basins of the Indonesian archipelago.

Floating LNG

But also areas less in the focus of international politics are of interest to Talisman: “Papua New Guinea has a reasonable amount of oil and gas but has difficulties monetizing it. It’s not a large market,” Wright characterizes the difficulties in exploring their natural gas acreage. Previous

PERSPECTIVES. Southeast Asia has become an important part of Talisman’s oil and gas business – and offers bright prospects.



attempts by the industry to build a pipeline to Australia were not successful and were cancelled. Jonathan Wright now wants to put a new technology to the test. "We started looking at 'Floating LNG'. It is an emerging technology that we think is going to work in this market."

In this concept, existing LNG production technology is combined with that used by floating, production, storage and offloading (FPSO) vessels: "You take an LNG tanker and put it on permanent station. On its deck you install all the equipment, but much smaller than you would onshore, to actually liquefy the gas processed offshore," Wright says. The benefit is clear: this flexible plant is used for offshore gas fields that are either too small or too remote to be developed economically on their own. With floating LNG, these "stranded" gas reserves may become accessible. The largest savings will be realized through reduced investments in related infrastructure.

The future is almost present: "Technology didn't exist but has been coming along well so that now it is close on the horizon," Wright explains. "We think it is a combination of energy demand, pricing and technology that might be able to work for us. We're working hard to make that happen for floating LNG."

Adding Accountability

Talisman has recognized that a demonstrated ability to conduct operations in a safe and environmentally responsible way has direct bearing on its people, reputation and business success. "We do a number of things in all areas," Wright underlines the high standards. The concept is continuous improvement.

Wright says that the element of corporate responsibility (CR) has always been an important ingredient in the way Talisman runs its business. In addition to its declared Corporate Social Responsibility programme and health, safety and environment management systems, the company adheres to the different governmental regulations. The targets and focus vary by area due to the diversity of operating environments. "For example, in Canada we have a very stringent minimal flaring policy, whereas in the North Sea we have shown good leadership in minimizing trace oil in water discharge."

Talisman has also dedicated itself to developing a new generation of local oil and gas industry professionals. "We couldn't do things without our people." The challenge is to find these technical people to undertake the planned growth. In Malaysia, Talisman develops junior professionals in a training & new graduate programme. "We have an active new graduate hiring programme, a university scholarship programme and a strong on-the-job training and career-development programme. It's good for Malaysia and it's good for us." The company also sends Malaysian staff overseas to gain experience. Talisman has to meet the challenge of all business-to-business companies: with no downstream business, the company has not been a household name in Malaysia. Attracting the attention of students needs heightened efforts.

The company supports charitable social and environmental initiatives of their employees in addition to company-led initiatives. They contributed to victims of a local flood and funded bird watching activities. In addition, Talisman is a participant in the world's largest corporate citizenship initiative, UN Global Compact.

Today, Southeast Asia already accounts for nearly 25 per cent of Talisman's total production. Producing rough-

Photo: Talisman Energy



TRANSPORT. A Talisman topside being transported to its destination, the PM-3 project between Malaysia and Vietnam.

ly 91,000 boe/d in the second quarter of 2008, Indonesia takes the lion's share of the net results. Operations in Malaysia and Vietnam follow. Besides those existing operating properties for oil & gas production, Jonathan Wright is eager to search for more: "We are looking in any country or region where we think we can apply our skills and have good growth at reasonable returns." Which area is he looking at? "Here in KL, we are very focused on finding another opportunity beyond the Northern Fields to continue growing within Malaysia. Beyond that we are always interested in opportunities in Vietnam, Indonesia, and points beyond in Southeast Asia."

Largest Growth Area

In the entire region, Talisman is in various stages of business development. "In some countries we are just looking, in some we have acquired new blocks, and in others we are already planning the drilling." Jonathan Wright is confident about the future: "It's a big region and that is why we are here. But overall, if you look at the 5- to 10-year frame, Southeast Asia, being the third largest area for Talisman, is currently the fastest growing. We like it!" ■ SNB



TALISMAN ENERGY

Talisman Energy is an oil and gas exploration and production company originating in Calgary, / Canada. Besides North America, the North Sea (UK and Norway) and Southeast Asia are their main operation areas. In Canada, Talisman operations are mostly land-based, but most international operations are offshore. Established in 1992, production has grown from 50,000 boe/d to 452,000 boe/d in 2007. Talisman produces both oil (54 per cent) and natural gas (46 per cent). In the past, the company has grown mainly as a result of mergers and acquisitions, and as such has a complex history and large diversity of holdings. Talisman is listed on the Toronto and New York stock exchanges.

www.talisman-energy.com

Quality is Everything

German ironworks Hammerschmiede Hans van Triel specialize in the manufacture of flanges and other custom forged parts made of corrosion-resistant special steel. Companies from the booming oil and gas sector are among the best customers of the family-owned business

Essen is a city right in the heart of Germany's Ruhr area, for decades the nation's bustling coal-mining and steelmaking district. Essen, home town of the Krupp family and its heavy-industry empire, emerged as one of Germany's leading industrial centres in the 20th century. In 1951, during the early days of Germany's miraculous post-

war rebirth as an industrial country, a young master blacksmith, Hans van Triel, gave up his good job at Krupp to start up his own business. In the big Krupp city, the young, daring entrepreneur opened a small forge and machine shop, called "Bauschlosserei und Elektrischer Schmiedebetrieb".

Today, Hammerschmiede Hans van Triel is the well-respected name of a well-established specialist manufacturer. The company focuses on the production of flanges and forged products made from corrosion-resistant special steels. The annual output is impressive: serving customers around the world, Hammerschmiede Hans van Triel manufacture over 1,000 metric tonnes of flanges out of stainless steel and other special steels each year. Much of the production comprises non-standard parts made to customer specifications. In particular, the booming oil and natural gas industry has been a steady source of orders for discs, rings, flanges, forged fittings, pipe sheets and custom



GL PRÜFLABOR

GL's subsidiary Germanischer Lloyd Prüflabor GmbH (GLP) is the materials and failure analysis business segment of GL. In its four laboratories, the company performs destructive and non-destructive tests of metallurgical materials. Apart from routine tests using advanced methods and equipment, the GLP labs provide damage analysis services as well as support for inquiries in the domain of material science. The lab facilities include a sample workshop that can handle parts of up to 2 metric tonnes, as well as a wide variety of equipment for destructive testing, metallography, scanning electron microscopy and X-ray emission analysis. Located in Hamburg, Mülheim, Herne and Stuttgart, respectively, the four GLP labs have a total workforce of over 50 employees.

The **non-destructive testing** technologies employed include ultrasonic tests of rolled, cast and forged products as well as welded joints using the pulse-echo method or magnetic particle

HISTORY: HAMMERSCHMIEDE HANS VAN TRIEL

On 1 April 1951 Hans van Triel established a small machine and forgery shop in Essen which he called "Bauschlosserei und Elektrischer Schmiedebetrieb". In its early years, his shop repaired farming equipment, reshod horses and carried out other kinds of metal and fitting works.

Growing demand prompted the company to purchase its first new forging hammer in 1959. This investment allowed van Triel to begin manufacturing flanges and other forged parts from corrosion-resistant high-grade steels.

From the very beginning, the production of custom flanges and other forged parts to customer drawings and specifications was among the strengths of the company. Furthermore, van Triel began accepting orders for parts made of corrosion and heat-resistant special materials.

Another milestone in the technological evolution of van Triel was the purchase of an ANDROMAT manipulator robot, dubbed

"the blacksmith's strong arm". This enabled the company to forge and handle parts weighing up to half a tonne.

The van Triel facilities, covering the entire range of production steps from sawing to shipping in four large halls and arranged in production sequence, currently occupy an area of 8,000 m². The customers primarily include companies in the mechanical engineering, chemical and petrochemical industries as well as

manufacturers of mechanical devices and containers. Van Triel exports approximately 70 to 80 per cent of its production output.



SPECIALIST. Production halls of the Essen ironworks.

forged parts from Essen. The customer base also includes companies in the mechanical engineering, chemical, and power-plant engineering industries.

Quality Materials

Van Triel offers its customers a full range of manufacturing processes, from cutting blanks on band saws and open-die forging of parts up to 760 mm in diameter to heat treating, machining and final quality assurance.

The 100-some employees of the iron works don't sit idle – the global demand for high-quality custom parts keeps rising. Especially the oil and gas industry is in need of precision-manufactured parts: in recent years, oil exploration has advanced into ever deeper formations, especially in deep-sea areas where massive oil deposits have been discovered. The materials and equipment used in offshore exploration, drilling and production must withstand enor-

mous physical forces. As a consequence, they must meet stringent quality and strength requirements.

"For Hammerschmiede van Triel, the quality of our products is a top priority," explains managing director Manfred van Triel. To guarantee consistent quality, the company has been contracting Germanischer Lloyd's inspection laboratory in nearby Herne for years to renew its certification as a manufacturer of industrial parts and materials. This certification programme, based on GL rules, provides an approval process for the manufacture of die and open-die forged parts made of austenite as well as ferrite-austenite steels and nickel alloys.

The co-operation between the manufacturer and the GL lab in Herne dates back more than 20 years. In addition to the certification programme, GL supports the ironworks by providing destructive and non-destructive material-testing services. ■ SG

inspection based on leakage flux. Furthermore, the spectrum of testing methods offered by the GLP labs comprises techniques such as dye penetration testing, wall and layer thickness measurements using magnetic induction, dimensional and surface quality inspection, endoscopy and non-stationary metallography, hardness testing and spectrometry.

On the other hand, the labs' methods of destructive material testing address the need to determine characteristic properties of specific materials. They include tensile tests with or without microstrain measurement, hot tensile tests at temperatures up to 1,000 °C as well as notched bar impact bending tests at up to 196 °C. In addition, GLP offers macro-hardness tests on materials and welded joints or microhardness tests. GL lab experts also analyse the technical properties of materials by way of bending, flattening, ring expanding, ring tensile and weld bead bend tests.

EXPLORATION. The reserves of the Greater Plutonio oil fields off the Angolan coast are estimated at 750 million barrels.

The FPSO (Floating Production, Storage and Offloading) vessel Greater Plutonio (above) and the drilling ship Pride, which are deployed in the region, use van Triel technology.





ARRANGEMENT. During an inclining test, known weights produce a heeling moment for measuring the change in the equilibrium heel angle.

Tested Inclination

A ship's cargo influences its stability and safety. In a class-relevant inclining test, experts from Germanischer Lloyd examine the actual loading capacity of new cargo ships

A key question for any cargo ship is how much cargo it can carry. To ensure it really can take on as much as the engineers have stated in the building specifications, and to determine the parameters of its stability, the vessel must undergo a so-called "inclining test" just before sea trial. This class-relevant test must occur in the presence of a GL surveyor. Because it is a complex test, there are usually two surveyors present.

Exact Measurements

The goal is to determine the ship's centres of gravity in a longitudinal, transversal and vertical direction, as well as the light-ship displacement. For the inclining test the vessel should be nearly complete and ready for delivery. During the test additional weights not belonging to the light ship should be reduced to a minimum.

During the test, a series of known weights are moved in a transverse direction with the ship floating in the water. This produces a heeling moment. The result-

ing change in the equilibrium heel angle is measured accurately. In combination with other measurements, such as seawater density, and the basic principles of naval architecture, all the readings are used to calculate the light-ship displacement and the ship's centre of gravity.

Extensive Tests

It is important for the ship to be moored in a quiet, sheltered area free from extraneous forces such as propeller wash from passing vessels. Freeboard and draught readings must be taken to establish the position of the waterline and determine the displacement of the ship immediately before the inclining test. The Germanischer Lloyd Instructions to Surveyors recommend a minimum of six freeboard readings.

The test results are calculated by the designer or the shipyard using the lines plan of the ship, its cross curves and hydrostatic data, tank sounding tables, keel profile and draught mark corrections, and other engineering data. They are then presented to Germanischer Lloyd for approval. ■ AN

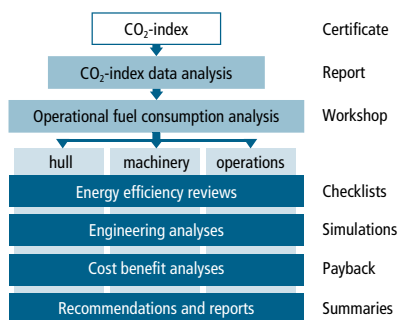


TEST. The heeling angles of a vessel in light-ship state are measured using leads.

FuelSaver



The GL approach to reducing fuel costs for existing vessels



HULL, MACHINERY, OPERATIONS.
The GL FuelSaver identifies specific possibilities for reducing fuel costs.

Going Green: GL FuelSaver

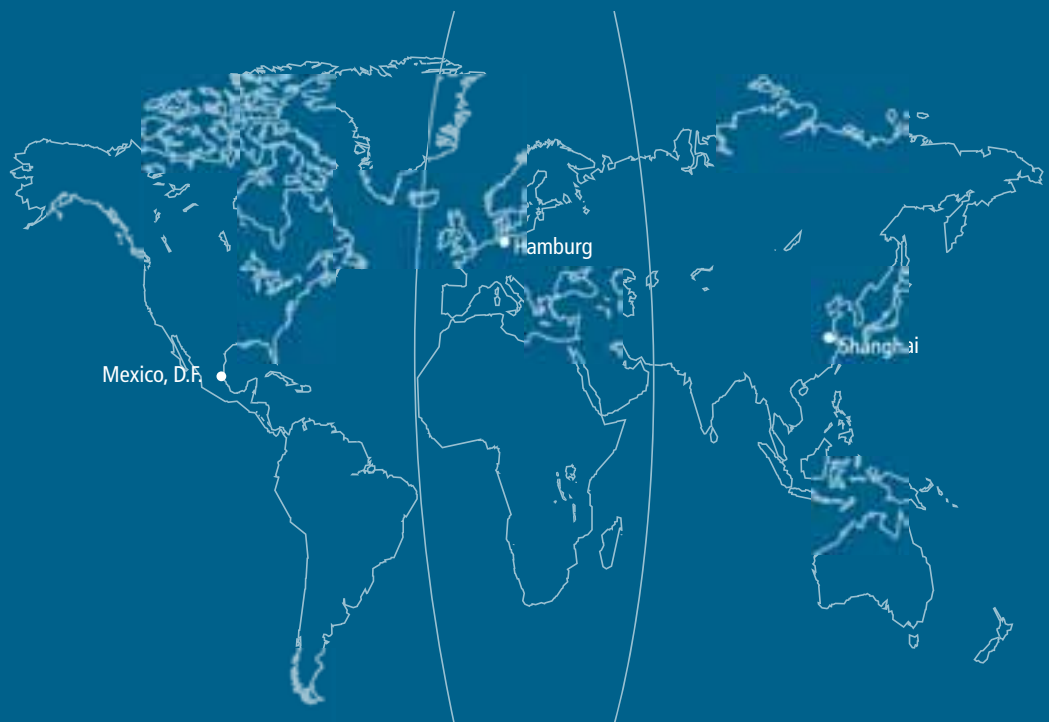
As a result of rising oil prices and upcoming environmental regulations shipbuilders, shipowners and charterers pay more and more attention to an economical and environmental friendly way of transport. Even small changes in the hull, machinery and operations may lead to a more efficient transport with reduced fuel costs.

Combination of Tools To support the customers identifying technical improvements and related economic benefits, Germanischer Lloyd will be presenting at the SMM 2008 in Hamburg its "GL FuelSaver" suite of new services including the "CO₂-index Data Analysis" and the "Operational Fuel Consumption Analysis".

Comparison of Data The CO₂-index Data Analysis focuses on high-level fuel consumption and transport work information. It is an entry-level analysis which identifies the main drivers of voyages with unexpected high or low fuel consumption. The analysis is split into the individual analysis of a vessels' voyages, design index and sister vessel comparisons. Ideally, the data from the certified operational CO₂-index are used.

Consumption of Fuel The results of the CO₂-index Data Analysis are used as input to the "Operational Fuel Consumption Analysis" together with specific ship system data. The experience of key crew members and the fleet management is integrated into the interactive analysis of actual fuel consumption and ranking of improvement measures. The resulting report summarizes practical advice on how to improve the ship's efficiency as a function of fuel price.

Continuation of Optimization Additionally, GL offers individual reviews and analyses for hull, machinery and the ship's operation to examine in more detail identified efficiency improving measures and their cost benefits ratios.



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