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Containerships / Japan / Eco technology / Chemical tankers / Mediterranean/ **November 2013**

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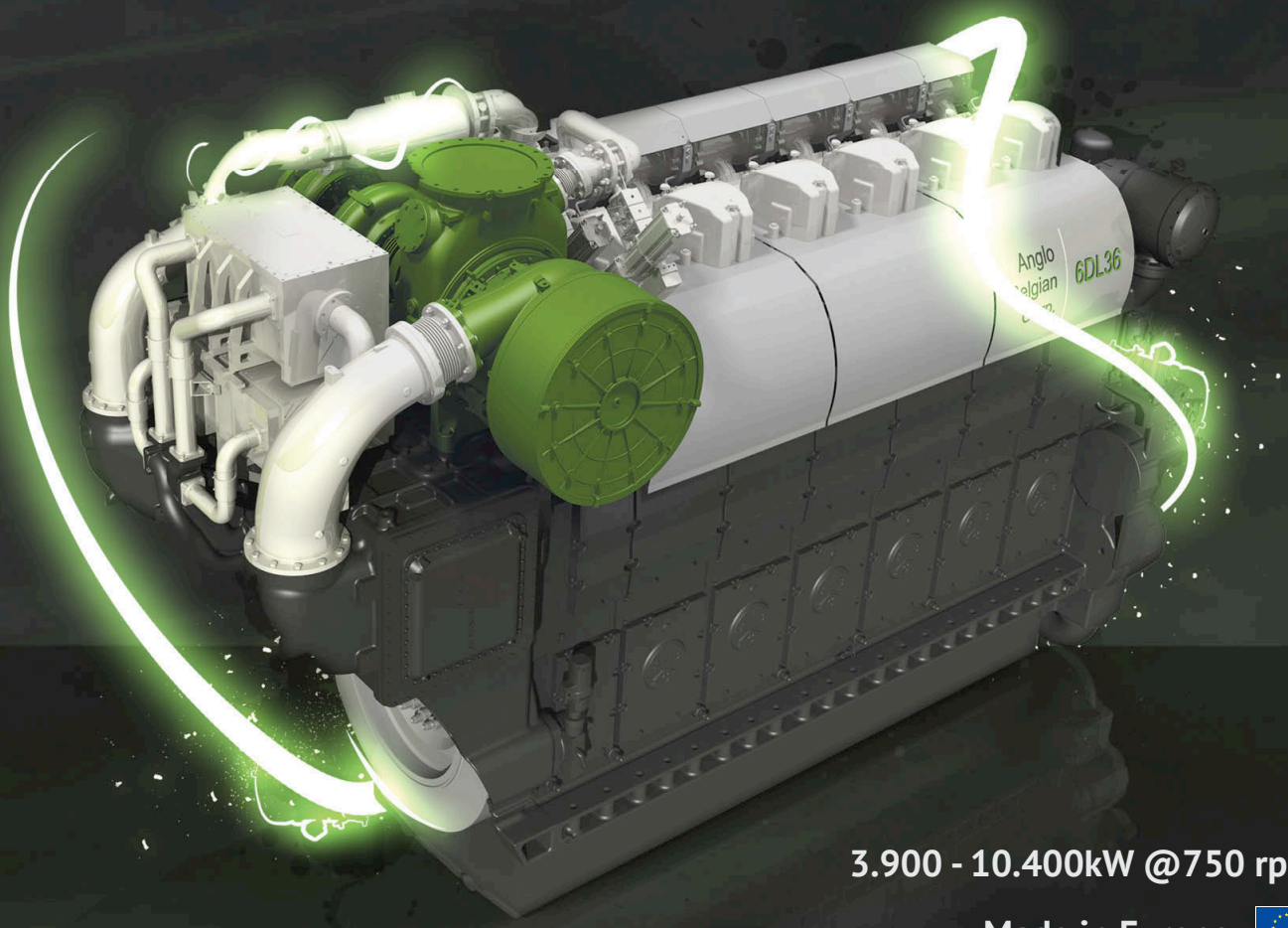

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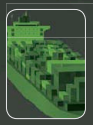

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Responding to market moves:

The METS success story

In an era where trade shows in every industry sector have been forced to re-evaluate their raison d'etre, one event in the leisure marine world continues to go from strength to strength. Some say it's the ideal location in Amsterdam, others the no-nonsense B2B atmosphere that attracts marine professionals and businesses in ever greater numbers. But there is a third factor behind the METS success story... the show's ability to listen to the market and diversify into new areas.

25 years and still growing strong
METS - the Marine Equipment Trade Show - celebrated its 25th anniversary in 2012 as the world's largest and most visited leisure marine trade show. Despite the recession, the event attracted an impressive international attendance and the number of exhibitors remained exceptionally high. The fact that almost half of the exhibitors pre-booked stand space for 2013 before METS 2012 had even closed speaks volumes for the value attached to this annual gathering of the global marine industry.

"It is clear that exhibitors and visitors alike welcome the fact that METS is strictly trade-only," explains Irene Dros, Domain Manager of Amsterdam RAI Convention Centre, which has successfully organised METS for the past quarter of a century. "Keeping our focus firmly on products attracts people from over 100 countries and has also led marine industry associations from 15 countries to set up their own pavilion."

The METS organisers have also enhanced the show's diversity by introducing specialist pavilions. "The first of these - the Super-Yacht Pavilion - was opened several years ago and we have been pleased to see it develop a very distinctive identity of its own while remaining very much part of the overall METS experience," adds Dros.

An unmissable date with the SuperYacht Pavilion (SYP)
While boat shows such as those in Monaco and Fort Lauderdale have traditionally been first on the calendar of companies in the large yacht industry, METS now attracts more suppliers in the sector than any other event worldwide. The SuperYacht Pavilion runs in association with the Global Superyacht Forum (GSF), one of the world's leading summits for captains, designers, builders, project managers, brokers and owners.

Showcasing innovation at the Construction Material Pavilion (CMP)
The Construction Material Pavilion offers a unique platform for material suppliers to showcase their products, skills and expertise to the global marine leisure industry. Last year's METS showed that visitors were very inspired by the wide variety of (raw) materials that can be used in boat and yacht building. METS 2013 will also feature high-end knowledge exchange via the special Construction Stage.

Fast developments at the Marina & Yard Pavilion (MYP)
The marina industry is developing at a rapid pace and the Marina & Yard Pavilion is dedicated to all kinds of equipment for the marinas and associated boatyards, the MYP attracts marina owners and operators from around the world. There is a particular focus on equipment such as pontoons, boat mooring systems, utility pedestals, specialist lighting, pump-out systems, hoists, cranes & trailers, in-water boat lifts, management software, boat cradles & stands, fire fighting & safety equipment and dock fenders.

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26-56 Features

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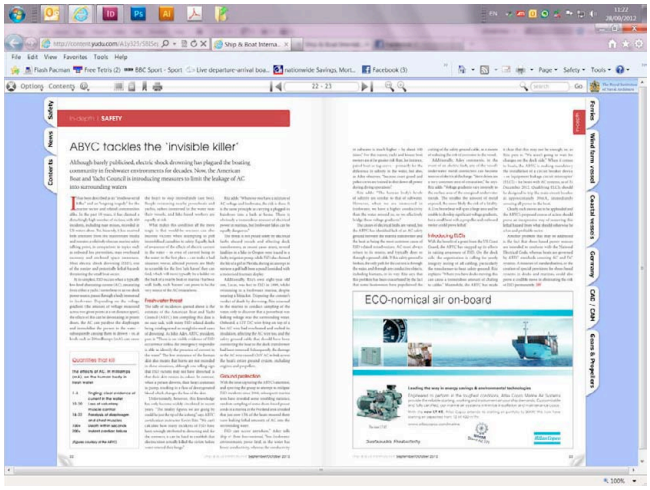

The Royal Institution of Naval Architects

Design & Operation of

Container Ships

21-22 May, 2014, London, UK

Call for Papers

The recent period of increase in the size of container ships presents unique challenges for owners, designers, operators and classification societies. This has been coupled with persistent economic uncertainty and new legislation which has created an emerging need for more energy efficient vessels. These, almost opposing trends, are driving innovation within the industry.

With the increase in size, the geographical constraints placed on draft and beam, and the calculation of the vessels dynamic structural response, including whipping and spring, become ever more important. Cost efficiency, flexibility, optimum speed, stability, and energy efficiency, must all be addressed in the new generation of container ships. Recent innovative technologies have been the result of environmental issues and the need to reduce energy consumption and atmospheric emissions.

To further investigate this aspect of the industry, RINA invites papers from naval architects, class societies, operators, researchers, and builders on all related topics, including:

- Design
- Structure
- Hydrodynamics
- Stability
- Operation
- Energy Efficiency
- Lashing loads
- Container handling
- Feeder vessels
- Hazardous cargoes
- Propulsion

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Collaboration nation

Kawasaki Heavy Industries (KHI) delivered the 177,000m³ LNG carrier *Grace Dahlia* in September to NYK from its Sakaide Works. The ship is the second unit of this, the largest, Moss type. For transporting LNG cargo, a reheat-cycle-plant propulsion system called the 'Kawasaki Advanced Reheat Turbine Plant' is fitted.

Some years ago the Japanese Government and the maritime industry recognised that it would have to collaborate to meet the shipbuilding challenges set by South Korea and China.

Both countries have overtaken Japan as shipbuilding nations, but the more mature economy remains a significant shipbuilding force, even if the levels of construction have declined since its heyday some 20-30 years ago.

In order to meet the challenges set by the 'upstart' newcomers Tokyo agreed to partially fund a series of research and development projects that would maintain the technological lead the country had in the shipbuilding field. Another third of the funding came from ClassNK and the rest came from the industry, a total of about US$75 million.

The success of some of those projects is now being realised. However, the idea was to help the major elements of Japan's shipbuilding industry to maintain their position in the global market place. Medium-sized yards have benefitted from these developments, but four yards felt that this programme was not enough and that the research would need to be better tailored to suit their needs.

In fact these projects, useful though they are, are not enough of a technological development. The development of paint that behaves in a similar fashion to the skin of Tuna fish, or the air lubrication system from Mitsubishi Heavy Industries (MHI) are all adding to the efficiency of vessels.

However, the additional efficiency from these developments is around 30%, what the industry and the global community needs is efficiencies of around 60-70% to offset the growth in demand that will occur over the next 30 years.

From such notions are new ideas formed. And so it was that the creation of a shared investment vehicle created for the sole purpose of developing new technology to make ships more efficient and significantly cheaper and cleaner to run has been born.

Maritime Innovation Japan Corporation or Mijac is the consequence of the latest bid by Japanese industry to compete with the Asian shipbuilding giants near by; and again ClassNK is a partner in this new technology development vehicle along with a ship operator and four yards.

It is Japan's collective belief that their maritime industry may go into a similar decline as that seen in Europe and the US and the nation is pulling together to prevent this decline. The power of pooling resources will be sorely tested in the current environment, but if some of Japan's shipbuilding capability is to be maintained then it will have to be financially viable.

Technology is the key element in this view. The development of new technology to meet the challenges of global warming which has meant new regulations have been enacted to curb the polluting emissions from the maritime industry.

Current maritime technology can, however, only take the industry a limited distance along the road to green Nirvana. Mijac's success or failure will be predicated not on the ability of the company to squeeze a little more efficiency out of the current technology, but its ability to create a technology that is a cheap and clean alternative to the current energy sources available.

In effect the development of LNG as a fuel in this scenario is already yesterday's news. The genesis of new ideas, the creation of a new technology is what is needed and one that is not only clean, but financially viable.

Nippon Yusen Kaisha (NYK), one of the non-yard partners of Mijac, took delivery of the largest Moss LNG tanker built to date earlier this year. *Grace Dahlia* is the 177,000m³ forerunner to what will be an even bigger series of ships that will be based on the *Grace Dahlia* design.

Even as the final touches were being applied to *Grace Dahlia* an agreement was being signed that would see an even bigger Moss LNG tanker delivered from the same Kawasaki yard.

K-Line has ordered the latest version a 182,000m³ LNG carrier from the same yard. But, with the expected growth in shipping as demand grows from an expanding population there is a need to reduce emissions by far more than the 20% reduction in CO_2 that can be gained from the use of LNG.

In this context the use of LNG is no more than a stop gap, or rather a plaster on a gaping wound. Mijac is looking to develop vessels that operate on wind, solar and fuel cell energy reducing a ship's emissions by significantly more than the 20-30% reductions we have seen to date. Whether such vessels will be viable in the future remains to be seen, but if Mijac is thinking in this way it is certainly moving the green shipping debate into a new phase. A case of blue sea thinking. *NA*

Shipbuilding

HHI signs LNG carriers deal

Hyundai Heavy Industries (HHI) announced that it has won an US$850 million order to build four 150,000m^3 Moss type LNG carriers from Malaysian oil company Petroliam Nasional Bhd (Petronas).

The contract also includes an option for the owner to order four additional LNG carriers of the same class. The double-hulled LNG carriers are scheduled to be delivered to the owner from the second half of 2016.

A Moss type LNG carrier Hyundai Heavy Industries delivered in 2000

The tankers will be constructed with four independent self-supporting spherical tanks that have more reliable performance when loading and unloading cargo, and have greater resistance to sloshing forces compared to membrane tank system, the company has said.

Ka Sam-hyun, executive vice president of Hyundai Heavy's Shipbuilding Division said: "We see this order as the first of many for LNG carriers as regulations for carbon dioxide emissions tighten and demand for LNG increases as an alternative energy source."

Classification

ABS gets focused

ABS has announced the formation of the Asset Performance Management Group (APMG). The new organisation has seen several existing services being merged into a single team focused on complete life cycle performance services that will complement its traditional classification services.

"The future of classification requires ABS to work with our members and clients in a more collaborative, more efficient and less intrusive way," says ABS chairman and CEO, Christopher J. Wiernicki. "To effectively meet the needs of the marine and offshore industries, we are continually seeking ways to better integrate our traditional classification services with innovative concepts, tools and practices."

The APMG will bring together the ABS Operational and Environmental Performance, Responsible for assisting clients with operational performance, energy efficiency and environmental performance; ABS Nautical Systems Product Line its provider of asset management solutions for the marine and offshore industries through the NS5 Enterprise software suite and Asset Integrity Management, which assists clients in developing life cycle management programs that address reliability, technical integrity and safety.

The company has said that its expects this shift to also drive the development of new class and asset integrity management capabilities and maintain the high standards expected from the ABS Nautical Systems Product Line; noting that Nautical Systems is a vital component of the integrated class service offering of the new APMG.

Propulsion

M-Motors team up with Mitsubishi

Mitsubishi Turbocharger and Engine Europe B.V. has announced the addition of its latest sales and service partner M-Motors LLC, to its rapidly expanding global network for the engine, genset & power plant division Europe, Middle East and Africa.

With experience in the Russian market and the ability to deliver customer- centric service, M-Motors LLC has demonstrated the key business practices necessary to become a Mitsubishi partner. The decision to move forward with M-Motors LLC was an easy one because the company is known for its technically skilled personnel. M-Motors LLC focuses on both high and medium speed engines for marine and industry. This vast product portfolio matches ours perfectly. On top of that, we will be able to profit from their global network and vice versa the company said.

Engines

Wärtsilä powers Chinese LNG carriers

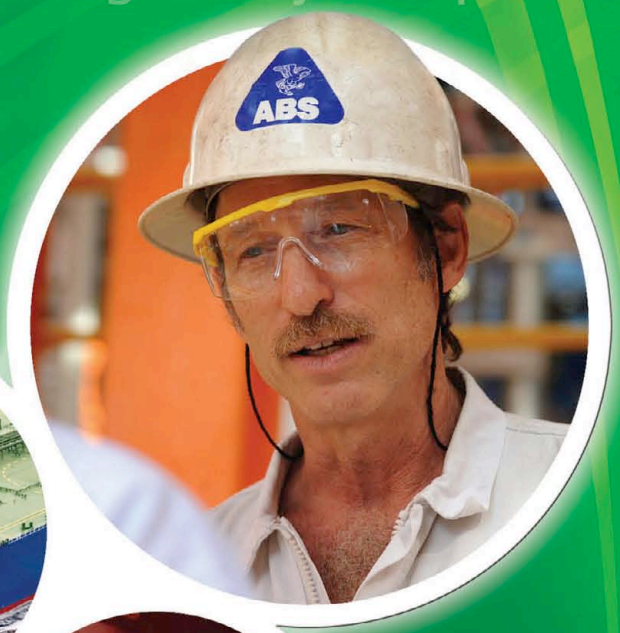
Wärtsilä is to supply its 50DF dual-fuel engines and propulsion systems for two liquefied natural gas (LNG) carrier vessels under construction in two Chinese shipyards.

The two orders are similar in scope as far as supply is concerned, but they have been issued separately. The first is from the Ningbo Xinle Shipbuilding Group Co., Ltd together with its trading partner, Shanghai CSR Hange Shipping Engineering Co., Ltd. The other order has been issued by Cosco (Dalian) shipyards. The ships are being built for two different Chinese owners, the Zhejiang Yuanhe Ocean Shipping Company and Dalian Inteh Group Co., Ltd.

Reliability Centered Maintenance

Operational and Environmental Performance

Regulatory Compliance



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Wärtsilä will supply its 50 DF dual fuel engines to Chinese LNG carriers

Each vessel will be powered by a Wärtsilä 50DF unit, a controllable pitch propeller (CPP), a gearbox and related systems. The Wärtsilä 50DF engines will enable them to operate primarily on LNG, while retaining the option to switch to conventional marine fuels if necessary.

Deliveries of the equipment are scheduled to begin in the summer of 2014, and the ships will be launched approximately one year later. They will operate mainly in Chinese waters, and will transport LNG between terminals and to other ships.

"Wärtsilä has been a pioneer in developing the technology that enables LNG carriers to utilise gas as a fuel, and the technical strength of this technology has provided considerable added value for our customers. Chinese owners are beginning to invest significantly in LNG carriers powered by dual-fuel engines, and these latest orders will add impetus to the market, both in China and globally," says Aaron Bresnahan, vice president sales, Wärtsilä Ship Power.

Classification

GL's latest stowage notation

Traditionally rules and layouts for vessel lashing systems have been based on the stormy North Atlantic routes. This ignores the potential of tailoring plans to reflect the reduced wave and wind loads of other routes, increasing the stowage potential of a vessel.

For this GL has developed, published, and implemented rules for the Route Specific Container Stowage (RSCS) class notation by combining long-term statistical wave data with advanced computations, taking into account current market developments, for routes with better weather conditions.

With RSCS, ship operators will have greater flexibility in stowing heavier containers in higher positions on deck. This is because the centre of gravity of shielded stacks can be increased by up to 21%. Moreover, a significant increase of in-hold stack weight for 20-foot stowage – up to 25% - can be achieved. In addition to these benefits, nominal capacity can be increased and an additional tier can be added where the line of sight is not affected the company has said

Jan-Olaf Probst, GL Global Ship Type director, said: "We have worked closely with several industry partners to develop the RSCS notation and have helped them to the increase their loading flexibility, while maintaining the same high levels of safety for their vessels and cargo."

GL explained that the implementation of RSCS is easy and offers high impact with low implementation effort. Owners and managers adopt an addendum to the Container Securing Arrangement plan and install or update a certified lashing computer onboard, with integrated software elements from GL. No further retrofitting measures of equipment are needed.

Engines

Lukoil launches 100-Series BN

Lukoil Marine Lubricants based in Hamburg has developed its cylinder lubricating oil Lukoil Navigo 100 MCL. With this has come the approval from Wärtsilä and MAN for the oil to be used for their two stroke main engines. Lukoil started its research work on it latest oil more than three years ago with the objective to develop a cylinder oil with a Base Number of 100mg KOH/g.

Stefan Claussen, technical and marketing director in the Hamburg office, explained the background for this development goal: "In the past few years, the power, consumption and emissions of ship engines have been optimised more and more. This has resulted in engines with an extremely long stroke, which are operated at lower speeds than before."

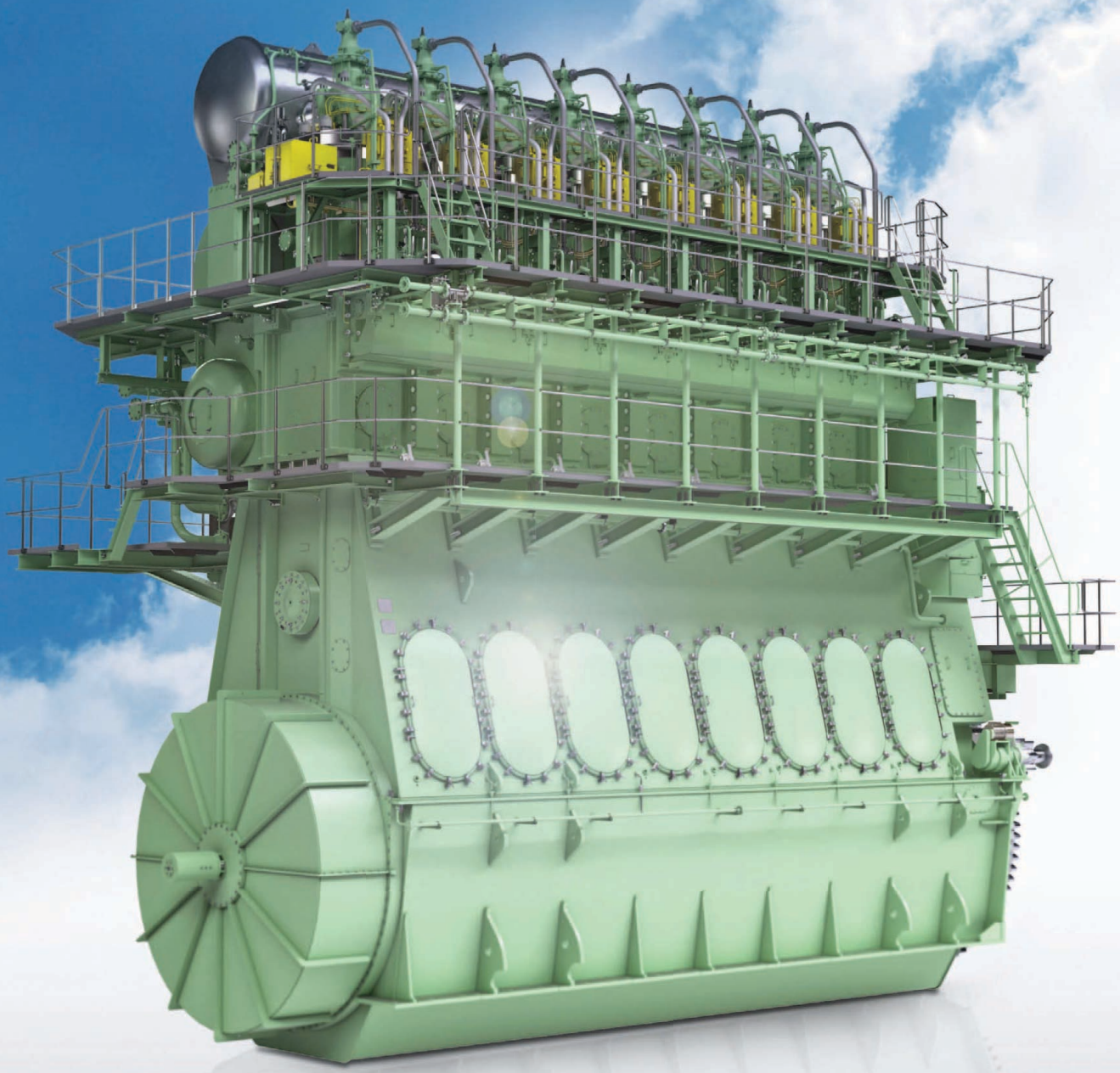
In the earlier, common full-load mode, the disadvantages of lubricating oils with reduced Base Numbers of 50 to 60mg KOW/h did not become apparent. "In contrast, today's operating conditions such as slow steaming or new consumption-optimised engine generations require much higher alkalinity of the cylinder lubricating oil than before. This can be achieved either through increased consumption or through increased alkalinity in the cylinder lubricating oil, ideally 100mg KOH/g," explains Claussen.

In a recent letter to customers from MAN, the 100-series BN oil was recommended as the standard product for the MAN 8.2 series and its successor generations. All the data in the engine manuals will therefore refer in the future to 100-series BN oils instead of the current 70-series BN oils.

Claussen said: "Extensive lab tests as well as onboard practical comparisons, such as with shipping company Norddeutsche Reederei H. Schuldt, have already confirmed to us that cylinder lubricating oil consumption turns out to be considerably lower at a higher Base Number. In addition, there is increased protection against wear." MAN Diesel & Turbo has also confirmed the lower wear in its customer letter. *NA*

The Future is Clear

ME-GI dual fuel done right



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EU Horse trails cart again

As the ferry industry approaches the 20th anniversary of the *Estonia* ferry tragedy and in the light of recent casualties like the *Costa Concordia*, passenger safety remains at the top of the agenda for the shipping industry, *writes Sandra Speares*.

The issue was raised by a number of speakers at the recent Interferry conference in Malta in November, the IMO symposium on the future of ship safety in June this year.

Speaking at the Interferry conference Professor Dracos Vassalos, of the UK's Strathclyde University, welcomed the introduction of goal-based rather than rules-based damage stability regulations, saying this opened the way for life-cycle risk to be addressed at the design stage.

However, he expressed alarm over the 'grandfather clause' exempting existing ships from the new rules. "As a result the bulk of contemporary knowledge is channelled to new ships – 1% of tonnage – leading at best to marginal safety improvements for the whole fleet," he claimed.

"This is a huge regulatory gap that undermines and inhibits progress on vulnerability to flooding – and the disparity between old and new ships is increasingly becoming a chasm."

Life cycle safety and risk management was the way forward, he told the IMO symposium in June. This incorporated not only a formal process to address risk at the design stage, but also monitoring and managing residual risk in operations, and crisis management in emergencies.

Interferry executive director of EU and IMO affairs Johan Roos warned that, in January, the IMO sub-committee on ship design and construction was expected to consider a proposal to increase the statistical survivability of new ships by adding more bulkheads. "We are deeply concerned that such a measure would jeopardise the entire ro-pax concept, possibly without adding to the actual safety level," said Roos.

"Interferry believes that, before adding more steel, much more emphasis should be placed on enhanced operational safety. Current regulations only credit physical alterations of designs. In our view, enhancements to an already very safe ferry system should focus on a different approach - not by trying to design a ferry that can withstand any plausible damage, but rather to avoid the accident to begin with. The expected proposal stems from extensive research that is currently under review by experts within the IMO. Their work is due for completion next year and we believe it should be allowed to conclude before any technical changes are proposed."

One point Roos stressed that while Interferry and its members are concerned about the regulatory changes that are coming in, and safety levels are always on the increase, there is a sense that the "cart is being put in front of the horse".

A number of academic studies have been undertaken in Europe over a number of years, which have been funded by the European Commission and presented to the IMO on a number of occasions but never looked at in detail, or gone through a peer review process.

The intention was for the IMO's Formal Safety Assessment Group to have a look at the proposals in November and come back to the Maritime Safety Committee to say whether they were valid or not. That work has just started, Roos says: "we are a bit concerned that the European Commission seems to be pushing for regulatory changes before we have seen the outcome of that FSA review".

> "This is a huge regulatory gap that undermines and inhibits progress on vulnerability to flooding – and the disparity between old and new ships is increasingly becoming a chasm"

The EU proposal is understood to be pushing for an increase in the overall survivability of passenger ships and, within the current technical framework, the only way for ferry operators to do this is by increasing the number of bulkheads.

Interferry would like to see the FSA findings fed back to IMO before any proposal is made on how to proceed, Roos says. This process would take about 12 months.

As far as the IMO sub-committee meeting in January is concerned, Interferry's impression is that the EU will be pushing for an immediate increase of the statistical level of survivability based on the assumptions and conclusions of the EU-funded studies, even before the studies have been assessed by the IMO.

The cart before the horse attitude is nothing new and has applied in a number of different regulatory areas, not least that of ballast water management, with the desire to get something out on the street effectively blocking the implementation of the regulation.

Roos emphasises that it is not an issue of being opposed to increased safety. "We just want to make sure we do the right thing" *NA*

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Environment

Netting the data

Nett Technologies Inc. of Mississauga, Ontario has announced the launch of its latest addition to the PTLOG family of data loggers; the PTLOG 270SCR.

The PTLOG 270SCR is an advanced data monitor and logger designed to monitor, log and provide alerts to the activities of Nett Technologies' Selective Catalytic Reduction (SCR) emission control system. The emission data logger device automatically collects, time stamps and displays sensor and warning related messages from the BlueMAX group of SCR emission control systems.

"The PTLOG 270SCR data logger has an easy-to-read 4.3-inch screen and software that's flashable and upgradable. This data logger is going to be extremely popular to those looking to log and monitor the NOx levels in their BlueMAX SCR systems," says Mohammad Pournazeri, head of R&D Product Development at Nett Technologies.

The PTLOG 270SCR uses a Freescale iMX35, 32bit 532MHz processor and monitors the SCR emission control system in real-time. The company says the data logger is easy to install and utilises the industry standard CAN 2.0B – SEA J1939 vehicle bus. The unit comes with 128MB of internal memory that can be downloaded by connecting a USB stick. The PTLOG 270SCR also has automatic onboard calibration.

www.nettinc.com

Ballast water treatment systems

Optimarin signs up V.Ships

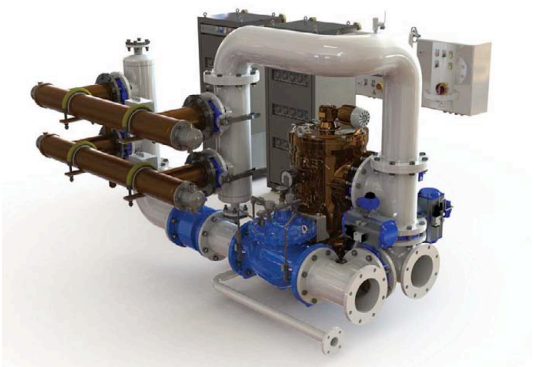
Ballast water treatment (BWT) system specialist Optimarin has announced that it has signed a framework agreement with V.Ships. The contract will see MARCAS, V.Ships' contracting association, promoting Optimarin's system to some 650 ships managed by the business.

The firm's OBS unit (Optimarin Ballast System), which is based on effective filtration and UV irradiation technology, will now be actively promoted as the BWT solution of choice for V.Ships managed assets under 52,000dwt. This encompasses a diverse fleet of cargo-carrying vessels, such as bulk and chemical tankers, through to specialised ships, including seismic and offshore vessels.

SeaTec, V.Ships' technical product division, conducted a comprehensive evaluation of competing BWT technology before choosing OBS as its preferred fleet solution. The company believes this endorsement will be a compelling one for many of the small-and medium-sized shipowners that entrust the management of their assets to V.Ships.

www.optimarine.com

V.Ships helps promote Optimarin's ballast water treatment system



Deck equipment

First order for Huisman Brazil

Dutch-based Huisman has received its first order for its production facility in Brazil. The new order includes three sets of five cranes, which will be manufactured as soon as construction of the Brazilian production facility is completed in 2014. The sets of cranes are scheduled for delivery between Q3 2015 and Q1 2017.

The order includes three identical sets of cranes for the new build vessels *Cassino, Curumim* and *Salinas*. Each set consists of two 60tonnes Pedestal Mounted Offshore Cranes (PMOC), two 60tonnes Knuckle Boom Cranes (KBC) and one 12tonnes Pipe Handling Knuckle Boom Crane (PHKBC). The first set of cranes will be installed on the *Cassino* and will be delivered in 2015. In Q2 2016 the *Curumim* will be equipped with their set of cranes and in Q3 2017 the last set will be installed onboard *Salinas*.

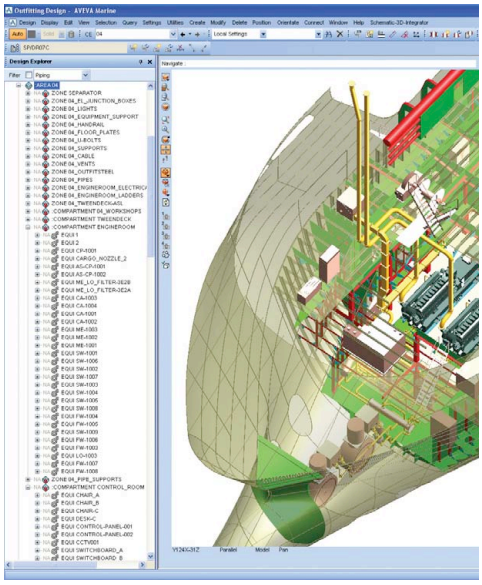
Besides the three sets of cranes, Huisman will also deliver 3 x 550tonnes Tiltable Lay Systems for Subsea 7 and the 2 x 650 and 2 x 340mt Tiltable Lay Systems for Technip-DOF. All these pipelay equipment orders are part of a big Petrobas order and should be ready to serve the Brazilian market in 2017.

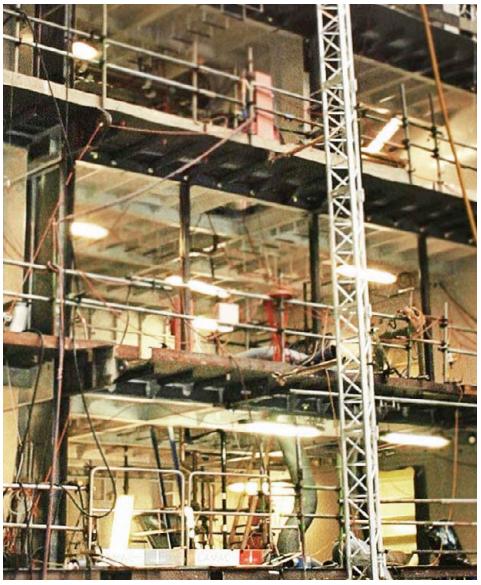
www.huismanequipment.com

Propulsion

Wärtsilä gets the thrust

Wärtsilä has introduced a new series of both steerable and transverse thrusters that the company has said will further develop the current portfolio. The Wärtsilä Steerable Thruster series (WST) is

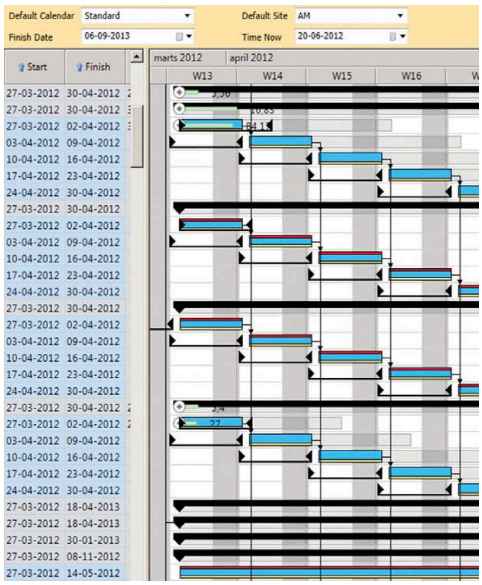


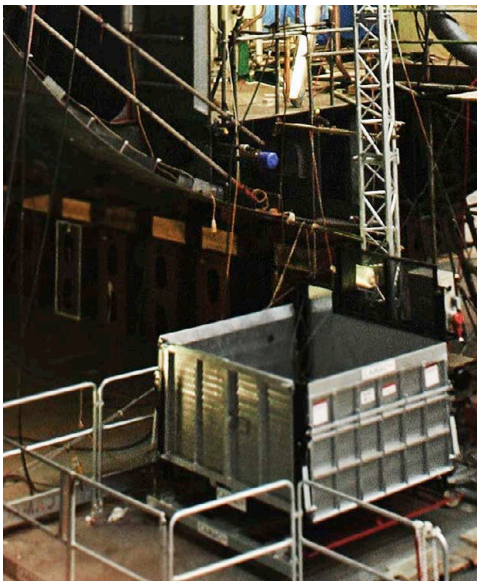


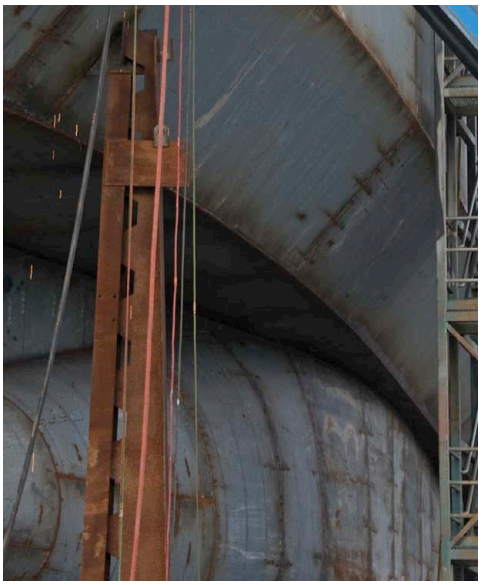
RIGHT INFORMATION

RIGHT MATERIAL

RIGHT RESOURCES







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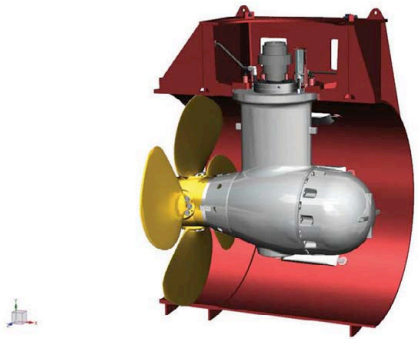

Wärtsilä launches latest range of thrusters

being introduced to replace the company's Modular Thruster and Compact Thruster series, while the latest Wärtsilä Transverse Thruster series (WTT) is replacing the current range of transverse thrusters. The new products have been developed in response to changing market demands, requiring competitive thruster products which are more efficient and cover a wider power range.

The first product to enter the pilot phase is a 4,500kW underwater (de)-mountable steerable thruster, the WST-45-U, which began its pilot phase in summer 2013. Two more products, the WST-14 and the WTT-11, are scheduled to begin their pilot phase before the end of this year.

The thrusters are available for various types of vessel depending on the size and features of the product. For example, the WST-45-U is designed mainly for the offshore drilling market; the WST-14 is intended for tugs up to 45tonnes bollard pull (BP), inland waterway vessels, and for river/sea going cargo ships. This thruster is compatible with both medium-speed and high-speed (1,800rpm) diesel engines. The WTT-11 is a 1,100kW tunnel thruster designed mainly for merchant cargo vessels.

The new WST and WTT units come with several added features, such as an increased power range, an 8degs tilted propeller gearbox, and a new Wärtsilä Thruster Nozzle for the thrusters designed for offshore drilling. The latest tunnel thrusters are expected to be more compact and efficient than earlier versions.

www.wartsila.com

Deck equipment

TTS remains strong in post Panamax market

TTS Group ASA has, through its subsidiary TTS Marine AB in Gothenburg, signed a new contract for equipment for the post Panamax car carriers market with a total value of approx. NOK80 million (US$13,531 million).

The contract includes delivery of cargo access equipment to three additional post Panamax car carriers under construction at Xiamen Shipbuilding Industry Co., Ltd in China. This is the eighth post Panamax Car Carrier contract for TTS Group in 2013. The TTS deliveries will be completed during 2015.

www.ttsgroup.com

Ancillary equipment

Chlorius gets in the groove

Chlorius Controls has developed a large capacity three-way valve G3CM-T with grooved joints. The valve is designed for regulating cooling water, sea water and lubrication oil in an integrated temperature control loop.

The valves can handle large liquid flows, being lighter and slimmer than other valve solutions in the same diameter nominal (DN) range. In addition, replacement of flanges with grooved joints will enable further weight reduction of approximately 20-25%, the company said.

Connection with grooved joints and couplings reduces the noise, vibration, and stress level in a pipe system. The company also highlights that the installation and mounting is easy and time saving and that no special skill requirements is needed for erection of the pipe system with couplings.

www.chloriuscontrols.com

Ancillary equipment

Hydac cools down

To cover increasing demand for coolers suitable for hazardous areas or aggressive environments Hydac have developed two new ranges of air blast coolers.

The ATEX range of coolers cover Hazardous Areas and the Marine Specification coolers are for Aggressive Environments. The Hydac ATEX Range of Coolers models are based on the OK-EL range of air blast cooler and have dissipation ratings from 0.125kW/°C up to 6kW/°C.

These ranges of coolers go hand in hand with the company's full range of ATEX and Marine Specification products including Filters and Accumulators.

www.hydac.co.uk

Environment

Imtech works on *Sonne*

Imtech Marine was selected as supplier of the new Research Vessel *Sonne*. Imtech will design and install the complete HVAC system for accommodation areas, laboratories and machinery spaces, as well as the redundant cold and warm water supply system with a combination of turbo chillers and absorption chillers.

After 44 years the current German research vessel *Sonne* will be replaced by an eco-friendly and

Sonne gets eco-friendly with help from Imtech

energy-efficient successor in the beginning of 2015, carrying the same name. The new *Sonne* is currently under construction at the Meyer Werft shipyard in Papenburg, Germany, and will be going on scientific expeditions around the world 345 days per year like its predecessor. By applying dynamic simulation techniques, Imtech Marine will provide solutions achieving substantial energy savings through the vessels HVAC system.

Sonne has a length of almost 115m and a width of almost 21m, providing sufficient room for 35 crew members and 40 scientists at the same time. The ship will sail in 2015.

www.imtech.com

Paints & coatings

Better ship performance with Jotun

Jotun Hull Performance Solutions (HPS) has launched its latest HPS Newbuilding Solution that is claimed to improve EEDI and ship performance. The HPS Newbuilding solution is aimed at yards delivering vessels with eco-design and who want to maximise the energy efficiency at both speed trial and in operation.

The HPS Newbuilding solution is based on the SeaQuantum X200, which comes with three upgrade components. The first component is a Smooth Application Package that combines a comprehensive technical service with an optimised anticorrosive system. Jotun's second component is an Outfitting Protection Package, which includes a final coat of its latest developed SeaQuantum X200-S, which is resistant to slime and fouling.

Jotun has said that any fouling incurred over the docking may have a major impact on the attained EEDI. With the Outfitting Protection Package Jotun has said that it guarantees a clean hull at speed trial. Yards can then avoid costly re-dock or under water hull cleaning, which is time consuming and may increase hull roughness.

The third and last component is a 60-month high performance guarantee with cash back if there is an average speed loss that exceeds 1.5% over 60 months, which may be transferred from the yard to the owner. This equals a 15% improvement in propulsion efficiency over 60 months compared to market average performance.

By analysing a series of accurate measurements from the ship in voyage, Jotun has said that it can determine the condition on the underwater hull and its effect on fuel consumption using the Jotun Hull Performance Measurement Method.

www.jotun.com

Ancillary equipment

Danfoss on a high

Danfoss has introduced two new high-flow models to the range. The launch of 125mm and 250mm AB-QM valves means Danfoss now offers a complete collection of PICV capable of handling any size of application from DN10 – 250mm. Offering flows up to 442,000 litres per hour for the new 250mm model, the new AB-QM valves will provide the potential for project cost reductions by downsizing valves.

The company has said that unlike a traditional two-way or manual balancing valve, Danfoss AB-QM is a control valve with a built-in differential pressure controller which provides a balanced, energy efficient indoor climate control during all loads. Even if the pressure fluctuates due to changes in demand, the AB-QM with a matching Danfoss actuator will maintain a constant flow across the valve, without the actuator having to constantly adjust to compensate. This precise control, together with reduced actuator movements, under all loads helps to cut energy consumption, said the company.

www.danfoss.co.uk

Veritas simplex oratio est

In the year since Philippe Donche-Gay succeeded Bernard Anne at the helm of the stock-listed Bureau Veritas (BV) the company has moved on. But, the new man at the wheel is determined to carry on his predecessor's good work while making sure he stamps his identity on the company

Merging the marine and offshore divisions of the French classification society Bureau Veritas was always on the cards, says Philippe Donche-Gay, the simple truth is the company is not the biggest class society in the maritime industry.

The company itself operates in a number of sectors, including commodities, industry and power and in terms of turnover is far larger than most of its International Association of Classification Society (IACS) partners.

Donche-Gay accepts that the pressure for growth will always be there in a publicly listed company and that the policy of expansion through acquisition will continue: "We will not necessarily buy large companies but, there will be small acquisitions," he confirms.

There were some 14 acquisitions in 2012 mainly of small companies, such as testing laboratories, often in strategic countries such as China. While there is a move to secure business in the offshore sector, strategic partnerships in countries such as Brazil are also seen as important.

Continued expansion is catered for without a move to centralisation, however, "There is no big central office, BV is a devolved organisation and that allows the company to respond flexibly and quickly to local events," Donche-Gay explains.

He says that this is a continuation of the policy started by his predecessor and one that he expects will continue into the future. However, Donche-Gay believes that there is a lot of wasted time and that there is a need to tweek the management philosophy in a move to what he calls "lean management".

He explains that lean management is not a restructuring of the company's managers, neither is it a comment on the hard working nature of the company's employees, but he says it is a philosophy

Philippe Donche-Gay says that a lean management philosophy can make Bureau Veritas more efficient

that has been successfully implemented in the car industry that will see processes streamlined to become more efficient.

"The initial assumption is that around 60% of working time is wasted so the initial task is to track waste and then you introduce management techniques that allow people to come up with their own solutions to reduce the response time," he says.

As an example Donche-Gay points to the design review process, he believes that applying the principles of lean management the company will be able to speed up its review service while maintaining standards. "The idea is to reduce the amount of time of the design review, but not to reduce the workforce, but, that extra capacity [created by the greater efficiency] will be used to grow the business."

As well as improving efficiency BV is taking aim at the fall out of the merger between DNV and GL, which is already apparent in the market says Donche-Gay. He believes that BV is well placed to pick up business in the container shipping market. The company's experience with CMA CGM's 16,000TEU container ships shows that it can handle vessels of this size, he says.

"In terms of new customers the 16,000TEU and above sector we have the experience, and we're one of the few that have that experience and we have the best whipping and springing analysis tools" he says. Updates of BV's rules have been made as a result of the R&D that was conducted on the 16,000TEU ships, but in general Donche-Gay believes that: "References are key, the market is changing and there has been a surge of orders for mega-ships."

Other fallout from the creation of DNV GL Group is the claims by DNV president Tor Svensen that the new company wanted to lead the debate on vessel safety and the environment. According to Donche-Gay this statement can be taken two ways; it can be understood that Svensen believes that IACS and the IMO are not effective in developing rules in these areas.

"We need to respect and assist IACS and IMO, class societies are not there to create a market," says Donche-Gay.

Another way to read it, is that class must assist owners to "have a quality fleet, not maximum detention of the fleet, but maximum availability of ships," he explains.

Donche-Gay wants to see class benchmarking and training masters to cope with inspections from port state control. "This is a good direction and one I can support," he explains, adding that it is his belief that Svensen is more likely to mean this rather than

to believe that the regulatory bodies are ineffective.

It is a roundabout way for Donche-Gay to say that precision is needed when making these statements because there is a danger in such misunderstandings damaging the industry.

In addition to leveraging its knowledge and expertise in the offshore and mega-container shipping markets BV believes that it is well placed to make further inroads into the LNG carrier sector.

There are a number of projects that BV is in partnership with other industry players and academic institutions. Donche-Gay points to the research conducted for the Stockman Arctic LNG project with St. Petersburg State University. This work led to new tools for measuring and monitoring sloshing in Arctic LNG operations.

"We have inherited an organisation with a capacity for research & development that is not strictly proportionate to its market share, but is greater than its market share," he adds, "We don't see research & development as a monolithic national activity."

CMA CGM Jules Verne was the third 16,000TEU vessel to be built to BV class for CMA CGM by South Korean yard Daewoo Marine Engineering

According to Donche-Gay he would like to extend the company's research activity, with partnerships across the borders, including an offshore R&D centre in Rio de Janeiro to add to a number of connections with universities around the globe, this is a conscious policy of developing local partners that will allow the company to further its R&D and ultimately further its commercial aims.

"Next year I want to do something in Shanghai, an R&D centre," Donche-Gay announces, the plan is as yet unformed, but it is a personal ambition to spread the research facilities and partnerships.

It is surprising that Donche-Gay makes such an announcement. Throughout the discussions he has presented as a cautious bookish man not given to rash pronouncements. In revealing his Shanghai ambitions he also reveals a more human side to his personality, a little brash, perhaps, many may think, a trait that is more in keeping with his predecessor. *NA*

Inaugural Shipping Week tackles safety and green shipping debates

Ship efficiency was just one of the themes to be aired at London International Shipping Week alongside a wide range of safety and security measures, insurance issues and technological advances

In the current environment, with rising fuel costs and many regulatory changes, energy efficiency is vital. As Niels Bjorn Mortensen, director of regulatory affairs at Maersk, explained to delegates at a conference organised by Fathom in association with Inmarsat, Maersk's annual fuel requirement tops 12 million tonnes per year, with an associated cost of US$8 billion.

Like other industry players, Maersk is looking at alternative fuel supplies, and Mortensen also updated delegates on Maersk's future fuel strategies, stating that whilst biofuel experiments have proven that biofuels are technically great, they are not commercially feasible currently due to the high costs associated with lack of suppliers and demand. However, he alluded to the fact that Maersk is now involved with two projects that focus on the feasibility of lignin-based biofuel as a potential for HFO replacement.

As Henrique Pestana, head of ship design at ABB pointed out at the conference, propulsion efficiency is affected when ships operate outside the design point and this happens quite frequently with a consequent effect on fuel consumption.

The fuel bill he said: "has never had an impact on the ship's cost structure as in today's world" and the market demands more flexible ships that can operate efficiently along a wide range of conditions. Amongst other features, he added, electrical propulsion can help to attain such flexibility.

The International Chamber of Shipping conference, which took place during the same week, gave an opportunity for the IMO secretary general Koji Sekimizu and Stephen Hammond, UK shipping minister, to support the UK's intention to accelerate the study into the availability of low-sulphur fuel to meet the emission standards set by IMO to 2020.

IMO secretary general Koji Sekimizu backs the UK's plans to accelerate study into low sulphur fuel availability

"IMO is the goal-setter and therefore should avoid changing the goal posts easily. Therefore, this study must be carried out as soon as possible so that we can get a clear picture of the availability of low-sulphur fuel, in order to take appropriate actions in time to meet the standard.

"Then, based on the results of the study, we need to take proper action. This may mean action for the oil refinery industry to make necessary investment to provide low-sulphur fuel at a reasonable cost to shipping; or it may mean some other kind of action, including to install onboard scrubbers or even to change fuel to other clean energy such as LNG. But, this must be debated by the community as a whole, because not only is the concept of sustainability beneficial for all parties involved but, also all parties must be involved in the debate on who should share the burden to ensure sustainability," Sekimizu told the conference.

There were a number of safety issues on the agenda at London International Shipping Week, including the issue of deaths in enclosed spaces, which continues to be a major problem for the industry.

"Preventing deaths in enclosed spaces is a serious issue. It is a deadly serious issue, and one which the marine industry has to come to grips with," said David Patraiko, The Nautical Institute's director of projects, summing up at the end of the day of education, awareness and training around enclosed space incidents held by The Nautical Institute's London Branch, in conjunction with Mines Rescue Marine, (see *The Naval Architect* February 2012 pg 25-28).

More people die or are injured in enclosed spaces than through any other related onboard work activity, delegates at the event heard. The largest problem is with spaces which are not perceived as dangerous – anchor lockers and deck stores which may suffer from oxygen depletion, for example.

In spite of the substantial amount of literature and guidelines that have been produced on the issue, not to mention a number of legal cases involving masters of vessels, the issue persists. If this is to change, there are four major areas which need to be tackled: culture, design, equipment and training, delegates heard.

Safety culture needs to be implemented at all levels, starting from

the top: "Adopting a shipboard enclosed space management plan based on onboard audits is a good new initiative. Procedures for Permits to Work need to be addressed".

Shipboard design and operation should minimise the need to go into enclosed spaces in the first place; escape possibilities should be designed in. In many cases, crews are expected to use equipment that is not fit for purpose, or that is complex to use. In particular, firefighting equipment is not suitable for evacuating casualties from enclosed spaces.

Firefighting systems on many container vessels are decades out of date and incapable of protecting valuable cargos, delegates at the International Union of Marine Insurance's annual conference at its annual meeting, which followed on from London International Shipping Week, were told.

Despite the development of much larger ships in recent years, many cargo fires can only be realistically tackled with external support from ocean going fire tugs.

Uwe-Peter Schieder, of the German Insurance Association GDV, called on the industry to promote the installation of more modern and effective firefighting systems.

"Fire protection systems have not yet realised that cargo is now transported in containers, as it has been for the last 30 or 40 years. Crews do not have the systems to fight fire. Hull insurers just have to stand by and pay out the claims."

Schieder stated that the fire which took hold on *MSC Flaminia* in 2012, took five and a half weeks to eventually extinguish. At the enclosed spaces event Michael Lloyd and Adam Allan, from Mines Rescue Marine, outlined a system for the management of enclosed spaces that uses risk assessment to develop a 'traffic light' system making it clear what precautions are needed when entering any given space on a ship. A simulated rescue carried out by Mines Rescue Marine demonstrated the sheer difficulty of reaching and rescuing people who have become trapped in enclosed spaces – and the need for the right equipment to do so.

Maritime industry leaders attending London International Shipping Week heard how shipowners and managers can achieve 10% operational savings if they focus on the value of satellite communications rather than on cost.

Frank Coles, president of Inmarsat Maritime, urged industry players to weigh up the cost of investing in improved satellite communications against the substantial benefits.

"The problem is people haven't always moved with the times and so may not know what's possible," he said.

"So, they'll look at their current cost, which is an average of US$25 per day, and seek a reduction. In reality, though, that's just 0.3% of a ship's running costs. It's literally a drop in the ocean. "However, if they were to increase that to just US$100 a day to take advantage of unlimited email and data, our figures show they could actually reduce the cost of running a ship by 10%."

In monetary terms a vessel using satcoms to their full potential could cut running costs by nearly US$200,000 a year, Frank Coles claimed.

According to Bob Billett, European sales manager for Applied Weather Technology, with bunker prices at approximately US$600/tonne and with a capesize bulk carrier steaming at around 14knots consuming in the region of 50tonnes of fuel per day, this equates to a cost of US$30,000 per day, compared to capesize charter rates of US$12,000 to US$14,000/day.

He told the Ship Efficiency conference that much of AWT's business is from shore-based routing services, mainly with charterers. Savings on each voyage are usually modest – 1.5% to 10%. However, a client running around 70 chemical tankers worldwide, using AWT's routing services would save around 30 sailings days and about US$1 million in fuel every quarter, he claimed.

Jorge Antunes of TecnoVeritas meanwhile considered the benefits of real-time ship energy performance monitoring. Real-time ship performance monitoring allows the early identification of converting energy systems onboard, and the optimisation of their time between one overhaul and the next. Proper data acquisition systems as well as the required data filtering treatment and statistical analysis are required, he said.

Such systems can produce important money savings in terms of fuel cost reduction and related emissions as well as empower ship management and create added awareness of energy performance by the crew, he told delegates.

One of the new products to be launched during the course of London International Shipping Week was Hempel's HEMPAGUARD, a hull coating concept for the shipping industry that offers resistance to fouling during idle periods and significant fuel savings. The new patented technology, ActiGuard, has been five years in development and is based on silicone-hydrogel and biocide science.

The company says HEMPAGUARD has shown excellent fouling resistance of up to 120 days during idle periods, fuel savings of 6% on average and offers the first performance satisfaction guarantee contract in the industry. The fouling defence system is available as two separate products: HEMPAGUARD X5 and HEMPAGUARD X7.

Hempel is offering a performance satisfaction guarantee contract for vessels complying with a full HEMPAGUARD X7 specification.

"If for any reason you are not satisfied using HEMPAGUARD X7, Hempel will pay, under the performance satisfaction guarantee contract, for the conversion of HEMPAGUARD back to conventional antifouling and with no questions asked," explained fouling control marketing manager Claes Skat-Rørdam.

ActiGuard integrates silicone-hydrogel and full diffusion control of biocides in a single coating. Surface retention of the biocide activates the hydrogel, which effectively holds fouling organisms at bay, cutting friction to a minimum while utilizing a minimum amount of biocide. It also has the long-term stability and mechanical properties required of a durable solution. *NA*

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Green ships key to shipbuilders' future

Environmental designs are key to the further development of China's shipbuilding industry. Designing green ships is the only way for the country's yards to catch up with competition from its neighbours in South Korea and Japan, reports Wang Jin

Since the beginning of the year, major shipbuilding companies in China have been eagerly developing energy-saving green ships in order to adapt to the structural change of the market.

Their efforts have paid off after they achieved a breakthrough in terms of winning new orders. These shipyards have emphasised the research of energy saving technologies and keenly promoted the application of low energy consumption, low material consumption and highly efficient automated equipment in ship design and key construction processes.

As the global shipping market remains lacklustre and the trend towards a low-carbon economy continues, Chinese shipbuilders have accelerated the adjustment of their shipbuilding activities; they have raised their competitiveness in the global market and achieved sustainable development the design of green ships.

In the past year alone Chinese shipyards have put a lot of effort into the development of green ship models. Chinese shipbuilders have the capability to design and build bulk carriers, tankers and containerships, and some of these products have reached world-class standards.

The new designs are becoming more and more economical and more adaptable to new international standards and regulations. Especially in the first half of this year, major shipbuilders in China have increased their efforts in developing new environmentally friendly models that match the latest international shipbuilding standards, optimised their models of the three major ship types and snatched new orders.

The influx of new orders has demonstrated the technological capability of Chinese shipyards. An example is an order for 10 50,000dwt product tankers won by Guangzhou Shipyard International Company Limited. The 38,800dwt *Green Dolphin* bulk carrier developed by Shanghai Merchant Ship Design & Research Institute (SDARI) has also been well-received by the market.

These key shipbuilding and research companies have worked on reducing ship body resistance, optimising main engines and their settings, heat recycling, reducing energy consumption of ancillary engines, etc while developing green ship models. They have come up with solutions such as installing a conduit, which can improve the wake field at ship stern and increase the efficiency of the turbine. They have also found that the cost of installing heat recycling systems can be redeemed in a short period of time.

In the area of high technology and high value-added ship types, Hudong-Zhonghua Shipbuilding (Group) Company Limited has won an order for six 174,000m^3 dual-fuel LNG carriers. COSCO Dalian Shipyard Co Ltd has won an order for a 28,000m^3 dual-fuel LNG ship with a C-type liquefied tank. With regards to the use of clean energy, most major shipbuilding companies have adopted LNG dual-fuel engines which can largely lower emissions, especially the emissions of SOx; satisfy Emissions Control Area (ECA) requirements and lower fuel costs.

In response to the green shipping trend, Chinese shipyards have proactively developed and built environmentally friendly ships. Meanwhile, some ship models are already equipped with speedy fuel oil recycling system (FORS). Through optimising the system settings onboard, salvage ships can directly collect fuel from stranded vessels after accidents and avoid a fuel leakage. Furthermore, many Chinese shipbuilding enterprises, research institutes and design companies

Launching of the 50,500dwt product oil tanker built by Guangzhou Shipyard International Company Limited

have commenced basic research on ships without ballast tanks.

Growing pressure

Facing an increasingly competitive market and a change in market demands for different ship types, shipbuilders in Japan and South Korea leveraged on their strong innovative capability and construction technology have shown strong relative advantages in winning new orders for energy-saving ultra-large containerships, LNG carriers, offshore engineering products, etc.

Foreign shipyards have started the conceptual design of LNG supply vessels and to improve their selective catalytic reduction (SCR) systems to fulfil the emission requirements of the US Education institutes, industry associations, shipping companies and shipyards in those countries have also worked together to form research teams to tackle issues in resistance reduction, ship propelling systems and integrated green technologies.

51,800dwt ice-strengthened product tanker built by Guangzhou Shipyard International Company Limited for Denmark's Torm

IMO has extended the control over the environmental impacts caused by marine

52,300dwt product oil tanker built by Guangzhou Shipyard International Company Limited

vessels from oil, waste disposal to the disposal of ballast water, gas emission, use of asbestos products and shipbreaking, etc. In Europe and the US there are also strict controls over SOx emissions and those controls are being tightened gradually. All these have created urgent needs for the upgrade of green vessels.

According to industry experts, Chinese shipyards have already had a solid foundation on green ship development. But, in terms of ship speed, light ship weight, operational economics and design concepts, Chinese ship models still lag behind those ship models developed by Japanese and South Korean shipbuilders.

With the same block coefficient, vessels built by Chinese shipyards have slower speeds and higher energy consumption levels compared to those built by Japanese and South Korean shipyards. Some of the ship models developed by Chinese shipbuilders do not match the operational requirements of shipowners and ports. The quality of accessories could also cause problem. Ships built by Chinese yards have higher lightweight in general. This is because the components used are heavier and the steel products used are usually with a plus tolerance in China; also, the proportion of high-tensile steel used in China is relatively lower.

It is expected that the Chinese authorities will gradually launch ECA standards that are similar to those applied in foreign countries in coastal areas, port cities and along inland rivers. In terms of emission reduction standards, the gap between ocean-going ships in China and in foreign countries is narrowing but, the gap between Chinese and a foreign river vessel is broadening.

Meanwhile, the drafting of emission standards and execution schedules for coastal areas, port cities and along inland rivers has shown little progress. China has to speed up the applications of new energy and alternative energy. There is a lack of guidelines for the design of inland river ships and coastal vessels; LNG propulsion systems design, installation, conversion and surveys still need improvements. Related standards in those areas are still waiting to be improved.

Narrowing the gap

The shipbuilding industry is facing a huge challenge as the uncertainty in world economies has slowed recovery, particularly in the shipping sector. Shipyards must be able to innovate and be flexible in order to compete. Major shipbuilding enterprises have to emphasise environmental protection, economic returns and high-end products and make R&D a priority.

Shipbuilders need to consider the operational returns of shipowners while developing new models, according to experts. It is a systematic process that needs to take into account shipbuilding costs (the calculation of which must take into account ship financing costs, oil prices and exchange rates, etc.), shipping costs, shipping management, return on investment and operational strategies.

Shipyards must, therefore, strengthen their understanding of international standards and conventions, accelerate their research and applications on new safety, environmental protection and energy saving technologies. They also have to work on the reduction of ships' lightweight and carbon emission; and conduct market researches to understand the needs of shipowners, port requirements and changes of shipping routes in order to develop high-end ship models.

Precise craftsmanship is the key to control light ship weight. Shipyards can reduce lightweight by choosing the right components and arrangements onboard. The thickness of every steel board must be appropriate and precise. Research on the lightweight of different bulker models with the same deadweight tonnage carried out by a Chinese research institute suggests that it is possible to lower ships' Energy Efficiency Design Index (EEDI) by optimising the arrangement onboard. Chinese shipbuilding companies also have to modernise their management style and information collection and processing style.

Speeding up the establishment of a set of energy saving standards and a surveying system can benefit the industry as a whole. There should be a system to evaluate the economic efficiency of low carbon green ships of different ship types and a set of economic standards to reflect the demand of shipowners.

These standards can help point the shipyards in right direction with regards to ship design, construction, surveying and operations. All parties in China's industry must redouble their efforts on the research of basic theories for green technologies and promote the development of green ship technologies. *NA*

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INTERNATIONAL SHIPBUILDING EXHIBITION

VIGO (SPAIN) 20th, 21st and 22nd May

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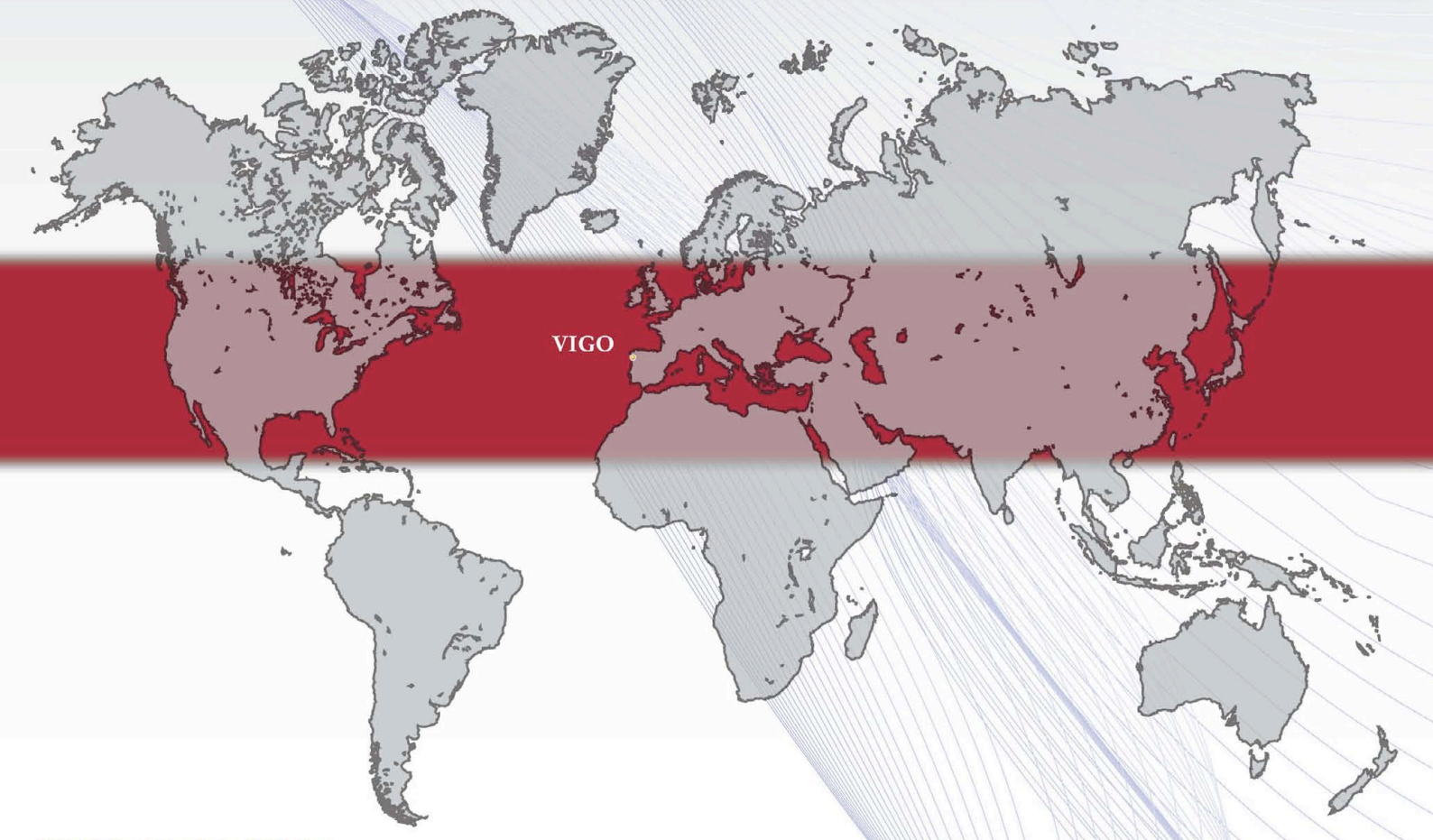
5th Edition



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Mega containerships generate whipping & springing sensation

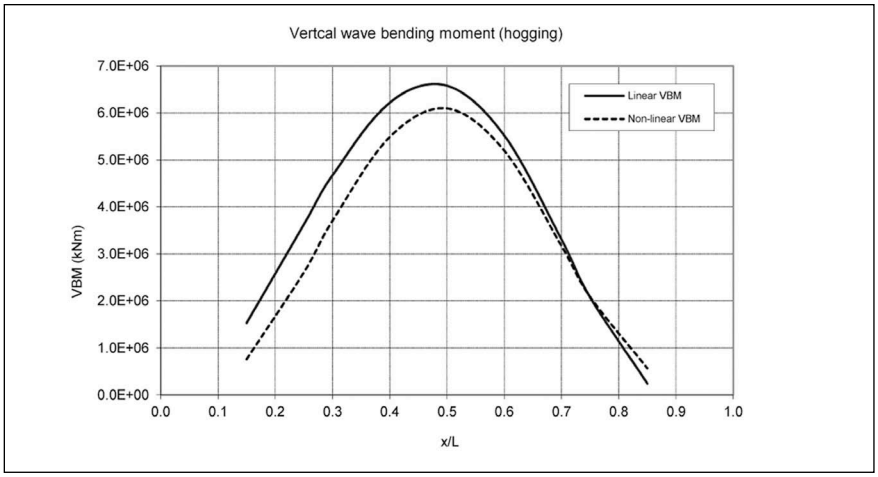
As we await the report on *MOL Comfort*, the hull strength of mega containerships comes into focus. David Tozer, Global business manager for containerships, Nigel White, technical manager hydrodynamics and Jimmy Tang, technical manager Hull, Lloyd's Register (LR) marine explain how whipping and springing affects these latest designs

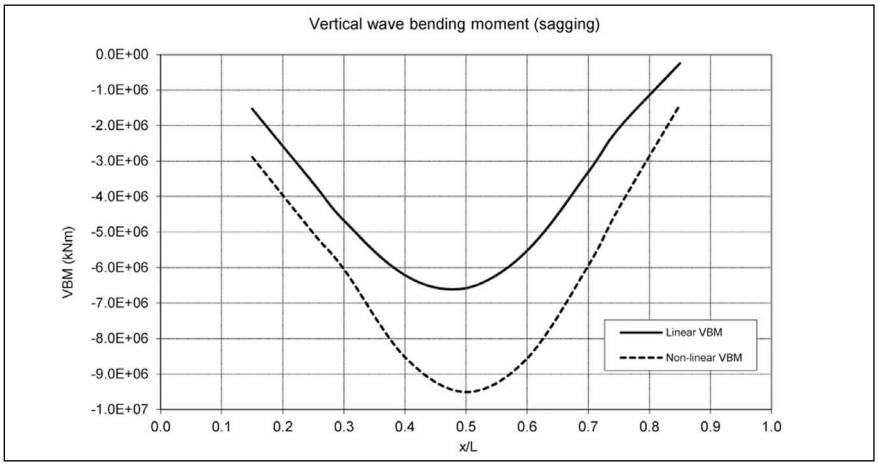
Increasing demand for container transportation worldwide has driven rapid growth in the size of the latest generation of container ships, particularly those which are designed for the Asia-Europe trades. This growth in ship size has been accompanied by innovative developments in the general arrangement of the ships, taking advantage of the additional stability which is often the consequence of the operational constraints on draught, etc and the general trend towards lesser L/B ratios deriving from the current reduction in design speed following the strong hike in bunker prices in the last couple of years.

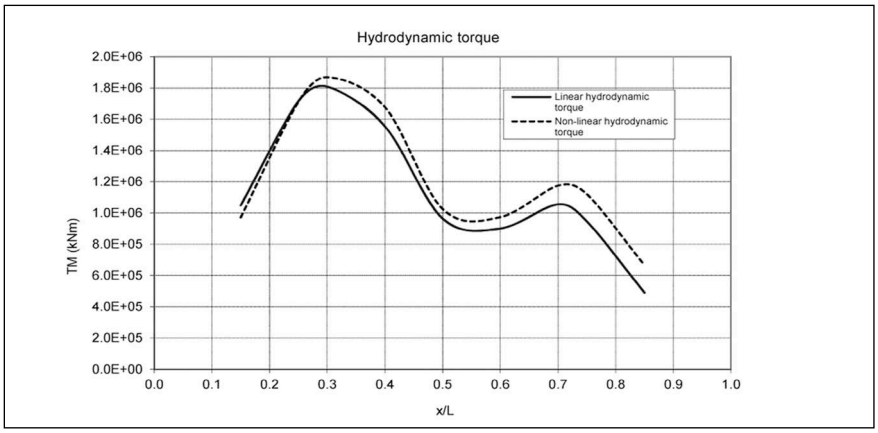
The traditional configuration of containerships, with the engine room and accommodation area located towards the aft end of the ship, has also evolved. The twin island configuration, with the engine room aft and the accommodation and bridge located at, or forward of, midships, has become common for larger containership designs. The mid-island configuration has also been adopted by some owners.

These developments, together with the increasing use of very high strength steels, has necessitated a review of the loads experienced by these ships in service, and the consequences of the dynamic responses of the now relatively more flexible hulls.

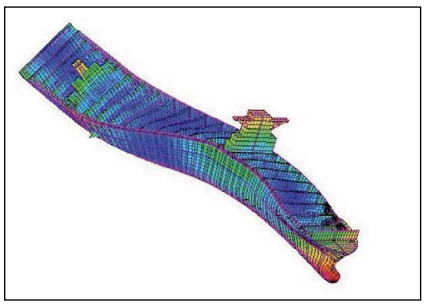
The structural assessment of these high speed ships, with their slender hull forms and large deck openings, present two challenges. Enhanced methods are necessary to determine accurately the



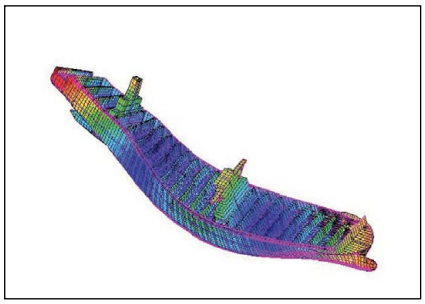




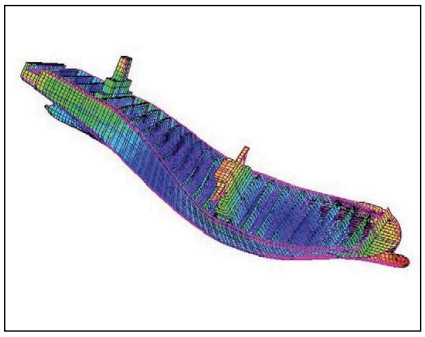
Non-linear and linear wave bending moments and hydrodynamic torque in oblique seas



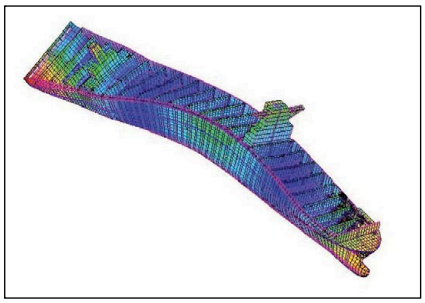
Wave cycle starts



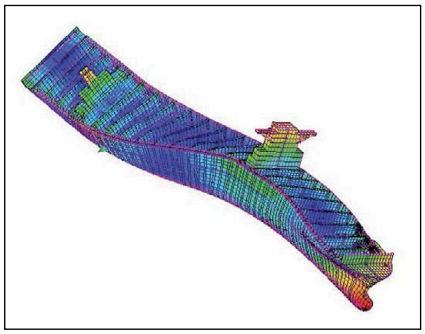
¼ of a wave cycle



½ of a wave cycle



¾ of a wave cycle



Wave cycle ends

Response of a container ship on an oblique wave showing combined bending and twisting deformation of the hull girder

oblique seas, and the vibrational response due to whipping and springing of the hull girder requires careful consideration from stress and fatigue perspectives.

In recognition of this, LR has investigated both of these aspects in order to produce workable design standards and methodologies with which container ship hull structure can be designed and assessed. This substantial piece of work has now culminated in revised draft rules for containership hull structure.

This paper outlines the background to the methodologies applied.

Hull girder strength

A new set of formulae have been developed which describe the hull girder hydrodynamic torque, vertical and horizontal wave bending moments and shear forces experienced by container ships in the oblique sea condition.

A range of containerships of different sizes and common configurations were used in the development of the new formulae. The appropriate design stress level was determined by using a first principle probabilistic approach, in which the long term structural stress responses are derived based on the North Atlantic wave environment. The wave energy was modelled using the ISSC wave spectrum, with wave spreading function, and an even distribution of heading probability was used; this is considered to be the most suitable method for structural strength assessment.

In order to determine the stress response accurately in regular waves, the wave loads were computed using a hydrodynamic model of each ship and the external wave pressures were mapped on to a full ship finite element structural model. The system was balanced with the cargo inertia loads derived from the ship motions. The use of a balanced full ship finite element model allows the model to deform freely by eliminating the need of introducing artificial boundary conditions. This is important in computing the correct structural response for open deck ships under twisting deformation.

The required Equivalent Design Wave (EDW) to generate the stress response obtained from the long term probabilistic analysis, was selected based on the regular wave stress response amplitude operator (RAO). In general, the wave frequency and heading is selected based on the maximum stress RAO, which is an acceptable procedure when equal probability of heading is considered. The wave height was calculated as the ratio of the long term stress to the selected stress RAO.

This procedure was applied to the range of containerships to obtain the EDWs in oblique seas. The corresponding vertical and horizontal shear forces, bending moments and hydrodynamic torque moment curves, were then extracted for each ship. A set of formulae were derived, which describe the instantaneous distribution of hull girder hydrodynamic loads.

Non-linear ship motion effects are important for containerships hence a study was carried out to determine the effect on the hull girder loads using non-linear time domain hydrodynamic calculation for the EDWs (regular wave). Non-linear corrections were derived for applying the non-linear effect to the hydrodynamic bending moment and torque; these corrections are included in the load formulae.

It is worth noting that the formulations are designed in such a way that the phase relationships between different load components are preserved so that the loads can interact correctly. This is an important aspect in determining accurately the response of the hull structure because the maximum load of each component, in general, does not occur symmetrically and their effect may be additional or cancelling.

Whipping and springing of ships in waves

The whipping and springing phenomena are not new and have occasionally been critical design issues in the past. Until recently this has been dealt with on a special case by case basis, but this issue is becoming more important due to the rapid increase in the size of container ships over the last few years. Due to the large deck

Figure 1: A typical hull girder response due to bow slamming impact measured by a long base strain gauge

openings of these ships springing and whipping phenomena can be critical for their design and operation.

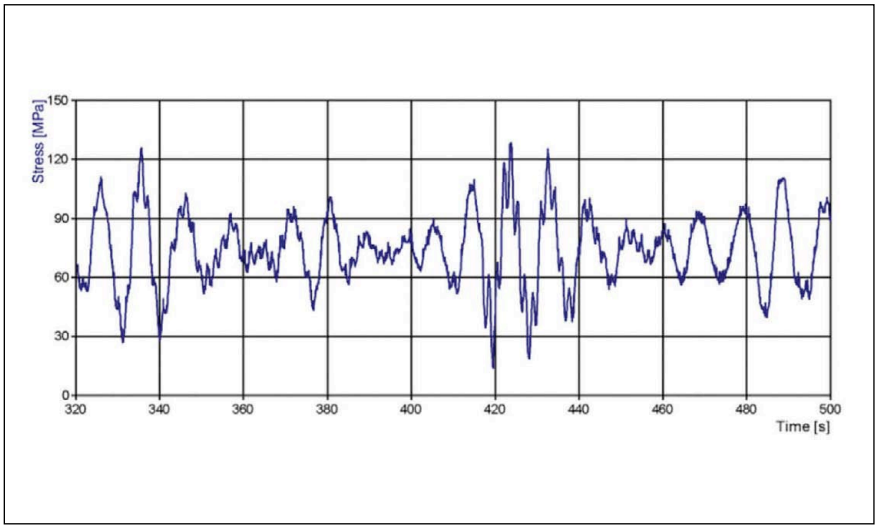
Whipping and springing are also very important for other ship types; in particular Great Lakers are specifically designed for operation in the Great Lakes and St Lawrence Seaway and hence are very long and narrow with low hull inertia values and whipping and springing are limiting design issues for these ships if they need to operate outside this region. Other ship types significantly affected include ultra large ore carriers and ultra large bulk carriers.

Springing

An analogy to springing is the action of a bow being drawn over a violin string. This gives a constant note due to the string being continually excited.

Springing of a ship is the continual hull girder vibration as a consequence of the waves exciting resonant hull girder frequencies.

The flexing of the hull girder due to springing may continue for a significant period once initiated. Springing is an issue for ships, which have low natural vibration frequencies of hull girder bending or hull girder torsional (twisting) modes, typically when the lowest natural vibration frequency is greater than two seconds and the ship speed is above 20 knots. This is the case for large container ships due to their long length, high speed and open cross sections. It should be noted that springing is not normally a strength issue because the magnitude of the hull girder stresses due to springing is usually low. However, the number of cycles of the springing stress is very large (about four to eight times the number of wave cycles) and this can



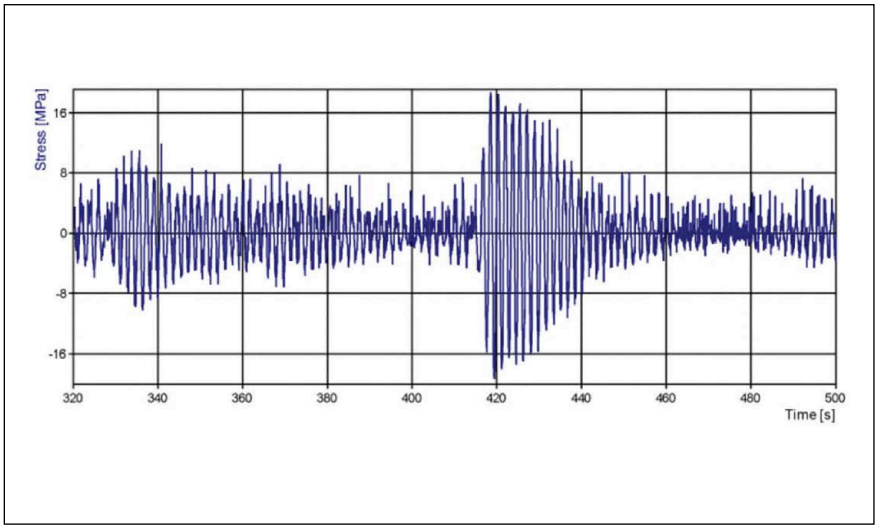


Figure 2: Hull girder natural frequency vibration (springing and whipping) response obtained by filtering

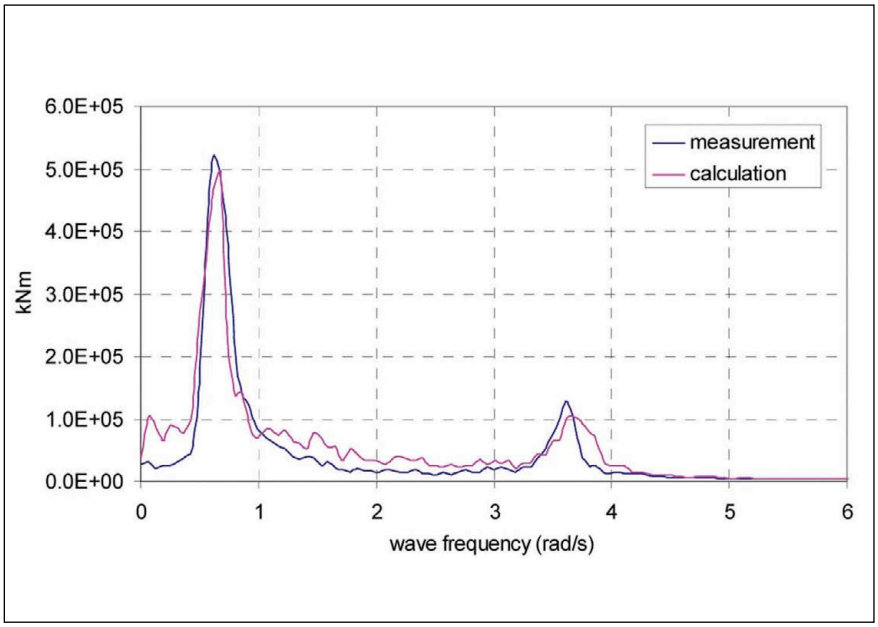
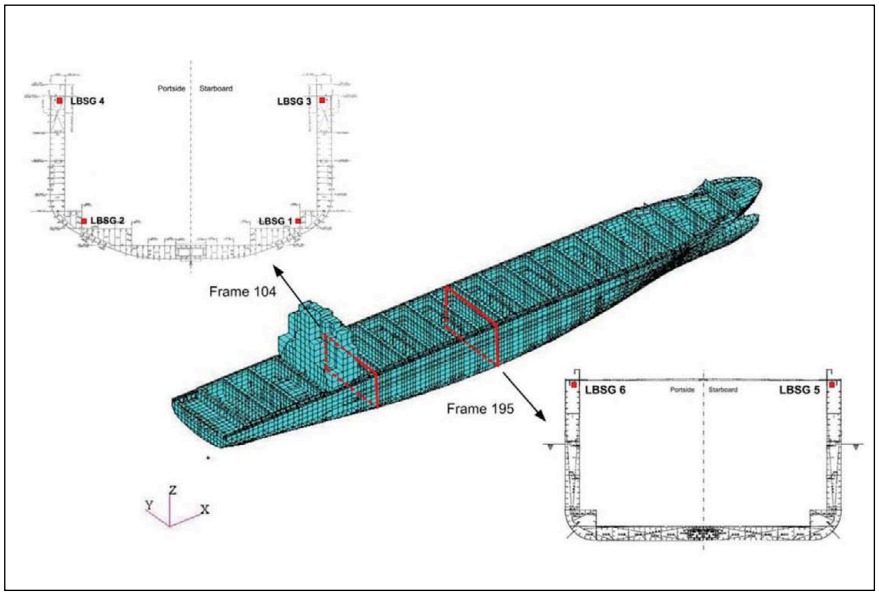


Figure 3: Vertical bending moment amidships for a JONSWAP wave spectrum

Figure 4: Long base strain gauge locations



make springing important with regard to the fatigue life of the hull structure.

Whipping

An analogy to whipping is the action of a violin string being plucked. This gives a loud initial sound that gradually dies away.

Whipping of a ship is the rapid flexing of the hull girder as a consequence of a wave impact on the hull. This can result in high frequency cyclic oscillations of the hull girder which can result in greater vertical wave induced bending moments and shear forces than would be predicted by linear theory.

High whipping responses are usually driven by bow flare impacts due to large bow flare angle and high speed or by bottom slamming. Occasionally stern counter slamming can lead to high whipping responses.

The oscillations of the whipping responses usually decay rapidly after several wave periods due to damping effects. Whipping is primarily a strength issue. It is not a fatigue issue as the whipping induced vertical bending moment oscillations usually damp out quickly and hence the total number of whipping cycles in a ship's life are small.

Ships that have hull girder natural frequencies close to the frequencies of the wave energy region are therefore potentially prone to springing. In addition, springing may be excited after a wave impact as there is little damping resistance of the hull girder natural vibrations.

Full scale measurements of the amidships vertical wave induced bending moment of an 8,500TEU container ship are shown in Figures 1 and 2. A typical hull girder response due to bow slamming impact measured by a long base strain gauge is given in Figure 1. The hull girder natural frequency response has been extracted from the total response in Figure 1 and is shown in Figure 2. A whipping event is shown by the sudden amplitude increase at 418 seconds caused by the slamming impact. The initial high response decreases quite quickly due to hydrodynamic and structural damping effects. This time trace also shows a continuous springing hull girder vibration (Bakkers, 2009).

Figure 3 shows the predicted spectral energy response in the wave frequency range for the vertical bending moment of an 8,500TEU containership against the measured response from full scale measurements. As can be seen, the comparison is very good. Some whipping response was observed in the full scale measurements, however, it should be noted that the spectral energy of whipping responses will normally be very small, so what is being shown here is mainly the springing response.

Assessment of whipping and springing effects

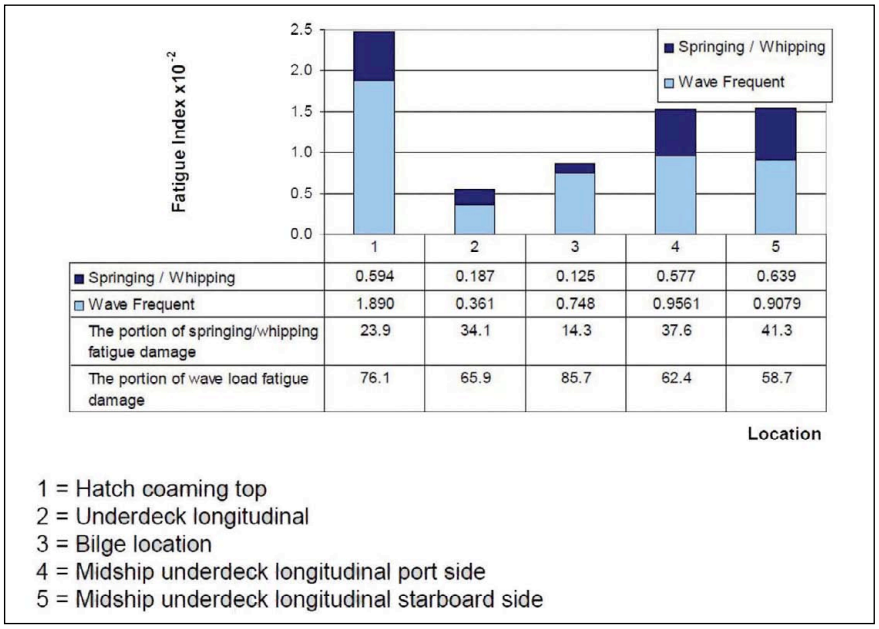
The assessment of a vertical wave bending moment and other global loads taking into account non-linear wave effects including whipping and springing actions is a very complex issue. The state-of-the-art with respect to ship motion analysis is still developing and will do so for many years to come, and hence the assessment of wave loads on ships using direct analysis is still very much a specialist issue. Currently, most yards, designers and classification societies have access to linear ship motion analysis programs and these all generally give similar results; however for solving the whipping and springing issue, the available ship motion codes are all in the research phase and need to be used by specialist hydrodynamists.

LR is currently undertaking an extensive research programme into whipping and springing issues. A draft document "Guidance notes on the assessment of global design loads of large container ships and other ships prone to whipping and springing" has been circulated to a few yards and designers as part of a consultation process prior to releasing a final version. So far this document is unique in that it is the only classification document that provides explicit details of the analysis procedures required to derive the hull girder design values including whipping and springing effects.

For the Whipping assessment, these guidance notes are applicable to assess the vertical wave bending moment (and global loads induced by waves) to cover non-linear effects of hull form shape including whipping due to the slamming and operating worldwide in any sea condition. The guidance notes include details on how to assess the hull girder strength against whipping induced hull girder loads.

For the Springing assessment, these guidance notes are applicable to assess the vertical wave bending moment (and global loads induced by waves) to cover non-linear effects of hull form shape including whipping due to the slamming and operating worldwide in any sea condition. The guidance notes include details on how to assess the hull girder fatigue strength against including springing induced hull girder loads.

The other major item of research is the development of in-house hydroelastic



	1	2	3	4	5
Springing / Whipping	0.594	0.187	0.125	0.577	0.639
Wave Frequent	1.890	0.361	0.748	0.9561	0.9079
The portion of springing/whipping fatigue damage	23.9	34.1	14.3	37.6	41.3
The portion of wave load fatigue damage	76.1	65.9	85.7	62.4	58.7

Location

Figure 5: Calculated fatigue damage based on the measured stress history for one voyage

The other major item of research is the development of in-house hydroelastic ship motion codes, HydroE-FD and HydroE-TD. These codes are based on the recently restructured WAVELOAD linear ship motion programme developed by MARTEC, a subsidiary of LR. Both codes support 3D shell finite element models of the whole ship or idealised 2D beam FE models in association with 3D diffraction ship motion analysis. The linear frequency domain springing analysis module of HydroE-FD is already available and has been used on several designs. The time domain non-linear hydroelastic code HydroE-TD will allow the wave impact forces acting on the ship in the bow and stern regions to be calculated as well as the resulting whipping response and the code will be subjected to rigorous testing shortly. LR's involvement in the WILS III JIP project and the full scale measurement projects is an important part of this validation exercise as these provide reference data against which the codes can be compared.

Full scale measurements

The important contribution due to the global wave induced hull vibration on containerships has been investigated by LR using full scale measurements and model tests.

In 2005, LR installed a full scale measurement system onboard an 8,500TEU containership during its construction in (Samsung Heavy Industries) SHI shipyard in Korea to measure the responses of the hull girder, ship motions and wave data. Data collected over a one year period has been analysed. The locations of the main strain gauges used are shown in Figure 4.

The main objectives of this project were to:

1. To expand the knowledge on the level of hull girder stresses (loads) and motions experienced by a larger containership in operation
2. To collect relevant data, which can be used to validate direct calculation methods and rule formulae for the improvement of LR rules and direct calculation procedures.
3. To carry out statistical analysis of the measurement data to obtain long terms statistics of peak stresses, hull girder loads, ship motions and rainflow cycle counts of stress ranges for fatigue assessment.
4. To improve knowledge on the level of stresses contributed by whipping and springing effects and their contribution to peak stress level and fatigue damage

The measured stress history was used to calculate the proportion of the predicted fatigue life that was used up during the voyages. Figure 6 shows the wave height during one of the voyages. The predicted fatigue damage index for a period of one year is shown in Figure 5; an index value of 1 denotes that the full fatigue life has been used up within one voyage. The fatigue damage index has been calculated with springing and whipping effects, denoted as "Springing/whipping", and without,

David Tozer, Global Business manager for containerships, LR marine

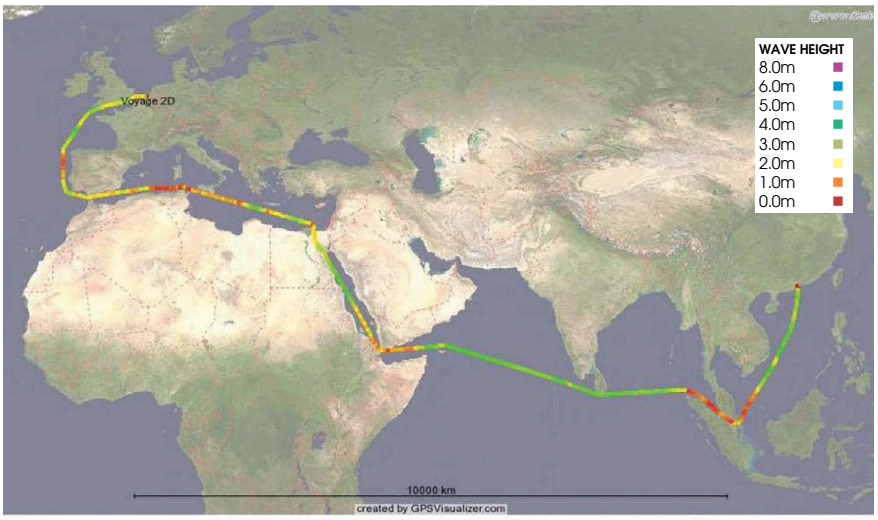


Figure 6: Measured significant wave heights for one of the voyages

denoted as "Wave Frequent" in the figure. For the strain gauge location with the highest predicted fatigue damage index, the combined whipping and springing actions account for 24% of the total. For the other locations, the contribution from whipping and springing is even larger, up to 40%, but the total predicted damage is lower. So it can be seen that the inclusion of springing actions in particular has a significant detrimental effect on the fatigue life of large containerships.

LR has participated in the WILS JIP over the past few years, this JIP is now in its third stage WILS III. The aim of this project is to enhance our understanding with respect to the combined effects of fully non-linear wave actions and wave induced loads on the global dynamic response of containerships. The main objectives of this JIP are to provide reliable model test data of a large containership and to compare these with predicted springing and whipping responses from current hydroelastic analysis tools.

MOERI (Maritime & Ocean Engineering Research Institute of Korea) has led the JIP and carried out model tests on a 10,000TEU containership divided into six segments. An FRP segmented hull with a steel backbone at a 1/60 scale was used. The main purpose of the model tests was to measure the wave impact forces, sectional forces, hull girder bending moments and torsion moments due to springing and whipping in waves.

This data has been used by LR as part of the validation process for our non-linear and hydroelastic ship motion analysis tools.

Design experience for other ship types

Springing has been an issue for the assessment of Great Laker Bulk Carriers (GLBC) since the 1970s. In particular it is quite common for a GLBC to be used for coastal trading along the US eastern freeboard and into the Gulf of Mexico. These vessels have very high length/depth and length/breadth ratios in association with less than minimum ocean going midship modulus of inertia (bending stiffness). These factors mean that these vessels are very prone to springing and it is essential to include the vertical bending moments due to springing into the design assessment for strength. Studies have shown that the effects of springing can increase the design bending moment for restricted sea state operation by over 30%.

Whipping due to bottom slamming forward is usually a more critical issue as the forward draught of these ships is relatively small, the same study showed that the effect of whipping resulted in a 40% increase in the design bending moment.

Only the higher modulus GLBC ships are allowed out of the Lakes and St Lawrence Seaway, so fatigue is not so much of an issue for the due to short duration of trade outside of the Lakes. For new GLBCs built in China, then assessment of the springing response and consequent degradation of the fatigue life is important for the delivery voyage from the builders to the Lakes.

Another ship type prone to whipping and springing effects is floating docks during the towage voyage from the builders to the operational area. Floating docks are not designed for operation in areas where there will be any wave loading and hence wave bending moments. They also have a very high length and breadth to draught ratios in association with low bending stiffness. This results in natural periods of springing vibration which can be around the three to five second band, hence for the towage voyage this vibrational period is within the main range of wave periods and will excite significant springing actions, which need to be reviewed. *NA*

Figure 7: model test (courtesy of MOERI)

Mijac sees the light

Japanese industry, in the form of four medium sized yards, a class society and a ship operator, has joined forces to create a new research and development vehicle. The Maritime Innovation Japan Corporation or Mijac was incorporated on 1 April this year and is set to build on Japanese maritime success

Just to clarify for all Michael Jackson fans the singer is not investing in the Japanese maritime industry from beyond the grave. It's just the latest R&D company to evolve from Japan called Mijac, shares its name with the singer's music catalogue.

Still you could be forgiven for thinking that the late singer wrote Thriller as a footnote for the decaying global shipbuilding industry. "Darkness falls across the land, the midnight hour is close at hand" sits as comfortably as a description of the horror show that has become the shipbuilding industry since 2008, as it does as the words to Thriller.

In fact the entire opening stanza of Jackson's masterpiece would fit the bill. However, Mijac has been founded as a result of the collapse in orders for new vessels caused by the knock-on economic effects of the 2007/08 banking crisis.

As demand for new vessels has fallen and demand for space on the existing fleet also dried up the maritime industry came to the gruesome realisation that there was over-capacity, not only on the existing fleet, which was exacerbated by the delivery of vessels ordered before the Thriller event, but there was an overcapacity of shipyards too.

For the more mature economies, such as Japan, the crisis has unleashed a multitude of demons that have attacked the industry. The strengthening yen meant that foreign owners were less likely to order in Japan, while the rise of China and the keen pricing competition that ensued with the South Korean yards and equipment manufacturers has compounded the horror show, particularly for the medium-sized yards.

> "a sense of crisis had developed in the Japanese shipbuilding industry because Japan was continually losing market share"

This was the context that prompted four yards, Oshima Shipbuilding Co., Ltd. Shin Kurushima Dockyard Co. Ltd, Tsuneishi Shipbuilding Co. Ltd and the Sanoyas Shipbuilding Corporation along with ClassNK and ship operator NYK, to fund the creation of Mijac as an investment in R&D for the Japanese industry as a whole.

Kazuichi Masuda, Mijac director, describes the background to the company's founding more succinctly: "The background is that a sense of crisis had developed in the Japanese shipbuilding industry because Japan was continually losing market share to the growing shipbuilding industries in Korea and China.

President Masato Nobuhara heads up the new innovation corporation

"And although research and development in naval architecture used to be implemented by individual dockyards, beginning two years ago the shipbuilders, shipping companies and scholars from universities and think tanks began examining the idea that the shipbuilders, shipping companies and manufacturers for ship's equipment could create a joint platform and thereby implement the research and development more quickly, widely, and deeply than in the past."

Last summer (2012), at a meeting of top leaders from the four principal Japanese shipbuilders the deal that established this new R&D platform was struck, eventually creating the first jointly owned research and development vehicle in the industry.

At the founding news conference Mijac said that its aims were "to lead in improving Japanese shipbuilders, shipping, and ocean

Sanoyas which delivered *Dragon Sky* earlier this year is also part of the corporation

technologies to ever-higher levels and keep them known worldwide as Japanese technologies. It is our intention to use the support provided by those involved to continue to move forward with research and development of ship design and construction, ship operating technology, technologies that reduce CO_2 and emissions from ships and technologies related to the use of ocean energy."

Some 14 staff are now employed by the new company in an attempt to fulfil those aims, including seven naval architects and seven mechanical engineers and when the company was established, the initial annual general budget was over US$2 million.

The budget is, however, expected to more than double over the coming three to five years as the planned projects begin their development.

"In the past, support used to come from the Nippon Foundation. But at that time, most shipbuilders conducted research and development jointly only as a temporary activity. Now we are spearheading a first-time challenge in which the four shipbuilders, all private companies, are each sending dedicated people to full-time work," says Masuda.

According to Mijac in past years each shipbuilder independently solved any problems that arose from an individual project, either through development or purchase of technology. This was an inefficient use of the limited funds available for R&D at each company.

"Now we are spearheading a first-time challenge in which the four shipbuilders, all private companies, are each sending dedicated people to full-time work"

By joining forces "the fruits of the R&D will be applied to the ships built by all four shipbuilders, who, between them, can build over 150 ships per year in total." The developed technology will be available on the open market for other shipbuilders to use also as Mijac investors look to make a return on their investment. It is planned that the first results of research work will be available within two years.

One of the major projects that Mijac will get involved with is the ECO-SMART ship, which it says will offer 30% fuel savings when compared to vessels that are operational today.

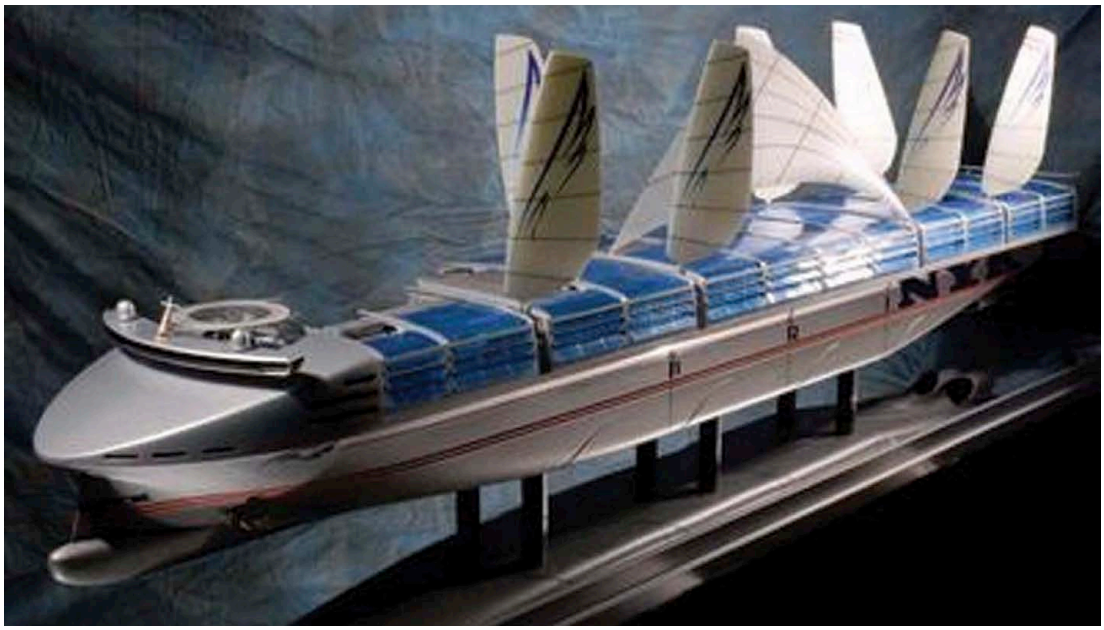
"The general plan [for the ECO-SMART ship] spans four or five years, but some items in the plan may reach their goals earlier, by one or two years, so that adoption becomes possible from the second to third years," explained Masuda.

He also pointed out that some of the development items are not new, but have been adopted on high powered ships such as container vessels, but not to slower vessels such as bulk carriers.

Another major project which could be ground breaking is the use of wind and solar energy combined with fuel cells to power a future ship.

A third project will see the design of a bulk carrier in collaboration with cargo owners, rather than shipowners. Up to now ship builders had to plan and propose a ship's construction within the conditions specified by the shipowners. "MIJAC will try to design the new concept for a global bulk carrier by finding cargoes and cooperating with the people who want to transport of those cargoes," says the company.

Overall the aim of Mijac is to turn a horror show into something altogether more pleasant, probably a romcom or a maybe a musical. That will be thrilling. *NA*



NYK green concept the NYK super eco ship 2030

JMU's first vessel, a symbol of change?

The first ship to roll off the production line at the newly merged Japan Marine United (JMU) was the Aframax tanker *Kaimon Maru*. The Universal Shipbuilding Corporation and IHI Marine United officially joined forces on 1 January this year in what could be a precursor for the shipbuilding industry which still has an excess of capacity

In order for any recovery in the shipbuilding industry to take place there needs to be some consolidation in the industry according to some well-placed sources within the business.

Already China and South Korea have seen a number of small to medium sized yards close and in Japan too capacity has been scaled back with the closure of major shipyards, such as the Kobe yard operated by Mitsubishi Heavy Industries (MHI).

Just as pure car carrier *Emerald Ace* was the last commercial vessel delivered by the historically important Kobe yard, so *Kaimon Maru* may prove to be a historic first from the fledgling Japan Marine United (JMU).

The Aframax tanker was delivered to JX Tanker Company Limited from the Kure Shipyard in January this year, shortly after the management integration of Universal Shipbuilding Corporation and IHI Marine United Inc.

Kaimon Maru is one of the largest Aframax tankers with a cargo tank capacity of 142,000m^3 and a deadweight of 120,000tonnes. Cargo is carried in 12 tanks arranged in six pairs.

The company has introduced its LV Fin (Low Viscous resistance Fin) and the AT Fin (Additional Thrusting Fin) onto the vessel design which will improve the vessel's performance including its fuel efficiency.

Meeting all the latest environmental regulations and delivering more cargo using less fuel and producing less pollution the vessel and the yard are clearly products of their time.

The company says: "JMU has developed an eco-ship equipped with contra-rotating propellers, waste heat recovery combined power generation system, optimal navigation system "Sea-Navi", energy saving devices and other features. JMU's eco-ship has improved energy efficiency by 16-20% compared to conventional vessels. It has been highly acknowledged and appreciated by customers around the world."

Improving the level of research & development was one of the key factors in the merger of the two yards. Essentially the two yards have increased their resources and the building berths available and can now challenge for a selection of vessel types that were previously out of its reach such as LNG carriers, mega-containerships and pure car and truck carriers (PCTCs).

"The operation of multiple large-scale shipyards has allowed us to respond to business negotiations for a whole lot of new vessel types; LNG vessels, container vessels and it has

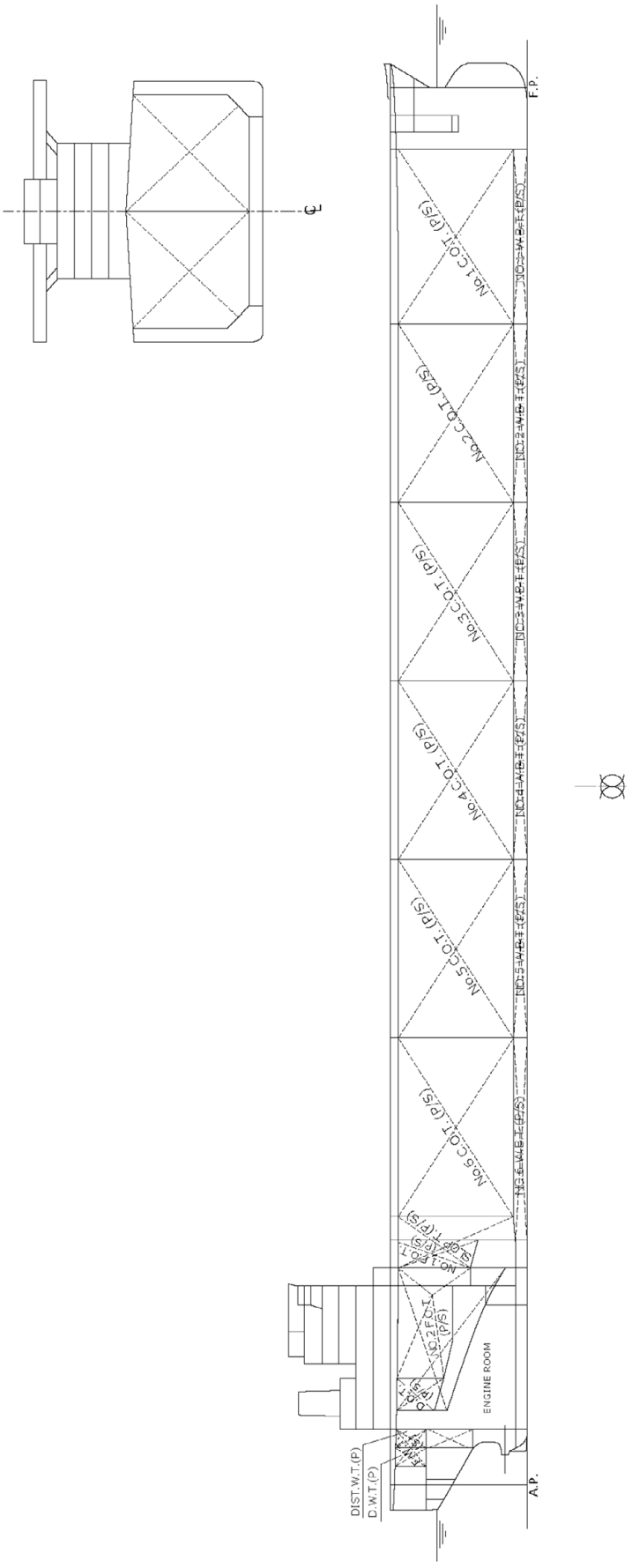
TECHNICAL PARTICULARS

Kaimon Maru

Length oa:	246.80m
Breadth moulded:	44.40m
Draught scantling:	15.439m
Gross tonnage:	66,071gt
Deadweight:	120,015dwt
Water ballast:	39,600m^3
Cargo capacity:	139,000m^3
Diesel Oil:	270m^3
Heavy Oil:	2,830m^3
Daily fuel consumption:	47.7tonnes/day
Classification society and notations:	ClassNK NS* (CSR, TOB, PSPC-WBT) (ESP) (IWS) MNS* M0
Main engine	
Design:	1 x Wartsila 6RTA58T-D
Manufactured by:	Diesel United
Output of each engine:	12,210 kW x 94.5rpm
Propeller:	1 x Ni-Al-Bronze fixed pitch propeller designed and manufactured by Japan Marine United/Nakashima Propeller
Diesel-driven alternators:	3 x YANMAR Nishishiba Electric units with an output of 680 kW/900rpm

The first vessel to float off the blocks at Japan Marine United could hail a new era in shipbuilding

GA Plan *Kaimon Maru*



enhanced the scale of the company, which has enabled us to consider a scenario for re-entering the offshore structure market" says the company.

JMU is convinced that shipbuilding in Japan, unlike many yards in Europe, will survive over the short to medium term. "We have the technological competence and accumulation of experience and knowhow for overcoming recessions. We will adapt to new environments by strengthening our network through collaboration with Japanese shipowners and marine equipment manufacturers to develop new products of unrivalled quality under the 'Japan brand'" says the company.

The new yard is looking to collaborate with partners on new sophisticated designs and the merger allows the newly merged yards to bid for contracts that as separate entities they would not have been able to offer contracts for.

For example JMU is looking to build up its offshore technology business and is now able offer a wider range of vessels to its customers.

"IHI Marine United Inc. and Universal Shipbuilding Corporation have been building various types of vessels since before merger and each of them had their respective specialty vessels. Through the merger, the integrated company has established a platform to build large-scale vessels on a lot-order basis and has now become capable of building various types of best-in-class vessels by utilising the combined technological capabilities of many designers and engineers", says the company.

The company added that in principle there had not been any consolidation or reorganisation within the company, there have been no job losses as a result of the merger, however, IHIMU Yokohama Shipyard and USC Keihin Shipyard, which are close in distance, have been integrated in terms of management as JMU Yokohama Shipyard (Isogo Works and Tsurumi Works) to maximise synergies and there has been personnel transfer in managing officers of the shipyards and other key general manager positions in order to share the advantages and to seek best practices of each shipyard as soon as possible and to the maximum extent."

JMU is looking to capitalise on its newly established ability to bid for more sophisticated and larger vessel projects by also developing its portfolio of LNG carrier vessel designs. The company offers two types of LNG tanks, type-B tanks including Moss spherical tanks and self-supporting prismatic tanks.

"JMU in collaboration with IHI can build a large-scale LNG tanker with an IHI-SPB tank design," says the company.

JMU delivered its first vessel in January

JMU has focused its developments on eco-friendly designs

The SPB tanks are a "self-supporting type of tank whose shape can be flexibly adapted to the shape of the ship to improve capacity efficiency. Through the flexibility to fit to the shape of ship, FLNG can equip plant with LNG production facilities and re-liquefying devices on the flat upper deck".

Having merged and developed a yard fit for competition in the 21st century JMU understands that the battle for survival in an intensely competitive market is only just beginning.

"Seaborne transportation will increase, but the excess in global supply of shipbuilding capacity will continue, therefore, we consider that ship ordering will generally remain at the current low levels for a while," the company explains.

In such a competitive landscape a strategic plan is necessary to meet the challenges from competitors who have a price advantage and the merger has established JMU's place in the field.

"The gap between demand and supply is still large and market conditions have not yet reached full recovery. Under such circumstances, however, we are still receiving a certain level of orders. We aim to open up opportunities by providing vessels that will offer value to the ship owner, such as eco-ships with significantly improved fuel efficiency."

Efficiencies from the merger will include ordering cost reductions and other management cost reductions that can be passed on to the customer.

In this sense *Kaimon Maru* is the first in what the new yard hopes will be a long line of ships that will prove JMU can compete under the savage competitive landscape. ***NA***

Green technology sets new standards

Sustainable shipping has been something of a buzz word in recent times as the shipping industry struggles to emerge from five years of economic downturn, but at the same time faces the challenges of new and emerging maritime regulation on the environment. Sandra Speares reports

Development of green technology has been gathering pace as the industry faces up to the demands of new regulation covering ballast water, sulphur and nitrous oxide emissions, waste water treatment and carbon dioxide emissions. Economic demands for reducing costs and emissions have led to an increase in slow steaming, which has brought its own challenges in terms of technology.

These technological challenges were raised at a recent seminar organised by Studio Legale Lauro in Naples to debate the future direction of shipping.

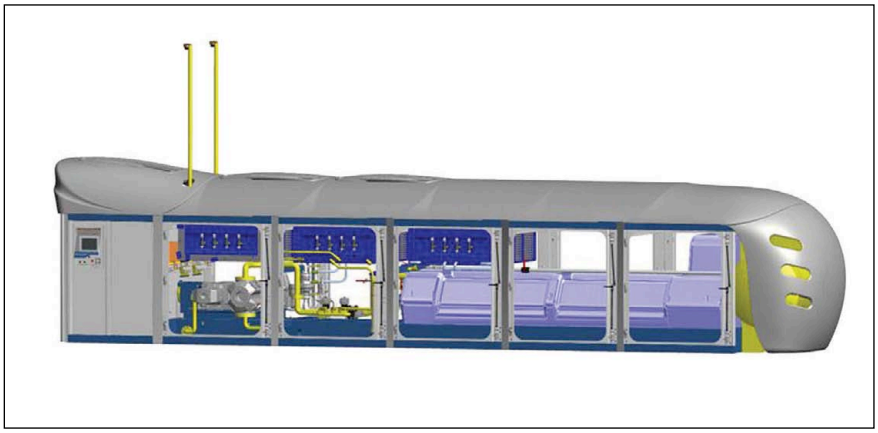
One of the sessions considered the impact of Ecoships and energy-saving technologies and whether the benefits could be quantified and the potential improvements be written into contracts in a way that protected owners from under-performance. RINa chief executive Ugo Salerno estimated that 16,000 vessels, equivalent to 400 million gt, were delivered pre-2011, designed for maximum cargo capacity rather than energy efficiency.

"Fuel is still the fundamental item. The annual fuel bill for a bulk carrier can be three times the cost of the interest payments," Salerno said. "Improvements of 20% in terms of ship efficiency are possible but for sophisticated tonnage, improvements in efficiency per tonne mile could go as high as 50%."

In describing Ecoships as effectively prototypes, Perserveranza CEO, Umberto d'Amato noted that 'eco' was a term open to interpretation. He suggested that the testing of Ecodesigns could be extended to verified model basin tests and performance during the first laden voyage in addition to normal sea trials.

Meanwhile, Pacific Basin, CEO, Mats Berglund warned delegates of the dangers of generalising about energy efficiency. Improvements in fuel consumption will vary across vessel type, size and speed. Slowing down was a low cost, highly effective solution.

Francisco the dual fuel fast ferry



Francisco has been fitted with a Cryobox LNG production nano station

"Before you embark in Ecoship ordering you must thoroughly do your homework. The consumption difference between a good second hand ship in slow steaming and a new Ecoship could be as little a one tonne of fuel. Ecoships are a high-speed strategy but, we assume that bunkers will stay high, which means slow steaming makes sense."

One of the big events of recent months has been the entry into service of Buquebus's new LNG-fuelled fast ferry *Francisco*. The 99m newbuild by Incat of Tasmania is a high speed dual-fuel vehicle and passenger ferry with a lightship speed of 58.1knots.

Part of the package is Galileo's Cryobox, and its LNG production nano station and Cryobox technology will make Buquebus the first maritime company to supply its own LNG.

Cryobox is designed so that the private industry and communities can become their own LNG suppliers. "LNG will allow *Francisco* to reduce combustion emissions by 98%, in marked contrast to traditional fuels," says Anibal Argomedo, Buquebus's technical

Manager. At the same time, it is estimated that the 66tonnes per day of LNG production required for its two daily frequencies will generate 50% savings within the operating expense. Seven Cryobox nano stations with a capacity of 84tonnes/day will be responsible for this LNG production. The product has been five years in development.

Each Cryobox unit is conceived as a module that can reach a maximum of 12tonnes/day of LNG (equivalent to 16000Nm^3/day of natural gas).

It is also a 'Plug & Play' module that can be sent to any destination by trailer for its immediate commissioning, since it can be installed at a fuelling station and then connected straight to a gas pipeline distribution or to a modular treatment plant, which allows gas pre-conditioning at a remote natural gas field.

The vessel's high speed can be attributed to the combination of Incat's wave piercing catamaran design, the use of lightweight, strong marine grade aluminium, and the power produced by the two 22MW GE LM2500 gas turbines driving Wärtsilä LJX 1720 SR waterjets.

Francisco has been constructed for South American company Buquebus, for service on the River Plate, between Buenos Aires in Argentina and Montevideo in Uruguay and the company says it will be able to make the journey faster than an airline.

Seeking to reduce resistance through the water, and improving hull coating to this effect have been two innovations in recent years. Reducing frictional drag on the ship's hull through the injection of a layer of bubbles has been at the centre of technological development, examples being Mitsubishi Heavy Industries' air lubrication system, and Damen's air chamber energy saving system.

Another version of this technology is DK Group's Air Cavity System (ACS), which works using compressors to fill with air a series of cavities fitted to the leading edge of the flat bottom of a vessel. As water from the surrounding sea flows past the still air in the cavities, it draws micro-air bubbles out of the chamber, which then form on the boundary layer of the hull, eliminating resistance between it and the water.

By reducing the friction between hull and water, ACS is able to reduce a ship's need for power and thus fuel consumption by up to an estimated 10%, according to the latest tests.

"We have been working very closely with Lloyd's Register and we see their brand as vital to this process, lending credibility and independent assurance to the new technology on its route to market," says Noah Silberschmidt, managing director of developer DK Group.

ACS technology is best suited to large, flat-bottomed vessels, such as tankers, bulk carriers and broad-beamed container ships, with the number of chambers or cavities varying from eight on a small vessel to 30 on a larger one. ACS can be retrofitted to existing vessels in dry dock in an estimated timespan of two weeks.

Silberschmidt says: "I am very excited about the retrofit variant. DK Group believes that the retrofit solution will be considered by shipowners as an alternative to investing in new tonnage. A potential 10% improvement of the efficiency on existing tonnage will narrow the gap considerably to new and more efficient vessels."

Tests have been carried out on the system and the final stage of the process is due in December 2013 or January 2014, when DK Group plans to trial the technology on a 45,000dwt Handymax tanker.

Wärtsilä, meanwhile, has launched its new Bio Seal Ring product for maritime stern tube seal applications, which the company says is the first seal on the market that works with environmentally acceptable lubricants (EAL) for a lifetime of at least five years. Conventional seal rings are recommended to be changed at two-and-a-half-year intervals.

The benefits offered by the Wärtsilä Bio Seal Ring to shipowners and operators are both environmental and economic, the company says. "The extended operating life expectancy has a significantly positive impact on dry-dock scheduling and related costs".

This solution is suited to fixed pitched propeller systems. Wärtsilä recommends that shipowners consult with the propulsion original equipment manufacturers to confirm EAL compatibility for controllable pitch propeller systems.

There has been a spate of newbuilding orders in recent months, many of which highlight their eco-friendly dimension. United Arab Shipping Company (UASC) has recently announced it will expand its container fleet. Constructed to DNV class, the designs have been optimised through a productive co-operation between FutureShip and Hyundai Heavy Industry (HHI).

UASC teamed up with Germanisher Lloyd subsidiary FutureShip, shortlisting four sets of designs for intensive evaluation by FutureShip with numerical tank towing tests based on Computational Fluid Dynamics (CFD) simulations for the ship with propeller. HHI's design emerged as the winner.

Test barge used by Damen to verify its research results for their air chamber energy saving system

UASC also decided to implement FutureShip's trim solution product, ECO-Assistant. Backed up with a comprehensive database of possible operational conditions evaluated by CFD analysis, this tool selects the most efficient trim for every voyage. The new ship designs are currently being finalised at HHI with deliveries scheduled between 2014 and 2016, including all options.

Other eco-design ships include AET's two VLCC newbuildings built at the DSME shipyard in Korea.

Innovations include MAN B&W's latest super-stroke electronically controlled main engine, together with a more efficient propeller of larger diameter and lower rpm. Other energy saving enhancements include DSME duct, rudder bulb and propeller boss cap fins. In addition, both vessels are fitted with a ship eco-management system, which includes ship performance monitoring, trim optimisation and weather routing.

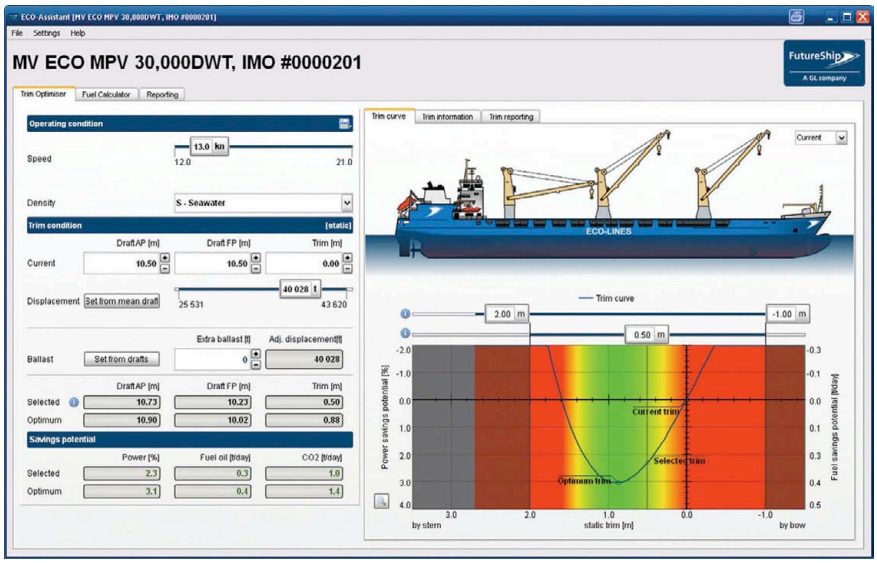
Together, these innovations will significantly improve fuel consumption and deliver an EEDI which is 16.9% better than the IMO base-line, the company says.

Bureau Veritas meanwhile is to class three 16,000TEU container ships to be built for China State Shipbuilding and due for delivery in 2015.

One will be built at the Shanghai Waigaoqiao Shipbuilding yard, and the other two at Shanghai Jiangnan Changxing Heavy Industry. The design was developed by the Marine Design and Research Institute of China in co-operation with BV.

The vessels will have an overall length of 399m, a beam of 54m, and a draught of 16m. Special consideration has been given to hydroelastic design issues. A hydroelastic examination was performed using BV's HOMER software in order to take into account extreme whipping loads due to slamming and additional fatigue damage due to springing, factoring in the elastic structural response of the ship.

The vessels will also be granted BV's VeriSTAR HULL DFL 25-year notation, which certifies various structural details, including hatch corners and coamings, for 25 years of fatigue life, following a spectral fatigue analysis with a 3D finite element analysis model. The importance of fatigue for large container ships, which generally lack torsional rigidity and become more elastic with size, has been confirmed by real measurements on board ULCSs classed by BV.



UASC gets kitted out with the FutureShip's trim solution product, ECO-Assistant

Ugo Salerno, chief executive, RINa speaks about how environmentally friendly ships can be achieved

Marine technology company Oceanfoil meanwhile is working with naval architects Owen Clarke Design and University College London's Energy Institute (UCL-Energy) on design and manufacture of the working prototypes of new improved wingsails for sea trials in the second half of 2014. UCL-Energy and Oceanfoil are developing analysis capability to maximise the performance of Oceanfoil's technology on representative shipping routes, and which will enable Oceanfoil to predict the potential savings to be obtained from fitting Oceanfoil wingsails.

Following testing indicating that Oceanfoil's design can achieve savings in fuel consumption of up to 20%; Owen Clarke Design is leading the development of Oceanfoil's wingsail technology aboard a vessel.

Aerofoils are designed to convert wind into forward thrust, using the same forces that give a wing lift, enabling a vessel to throttle down its main engine to save fuel and increase efficiency.

The ability to harness the wind as an additional power source to enable a reduction in fuel consumption is now verging on necessity if the maritime transport industry is to remain cost-efficient and offers exciting prospects for the fuel efficiency and significant cost savings within a matter of years, the company says.

As much attention focuses on ballast water treatment technology, OceanSaver's Mark II Ballast Water Treatment (BWT) system has achieved US Coast Guard (USCG) approval, while the company itself has achieved ISO 9001:2008 certification.

The USCG's Alternate Management System (AMS) approval means that vessels fitted with OceanSaver systems – combining effective and reliable filtration with high-performance electrodialytic disinfectant treatment – are free to discharge ballast water in US ports. Newbuilds constructed after December 2013 must have USCG compliant systems to perform this task.

OceanSaver CEO Houtan Houshangi says that OceanSaver's modular Mark II system, with its small footprint and easy to maintain nature, is equally as attractive for both the newbuild and retrofitting segments. *NA*

Rolls-Royce sees double vision

Rolls-Royce presents its latest ferry concepts to the market. The two options offer a premium and standard ferry design

As regulations governing the design and operation of ferries is overhauled Rolls-Royce has come up with two concepts that aim to meet the needs for all ferry owners. The work carried out for the concepts has been based on taking two different approaches to ferry design.

Oskar Levander, vice president innovation, engineering & technology, marine, Rolls-Royce says that the ferry fleet does need to be renewed, but the theory behind the concept has further potential. "Ferries came first to mind as this is an area that we work in, but other vessels will be coming up that will also need to be optimised and can be done with the same application as we have used with the ferries. We see a need in the ferry fleet to be replaced, but with the financial downturn it has been a challenge and not happening at the speed that it should be, but we need to do something."

The two concepts, Clear Blue and Dynamic Blue, are ferries that have the same capacity, but have separate economic goals. The Clear Blue concept looks at a minimalist design with a low investment cost for owners that want to see savings from the start or may not have the financial investment to opt for a more sophisticated design. Whereas the Dynamic Blue is a fully optimised design with all environmental enhancements on the market added.

Rolls-Royce says that the drivers behind these concepts have been passenger expectations, finances, fuel costs, rules and regulations and technology. "We looked at the efficiency trends, LNG fore-runners and what options are open to owners in the current market. An owner could get a second-hand ferry, but this would mean that it would probably need expensive retrofitting of scrubbers to be able to comply with future regulations."

Whilst creating these concepts Rolls-Royce created a process of comparing and contrasting the results against a reference vessel, a second-hand 2005 ferry, and the associated costs that would accrue to make the vessel meet future regulations. The reference ropax ferry is based upon a vessel that was delivered in 2005. It runs on MGO and HFO and has a gross tonnage of 28,000gt and has a speed of 23knots. The vessel has the capacity for 1,800 passengers and 160 cabins.

Clear Blue: a low investment option for owners

The two concept ideas have been optimised for the same route and are the same size. The concepts technical attributes have been based on an operational profile of 110Nm with no intervening stops, rather than a geographical location. The operational profile takes in to account Summer three crossings per day (four months), two winter crossings per day (eight months) and one week lay-off in winter.

Clear Blue

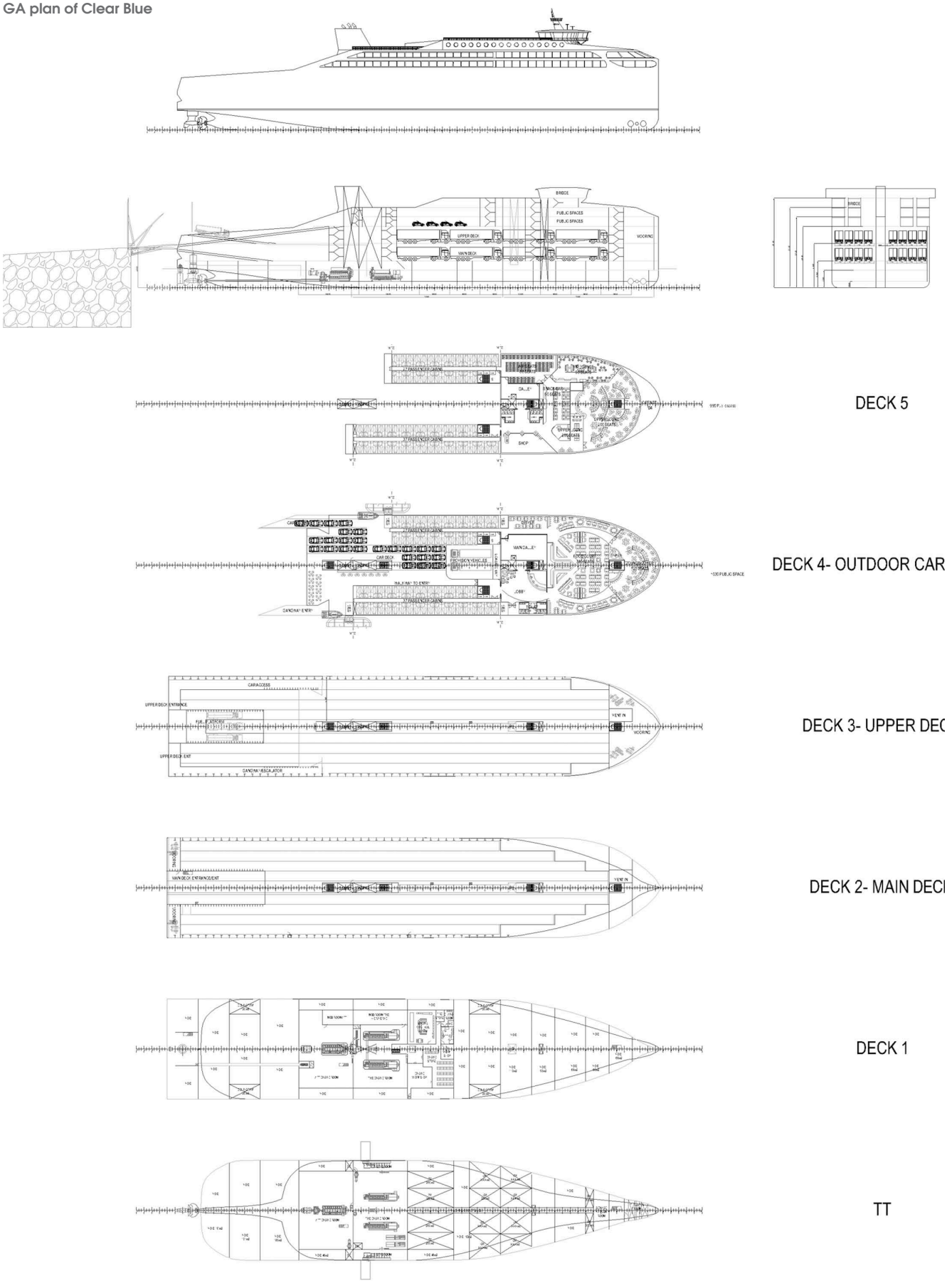
The Clear Blue concept looks at minimising the investment cost from the beginning. To be able to to do this Levander notes that concept needed to be of a minimalist design with the cargo arrangement simplified as this is a major cost on a ferry.

"In Clear Blue the first saving is in removing the equipment that we don't need such as movable ramps and then we look at outfitting and machinery. The price of steel is higher as more is need for the structure, but if you can remove 25% of the cost by removal of equipment that isn't needed then this still makes an impact", says Levander.

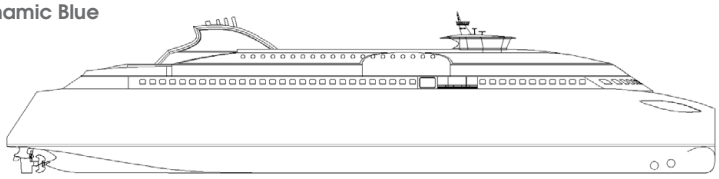
The hull of Clear Blue has an overall length of 152m and a relatively broad beam of 31m. All vehicle movements take place over the stern, and there is no moving ramp structure for cargo operations. The wider beam allows extra vehicle lanes and combined with a short central casing allows easy U-turns in the vehicle decks. There are two main vehicle decks totalling 1,950 lane metres, and space on the open upper deck aft for a further 35 cars.

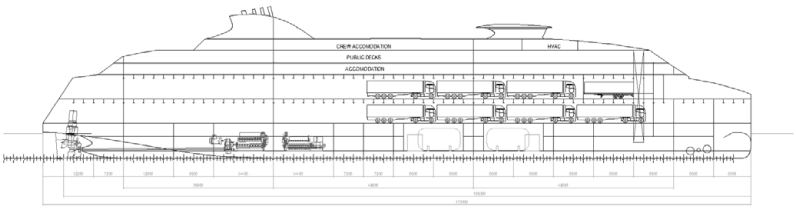
The superstructure contains two decks of passenger cabins, which are arranged at a block each side of the ferry with a space between, allowing for cabins either side of an alleyway in each block so that all cabins can have windows. For the shipbuilder there is the cost saving element that self-standing cabin blocks can be 'plugged-into' the hull and installed as

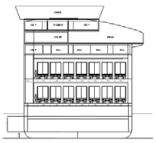
GA plan of Clear Blue

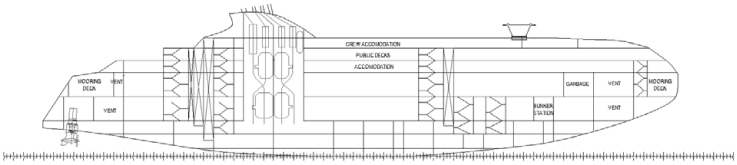


GA plan of Dynamic Blue









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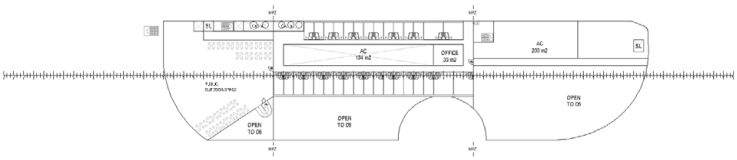
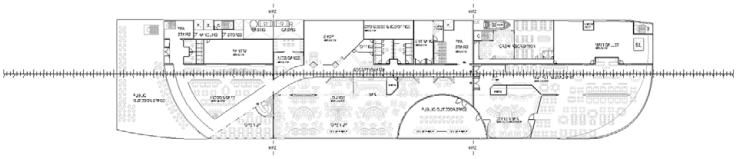


DECK 6



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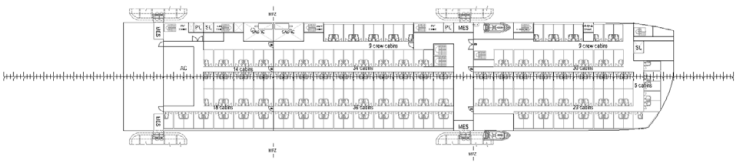
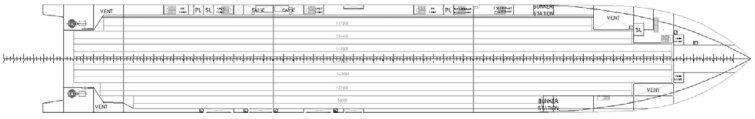
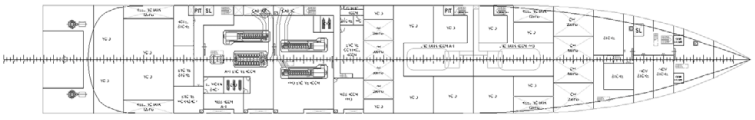


DECK 4- ACCOMODATION

DECK 3- UPPER DECK



DECK 2- MAIN DECK



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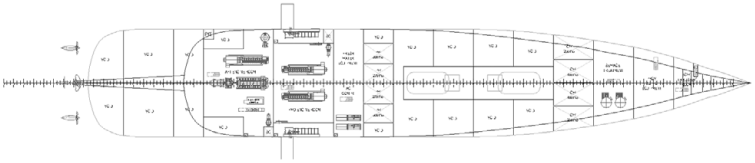

TT

large pre-outfitted modules including heat, ventilation and air conditioning plus other auxiliary services.

Facilities such as the restaurant, bar, shop and so on are forward of the cabin blocks, with a single galley serving all consumers. It is intended that stores for the voyage are brought onboard in refrigerated containers parked next to the galley service area between accommodation blocks, eliminating unloading and onboard stores.

An efficient propulsion system has been devised, allowing a compact engine room well protected from collision damage. The rest of the space below the vehicle deck is divided into many watertight compartments to give a high level of survivability in the event of damage.

There are only three engines in the vessel, and the arrangement is fully compliant with the Safe Return to Port requirement. The main propulsion is provided by a Bergen B35:40V16PG lean burn gas engine of 7,600kW driving a single CP propeller through reduction gear equipped with a Hybrid Shaft Generator (HSG).

Two Bergen gensets with six cylinder engines of the same type, each provide 3,700kW. Aft of the propeller is an electrically driven Azipull azimuth thruster. In transit this provides the equivalent of contra-rotating propellers for increased efficiency, with a power split 70/30. Rather than steering the vessel by thruster, a rudder is located aft of the Azipull. When manoeuvring at low speed the Azipull provides vectored thrust at the stern, assisted by two tunnel thrusters at the bow to give a high level of agility.

Instead of installing gas tanks onboard, with this ship concept, LNG will be provided by trailers on the open deck in the aft part of the vessel. A case study has been conducted looking at an operational profile, where two out of three containers are replaced daily and locked to the hull during the sea voyage.

Dynamic Blue

The Dynamic Blue concept is fully optimised and aimed at owners that are willing to gain their investment back over time through the operation of the vessel. Once again the cargo arrangement has been modified to meet the different demands of this vessel along with fuel savings and making the onboard facilities more profitable.

"Here our goal is to minimise operational costs using high-end technology," says Levander. "We have also designed the interior layout to maximise passenger revenue generation."

An interesting non-symmetrical layout has been developed for the upper decks. Casings, services, deck to deck accesses and the shop are concentrated on the port side which leaves the whole of the starboard part of the ship for passenger facilities including restaurants, bars and lounges. This gives a feeling of spaciousness and light, enhanced by the fact that this part of the public deck is cantilevered out over the lower decks to give extra space and overhead light. The roof above this deck is glazed and the block of crew accommodation on the deck above is narrow and arranged to port. Below the public deck is a deck of passenger cabins. Passenger capacity is 1,000 and there are 166 passenger cabins plus 50 crew cabins. The focus on eating and shopping provides activity for passengers and maximises the revenue for the ferry owner.

Below the passenger spaces are two levels of vehicle decks, giving a total of 1,800 lane metres. A drive through arrangement has been chosen for Dynamic Blue, with bow and stern doors and simultaneous loading on both decks from twin level linkspans. Hoistable decks also boost car capacity. The hull is 170m long with a 25.9m beam, based on the Rolls-Royce Environship form to give a low resistance and environmental vessel. The gross tonnage of the vessel will be 27,500gt.

A hybrid propulsion layout is used, also with gas engines, and LNG can be bunkered from quay or barge into two fixed tanks onboard, located below the vehicle deck and each holding about 145m^3 of liquid gas.

As with Clear Blue a single centreline CP shaft line has been selected for Dynamic Blue, but in this case in a Promas arrangement with propeller hubcap, rudder bulb and twisted leading edge rudder for high propulsive efficiency. The main propeller is flanked by two electrically driven Azipull thrusters, which can be used both in transit and for manoeuvring.

A 7,600kW Bergen B35:40V16PG engine drives the centre propeller and the gearbox has electric PTO/PTI. Three Bergen gensets each rated at 3,700kW supply the switchboard. This configuration allows selection of mechanic, electric or hybrid mode for optimal performance in all operation conditions.

To further increase efficiency and reduce fuel cost and emission, Dynamic Blue will have extensive waste heat recovery. Waste heat exhaust gas economisers will supply steam to a co-generation system capable of delivering about 750kW of electric power to the switchboard at 19knots. The cold LNG fuel is utilised to provide a free cooling effect for ships services. *NA*

Dynamic Blue looks to clean up the seas

The Royal Institution of Naval Architects

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Replacing the Soviet tanker fleet

New river-sea product tankers were built for Russia and Ukraine in 2013 to replace the soviet style tankers with significant improvements

The tanker fleet, now operated by post-Soviet shipowners, has developed a rather difficult situation; the majority of river – sea product tankers (RST), does not meet the requirements of Rule 21 of the IMO's MARPOL 73/78 convention for carrying oil and petroleum products with a density greater than 0,900t/m^3.

As a result it is necessary to build about 180-190 RST's of the new Volgo-Don Max and Dnieper Max generation during the next five years in order to replace the old soviet tankers.

The MARPOL requirements have instigated a building boom of new tankers, many designed by the Marine Engineering Bureau (MEB, Odessa, Ukraine). In 2013 at the Kherson shipyards in Ukraine, Zelenodolsk Shipyard named after AM Gorkiy, Krasnoe Sormovo in Nizhniy Novgorod and the Oka shipyard in Navashino, Russia, received orders for 13 vessels of the RST27 type (see Figure 1), three vessels of RST25 (see Figure 2) project "Bavly" type and two vessels of the RST22M project New Armada type ships.

All the vessels mentioned above are MEB projects and belong to one of the most popular types of RST in Russia, Volgo-Don Max and in Ukraine Dnieper Max class, which is defined by maximal dimensions of Volgo-Don Canal and Dnieper River locks and has the maximal load capacity of up to 4,700-5,400tonnes in order to meet the river draught of 3.6m; at the same time the load capacity can reach 6,600-7,100tonnes when operating at sea.

These vessels satisfy the dimensions of the Volgo-Don Canal so they can be used for sailing through practically all the united high-depth system of inland waterways in Russia and the Ukraine.

RSTs of this class built before 2000 have hulls with a block coefficient of C_b = 0.84-0.85. Investigations of wide vessels have been carried out many times, but the C_b value didn't exceed 0.88.

Hulls of the new MEB generation RST are characterised by fuller forms (C_b = 0,88-0,93) and by a longer cylindrical part (68-70%) (See figure 3).

Figure 1: RST27 project tanker launching in Kherson shipyard (Ukraine)

Figure 2: RST25 project tanker in Zelenodolsk Shipyard (Russia), after launch

The effect of the block coefficient alternation (in the region of 0.88-0.93) is insignificant when using a typical RST operational speed of 10knots. Finding the theoretical results let MEB create a new project of the "fat" river-sea going tanker (RST27); the tanker's deadweight is 5,520tonnes for a river draught of 3.60m. One may compare with the RST22 tanker, which has a river deadweight of about 4,700tonnes.

Overall the RST27 (RST25) vessel length is 140.85m (139.99m), breadth is 16.6m, and depth is of 6.0m (5.5m).

Distinctive features of the RST22M, RST25 and RST27 projects are the use of fully rotating rudder propellers (RP) (see figure 4) as a uniform means of movement and steering; the absence of a centreline (CL) longitudinal bulkhead; the application of submerged pumps and the absence of structure elements inside cargo tanks.

New RST designs fully comply with the new international standards for carrying vegetable oils, including the damage stability requirement where the vessels remain afloat with two flooded compartments.

Special design requirements from oil company customers and additional ecological requirements for an "ECO DESIGN" class from the Russian Maritime Register of Shipping have also taken into account.

For example, vessels used to carry cargo from areas around Volgograd, Astrakhan and Turkmenbashi, Aktau to ports Turkmenbashi, Makhachkala, Kerch, Caucasus and on other routes to ports in Turkey, Greece, Italy, Israel and others, include on the route the ports of the Caspian sea – ports of Mediterranean sea.

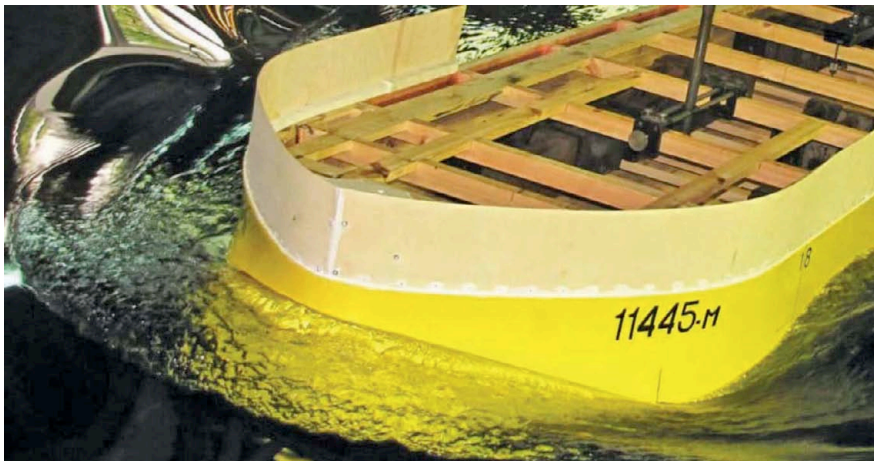


Figure 3: Model of tanker project RST27. Test in Krylov State Research Centre

The basic cargoes are spring-and-summer fuel oil and other petroleum oil from the Volgograd petroleum refinery and crude oil from ports on the River Volga to the FSO tanker in the area of Kerch Ukraine and in port Turkmenbashi with limited passing draught.

Vessels operate on the Caspian, Black, Mediterranean and Baltic Seas. During the winter months there is a period where the vessels will carry mineral oil, including gasoline, diesel and oven fuel, and also vegetable oil.

Distinctive basic features of new RST22M, RST25 and RST27 projects include meeting the formal requirements of class and IMO conventions, but also on requirements of cargo owners and the leading oil companies. In addition the vessels exceed the ecological standards set by the MARPOL convention and the hull design makes the vessels stronger.

The ships also have more powerful engines with modern equipment, the ability to work with FSO tankers, increased cargo carrying capacity and a broader nomenclature of cargoes, including vegetable oils, ethylene glycol among other cargoes.

Evaluations of vessel operations including idling times and weather conditions allow for RS Class R2, which certifies the vessel for operations in Europe and the Irish Sea. However, the RST22 has been designed to standards of strength corresponding to requirements for the higher R1 class of operation.

Accumulated operational experience from a number of owners in the Azov and Caspian Seas allows for vessels to be built to Ice1 standards (RST25, RST27). However, in view of the probable operation of these vessels in the Baltic Sea the ice category has been raised up to Ice2 levels (RST22M project).

Figure 4: Fully rotating rudder propellers on the RST27 tanker project

In addition the increase of the height of the hull section in way of the cargo area, which increases tank capacity and reduces expenses in domestic ports, whilst still providing sufficient strength for the chosen class, the overall longitudinal strength without an increase in thickness of the overwhelming majority of the structural elements when compared to the minimal thickness of RS Rules.

Furthermore, the raised block coefficient, up to 0.90-0.93, provides the maximum carrying capacity on limited draughts (3.40m in VDRC and 4.20m – in the Caspian Sea).

The use of rudder-propellers allow for the required manoeuvrability and speed and for the increase in length of the cargo area, to reduce approximately by 20% length of the engine room, to reduce expenses for installation and prospective expenses for repair and service.

The vessel design allows for identical wall thickness and ordinary structural elements and the shell for maintenance of equal durability on wear, whenever possible (in application to this project principle is for 9mm plating).

To design the sides and bottom structures for operational loads and in contrast to the previous frame systems the hull of the new vessel has been completely redesigned on longitudinal frame system amidships.

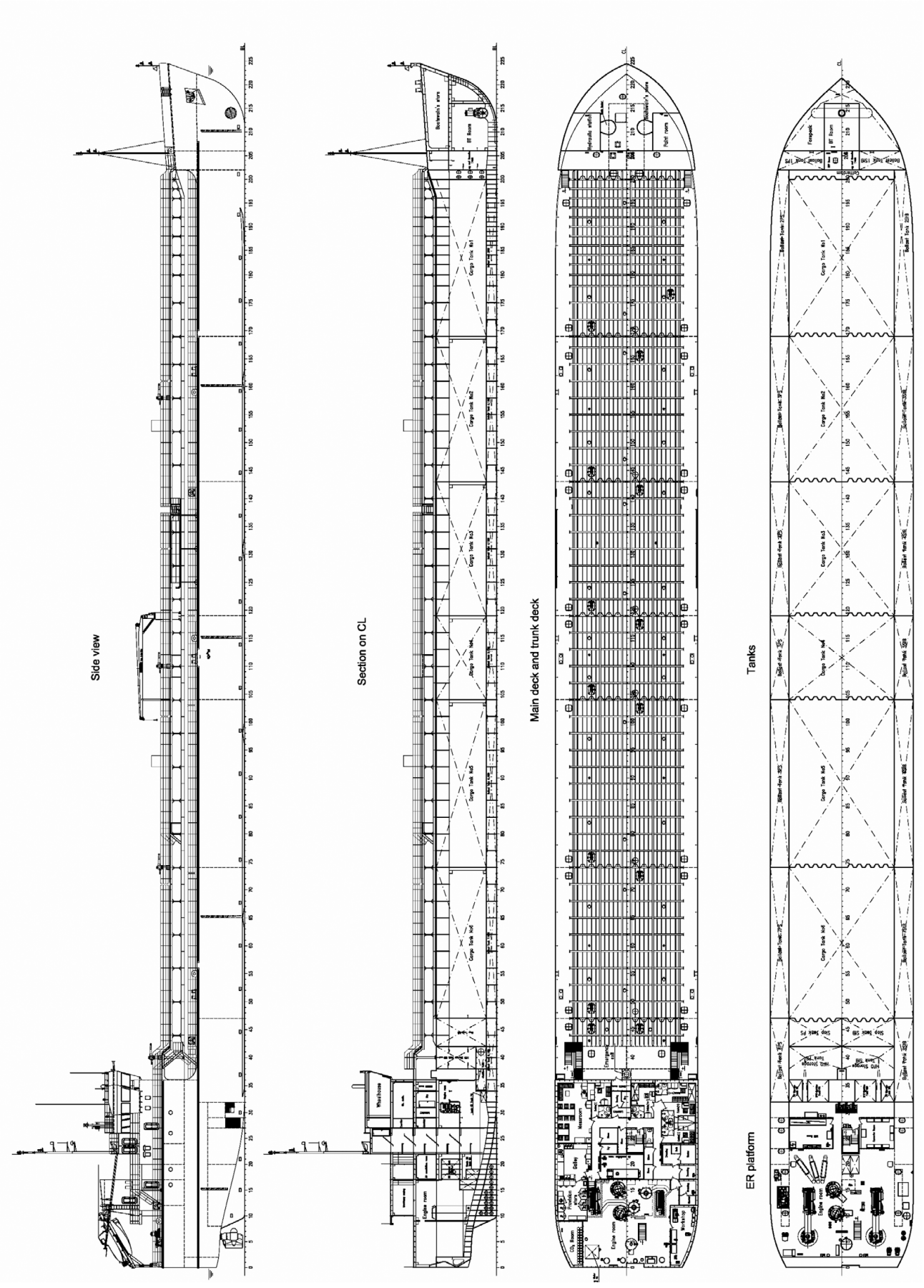
This includes the application of the ordinary and web elements to maintain local strength as well ensuring the overall strength of the vessel, while also maintaining a uniform shell thickness of 9mm.

With the purpose of improving the actual fatigue durability of the design; smooth flanges of an equivalent bar with a minimum number of weld fittings, openings and transitions are used to rationalise the assembly of the structural element and smooth the areas of the longitudinal structure of the hull through its length.

The subdivision of ballast and dry compartments within a double sided structure including a double bottom meets the Rule 25A of the IC MARPOL 73/78 requirements and allows the removal of the CL longitudinal bulkhead, reducing metal consumption of the hull.

The new type RST (see Figure 5 page 48) represents a steel single-deck vessel with

GA Plan for RST25 vessel



the minimum freeboard, with two rudder-propellers, with the advanced superstructures that have a height of 2.5m and a trunk with a width of 0.82B and a trough the whole length (forecastle in length 0.08*L*, poop in length 0.14*L* and trunk between them), with aft deckhouse and engine r00m (ER), with double bottom in height B/15 in CL (with rise to sides) and double sides in width 0,09B in a cargo area.

At the fore end with the high forecastle is located at the fore peak, log and sounder trunk, boatswain store, hydraulics station, paint room, deck store, and also the forward bow thruster that hasan output of 230kW.

The engine room is located at the aft end of the vessel with a high poop superstructure. Two tier deckhouse with service and living accommodation for 14 crew, designed in view of the limited air draft (14.2m at the draught of 3.00m).

The hull form of the new vessels were created using CFD and the special form of the aft end close to the sledge, which in the former Soviet states is a sledge shaped stern, is optimised for the installation of rudder-propellers.

Movement and manoeuvrability of the vessel is provided by two Schottel fully-rotating rudder-propellers SRP-1012FP type with fixed pitch propellers with a diameter of 1.95m in nozzles. The drive to rudder propeller from the main diesel engines is carried out through mechanical Z-transfer.

There are six cargo and two slop tanks located in the cargo area.

The omission of the CL longitudinal bulkhead has allowed the designers to reduce the weight of the metal hull by 3% and to reduce the weight of pipelines, valves, plugs and collars n the cargo system by half. An indirect effect of this decision was to decrease the design heeling angles following damage to cargo tanks.

The main power plant consists of two Wärtsilä 6L20 type mid-speed diesel engines with specific MDM of 1,200kW each providing an operational speed of 10.5knots at 85% of power. The main engines work on heavy fuel with viscosity up to 380cSт.

The cargo system of the tanker supposes simultaneous work with three sorts of petroleum products, including gasoline with a density of 0.72-1.015t/m^3 without restrictions on temperature of flash and provides the closed loading of a cargo by shore means with capacity up to 1,200m^3/h.

Six fixed centrifugal explosion-proof type submerged pumps with electric drives operate at 900m^3/h. Regulation of the cargo pumps is controlled from a panel located on the bridge by cargo operations through the frequency converters providing smooth regulation of frequency of rotation of pumps.

The cargo system provides a division of the tanks into three groups (each group for the certain grade of a cargo). Forward group includes cargo tanks No 1 and No 2, midship – No 3 and No 4, aft – No 5 and No 6. Each group of tanks has its own manifold, providing loading and discharge of a cargo on both sides. The capacity of the submerged cargo pumps allows for the discharge of a cargo for 7-8 hours depending on its viscosity.

A pipeline coil system for heating a cargo is installed in the cargo tanks, allowing cargo to be transported at temperatures of up to +50°C, even with external temperatures at -20°C. The condensate from coils is removed through condensate discharge fitting from

Figure 6: Tanker RST27 project at Kherson shipyard. Accepted to operation (author - Nickolay Dubrov)

Figure 7: Tanker RST27 project at Kherson shipyard. Aft view (author - Nickolay Dubrov)

Figure 8: Tanker RST25 project in operation (author - Sergey Stroykov)

Figure 9: Tanker RST25 project. Aft view

Figure 10: Tanker RST25 project in operation. Built on Verf' brat'ev Nobel' (Russia)

Figure 11: Tanker RST27 project in operation (author - Sergey Morozov)

each section independently in the main condensate line and after that in to the engine room in the control tank of a condensate.

Each cargo and slop tanks are equipped with individual vent pipes with an automatic high-speed gas-relief valve. Outlet ends of high-speed gas-relief valve are combined in two groups and installed at the level greater than 3.0m above the catwalk bridge near the refuge places. There are pressure gauges constantly monitoring the tanks on the cargo operation control panel and emergency-warning signals for overpressure and vacuum in each cargo and slop tank. A fixed system for the gathering and discharge of vapours are provided from cargo and slop tanks on shore through a separate manifold with international type flanges.

A sprinkler system on the trunk deck is provided by seawater for operations during the summer that is during periods of high air temperature, more than 25°C, for reducing the evaporation of petroleum products and environmental contamination.

While the design of the full–shaped hull was still open to question about the vessels' actual ice behaviour, therefore, the results of the 2012-2013 ice campaign proved interesting:

- Navigation in ballast condition (with fore draught about 2.40m) vessel goes well: slowly, but truly opens ice, lifting ice up and breaking it using the bulb. The same picture is observed at navigation in a partly-laden condition (draught about 3.40m)
- Fully loaded navigation shows a different picture: ice does not break, pushing ahead until it cracks. It leads to an insignificant decrease of performance in ice
- Installation of screw-rudders gives the vessels a big advantage in comparison with standard vessels in that ice damage to the propeller blades is virtually impossible since the screw is in a nozzle. For moving astern the nozzle simply turns around 180degs and the screw works 'ahead' and this also minimises the probability of damage to the blades.

It is remarkable that in moving in an ice convoy in the Sea of Azov captains of ice breakers prefer to put RST27 vessels in a lead position.

In 2013 the Krylov State Research Centre successfully carried out the rough-weather trials for the RST27 project vessel, which confirmed the ice operating characteristics for the vessel. In the tests with waves which do not exceed heights of 0.5m, stresses through the common bend of a vessel amidships from wave motion have not exceeded 5MPa, that is essentially lower than permissible (at navigation in stormy conditions insignificant vibration and a bend in the hull is observed, that is typical of all vessels of the mixed the river – sea navigation type).

The maximum amplitudes of pitching on 0.5m waves with SR operating mode corresponding to 770rpm, did not exceed 0.4degs. The maximum amplitudes of rolling reached 0.3degs on speeds from 8.0 up to 11.4knots. Vessel sheering varied in limits ±1.5degs.

At all speed regimes vertical accelerations are small, the maximum values do not exceed 0.04g. The maximum registered values of transverse-horizontal acceleration at a speed of 11.4knots is 0.03g. Navigation in the most adverse storm conditions in head waves, a reduction in speed was observed. Side waves essentially have no effect on the vessel's movement.

Application of a record block coefficient of 0.93, the special form of fore and aft shapes, some other constructive decisions has allowed designers to improve the design and construction of the new tanker of the mixed river-sea navigation, with a significant increase in carrying capacity in river navigation when compared to competitor vessels and with the standard of strength not less than other vessels. *NA*

It's a gas for Oxymat

Keeping focused on product development without compromising the environment is key to Oxymat as it presents its latest product test results

The latest R&D test results are in for the Oxymat X4 nitrogen system, used for inerting tanks, which holds great expectations for the future, with a reduced system footprint as well as a reduced carbon footprint.

Well aware of the resources involved in keeping a dynamic development, Oxymat has built up a strong R&D department in Slovakia that has been set the task of finding further power reductions on the existing nitrogen generator programme.

"It is our clear vision to be known as *the* pressure swing absorption (PSA) company with, not only the smallest system footprint but also, the smallest carbon footprint" Jesper Sjögren, CEO, Oxymat points out. "Our goal for 2015 of a 15% power reduction is already passed in all purity ranges from 5% to 1ppm, leaving only documentation and redesign of the existing programme for the R&D team to finalise. Although we still face a few challenges, combining our environmental goals with our desire to cut cost prices with another 15% looks achievable", he says.

The Oxymat X4 nitrogen generator series is used by chemical tankers, oil tankers and LNG carriers for inerting, purging, discharging, padding, tank cleaning and super stripping of tanks. The nitrogen generator technology, originally designed in 2006, uses PSA technology, by using two pressurised columns with molecular sieves to ensure a continuous production.

Dry compressed air is blown through a valve to the vessel where the pressure is built to reach 5 to 7bar (g). Oxygen is tied to a molecular sieve during the building of pressure and the nitrogen is allowed to pass through to the accumulation tank.

While the pressure up builds in one vessel, the second remains without pressure. Part of the gas produced is used for regeneration of the molecular sieve, which, in the case of nitrogen, is a carbon molecular sieve (CMS). The molecular sieve is fully regenerative and has a life span on to 40,000 operational hours.

Oxymat results from nitrogen generator test promise future emission reductions

The nitrogen generator with its PSA technology meets all carrier/tanker requirements. For supply vessels, the Oxymat product portfolio includes a dedicated Supply Vessel Inert Gas Generator (SVIGG). The construction of the X4 series is characterised by simple construction and high reliability and the system can be adjusted to the given space onboard, the company highlights.

The system can be installed in a very short time onboard any vessel due to its 'plug & play' installation. Also, water cooling pipes and pressure pipes for two compressors and one dryer is all the preparation needed, all the other connections regarding monitoring and control is linked with a few hybrid cables (such as LAN).

The X4 nitrogen systems are developed in a series of 15 units from 300m^3/hour to 10,000m^3/hour all with extremely small foot prints. A 1,500m^3/h system only uses 11m^2 of space for machinery.

"The system eliminates the need for recharges of bulk cylinders in dock saving both time, money – and, in the end, also reduces impact on the environment. By introducing a high pressure booster compressor and a fully automated bottle station in the PSA system, the resulting product is much more appropriate to the needs and purposes", Sjögren explains.

The Oxymat Marine division service a long range of ships; chemical carriers, LNG's, LPG's, multipurpose carriers, oil tankers and supply vessels. Sjögren says: "Supplying to the marine industry poses a number of challenges and issues such as system size and weight, rough sea conditions under which the system must perform, corrosion risks of components to mention just a few. At the same time, concerns regarding the environmental impact by this industry are increasing. Therefore, we continuously aim to find new ways of meeting customer requirements and reducing the impact of the environment". *NA*

RINA - Lloyd's Register
Maritime Safety Award

The Institution believes that the safety of both the seafarer and the maritime environment begins with good design, followed by sound construction and efficient operation. Whilst naval architects and other engineers' involved in the design, construction and operation of maritime vessels and structures do not have a patent on such issues, nonetheless their work can make a significant contribution.

The Institution also believes that it has a role to play in recognising achievement of engineers' in improving safety at sea and the protection of the maritime environment. Such recognition serves to raise awareness and promote further improvements.

The Maritime Safety Award is presented by the Institution, in association with Lloyd's Register, to an individual, company or organisation which has made a significant technological contribution to improving maritime safety or the protection of the maritime environment. Such contribution can have been made either by a specific activity or over a period of time. Nominations may be made by any member of the global maritime community, and are judged by a panel of members of the Institution and Lloyd's Register. The Award will be announced at the Institution's Annual Dinner.

Nominations are now invited for the 2013 Maritime Safety Award. Individuals may not nominate themselves, although employees may nominate their company or organisation.

Nominations may be up to 750 words and should describe the technological contribution which the individual, company or organisation has made in the field of design, construction and operation of maritime vessels and structures,

Nominations may be forwarded online at *www.rina.org.uk/MaritimeSafetyAward*

or by email to *MaritimeSafetyAward@rina.org.uk*

Nominations should arrive at RINA Headquarters by 31 Dec 2013

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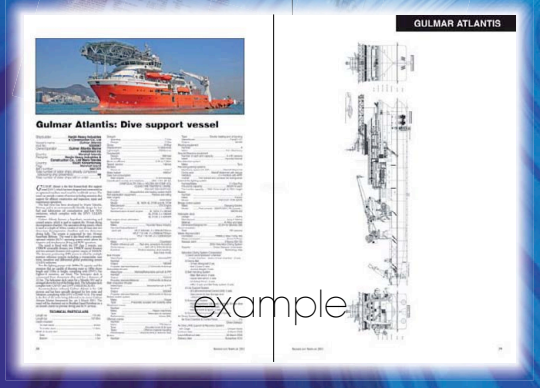
Nissei Maru – Roro with solar power
Rio 2016 – 157,000dwt shuttle tanker
Velikiy Novgorod – State-of-the-art gas carrier
Viking Grace – LNG passenger ferry
plus many more....



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Fincantieri stays on top

All shipyards have struggled through the recession, but Fincantieri has managed to remain ahead of the game

Adapting and growing has been the name of the game for the Italian shipbuilder over the past few years with the acquisition of Norwegian STX-OSV shipyard, now known as Vard, and also development in its key areas of operation.

The Global financial crisis has impacted both the shipping and the shipbuilding industries, after a long period of growth and a high demand for newbuildings, which had its peak in 2007. Fincantieri notes that 2012 was the fourth consecutive year characterised by ship deliveries exceeding new orders; where investments in new ships were and currently are not enough to feed the shipbuilding production capacity, the structural imbalance between supply and demand remains large.

"The market scenario suggests that it is unrealistic for the European shipbuilders specialised in high tech products to switch back to standard / mass ships, there is no alternative for them but to preserve their 'niche positions' and look for the opportunities arising in other niches characterised by positive market prospects, high technological content and high innovation rate. Offshore and 'green' niches comply with these features", says a spokesperson for the company.

Fincantieri has been addressing this difficult period at various levels. The company has been developing a strategic effort towards diversification and internationalisation of the yard's business. It has started expanding its interest into other industrial sectors, such as offshore, mega yachts, shiprepairs and conversions, marine systems and commercial industrial services. The progressive development of the company as an international player has seen the recent acquisition of a majority stake in VARD (previously STX OSV Offshore) by Fincantieri.

Fincantieri has identified the offshore vessels market as an area of development and diversification that can ensure it long-term competitiveness. The company says that the acquisition of the STX OSV, which operates 10 shipyards around the world, five in Norway, two in Romania, two in Brazil and one in Vietnam, will give Fincantieri a lead position in the offshore market, which is still developing technology for advanced vessels.

Royal Princess delivered earlier this year is one of Fincantieri's most significant projects

Fincantieri is also reviewing its technological portfolio, as well as some of the "make or buy" choices, in order to be able to better control the critical path of design and manufacturing. On a more operational level the yard is implementing a rationalisation programme that consists of the integration of the production sites and the centralisation of a number of key processes.

"We have always devoted our attention to the whole spectrum of cruise products and to all possible customers. We have been particularly proactive towards all the owners that were entering the cruise sector. We deem that our deals with Oceania, Viking and Compagnie du Ponant demonstrate that we have been fairly effective so far. As a consequence our product portfolio is the widest in the industry, ranging from small niche exploration vessels to premium and luxury cruisers to the largest vessels for the mainstream market", says a spokesperson.

Fincantieri highlights that one of its most prestigious projects launched this year by the yard has been the cruise ship *Royal Princess*. The 141,000gt cruise ship, apart from being the largest vessel built at the Italian shipyard, is Princess Cruise's new flagship and is the development of a new prototype of ship, which has received huge investment from both yard and owners. Fincantieri says that they expect further sister vessels of this ship to be constructed at a later date. *Regal Princess* the sister ship of *Royal Princess* is under construction in Monfalcone shipyard and will be delivered in spring 2014.

"Building a series of vessels has been the golden rule in past years and we deem it will be applied also to the new generation of cruise vessels that are currently being developed. The benefits of repetition are not limited to the ships cost (and price) but, are definitely more far-ranging. Among other factors we would underline that, on sister vessels, owners and builder have the possibility to optimise (in an evolutionary way) the ship's configuration, implementing all the feed-back coming from the operation of the previous vessels of the series", says a spokesperson for the yard.

The ship's design has included the rational use of space with the aim of avoiding any wasted tonnage that would otherwise increase operating costs. Also, energy saving devices and optimisation has been carried out to reduce the emission from the vessel. The main aim of the ship is to adapt to all types of cruises from operating in Alaska to Australia and also emission control areas (ECAs).

Fincantieri says that the same platform can be used as starting point for ships of different brands, carrying over the main ship's characteristics, but developing individual solutions and arrangements capable of satisfying different market requirements. *Royal Princess* is the reference platform also for the new P&O vessels, while Holland America Lines (HAL) and Carnival Cruise Lines (CCL) have each developed their own prototype. *NA*

Vard opens new opportunities for Fincantieri

Italian yards defy building recession

Adapting to the financial crisis has been forefront key element in the strategy of shipyards around the globe, but Italian shipyards are still getting orders, says Italian classification society RINa

Although the small vessel market has been hit hard by the recession, Paolo Moretti, general manager, RINa says that shipbuilding in Italy has been focused on larger sized vessels in the yacht market in particular.

"Very large yachts have not been affected because the owners of these types of vessels have not been impacted by the credit crunch, but this is only 10% of the market", he says.

Italy has seen a 40% decrease in business since the financial crisis hit, but now it believes that this decline is starting to level out and that yards are now starting to see a slight rise in orders. However, even though there has been a slight increase in one area, it is expected that the number of orders will equate to the same as last years.

Moretti notes that the rise in orders looks to be linked with a change in the type of customers that are buying these vessels. "The nationality of the customers is changing. We now see more customers from the Far East, India, Turkey and America buying these more luxurious vessels", he says.

Catering for a changing market has meant that shipyards have had to react to this change. Moretti says that because of this some builders have given up the old methods of production and are adapting production to suit the new design of vessels. In particular looking at full displacement hull forms and focusing more on high value products.

In addition, shipyards are looking at making their designs more efficient through better fuel efficiency and compliance with the regulations, Moretti points out that where these yards used to build fast yachts, the focus has now shifted as a consequence of new regulations and the cost of fuel.

"Concerns for the owner is that they make a big investment but, it is only used for a short time", says Moretti. With more emission control area's (ECAs) coming into play and existing ones tightening the emission discharge rate the pressure is on for larger shipowners to either adapt a vessel's emission systems or to change fuel.

However, most large yachts already run on MGO Moretti notes, and that means the emission regulations will not impact on these vessels too much, whereas smaller yachts that run on diesel will need to implement emission control systems like scrubbers to comply with regulations. "The impact will be very hard", he says.

LNG is considered to be the fuel of the future. RINa has been working with both owners and shipyards that are looking to develop this fuel for future ferry designs. Moretti says that there are many points to be looked into, such as the fitting of the hose and bunkering points, which need to be looked at in wide perspective.

Other factors to be considered are compliance with safety regulations and also port state control. "There is a problem with port state control. Will they allow refilling of the vessel with passengers onboard or will this need to be done at two separate places and therefore take longer in the turnaround of the vessel?" He asks.

RINa is currently working with one owner to develop a larger size ferry for local traffic that will be fuel by LNG with an order hopefully materialising in the next couple of years. *NA*

The Royal Institution of Naval Architects

Education & Professional Development of Engineers in the Maritime Industry

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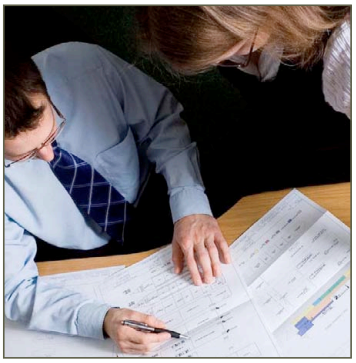
First Notice & Call for Papers

As the global maritime industry emerges from the downturn it has been experiencing in recent years, the key to its future success will be innovation in all aspects and sectors of the industry, whether it be in research, design, construction or operations. And in an industry which is technologically led, such innovation will be provided by engineers who have the professional skills to meet the future demands of the industry. Such engineers will need to have achieved the knowledge and understanding which underpins those professional skills while at university, and to have developed them through training and experience after graduation. But what are those skills which the maritime industry of the future requires, how are universities and colleges to provide the graduates who are able to develop them, and what is the role of industry in enabling those skills to be developed? What are the particular skills required by different sectors of the maritime industry – commercial, naval, recreational, offshore, renewable energy? What are the interpersonal skills which engineers of the future will require to complement their technical skills?



The conference will compare the differences in the requirement and delivery of education, training and professional development in different sectors of the industry and in different countries, seeking to both learn and benefit from such differences. Given the lead time to provide professional engineers, the conference will seek to identify the changes needed now to provide the engineers of the future. Papers are invited on the following topics:

- Industry's current and future requirements for professional skills
- Curriculum development - mechanisms for ensuring that education providers are responsive to industry requirements
- Collaborative provision, including experiences of educational and CPD programmes delivered by several institutions on more than one site.
- International developments, including: education's global market; the international student experience; programme delivery on a satellite campus
- E-delivery - successes and failures in delivering programmes remotely, including: web based material, video streaming, and live delivery via video link
- Visas and permits - the impact of governmental policies on the provision of educational programmes
- Accreditation - international recognition of nationally accredited programmes, and the future of accreditation

Contributions are also welcomed from graduates on their experience and views on how their education fitted them for their careers.

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BV sets out latest shaft criteria

Recent incidents involving poorly aligned shafts has made Bureau Veritas (BV) take a closer look into and launch of its own Elastic Shaft Alignment (ESA) notation

The ESA notation has been developed to help ensure the integrity of the structure and shaft bearings on very large vessels such as ultra-large containerships and next generation LNG carriers.

The ESA notation will apply to vessels with shafts in excess of 750mm diameter, or smaller shafts handling over 20MW of power, propellers over 30tonnes or using synthetic bearings. The notation requires full analysis of the criteria covering hull flexibility with respect to loading conditions, bearing material stiffness, shaft speed and oil film behaviour.

Jean-Francois Segretain, deputy technical director, Bureau Veritas, says: "Critical attention has to be paid at the design stage to analysing the elastic shaft alignment and ensuring that the bearings and structure match the shaft response, especially when the vessel is turning. If this is not done, huge forces will either lead to bearing failure or excessive vibration. We have been called in to help solve incidences of both on new ships. This new ESA notation sets out standards of how the shaft must be analysed and the criteria the whole shaft, bearings, and aft structure must meet to avoid such problems."

Segretain also points out that the damage that BV has encountered where the shaft alignment has been the cause has come about from the shaft line not being accurately aligned at the shipyard, as "not all shipyards give proper thought to shaft alignment." He adds that they are now seeing problems coming back from 10 years ago.

The reasons for this type of damage becoming more abundant now is due to new types of vessels coming on to the market such as LNG vessels. Also, due to the need for owners to save fuel costs, vessels are now sailing slower and opting for energy saving features such as increased propeller diameters, which all adds to the stress and vibration on the vessel and parts, such as shaft the bearings.

"We will make this notation obligatory for ships meeting these conditions in our class, and will also make it available as a voluntary notation for smaller vessels and vessels not in BV class. Getting the shaft/structure right is critical for modern designs and we have the deepest expertise in this area available anywhere. This notation helps to codify that and guide yards with new designs", Segretain says.

The studies of the shaft alignment can be carried out by or verified by BV at the design stage. The classification society notes that it has been conducting these studies for many years and has its own specialist software for carrying out the studies. *NA*

The Royal Institution of Naval Architects

Marine Design

3-4 September 2014, Coventry, UK

Lifelong Learning Programme

EBDIG European Boat Design Innovation Group

Coventry University

First Notice & Call for Papers

RINA Marine Design 2014 will provide a forum for reporting and discussing the design practice and technical issues associated with aesthetic design. The full spectrum of marine design from small craft to super yachts, including commercial and specialist vessels, will be examined.

An exhibition celebrating the 30th year of boat design at Coventry University will be opened at the end of the conference, which will include a virtual 3D exhibition of Coventry University students' design work. This will show the breadth of capability within the department of Industrial Design including automotive, transport and boat design.

The conference will present technical papers on a number of aspects of aesthetic marine design, including:

- ***Design Visualisation*** (including design methodologies, design practice, innovative concepts, design analysis tools, Computer Aided Design, TOI (Transfer of Innovation) from other industry sectors).
- ***Human System Integration*** (including HFE (Human Factors Engineering), Maritime Security, UCD (User Centred Design) methodologies, Emotional Design methodologies, Empathic Design methodologies, 'Ageing in Place', TOI from other industry sectors).
- ***Sustainability in construction*** (including one-off construction and series production issues, facility design, materials, joining technologies, reconstructions and rebuilds of historic craft, results of simulation).
- ***Sustainability in operation*** (including, equipment, results of sea trials, results of instrumentation, results of simulation, TOI from other industry sectors).
- ***Implementation of regulations*** in the design process (including international, national, and regional regulatory frameworks, classification, codes of practice, rating rules).
- ***Virtual work/learning environments*** (including, CPD for marine designers, networking opportunities for innovation and exchange, virtual work environments to facilitate multi-disciplinary, multinational teams).

www.rina.org.uk/marine_design2014

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Compiled By The Nautical Institute Ref: ISOD
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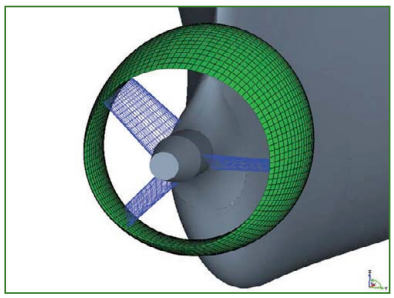
The Royal Institution of Naval Architects

Influence of EEDI on Ship Design

24-25 September 2014, London, UK



Call for Papers

The reduction of CO_2 emissions has been a key target in the Marine Industry since the IMO's Marine Environment Protection Committee published its findings in 2009. From which a number of measures resulting in technical and operational reductions were made mandatory in 2011. Foremost amongst these measures; nearly all new builds have to conform to the limits of the Energy Efficiency Design Index (EEDI).

The EEDI will enter into force in a number of phases that increases the restriction on CO_2 emissions. The current phase has led designers and operators to retrofit existing technologies and make operational changes that make slight gains in hull and engine efficiency. However as later phases introduce tougher restrictions, more fundamental changes in ships design will be needed in order for a vessel to comply. The EEDI will become an ever more important design parameter.

To further investigate the impact of the EEDI on ship design, RINA invites papers from naval architects, class societies, regulators, operators, and researchers on all related topics, including:

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