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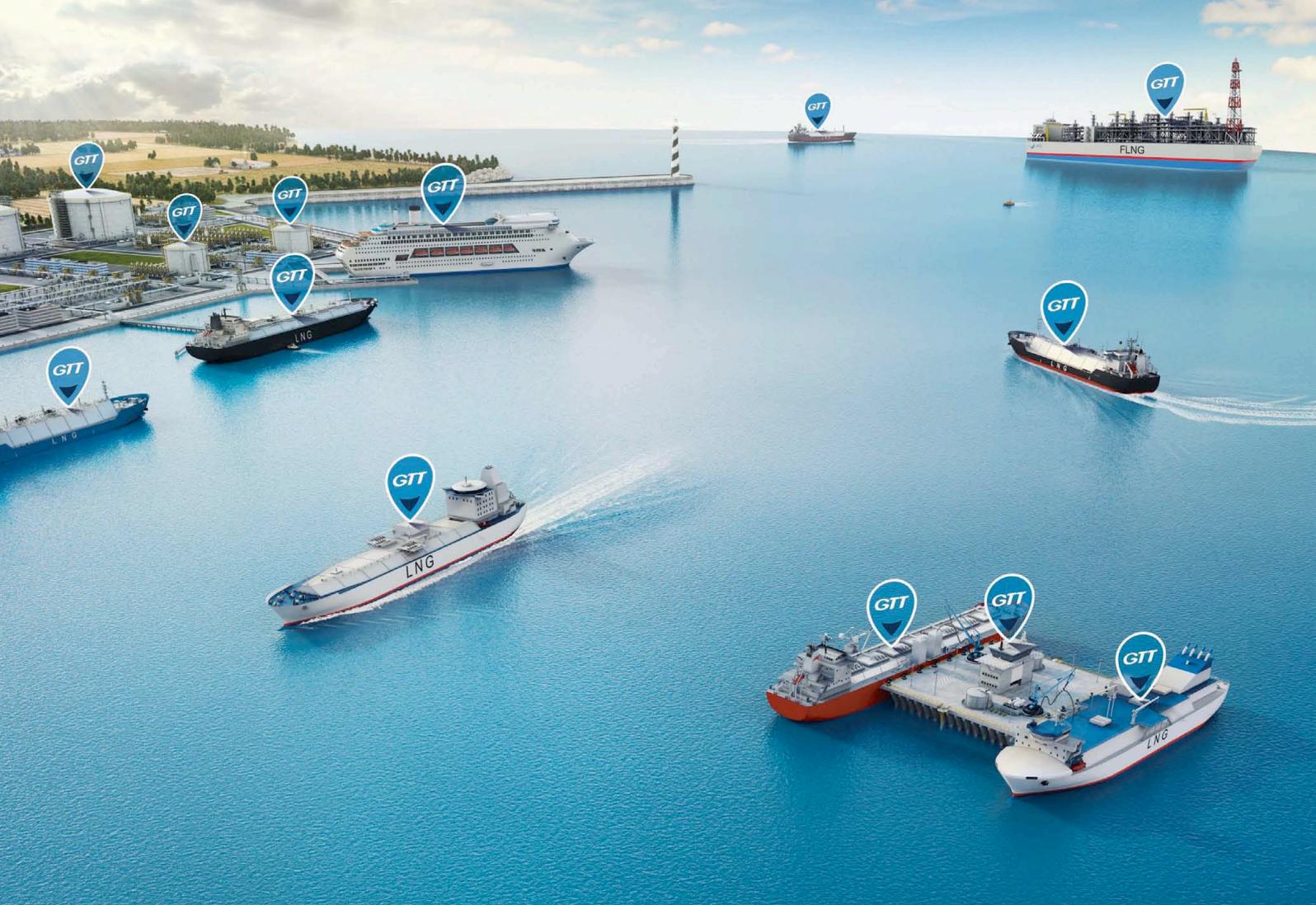


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Green shipping / Cruise ship update /
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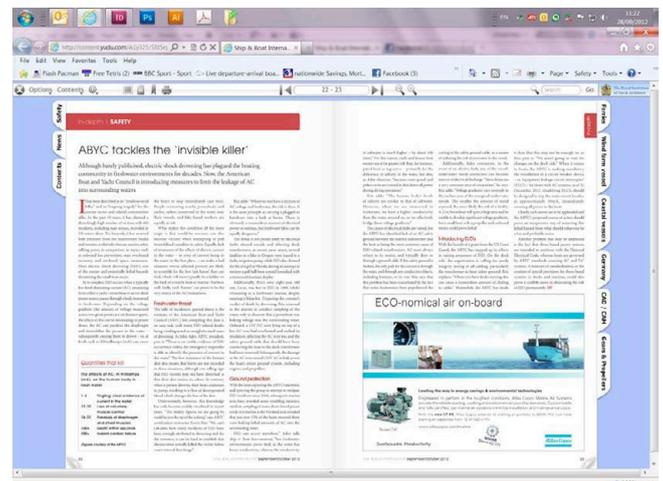
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Time to weigh the possibilities

Since *Napoli* industry has dragged its feet over the weighing of containers

Focus for the investigation into the causes of the break up and subsequent loss of *MOL Comfort* has turned to the structural strength of the vessel and the declared weight of containers.

According to investigators from the Committee on Large Container Ship Safety in Japan, which is investigating the causes of last year's accident in the Indian Ocean, the time has come for the industry to start weighing loaded containers to determine their actual weight, rather than relying on shippers to declare the correct weight of a container.

The committee's report concludes: "With regards to the proper management of cargo weight on the hull for large container ships in the 8,000TEU class and over in particular, cargo loading planning for actual voyages could be frequently reached to the maximum permissible still waterbending moment (hogging condition). In accordance with the deliberations at the IMO related to the enforcement of container weight verification prior to loading, verification of the actual weight of container cargoes provided by the shipper is recommended as a safety measure for large container ships."

In fact this is not the first time an investigation into the loss of a vessel has reached such a conclusion. In January 2007, while travelling in the English Channel *MSC Napoli* encountered heavy weather, with wave heights of up to 9m, while travelling at a speed of around 11knots. At around 11am that morning *Napoli* suffered catastrophic hull failure causing the crew to abandon ship.

In its report of the *Napoli* accident the UK's Marine Accident Investigation Bureau (MAIB) noted: "The load and capacity

assessments conducted by DNV and BV show that, in the case of *MSC Napoli*, the design margin of safety was either insufficient when whipping is taken into account (BV), or non-existent (DNV). The analyses are supported by the fact that the vessel broke her back when within her seagoing limitations and, although the conditions were severe and had a low probability of occurrence, they were nevertheless equivalent to the current UR S11 design value [the longitudinal strength standard set by the International Association of Classification Societies]."

In conclusion the MAIB reported: "The effect of the discrepancies in the declared weights of the containers would not have been sufficient to cause hull failure, but it would have contributed to the reduction of the safety margin between the total bending moment experienced and the strength of the hull"

As a result MAIB said that the stresses on a vessel's hull cannot be "accurately controlled" unless containers are weighed before loading. Screening of more than 1,500 container ships by class societies took place following the report on the *Napoli* loss and a further 12 vessels were found to have localised buckling as a result of insufficient strength for the hull structure to cope with certain loading conditions.

Furthermore, the report concluded: "It is apparent that UR S11 has lagged behind the development of container ship design and operation, and requires immediate revision. Buckling checks must be based on global hull stresses along the entire length of the hull and not left to the discretion of individual societies. The use of common methodologies in this respect would

provide greater assurance that the strength of all newbuild container ships is being adequately addressed."

According to the *Napoli* report the maximum allowable loading of a vessel's hull structure relies on the experience of the class society in question. It does not "explicitly take into account factors which increase bending moments such as whipping, or other variables such as inaccuracies in container weights and distribution."

"The audit of the containers removed from *MSC Napoli* and the deadload calculated on departure, indicate that the declared weights of many of the containers carried by the vessel were inaccurate. This discrepancy is widespread within the container ship industry and is due to many packers and shippers not having the facilities to weigh containers on their premises."

However, the MAIB went on to say: "It is also due to shippers deliberately under-declaring containers' weights in order to: minimise import taxes calculated on cargo weight; allow the over-loading of containers; and to keep the declared weight within limits imposed by road or rail transportation."

As a result container ships are sailing at either above or close to the permissible the maximum loading limits. "Container shipping is the only sector of the industry in which the weight of a cargo is not known," says the MAIB.

Mitsubishi Heavy Industries, the builder of *MOL Comfort*, believe that these issues will eventually be seen as a significant contributory factor to the loss of the vessel. Surely it is time for all containers to be weighed and for accurate measurements to be available to master prior to sailing? *NA*

China

Rongsheng's troubles persist

Speculation is mounting that China Rongsheng Heavy Industries Group may become the first casualty in an increasingly difficult shipbuilding market that is suffering from overcapacity and a lack of orders.

In March China Rongsheng reported a net loss of RMB8.68 billion (US\$1.39 billion) for the fiscal year ending December 2013, substantially greater than the RMB572.6 million (US\$91.8 million) losses it posted a year earlier.

According to the yard, its borrowings at the end of the period had reached RMB22.41 billion (US\$359.22 million) of which some RMB127 million (US\$20.36 million) was reportedly overdue and had not been renewed or repaid, a further RMB13.71 billion (US\$219.8 million) will become due within the year.

Rongsheng the group has signed "a framework agreement with over 10 principal banks to establish a debt optimisation syndicate, for the purpose of ensuring our stability of operations and improving our state of liquidity,"

Employee numbers at the yard fell 28% in the year up to the end of December 2013, with the number now totalling 4,738. The yard also said it had taken orders to build 23 vessels with a combined value for the orders of US\$726 million, more than US\$1 billion below its target.

China

Increase in vessel delays at China yards

One in three newbuilding orders in China were behind in their delivery schedules during 2013, according to Clarkson's Research. The massive backlog of orders is having a significant effect on China's shipping finance sector with banks being forced by owners to comply with bank guarantees as owners reject late deliveries.

The root of the financier's problems lies in the banker's rush to offer refund guarantees to owners building new vessels following the 2008 financial crisis. Encouraged by government tax incentives and easy credit the owners were keen to order new vessels. Subsequent oversupply of capacity saw demand for ships of all kinds dwindle and many owners were looking for a route out of newbuilding contracts for ships that would be unlikely to find cargoes.

Yards were, however, keen to maintain the orders and keep the money paid up front for new orders have issued injunctions against banks to prevent the

financiers from paying the refunds to owners. Banks had seen the refund guarantees as insurance and failed to demand collateral from the yards, meaning that the financial institutions are now exposed to massive debts from the newbuilding drive, which ended in 2010.

Effectively the banks are caught between a rock and a hard place, if they obey local injunctions issued by Chinese yards to prevent payment, they are at risk from owners who could sue in a foreign jurisdiction, but if the banks pay and attempt to recoup the money from the yards they could alienate local governments, which in turn could damage their regional businesses.

Clarkson's data shows that Chinese yards achieved US\$37 billion in new ship orders during 2013 a 92% year-on-year increase. However, Chinese state media reported that 80% of new orders went to just 20 yards. Raising the prospect that heavily indebted Chinese yards are likely default if government fails to bail them out.

Strategy

MOL steers new course for 2020

Japanese shipping company Mitsui OSK Lines (MOL) released its latest management plan at the end of March. Entitled 'Steer for 2020' the plan is a change of direction for the company which will look for stable, long term business, according to MOL executive officer and general manager of the Technical division Yoshikazu Kawagoe

"There is too much supply in the shipping business," explained Kawagoe, "so we're not chasing the high margin business, but we are targeting less profitable, but more stable business".

MOL believes that the LNG and offshore business will provide a steady income for the group and as such it has ordered a number of LNG carriers from a number of yards. Five 155,000m³ vessels have been ordered from Mitsubishi Heavy Industries, another 165,000m³ vessel has been ordered from Kawasaki Heavy Industries. The Japanese yards will build ships with Moss type cargo tanks.

A further 12 vessels are on order from the Hudong yard in China and these will all be built with membrane type LNG cargo tanks. A further new order has gone to the Japan Marine United yard and this will be built with an SPD type tank.

Daewoo Shipbuilding and Marine Engineering of South Korea will also build a 170,000m³ floating storage and regasification unit (FSRU) for the operator.

Kawagoe added that the carrier will also order some large container ships, but the size and number

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of ships to be ordered are still under consideration by the carrier.

Software

NAPA independence not at risk

Executives from both the newly acquired NAPA and its new parent company ClassNK were at pains to stress that the Finnish software group would retain its independence following the 100% buy out deal.

Final details of the deal were ironed out in April and the Finnish company's president Juha Heikinheimo stressed that NAPA had a global reach, with agencies in the US, Europe and Asia, 2,000 installations and 700 user organisations. "Our mission is to increase maritime safety and efficiency," and that will not change said Heikinheimo.

Tetsuya Kinoshita, vice president at ClassNK, says: "Our relationship with NAPA means that we can provide opinions on particular issues," however, he also stressed that confidentiality was key to the working relationship and that ClassNK would guarantee that confidentiality.

NAPA's two main software offerings remain NAPA Steel which is a solution for ships design and NAPA Green for operational efficiency. NAPA Steel will use 3D data for the basis of its ship design programme.

Meanwhile, NAPA Green has been installed on an 8,000TEU K-Line vessel for trials. Esa Henttinen, NAPA vice president of operations, told *The Naval Architect*: "Full scale trim tests had proven the potential of system to realise 4% cost savings or US\$450,000 annually for one vessel."

According to Henttinen NAPA Green uses a "self-learning, dynamic performance model" for maximum accuracy and takes into account weather and other conditions on the vessel's route. Henttinen says NAPA Green achieved an accuracy of 99.6% on the trials when compared to the captain's voyage plan as a reference and this translated to a 7% fuel saving over the captain's plan.

Litigation

MOL sues MHI

Litigation in the case brought by Mitsui OSK Lines (MOL) for ¥12 billion (US\$120 million) damages from shipbuilder Mitsubishi Heavy Industries (MHI) following the loss of *MOL Comfort* last year started in March.

Damages are being sought by MOL for the loss of *Comfort* and modifications made to sister vessels, which revealed deformations in the lower hull following inspections triggered by the *Comfort* loss.

According to MHI the initial arguments in the case have already been heard by the court and the shipbuilder's riposte is expected to be heard during next month.

Hull Strength

Phase two of *Comfort* investigation started

Kazuhiro Tabuchi, director of ship safety standards office at Japan's Ministry of Land, Infrastructure, Transport and Tourism (MLIT) and a member of the Committee on Large Container Ship Safety which was convened following last year's loss of *MOL Comfort* says that the second phase of the committee's investigation started in February.

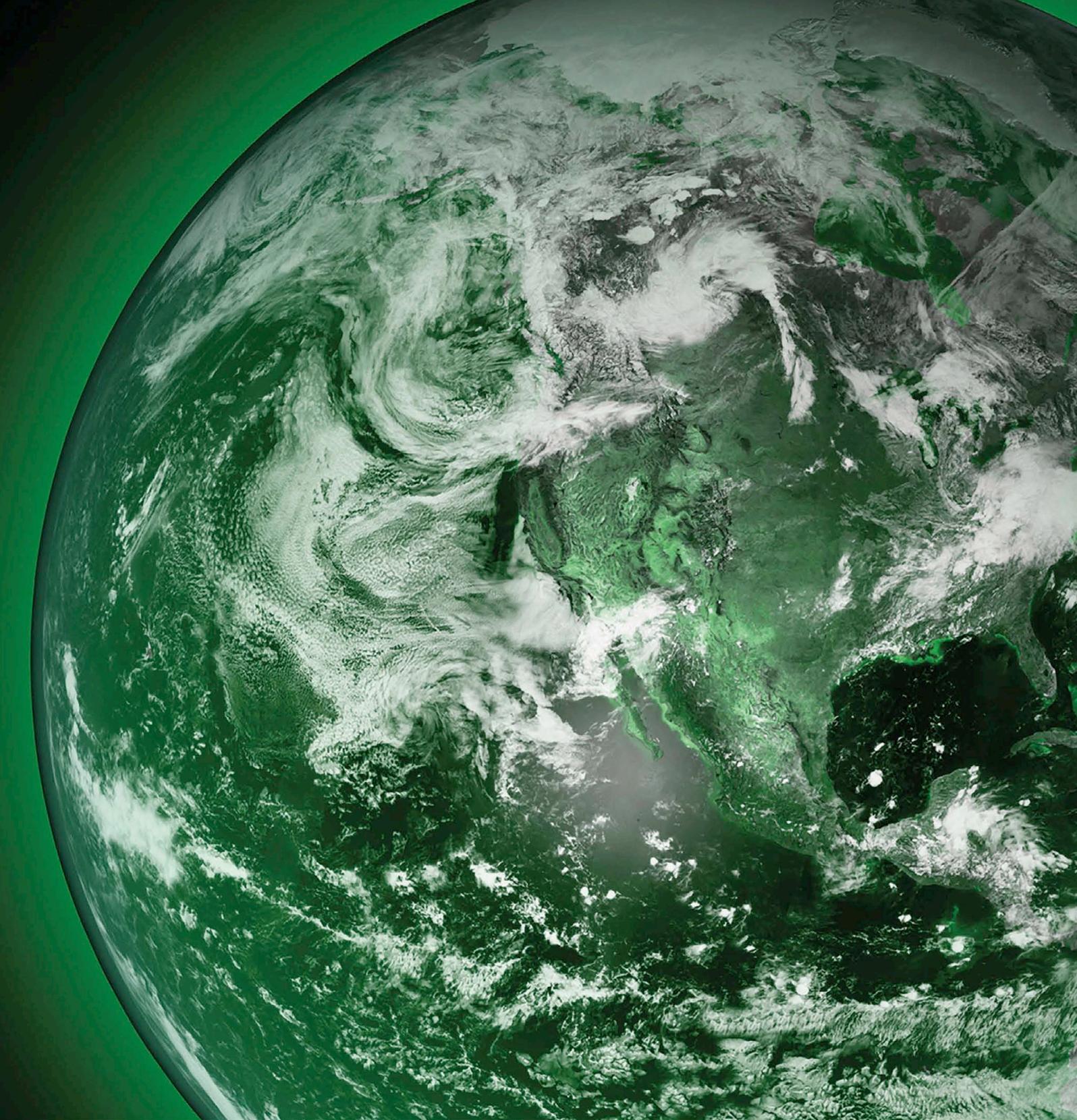
The initial investigation ended with the publication in Japanese of the Interim Report into the *Comfort* loss, with the English translation released in March. A number of possible causes of the accident were ruled out such as fire, weld failures, etc. and the focus has now turned to the weight distribution of cargo and the effect of the ship's motion. However, the investigation has only the declared weights of containers work on following the sinking of the vessel which showed that the load estimates were within the vessel's design limits.

The second phase of the investigation began in February also with the investigators focusing on hull structure strength and the increased forces acting on the hull structure in a variety of sea conditions. Monitoring of one of *Comfort*'s sister ships is expected to continue over the next 12 months, according to Tabuchi. In addition the committee is monitoring other large container ship types in order to see if the difficulties are specific to the *Comfort* design or if there could be a more widespread problem for larger ships.

"We will pay particular attention to whipping and working out how this effect worked on the vessel [*MOL Comfort*]," says Tabuchi.

Debate over *MOL Comfort* continues, as owner sues yard for damages





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MEPC nudges industry towards cleaner shipping

Renewed concerns were expressed by industry bodies at the Marine Environment Protection Committee meeting in April about implementation problems relating to the IMO's Ballast Water Management Convention, *Writes Sandra Speares.*

The International Chamber of Shipping (ICS), BIMCO, Intercargo, Intertanko, the World Shipping Council, Cruise Lines International Association and the International Parcel Tanker Association, said member governments had not discussed in full or resolved those issues on which the industry had made a joint submission in January.

The submission addressed concerns about the lack of robustness of the current IMO type-approval process for the expensive new treatment equipment, the criteria to be used for sampling ballast water during port state control inspections and the need for 'grandfathering' of existing type-approved equipment that has already been fitted. However, the industry bodies say that governments have decided not to address these proposals until after the convention has entered into force.

"Rather than agreeing to a 'road map' that would have demonstrated IMO's commitment to addressing the concerns, the MEPC instead decided to look into conducting a study of the problems raised by the industry. This proposed study will probably take at least three years to complete and the decision implies no guarantee as to what actions might finally emerge," the associations said in a joint statement.

In consequence, "shipowners, and society at large, will continue to lack confidence that the new treatment equipment will actually work, or that it will be found to comply with the standards that governments have set for killing unwanted marine micro-organisms".

The associations believe that: "legal changes needed to make the ballast regime truly global and fit for purpose – such as making IMO Guidelines on type-approval mandatory – are relatively straightforward and could still be agreed in principle by governments quickly." Another submission proposing a possible way forward will be presented at the next MEPC meeting in October.

"In the meantime, the shipping industry cannot recommend that further member states ratify the BWM Convention until confidence building measures on resolving implementation concerns have been set in place."

Other issues on the MEPC agenda included adopting amendments to the MARPOL Convention to set a date for the implementation of Tier III standards within emission control areas (ECAs) and to make the IMO Member State Audit Scheme mandatory as well as reviewing

environmental provisions in the draft Polar Code and considering the implementation of energy-efficiency regulations and the Ship Recycling Convention. The amendments provide for the Tier III NOx engines installed on ships constructed on or after 1 January 2016 and which operate in the North American ECA or the US Caribbean Sea ECA.

According to ICS director of external relations Simon Bennett, MEPC took "significant steps" towards the development of a global system for the monitoring and reporting of CO₂ emissions from ships. "In the interests of measuring the progress that shipping is making to reduce its CO₂ emissions, ICS fully supports a global monitoring and reporting system. This is on the basis that the mechanism should be simple for ships to administer, primarily be based on fuel consumption, and that the system itself should not be used for the development of a full blown Market Based Measure," he said following the closure of the meeting.

"The current priority for ICS is to help maintain the primacy of IMO with respect to the development of additional regulation to address CO₂ emissions. In the interests of discouraging unilateral legislation - particularly by the EU, which is now developing a parallel regional proposal - ICS has therefore sought to help reconcile the wishes of those nations that want IMO to make rapid further progress on regulating CO₂ with the legitimate concerns of developing countries," Bennett continued.

The actual goal of the US and several other administrations "appears to be the eventual establishment of a mandatory system of energy efficiency indexing for application to individual ships, the ultimate purpose of which might be to penalise or reward ships on the basis of a theoretical operational rating. This is something to which ICS is very strongly opposed, not least because of the danger that it will lead to a serious market distortion. However, in the interests of maintaining IMO primacy, ICS suggested in its submission to the MEPC that the question of additional measures might be left open until after a mandatory CO₂ emissions reporting system has been first established, tested and the results analysed," he explained.

ICS was encouraged that the MEPC had decided to focus on the data collection system on CO₂ rather than getting "dragged into the weeds" on discussions about how the information is going to be applied when the system is established. Setting up a ship energy efficiency indexing system is controversial.

The MEPC also agreed to set up a correspondence group to look at the terms of reference for the study of availability of low sulphur fuels to meet the global 0.5% cap due to enter into force in 2020. *NA*

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Software

IMO approved method for EEDI

The new STAIMO software for Speed/Power Trial analysis and reporting onboard has been released for use by the worldwide maritime industry free of charge.

The software package is the result of the implementation of the new International Towing Tank Conference (ITTC) Guidelines for Speed/Power Trials, which has been approved by IMO MEPC for evaluating the ship speed for the Energy Efficiency Design Index (EEDI), which is now effective for most newbuild ships.

STAIMO has been developed by the STA-Group comprising 38 leading shipowners, operators, yards, class societies and institutes, which have been cooperating in this field since 2002.

Over the last two years the STA-Group has cooperated with the International Towing Tank Conference (ITTC) to develop this method and the underlying approach and models were scrutinised by hydrodynamic experts. The resulting ITTC Guidelines for Speed/Power Trials have been accepted by the IMO as the method to conduct and process speed trials in line with the EEDI rules.

Subsequently, the STA-Group decided to develop the STAIMO software and release this as freeware in order to harmonise the EEDI and speed trial procedures worldwide and to achieve a level playing field. For use onboard the software carries out both analyses and reports.

www.staimo.org

Ancillary equipment

Holmatro lightens up

Holmatro's has developed its latest range of aluminium cylinders as an alternative to steel, which are 50% lighter, but just as strong as steel cylinders, the company claims. They enable individuals to handle far higher tonnages. The new aluminium cylinders meet the stringent quality standards that characterise the hydraulics specialist.

Holmatro's complete range of cylinders, which consists of 36 models with different capacities and stroke lengths, are constructed with a lightweight spring return and double-acting aluminium cylinders and are produced from 7075-T6 black anodised aluminium.

All of the aluminium cylinders are fitted with the Duo Power Ring concept, a combination of a seal and a strong composite bearing. This combination offers resistance to lateral loads to a maximum of

10% and ensures a longer life-span. The plunger of the cylinders is specially coated with a hardened anodised layer that makes it extremely wear and corrosion resistant. The XL Saddle optimally protects the plunger of the cylinder. This saddle also ensures that the load is guided as effectively as possible. This limits undesired eccentric loads, says the company.

www.holmatro.com

Communications

Neptune on the waves

Chart distributor Nautisk has announced that it has received DNV approval for its Neptune Pay As You Sail (PAYS) Solution. PAYS enables users to access global electronic navigation charts (ENCs) for use with onboard ECDIS systems, whilst only paying for those that are actually used.

As no hardware installations are required for use of the service, additional onboard equipment is not required. The system is fully compliant with SOLAS regulation and take-up has so far been positive.

Neptune is a real-time vessel information service compatible with both bridge and shore-based systems. It works by combining electronic Notices from British Admiralty, the Norwegian Hydrographic Service and National Oceanic and Atmospheric Administration (NOAA) with an update service for ENC cells from the United Kingdom Hydrographic Office (UKHO) and Primar.

www.nautisk.com

CAD/CAM

Siemens speeds up PLM ROI

Siemens has announced that its latest shipbuilding catalyst is aimed at helping to accelerate the deployment of product lifecycle management (PLM) software, further enhancing PLM value. Using a pre-packaged combination of industry-

Siemens aims at speeding up the PLM paper trail for vessels, with its latest software solution



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www.siemens.com/plm

Cranes & cargo handling

Transas launches LCHS 5000

Transas Marine has launched its latest liquid cargo handling simulator LCHS 5000 TechSim LNG. The Transas LCHS 5000 TechSim product line includes simulators for LNG tankers, LNG terminals and LPG carriers. The Transas LCHS 5000 allows for a complete resource management training involving crews of both mother and daughter vessels.



Transas launches its latest LNG cargo handling solution

The new simulator will enable trainers to provide highly realistic, in-depth training using the simulation technology within LCHS 5000 TechSim, the company said. This includes vessel team management exercises as well as interaction with terminal operations staff.

The LNG vessel and LNG terminal simulator models were developed in close collaboration with the Szczecin Maritime Academy, Poland. Simulated models have been designed to reflect real installations which are currently under-construction at the Swinoujscie LNG terminal in Poland. To further complement the liquid gas vessel model range, an LPG vessel model was developed by Transas and validated by LPG operators.

www.transas.com

Cranes & cargo handling

Huisman gets a lift

Huisman has received a Letter of Intent for the delivery of the world's largest cranes onboard Heerema's planned new semi-submersible crane vessel. The cranes will have a lifting capacity of 10,000tonnes at a radius of 48m. The two cranes will be built by the Huisman production facility in China and will be tub mounted on the vessel. The final decision to build this new semi-submersible crane vessel will be made by Heerema before the end of this year.



Huisman will deliver its largest capacity cranes yet to Heerema's latest vessel

The cranes further feature a 2,500tonnes auxiliary hoist and a whip hoist with a maximum reach of 155m. The main hoist, can lift 1,000tonnes to 1,000m water depth and is fitted with active heave compensation.

www.huisman.com

CAD/CAM

ShipConstructor 2014 R2 released

The latest update of the SSI software, ShipConstructor 2014 R2, is focused on streamlining workflows for users and enhancing the user experience, says the producer. This has been accomplished by collecting feedback from clients in all markets and industries, then implementing hundreds of suggestions that boost efficiency, quality and stability.

ShipConstructor 2014 R2 also introduces major enhancements to the WeldManagement product which now enables complete 3D weld management. This means that engineering and production can be seamlessly linked to efficiently and effectively administer the entire welding process.

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Communications

Free as a C-Bird

Maritime Broadband's VSAT communications solution C-Bird is gaining wide acceptance among major companies in the shipping industry, the company has said with the addition of further key distribution partners.

Maritime Broadband's C-Bird system enables the ship's personnel to stay connected to the world with Internet access to news from home, friends, Facebook, professional development sites and many other resources.

The proprietary C-Bird antenna can be assembled and commissioned in less than six hours by the onboard crew without the aid of cranes or the need to put the ship in dry dock. The company added that an entire fleet can be deployed in the time it takes to deliver the equipment to the vessels.

www.maritimebroadband.com

Lifesaving

Ocean Safety enhances its strength

Ocean Safety, has introduced a tried and tested fabric to strengthen the construction of its internal lifejacket bladders by up to 25%, across its range of professional and leisure lifejacket ranges.

Riverseal uses a high tenacity nylon based yarn to give a higher tensile strength of up to 20% over its main competitors' products, the company has said. It has also been proved in tests to have up to 25% increased tear strength and an increased puncture resistance and increased abrasion resistance over competitors' materials, as proven by independent

Ocean Safety toughens up its lifejackets



UKAS accredited laboratory reports. Riverseal is ISO 12402 Approved.

Ocean Safety is currently the sole provider of Riverseal's High Visibility Neon Yellow colour and is now incorporating it into the company's new Kru and K2 ranges of life jackets.

www.oceansafety.com

Interiors & accommodation

Metalcolour moves into Asia

In cooperation with our long term partner, Yan San Metals, Metalcolour has started a production site in Singapore. From this latest production site, Metalcolour Asia will offer similar services to those offered in Europe for the last 40 years, the company says.

"We can now finally offer the same flexibility, service and quick deliveries for our Metalcolour products, including Dobel, to Asia as we've become so well-known for in Europe" says CEO Ingemar Forsberg

"A long-awaited collaboration with Metalcolour to be able to offer locally produced Dobel-material to old and new customers in Asia has finally become a reality" says managing director and co-owner Quah Poh Keng

www.metalcolour.com

Water treatment

Alfa Laval acquires Frank Mohn

Alfa Laval has signed an agreement to acquire Frank Mohn, a manufacturer of submerged pumping systems to the marine and offshore markets. The acquisition, which strengthens Alfa Laval's fluid handling portfolio by adding pumping technology, will further reinforce Alfa Laval's position in the marine and offshore oil & gas markets, the company has said.

Alfa Laval has agreed to acquire Frank Mohn with the product brand Framo, for a total cash consideration of NOK13 billion (US\$2.2 billion), on a cash and debt free basis, from Wimoh, a company controlled by the Mohn family.

Alfa Laval intends to include Frank Mohn and the product brand Framo in the Marine & Diesel division, headed by Peter Leifland, executive vice president, Alfa Laval Group. The company will be kept together and form a new segment in the Marine & Diesel division, under the same management as today. The activities in the Bergen area in Norway; the new office and sales & service facility at Askøy, as well as production facilities at Fusa, Flatøy and Frekhaug, will become Alfa Laval's operational centre for marine and offshore pumping systems.

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In the Comfort zone

Following the break-up of the 8,000TEU container ship *MOL Comfort* in June last year the Committee on Large Container Ship Safety was established in Japan under the auspices of the Ministry of Land, Infrastructure, Transport and Tourism. The committee has now entered the second phase of its investigation

In March this year MOL decided to sue Mitsubishi Heavy Industries (MHI) for the losses incurred following the loss of *MOL Comfort* in the Indian Ocean last June. Initial presentations have already been made to the courts and MHI will itself make representations in June in its defence.

English translations of the Interim Report on the *MOL Comfort* accident were released in March, some three months after the original had been published, and copies of the report have been passed to the IMO's Maritime Safety Committee 93 (MSC 93), which meets in mid-May. Formal discussions on the accident will, however, have to wait until the second phase of the investigation is concluded.

Following the publication of the Interim Report the committee had narrowed down the possible causes, but must now focus on the factual pointers that indicate a structural failure caused by either a design flaw in the vessel or a series of events that caused the catastrophic failure of the structure holding the vessel together.

In its initial investigation the committee considered a number of possible causes such as fire, explosion, grounding, collisions and metal fatigue and welding failures and these were all discounted as possible causes explained Kazuhiro Tabuchi, the director of the Ship Safety Standards Office, a part of the Ministry of Land, Infrastructure, Transport and Tourism (MLIT).

In a process of elimination that leaves structural failure of some kind. But, Tabuchi admits that: "The simulation programmes are not able to reproduce the buckling effect seen in *MOL Comfort*. There are two points from the interim report that require further



Enlarged view of *MOL Comfort* during the accident showing the direction of the crack from the bottom upwards. (Photo by Mitsui OSK Lines)

investigation the insufficient accuracy of the actual loading conditions of the vessel and the simulation of the hull strength," says Tabuchi. He adds: "In the simulations that we have already conducted, when the hull cracks it's a very heavy destruction, we don't know if it's a software or a data problem."

Effectively the committee cannot reproduce the accident through computer simulation and according to the shipbuilder, MHI, this is because there was a confluence of incidents that contributed to the loss.

"We believe there was a combination of problems, an unusual combination of extreme loads, the still water bending moment, the wave bending moment and whipping, if all three are extreme then accidents may occur," explained Naoki Ueda, general manager of the shipbuilding and ocean development division at MHI and also a member of the Committee on Large Container Ship Safety. Ueda added that MHI are uncertain what the share of each of the different loads were and that

this will probably never be known as the evidence is now on the sea bed.

However, it is the still water and wave bending moments combined with whipping vibrations that has become the focus of the secondary investigation into the *MOL Comfort* accident and the committee has now fitted sensors, in February, to one of *Comfort's* sister ships so that it can monitor the loads acting on the vessel and their effects.

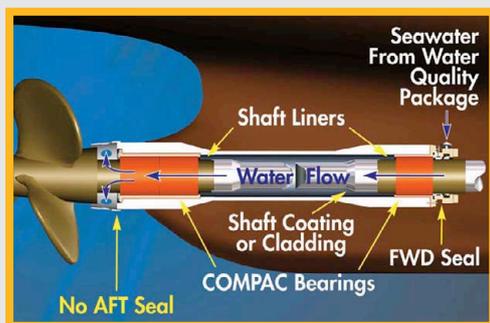
According to the interim report: "Estimation of load (*sic*) acting on The Ship at the time of the accident (17 June, 2013) gave the value 9.4×10^6 kN-m, which was only about 67% of the hull girder strength (ultimate strength) of 14.0×10^6 kN-m, so that the failure could not be reproduced. The load acting on the ship at the time of the accident was 9.4×10^6 kN-m when the failure occurred, while the ship encountered a sea state which may lead to a load of about 10.0×10^6 kN-m three years ago."

In the first instance MHI has calculated and evaluated the still water

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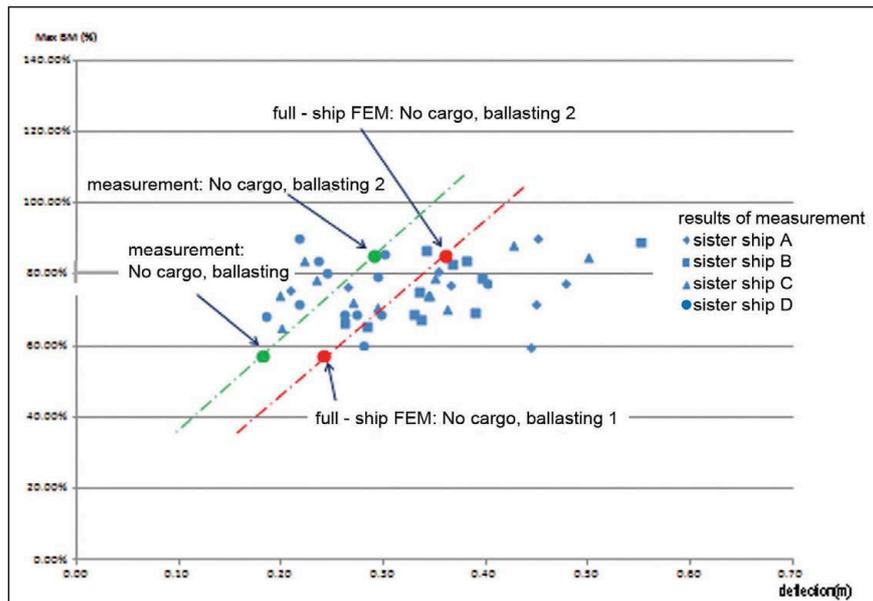
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Still water vertical bending moment and hull deflection

	Significant wave height (m)	Mean wave period (sec)	Wave direction (true north 0 degree, clockwise)
Private Data Source A	5.5	10.3	225

Acquisition of wave data (comparison of data acquired for the sea area during the accident)

bending moment of *MOL Comfort* from details received from the crew following the vessel's last port of call at Singapore. According to crew evidence, the hogging deflection of the ship was 630mm.

According to O. Kitamura, naval architect, engineering manager innovation & technical development at MHI and also a member of the Committee on Large Container Ship Safety, the maximum deflection should not exceed 480mm. "The actual still water bending moment was in excess of 20% higher than the maximum allowable load," says Kitamura.

MHI believe that the still water bending moment has become a problem because for smaller vessels, up to Panamax size, the narrow beam of the ship causes stability problems and ship operators dealt with this difficulty by using ballast water, usually in the midship tanks. "Due to the stability problems the actual still water bending

moment in Panamax vessels was never reached," claims Kitamura, adding that with post-Panamax vessels the beam has increased significantly, "so there are no restrictions from stability so the owner can load containers freely up to the maximum still water bending moment".

Kitamura believes that the maximum bending moments are often reached in post-Panamax ships as can be seen in the graph above.

The belief at MHI is that with the reported still water bending moment from *Comfort's* crew and the mis-declaration of container weights by cargo owners may have significantly contributed to the loss of the vessel.

"We were surprised by the figures produced by the crew," admitted Ueda, however, he argued that the industry must face up to the problem of mis-declared container weights, with the UK Maritime Accident Investigation Bureau recording some containers that were double the

declared weight following the loss of *Napoli* in 2007.

In conclusion the Marine Accident Investigation Bureau in the UK said in its report on the *MSC Napoli* accident: "The stresses acting upon a container ship's hull cannot be accurately controlled unless containers are weighed before embarkation"

The loads acting on the structure, whether containers are the correct weight or not, are exacerbated when the ship is at sea. Loads that determine the maximum wave bending moment are determined by the wave, motion, length and height. For ships of around 300m in length this can produce a significant difficulty that is not found in smaller or significantly larger vessels.

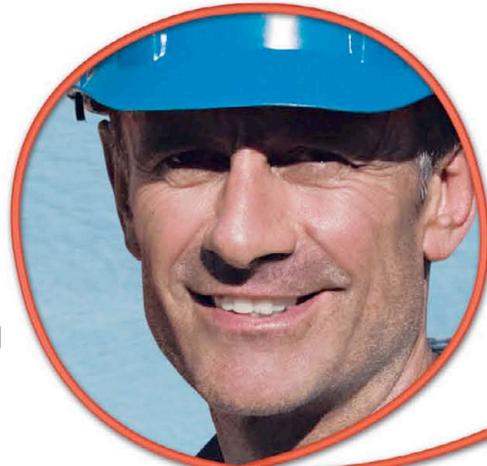
"Roughly speaking the ship design [*MOL Comfort*] is equal to the wave length," explains Kitamura. He says that a long wave length requires high winds and the wave height increases are dependent on the duration of the wind. In addition to the wave length and height, the direction of the waves can also be significant and here MHI believes that the waves may have been impacting the vessel from more than one direction. In addition, the sea state data used in the Interim Report is known to "include errors in significant wave heights from 0.5m to 2m approximately and in average wave periods from 0.5 to 2 seconds," according to the Interim Report.

These inaccuracies could be potentially very significant with the flag state, the Bahamas, reporting that "high winds and sea conditions were estimated to be in the order of 5-6m wave height. The ship was hit by an abnormal (*Sic*) large wave, which resulted in water ingress into one cargo hold and several tank spaces."

Whipping loads in these sea states can also have a significantly greater effect on the vessel, with the beam of smaller ships reduced the bow flare is also limited, but as mentioned earlier with the larger vessels the increased beam has resulted in a corresponding increase in the bow flare causing much higher whipping vibrations as a result, say MHI.

"Designers have increased the block coefficient of the ship design, so a fuller ship has resulted in a fuller bow

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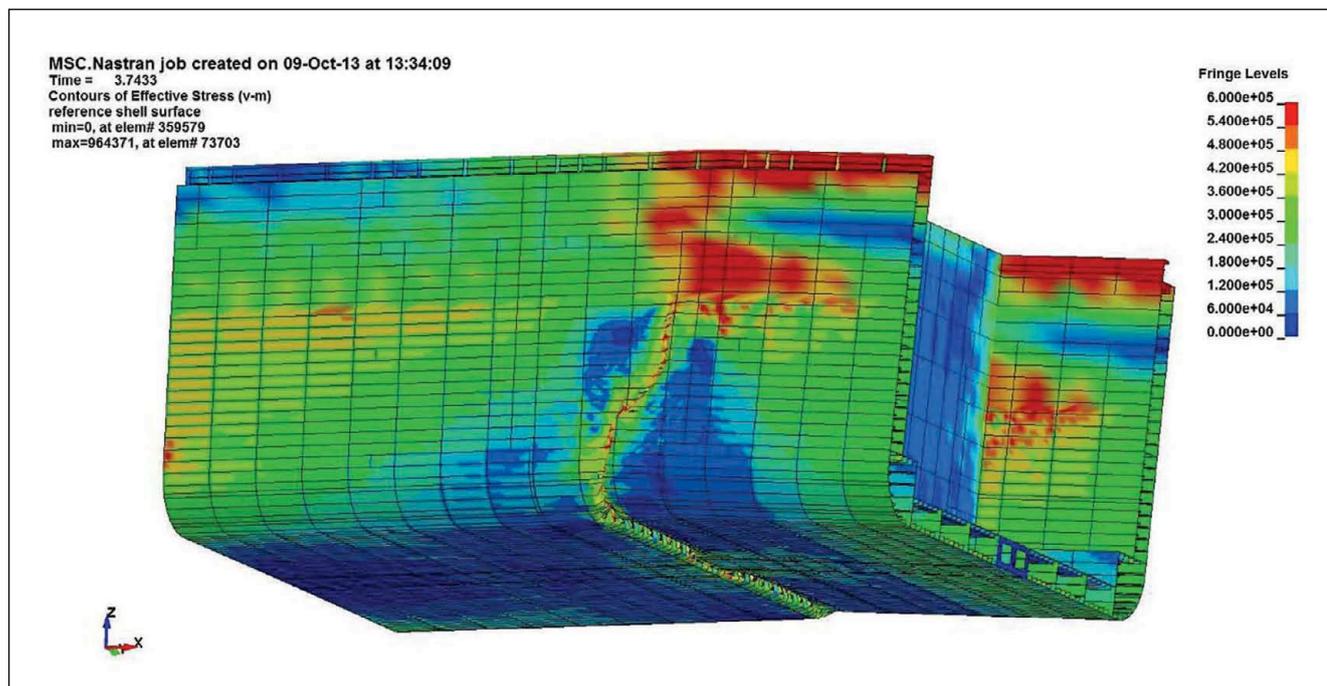
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Example of deformation nearby hull girder structure strength (Ultimate hull girder Strength) (by simulation)

flare too,” explains Kitamura. That increase in the bow flare has caused a significant increase in the whipping vibrations caused by waves and vessel motion together.

According to MHI these forces working in combination would have been enough to cause the failure of the structure. “It is a surprise to the industry,” claimed Ueda, “all shipbuilders and class societies considered that there should be enough safety margin against the collapse of a hull girder in such container ships.”

The interim report concludes that: “Even in cases where wave height is not considerably high, superposition of the load due to ship motion and hull girder vibration (whipping load) may be substantial depending on the wave period. While conventional rules for hull structure do not consider the effect of whipping on vertical bending moments explicitly, the effect of whipping accounted for 70% of the wave induced vertical bending moment in the present case.”

This view was also expressed by the MAIB in its analysis of the *MSC Napoli* accident: “Whipping response on container ships has been monitored on actual ships and model tests. The results indicate that the additional wave load

is typically between 10% and 50%. A 2D analysis of whipping effect included in the BV load assessment concluded that the effect increased wave bending moments for *MSC Napoli* by 30%.”

The International Association of Classification Societies (IACS) has said it will revise its rules regarding the longitudinal strength of large container ships in the wake of the *MOL Comfort* loss.

Naoki Ueda says: “The counter measures are simple. An increase in the longitudinal strength would improve safety, so we need a revision on the strength rules for container ships; so any actions by IACS are appreciated. Secondly, we need to enhance the safety level requirements on cargo owners to declare accurate container weights.”

IMO is already looking at the mis-declaration of container weight issue, which MHI believes is crucial and with these two revisions the shipbuilder believes that post-Panamax vessels will be safe.

The Committee on Large Container Ship Safety is to look into whipping effects on hull structures as part of the second phase of the *MOL Comfort* investigation. The committee says it will evaluate the ship’s motion and the loads on the structure from the point of view of

hull structure rules, using full scale stress measurements on ships. This monitoring work has already begun and is due to take around 12 months to complete.

In addition the Interim Report concludes: “the load simulation only takes into account long crested and single-directional long crested waves. However, as observed in Annex 6 with regard to whipping effect, actual ships also encounter short crested and multi-directional waves.

“Furthermore, technical knowledge with regards to the behaviour of hull collapse caused by whipping loads with limited energy of this kind is very restricted at the present, and should be clarified in the near future along with the development of a reasonable method of evaluating strength. (If some confirmative findings are gained from full-scale stress measurements of sister ships, this could be a possible explanation as a mechanism for generating the buckling deformation detected in the bottom shell plate of the sister ships).”

MOL Comfort’s owner, Mitsui OSK Line, was asked to comment on the issues raised by the Interim Report and by MHI, but the company declined to comment. **NA**

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Four into two: CSSC shuffles Guangzhou regime

Under financial and competitive pressure four China State Shipbuilding Corporation companies in Guangzhou decided to restructure. Guangzhou Shipyard International acquired Longxue Shipbuilding and Huang Pu Shipbuilding merged with Wenchong Shipyard. Chen Jia Nan reports

In recent years, to counter pressure from overcapacity which has kept shipbuilding prices, profits and demand at rock bottom, shipbuilders in different regions have focused on business consolidation and boosting their core competitiveness.

For shipbuilding enterprises that form the spine of Southern China's yards these reforms and adjustments represent 'opportunities' much more than obstacles, the reason being to trim and converge their operations is not a matter of simply adjusting quantities; they are given the chance to better exploit their production capacities, increase their shares in different market segments and have a more focused and better structured business to warrant leadership. Furthermore, they are prompted to embrace innovation that they may venture into such high-end and new markets as high-tech vessels and marine engineering.

The shipyards within the China State Shipbuilding Corporation (CSSC) in Guangzhou have been a pillar of the Guangdong shipbuilding industry and remain a strong player in the global shipbuilding market. The latest efforts of CSSC to integrate resources and production capacities, which agreed with national policies, are commended by the industry as "being able to effectively help the Guangdong shipbuilding industry refine its focus and develop core competitiveness in areas such as high-end outputs".

Apart from meeting national requirements, the moves have helped address issues from overcapacity while improving the business structures, in particular the production set up of the group's member companies in Guangdong, easing their transformation and upgrade.



Diesel engine ducts and cables

It is widely believed that by reaching deep in its reform, taking measures to tackle overcapacity, improving resource allocation, marrying strengths and exploiting complementary advantages, shipbuilders in Guangdong will be able to release their full potential, benefit from the economy of scale and ultimately show new vigour.

In recent years, to counter pressure from overcapacity, which has kept shipbuilding prices, profits and demand at rock bottom, shipbuilders in different regions have focused on consolidation and boosting their core competitiveness.

Heeding the predicament of the country's shipbuilding industry, the State Council has published the "Guiding Opinions on Resolution of Issues from Serious Over Capacity to support shipbuilders in the restructure process and to also work together to integrate products and production capabilities so as to make the best of their resource advantages and boost their market competitiveness.

Riding on the back of national policies and its parent CSSC, Guangzhou Shipyard International (GSI) has followed in the footsteps of the global shipbuilding industry and undertaken a thorough structural adjustment.

After the Chinese New Year, on 13 February, GSI called an Extraordinary General Meeting to study and endorse the acquisition of Longxue Shipbuilding via a private placement of H shares. Sources said the move has already been given the green light by the China Securities Regulatory Commission and all work in relation to the acquisition was completed in the first quarter of the year after the Ministry of Commerce and National Development and Reform Commission had given their formal approval.

This means the company's grand scheme – a move made despite the market slump – to integrate production capacities targeting the super vessel market and to become a CSSC flagship yard in Southern China can begin soon.



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GSI's latest move into the capital markets was also in line with national policy. What is more, it will see its shipbuilding capabilities and its operational efficiency rise while allowing the company to enrich its product portfolio.

Its president Han Guangde said: "The acquisition of Longxue Shipbuilding will give us a bigger and reasonably planned production ground as well as advanced shipbuilding gears, enabling us to quickly expand production scale and boost our capabilities to build large vessels. We will be able to remove our development bottleneck, become more competitive and have more room for sustainable development."

As well as being a key shipbuilding enterprise in Southern China GSI is also a major producer and production base of large naval auxiliary vessels in the country. However, with aging facilities and space limitations, its products are restricted in size, making it difficult for the company to compete for mass tonnage vessel orders. Its survival depends on whether it can find solutions to these problems.

As for Longxue Shipbuilding, as a major shipbuilding base in Southern China, it is equipped with advanced production facilities, craftsmanship and procedures, and boasts an annual output capacity of 3.5 million DWT. Its problem is not having enough orders in hand and needs help to turn the yard around.

The yard will, therefore, benefit from new management expertise and market resources from the outside. To meet the country's demand for large security vessels while taking into account the government ban on increasing capacity, CSSC decided to support GSI's move for Longxue and increasing financial support.

According to some analysts the deal will allow GSI to take its business into the high value-added marine engineering and special vessel markets and also make breakthroughs in its champion product areas such as semi-submersible vessels and naval vessels.

After the transaction is completed, Longxue Shipbuilding will become a wholly-owned subsidiary of GSI. The future

"The acquisition of Longxue Shipbuilding will give us a bigger and reasonably planned production ground as well as advanced shipbuilding gears"

industrial set up of the company will be one of "two bases and one park" with the Nansha and Zhongshan facilities focusing on shipbuilding and marine engineering and non-vessel production and pre-fabrication, respectively, and the Liwan base will be company's bridgehead for developing modern services, giving the company an integrated shipbuilding industrial park with innovative capability.

In 2013 as government called for yards to focus on producing large-scale vessels, the company aimed for breakthroughs in

products like large oil tankers, bulk carriers and high-tech vessel products and landed orders totalling more than RMB10 billion (US\$1.61 billion). Following the acquisition, Longxue will continue to strengthen and adjust its industrial set up, fine tune its development strategy at the relevant time and accordingly enhance its business segments.

Its goal is "to become a first grade shipbuilding enterprise with a technological edge that stands out in the global marine and heavy equipment market and is capable of excellent service," says the company. The company said the capital merger will give it the opportunity to optimise set up, hasten transformation and groom new growth advantages.

Huang Pu Shipbuilding and Wenchong Shipyard merge

Fierce competition is typical in the post-financial crisis shipbuilding market. Orders are shifting to shipbuilders with a strong brand name, who are reliable and capable of quality delivery. This trend has driven shipbuilders to consolidate industrial assets and look at each other for complementary advantages.

While GSI turned to the capital markets for help with its Longxue acquisition, its CSSC sister Huang Pu Shipbuilding has also made efforts to consolidate its business. The market is rather keen to see what it looks like after a "make over".

On 1 January 2014, Huang Pu Shipbuilding and Wenchong Shipyard merged to become Huang Pu Wenchong Shipbuilding Co., Ltd. The two shipbuilders are now a single, new, united entity moving into a fresh phase of development.

The merger is an important strategic endeavour for CSSC in enhancing related industrial segments, allowing its subsidiaries to combine their strengths and enjoy synergies. Industry sources pointed out that the new company will be able to centralise resource deployment, gain from state-and-private cooperation from both the Huang Pu and Wenchong brands. The new company will grow into a competitive international shipbuilding enterprise capable of building and repairing ships as well as non-shipbuilding related businesses.



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Huang Pu Shipbuilding boasts an advantage in naval vessels, government vessels and special engineering and marine engineering products. As for Wenchong Shipyard, it is a well-known brand overseas appreciated for its medium and small container ships and dredgers. The complementary product portfolios of the two companies will boost the merged entity's strengths and the hope is it will help it to land more orders.

Integrating development has brought much good to both companies. In August 2013, CSSC announced management adjustments for the two companies to pave the way for the merger. After the two companies merged into one, the new management has steered the merger of originally separate strategies, resources, operations, management and culture, and pushed for better production and operational performances.

In 2013, Huang Pu Wenchong Shipbuilding delivered 45 vessels, completed industrial

output of a total value of RMB10.08 billion (US\$1.60 billion) and industrial value-added of RMB1.17 billion (US\$187.48 billion) and made sales income of 10.09 billion (US\$1.62 billion) and profits of RMB360 million (US\$57.91 million), all historical highs.

This year, the company has started to devise a development strategy for the latter two years of the country's "12th Five Year Plan" and for even the "13th Five Year Plan" period. Armed with a management mode of a large corporation and having laid down effective directions of development for its three production bases and product positioning, the company is looking to speed up business integration and transformation. Taking integrated development and product portfolio adjustment to the necessary depth will help bolster the company's long term growth.

The company said it will bring together and apply fully the market advantages of the Huang Pu and Wenchong yard and will

work hard to maintain its leadership in the government vessel, feeder container ship and marine engineering vessel markets while aiming for breakthroughs in the dredger, marine engineering auxiliary vessel and marine engineering platform segments.

On the product front, it will push for complete transformation and integrated development, and actively explore new product markets that agree with its positioning. It will step up development of vessel models that can give the company a solid technological claim.

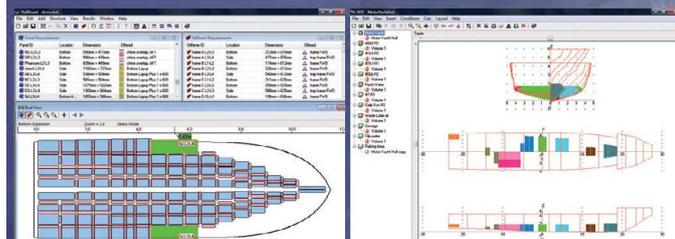
As for non-shipbuilding endeavours, it will move into outfitting and marine auxiliary products and turn itself into an outfitting production centre in Southern China. It will also put its weight behind the construction of the Wenchong luxurious cruise ship home port, as well as strive for breakthroughs in such areas as new energy applications, pumps and oil extractors/oily-water separators and power generators for ships. **NA**



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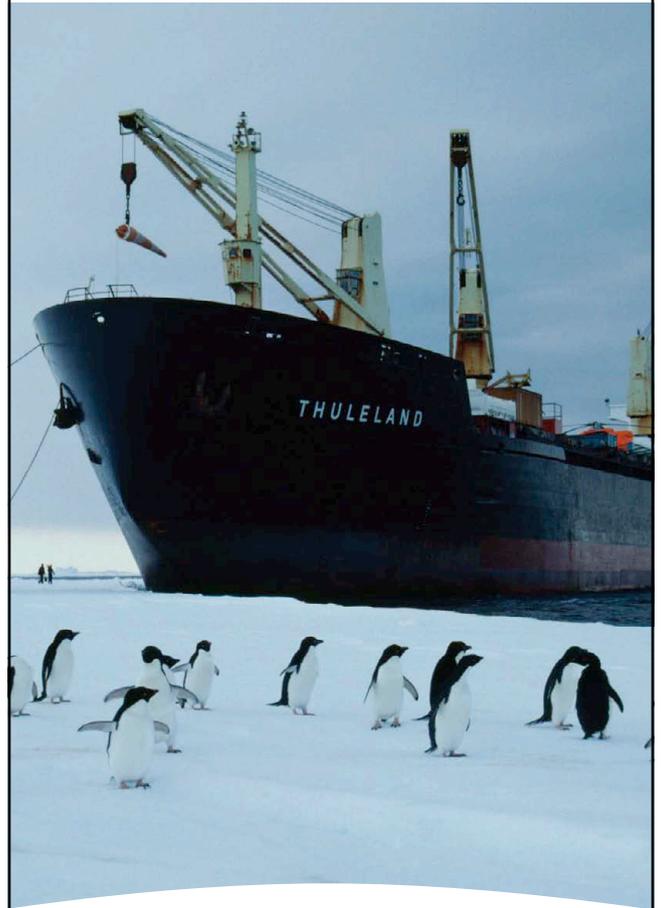


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RC ships: a thing of the future

While most of the shipping industry is focused on how to make vessels more environmentally efficient, Rolls-Royce is looking into the future already and at the possibility of remote controlled ships

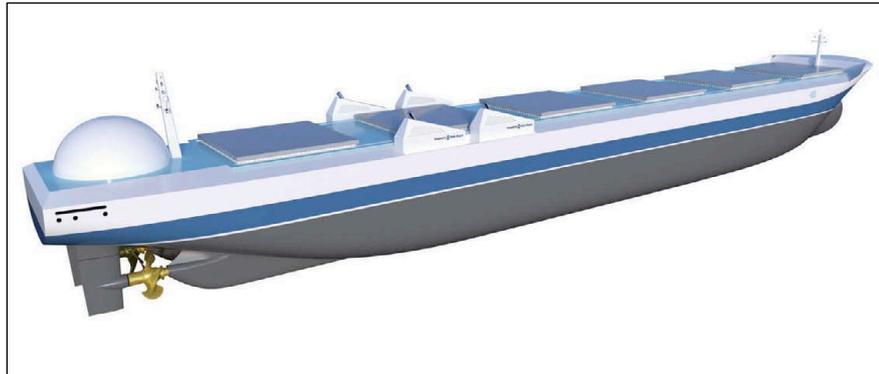
Key drivers for remote controlled (RC) ships are the increases in efficiency and reduction in costs says Oskar Levander, vice president innovation, engineering & technology, marine, Rolls-Royce. He also notes that as developments take time to mature into reality, now is the time to start putting the idea to the market.

“It is not about the technology, but about the social acceptance of such a thing as a remote controlled ship. Other industries have already been developing this technology such as the aviation and automotive industries.” As for the safety of the technology, Levander notes that: “Yes, safety is always a big question as in the aviation industry, if a drone stops working it falls out of the sky, but if a RC ship stops working, where is it going to go...?”

Further development of the systems will need to happen first to make this concept in to a reality. “There has to be redundancy in the machinery. It needs to be safe and that if there are any issues that the ship will stop,” he adds.

In today’s market attracting new recruits has been a challenge due to the environment onboard vessels, even with better facilities it still puts a strain on social lives. Adding to this is the increased paper work that is now part of the job. Levander says that: “paper work should be done by the administrators and let the crew get on with the operation of the vessel, it is how we utilise that talent correctly.”

By taking the crew off the vessel and putting them in land-based operation rooms, the crew can operate a vessel without the need for staying away from home for very long times and also ensures greater safety from other dangers associated with sailing. Levander envisions hubs across the globe where crew will be able to go to operate their vessels.



Remote controlled ships will be safer and beneficial to crew

“You would have a hub where you would operate many ships. There would be an operations room, where it is a mock-up of a vessel. There would be sub rooms also for ships out at sea where less

people would be used to operate them. Then for operation in port you would have one ship per room.”

He also notes that there are further safety advantages of having a remote

Bridging the future

Rolls-Royce has teamed up with VTT Technical Research Centre of Finland to develop bridge concepts for the crews manning the bridges of future vessels.

VTT’s researchers in collaboration with Rolls-Royce have conducted a study looking at the future of seafaring with crew operations, future studies and user experience design. From this study, VTT has generated ship bridge concepts, which were visualised as 3D animation videos by visual effects company Troll VFX to present what the bridge of the future could look like.

Hannu Karvonen, research scientist, VTT explains that the main difference between a bridge today and the concepts that VTT have been working on is that all the bridge systems are integrated into one unit, along with a head-up display allowing the operator to be able to focus on what’s in front of him as well as having information at hand that he needs. “This concept is designed to raise the question could this be possible in the future and to make both manufacturers, users and official bodies to start to think about its development,” explains Karvonen.

Video footage of one of the concepts from Rolls-Royce and VTT can be viewed at <http://www.youtube.com/watch?v=27uCL90s20o>

The ship bridge design process will be explained in detail in an upcoming conference on ergonomics: M. Wahlström, H. Karvonen, E. Kaasinen and P. Mannonen, *Designing for future professional activity: Examples from ship bridge operation design. Proceedings of the 5th International Conference on Applied Human Factors and Ergonomics, 2014.*

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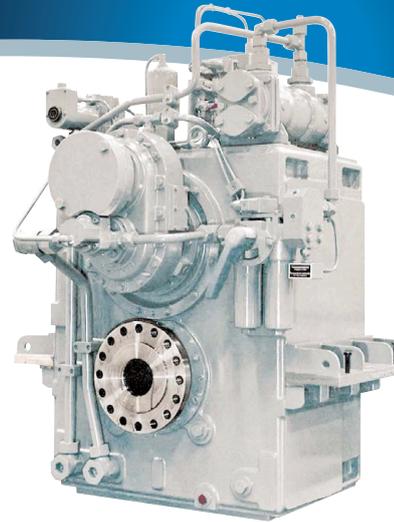
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vessel on an ocean voyage as a RC vessel is not at risk from piracy, due to the lack of personnel onboard and sealed cargo, there are no gains for this type of vessel to be attacked by pirates.

In addition, the concept for a remote controlled ship allows the space that is used by crew and for hotel systems to be given back to the vessel as cargo space and also lightens the ships weight, making the vessel more economical to run. Levander believes that it is possible to take out 50%



Oskar Levander, vice president innovation, engineering & technology, marine, Rolls-Royce highlights how remote controlled ships can improve shipping

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of the systems onboard a vessel, which represents the hotel load on a vessel.

“First we will look at the non-critical systems which can be removed and then progress to the larger systems, which can be down sized or removed,” says Levander. “This concept would appeal to long voyage vessels eventually, but will look at more local and regional vessels to start with.”

Levander adds that additional investment in communications such as cameras would be needed, so that you would still be able to have a 360deg view of the vessel in addition to the redundancy in the equipment.

“There has to be redundancy in the equipment. The control of the vessel you will lose at some point and you have to be sure that it is safe and will stop in this instance. For this you will need multiple control levels, which will have a financial impact. In certain modes vessels will be able to be operated by satellite, but will use shore-based connections as well. There also needs to be a system to see where the ship is and what it is doing”, says Levander.

Automatic systems are already in play today. Levander says the test of these systems will be will they know what crew know and be able to react to changing circumstances of the vessel without someone inputting into them.

Levander believes that the future lies with remote controlled ships as: “Incidents happen today because of human error. If you have a control room you can monitor the situation and you can ensure that people are awake.” The question lies with the affordability of the technology and its social acceptance. **NA**



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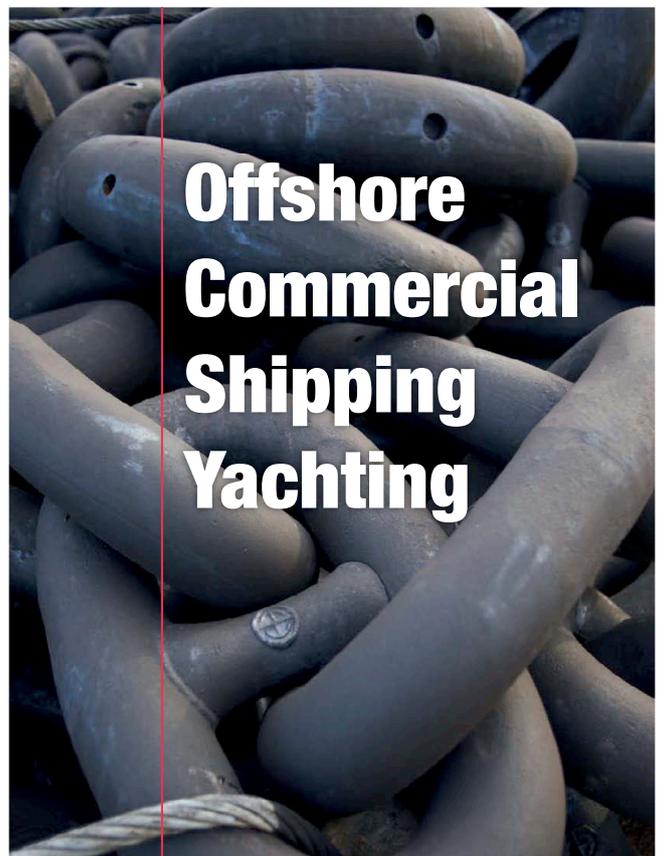
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Remote ships hit the virtual ocean

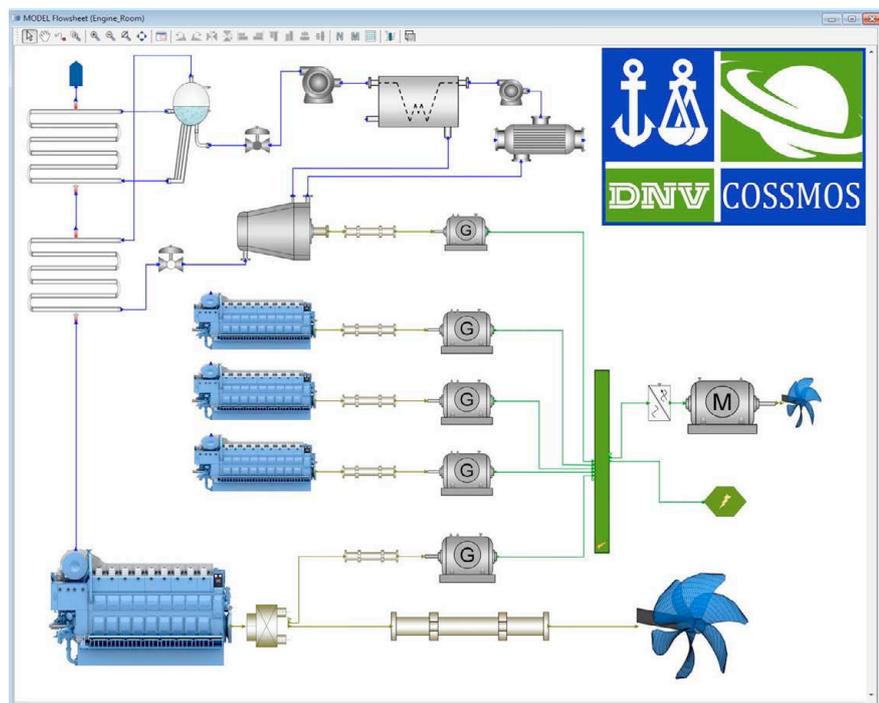
The 13th International Conference on Computer and IT Applications in the Maritime Industries (COMPIT) will be held from 12 - 14 May 2014 in Redworth, England. First held in 2000, COMPIT has established itself as a key IT conference for the maritime industries, bringing together software developers and users

Most COMPIT participants come from industry, reflecting the practical relevance of the event and selected papers for the upcoming event are discussed below, illustrating general trends in IT for the maritime industries. The main trends, in short, are:

- Focus on energy system performance – Performance insight (a.k.a. energy flow) simulations make bottlenecks and inefficiencies in onboard energy systems transparent. After hull and propeller, the limelight is now also on the main energy converters and onboard consumers – both for design and ships in operation. Performance insight or energy system simulations enter COMPIT 2014 with a bang. One session is dedicated to applications in design and refit applications, two sessions to applications for ship operation.
- “Numerical towing tanks” become reality – or better “numerical sea trials”, as the applications consider the full-scale ship. Especially for propellers and propulsion improving devices (a.k.a. energy saving devices) CFD has become the tool of choice to improve or optimise performance.
- Unmanned ships within reach – Robotics is developing rapidly. Swarm robots working cooperatively are one major trend in marine robotics. The success of the small robots has whetted the appetite for the holy grail of ship automation – the unmanned ship.

COMPIT covers three full days. Traditionally each day is dedicated to a major phase in the lifecycle of maritime structures:

- Day 1 – ship design and associated issues such as CFD (computational



Energy flow simulations connect power generators and consumers to give detailed performance insight in design and operation (DNV GL)



Simulations play a key role in ship design, for safety, comfort and efficiency (ANSYS, Courtesy: HDW)

Robots like the presented HullBUG may play a vital role in future antifouling strategies – saving fuel and preventing invasive species (US Navy)



fluid dynamics) and energy system simulations used in concept design

- Day 2 – ship product lifecycle management, issues of detailed design (including structural analyses), production and robotics
- Day 3 – ship operation, these days with a strong focus on performance insight / energy efficiency.

Arguably, Day 3 steals the show this year. There is a whole session on unmanned ships and two sessions on largely unknown techniques to investigate and improve onboard energy management.

IT in Ship Design – Energy efficiency dominates

Computer aided design (CAD) is old hat. So what's new? Conceptual ship design involves various tasks, some of which are addressed in four dedicated sessions.

Hull shape design

There is still debate on the best approach to describe ship and propeller surfaces. While NURBS (non-uniform rational B-spline) have become the standard choice for most ship hull design software, there are better alternatives to describe arbitrary (hull) surfaces. However, these alternatives are not supported by standard import-export formats, such as IGES. And what good is the best form if the designer cannot pass it

on simulation tools and subsequent detail design tools?

Several papers focus this year on surface descriptions; in particular on the problem of generating high-quality surface models from poor-quality surface descriptions (e.g. laser scans).

CFD-based shape design

The process of shaping hull, propeller and appendages is increasingly driven by CFD, often coupled with formal optimisation. The “Numerical Towing Tank” becomes reality. More precisely, “numerical sea trials”, i.e. CFD simulations for the self-propelled ships at full scale, have reached industry maturity.

Layout and compartmentation

Ship designers are naval architects. As the name suggests, ship architecture is

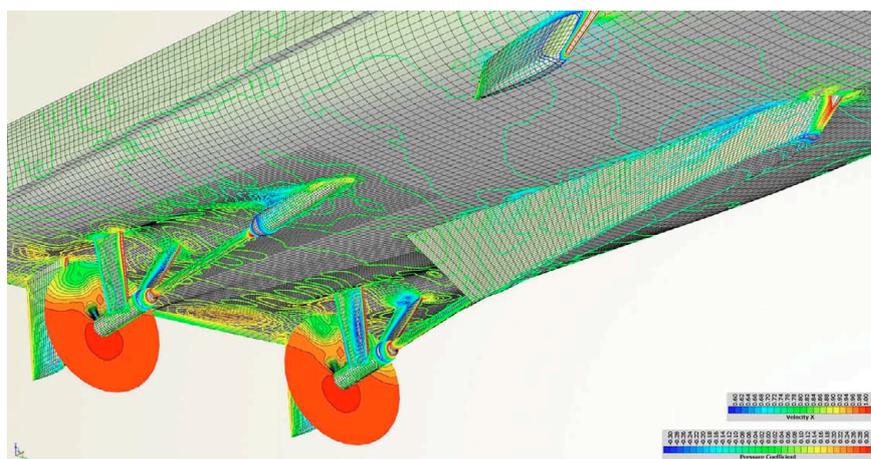
a main part of design and a key aspect for large and complex vessels, such as navy vessels and cruise ships. Here, one approach is to design the ship from inside out, working with space and connectivity requirements. Obviously, these have to be matched with outside shell requirements for hydrodynamics and producibility. For some ships, the task is so complex that it has been considered for a long time as beyond the capability of a computer. However, the last five years have seen a transition to a stage where the computer can at least be a valuable assistant in layout design.

Energy system simulation in design

Energy is best saved in design. We all know that. After hull and propeller, the limelight is now on the machinery systems.

Product data models for virtual reality

CAD has progressed from mere electronic drawing to a central design platform. This has gone hand in hand with the trend of employing 3D models of ship hulls and machinery. Modern product data models (PDMs) combine geometric information with other product data (such as material, tolerances, suppliers, etc.). PDMs are the backbone of many IT applications in our industry. They are used as a starting point for



CFD is often combined with optimisation to obtain extra fuel savings (Friendship Systems)

a multitude of detailed simulation options including virtual reality applications.

PDMs are generally compiled at shipyards, using in turn PDMs from suppliers. The IT model reflects here the physical assembly and coordination task of the shipyard. Operators could greatly benefit from access to PDMs, e.g. for life-cycle structural maintenance, refits and even training. The buzzword is PLM, product lifecycle management. At present, this is mainly just that, a buzzword. While PDMs are everybody's darling, in practice information sharing between shipyards, suppliers, service providers and ship operators faces many challenges.

Those challenges are recognised and at least partially addressed by the main suppliers in the market. But, the process is tedious and involves not only technical, but also legal, commercial and psychological obstacles. We are still at the beginning of a development that may take decades for full acceptance and implementation in the maritime industry. Two solution philosophies can be discerned from current market developments: Single-vendor systems (including design, engineering, production and PDM) and multi-vendor solutions.

Virtual Reality (VR) enjoys growing attention. The trend is towards Augmented Reality (AR). In Augmented Reality, computers (e.g. tablets) overlay a live image with computer generated information. For example, a building block may be shown with a part to be installed, illustrating how both fit together. The fitting of parts becomes then very intuitive, reducing assembly times and errors. Various advanced shipbuilding nations are active in AR applications for shipbuilding.

Maritime robots and unmanned ships

For many years, maritime robotics has been a bit of an unloved child at COMPIT, occupying an "obscure niche" as perceived by many with a classical CAD background. This has changed. The elements are coming together and robots play an important role in supporting varied tasks in life-cycle support of ships.

Don Darling (SeaRobotics) presents *HullBUG – Hull Grooming Crawler Robot*

with Fluo-rometric Fouling Recognition. This contribution deserves special mention. Hull roughness management is one of the largest levers for fuel savings. Frequent grooming (light cleaning of fouling films) is a widely recommended approach. Darling presents here an interesting robotic solution. The robot uses four wheels and suction (via a mini-thruster) for attachment to the hull. Sensors provide obstacle avoidance, path planning and navigation capabilities. It employs a biofilm detector to spot the differences between clean and unclean surfaces, and then uses rotary brushes or water-jets to scrub the fouling film off.

The EU project MUNIN (Maritime Unmanned Navigation through Intelligence in Networks) aims even higher, namely at the holy grail of ship automation: the unmanned cargo ship. MUNIN shall demonstrate the feasibility of putting a Handymax bulker under autonomous command. The project includes autonomous navigation, autonomous engine control, fall-back shore-based remote control with the necessary communication links, small object detection, participation in search-and-rescue operations, and a consideration of the legal implications of autonomous shipping. Four presentations treat different aspects of the envisioned unmanned bulker shipping.

With the crew removed, there is nobody to carry out hull and machinery management. In the past, this issue has been a killer criterion for unmanned ship operation. However, progress in coatings and particularly the prospect of LNG as fuel allow much longer periods between maintenance activities.

Performance insight software – The rising superstar

Performance insight software or energy flow simulation – never heard of it? You are not alone. Largely unnoticed, this technology has spread like wild fire over the last few years. R&D groups in many countries have started to develop similar work, largely unaware of each other. A beloved child has many names, and so we find dynamic simulation of machinery operation, ship energy modelling or energy system modelling or "energy process modelling".

The technology is so young in our industry that a common terminology has yet to evolve. But, the approach is here

to stay and ship operators should take notice. In essence, the simulation model considers energy converters (main engine and generator sets) and energy consumers (propeller, pumps, heat exchangers, ventilators, cargo handling gear, etc.) in a graphical network. Ambient conditions and operational profile are input dynamically (i.e. changing over time) and the simulation reveals energy flows and utilisation rates (with bottlenecks and idle over-capacity). As such, not Nobel Prize winning stuff, but a major leap forward compared to simple Excel sheets for energy balances. Once the model is set up, the simulations are so fast that they can be used in real time.

Ship operation topics on the rise

Giampiero Soncini (SpecTec) looks at our industry's (alleged) reluctance to embrace modern information technology, with a refreshing tongue-in-cheek approach: *Homo Informaticus versus Homo Maritimus: Can They Coexist?* His paper examines the behaviour of "homo negativus, a particular sub-species of the homo maritimus. This species is easily identified by its frequent calls "it will never work" and "it has never been done that way". Soncini speculates on whether homo maritimus may cross-breed with homo informaticus to become the dominant species on the maritime world.

It looks like it is about to happen. The applications are coming together. IT worlds between ship design and ship operation are connecting. This trend is also reflected in the composition of the participants, who come from various backgrounds and industry segments. Homo informaticus maritimus? We are getting there – at Compit. **NA**

COMPIT 2014, www.compit.info

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Adapting and adopting 3D design technology to cruise ships

Michael Polini and Yann Limon Duparcmeur, Intergraph Corporation along with Paul Lemoine, STX France explain the collaboration between their companies to improve 3D design for cruise ships

Modern cruise ship design processes and workflows create special challenges for organisations that want to apply 3D modelling technology to the early design stages. Some of the unique requirements stem from the high volume of 2D design data produced by outside parties, such as owners, architects, suppliers, and sub-contractors. Others are driven by the volumetric restrictions placed on the design in the public spaces. As challenging as these issues are, the sheer magnitude and scale of change during these early stages of the design have led to workflows and processes that delay the start of 3D modelling efforts until some level of maturity has been reached and the rate of change has not only stabilised, but it has slowed to a manageable level.

Being able to apply 3D modelling technology in a highly concurrent, integrated, multi-disciplinary engineering environment early in the design process has a number of business benefits that lead to improved product quality, more accurate engineering data, and better visualisation and understanding of

the design. Cruise ship design poses challenges that are unique to the industry (Figure 1). Applying 3D design tools developed for general-purpose modelling may impact both the cost and schedule for a project. The only recourse in this situation is to modify your business practices, workflows, and processes to work within the limits of the technology. An alternative is to partner with a technology provider and together, develop a plan for adapting the technology in conjunction with logical and beneficial process re-engineering. This is the path STX France took with Intergraph for adopting their Enterprise solutions and, more specifically, for enhancing their marine product SmartMarine 3D (SM3D) for use on STX France's Cruise Ship projects.

Intergraph has a broad suite of solutions (Figure 2) for Enterprise including 2D schematic products, 3D modelling solutions, analysis applications, and procurement, fabrication, and construction tools. The paragraphs below highlight several key areas where new features and functions were incorporated

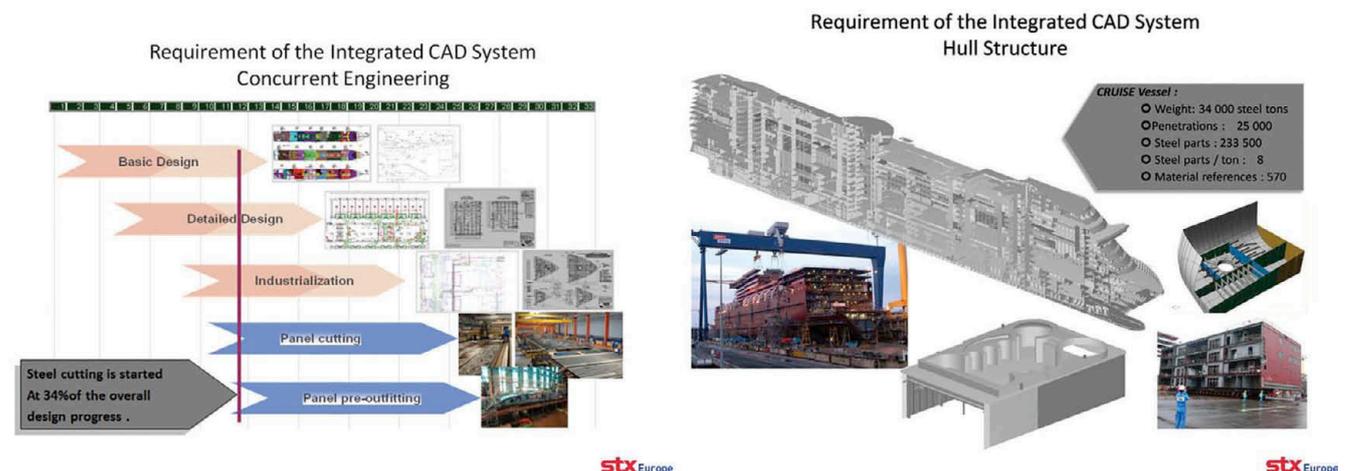
into Intergraph's 3D modelling product based on requirements provided by STX France in the form of 'use cases'.

This work was predicated on an in-depth benchmark and analysis of the features and functions in production used by the marine industry from the perspective of applying the technology to cruise ship design. The net effect was a 'gap analysis' that identified areas where productivity gains in modelling could be achieved with enhanced or improved features and functions. Each of these was jointly reviewed. Where benefits were seen for the broader marine customer base, agreements were made to develop the capability and incorporate it into the product.

Cruise ship design lifecycle

The various high-level stages of the design lifecycle are similar in cruise ship projects to those of other types of marine projects. What is significantly different, however, is the duration, the volume of 2D design data coming from 3rd parties, the number of concurrent users, amount of subcontractor involvement, and type and frequency of design change.

Figure 1: Requirements of the Integrated CAD System – Concurrent Engineering and Hull Structure



The pre-sales design phase is sometimes overlooked because it is traditionally done without the benefit of a 3D model. This work is done using a limited set of resources composed of CAD designers, engineers, naval architects, and sales, finance, and engineering specialists. Two types of deliverables are produced one targeting the yard's technical teams, and the other the client. The majority of the deliverables are in the form of 2D drawings, mostly arrangement drawings of various systems including structure, and technical specifications.

Based on results from other world-class, commercial yards, significant cost and risk can be eliminated if one can take advantage of 'experienced' designs. This means re-using data from previous projects and adapting and/or adopting it to the new design. The extent of re-use varies from product to product within the marine industry, and in the case of cruise ships, it is mostly limited to the technical areas in the lower decks. 3D models and re-use of previous designs is not something clients are asking for. Some experimentation with 3D models for cabins has been done and clients have found it useful to review the design in an immersive 3D virtual reality (VR) simulator.

Cabins and public spaces are almost always done by outside architects hired by the client and the yard's design departments rarely lead in this work and are on the receiving end. In the construction stage of the design, the architect is responsible for all creative

content, but the yard is responsible for ensuring the integrity of the design and the integration into the ship.

A process workflow diagram is divided into stages and flow lanes and identifies the interim products and shows the processing of a particular interim product through a specific stage and flow lane. These workflow diagrams are instrumental in helping an Enterprise understand, document, and optimise its engineering and production processes.

Figure 3 represents a generic high-level process and workflow developed by Intergraph and used to communicate with the customer and to drive the development of the product next to a high-level "roadmap" that outlines actions that can be taken over the short, medium, and long term to adapt and adopt SM3D technology to the pre-sales design stage activities conducted by STX France. Short-term actions can be started or undertaken using the features and functions available in the released, production versions of the software. Mid- and long-term actions take into consideration new features and functions that are either currently under development within the scope of the next version or are planned for future versions of the product.

In summary, the need for 3D models is not clear, but the trend is towards earlier adoption of 3D models. This will accelerate and become more accepted as the amount of legacy 3D data grows; owners are exposed to more 3D mock-ups and reviews, and the design

productivity for developing 3D models rises. It is the author's opinion that the ability to utilise 3D model data early in the design process will be a significant competitive advantage.

Managing the design process

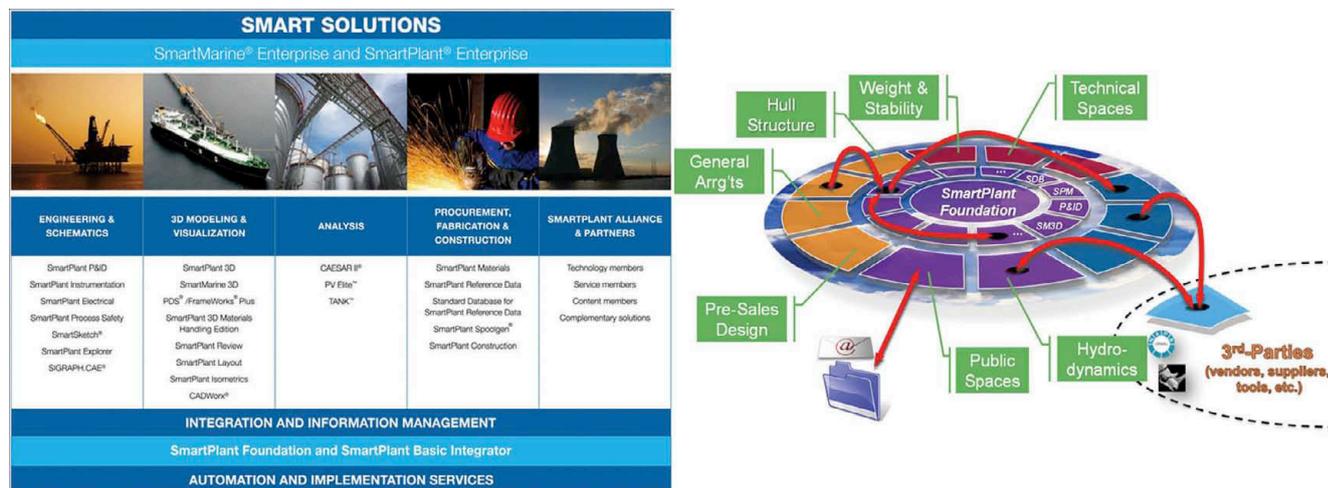
To effectively design and construct something as complex as a ship, an organisation must manage people, information, and work. Most advanced shipyards employ an integrated approach that was developed over 30 years ago and has undergone change and refinement ever since. In this approach, a dual grouping is used which first addresses the product by functional systems (e.g. shell, decks, longitudinal and transverse bulkheads, frames, webs, etc.).

At some point, a transition is made where the design information is reorganised by zones and/or blocks regardless of the systems represented. Using dual grouping techniques enables one to describe how to design and how to build the product. System-by-system-based formats for key plans facilitate functional design and owner and regulatory approvals. The zone-by-zone format is used for yard plans, specified by production engineers, and facilitates management of the plan for erection, assembly, subassembly, and parts fabrication.

System-based modelling

SM3D was designed to support the creation of 3D models based on large plate

Figure 2: Enterprise Technology Platform and Concurrent Design



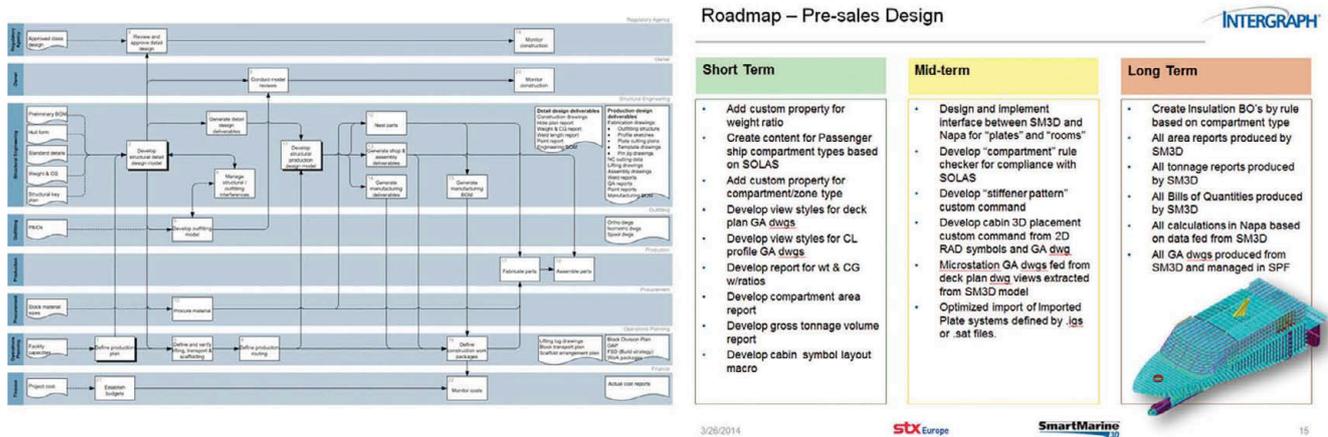


Figure 3: Process Workflow and Pre-Sales Design 3D Technology Adoption Roadmap

and profile systems. This means that the design is driven purely by a functional, system decomposition without regard to how it will be physically assembled. This approach produces models with fewer objects; hence, more attuned to rapid design changes in the early stages of the project. At this stage, it is still necessary to manage the design by assigning subsets or regions to specific individuals or teams. In these early stages, the regions are a combination of functional and spatial partitioning, commonly referred to as 'zones'.

Block-based modelling

The counter-part to 'system-based' modelling is 'block-based' modelling. With this approach, the model is developed within physical limits imposed by the facility that will be used to construct the vessel. These limits include size and capacity of transport mechanism, crane lifting capacities, and work centre and work cell size and capacities. The advantages of block-based modelling is that the scope of change is very small, limited to the extents of the block, therefore few if any other designers are impacted by the change. A designer is usually assigned full responsibility for a block; hence they have total control over their region of the design. Their major disadvantage, however, is that modelling is dependent on factors and decisions that may not be known with any level of certainty in the early stages of the project – thereby delaying the start of 3D modelling.

The ability to model by zone enables an organisation to start the 3D model

earlier in the design cycle than would be possible if modelled by block. Further, a system-based model is more adaptable to future design variants and also to sister-ships that may be produced at different yards or facilities. In effect, it is a more generic design, free from any constraints imposed by the physical process of fabricating and assembling the product.

Transitioning from zones to blocks

What STX France needed was a way to start the 3D model using large plate systems on a zone-based approach but then transition to a block-based approach as the project advanced through the design stages. This was necessitated by the need to add designers in later stages, as well as the need to add sub-contractors as the workload increased.

In order to meet this requirement, Intergraph developed a function to 'split' the design from large plate systems to smaller plate systems. The ability to begin modelling on a system-based approach and then transition to a zone-based or block-based approach provides users with the ultimate flexibility and enables them to take advantage of the benefits of both approaches. This is a game-changing capability as most 3D technologies on the market today only support block-based modelling.

Conclusions

Adopting new technology is not a question of "whether to adopt", rather,

it is a question of "when to adopt". In the ever-changing dynamics of the shipbuilding industry, history has proven that success belongs to those who take the risks necessary to define the future in their terms. It is important to have a strategic vision – a roadmap – that maps technology with their business, engineering, and production processes; manufacturing facilities; and financial plans. For large enterprises, a 'big-bang' approach to technology innovation carries a high-level of risk and may not be feasible. An approach based on continuous process innovation where technology is incrementally introduced is a better choice for large enterprises. This effort must be driven by strong leadership and commitment from senior executive levels that focus on a path to putting technology to work to support and improve the organisation's work processes and ensures that they reflect 'best practices'.

STX France and Intergraph have chosen to team together and collaborate on both the adaption and adoption of 3D technology to the problems they are faced with in the cruise ship market. Acting alone is a slow, costly, and inefficient way to approach technology innovation. Through this co-operative development effort, Intergraph is assured that the enhancements are driven by the high-value use cases and STX France is assured that the resulting new features are fit for use and production ready. **NA**

Cruise safety issues concentrate IMO minds

Energy savings, improving communications, environmental requirements and above all safety improvements are just some of the areas that cruise lines and their suppliers have been focusing on in recent times, writes Sandra Speares

Passenger ship safety is expected to be a major topic for discussion when the IMO's Maritime Safety Committee meets in May.

One safety initiative announced by Holland America Line in March was its decision to retrofit Interschalt voyage data recorders. Holland America Line is fitting the Interschalt VDR G4 on all 15 of its ships.

Replayer, VDR G4's online monitor, provides a detailed picture of the ship's position in real time on a chart and can transfer this playback to a notebook or a smartphone so that the captain can access an overview of the current situation at all times even from his cabin. Important information about radars, alarms, the positioning on the electronic chart, machine data from the conning display and helm data is available in real time.

Using the online monitor, the captain can see at a glance whether the watertight doors are all properly closed or, in the event that they are not, which locations need to be re-checked. The online monitor provides reliable information and is individually customised and optimised for each ship.

Information automatically flows through the newly installed VDRs and INTERSCHALT's Bluetracker software solution via satellite communication, which means that in cases of emergency the crew no longer has to worry about transmitting data, but instead can take action and simultaneously receive support on account of the data, which is transmitted automatically, via email, SMS or to smartphones. This way, the onshore team can provide valuable assistance. The retrofitting programme will be completed in the second quarter of this year.

Meanwhile a new programme from training provider Videotel highlights the importance of psychology in effective passenger evacuation, a topic which has been the focus of much attention in the industry since *Costa Concordia* grounded in January 2012, with the loss of 32 lives.

'Making the Difference - Passenger Mustering and Crowd Control' looks at all aspects of passenger mustering, in particular the flow of passengers on stairways and the care and control of passengers once they are assembled in their designated muster stations.

Explains Nigel Cleave, CEO of Videotel: "Without doubt, muster station personnel and stairway guides are key players in a maritime incident where passengers are involved. They are the public face of the emergency and well trained and drilled personnel enable the captain and his team to concentrate on the important task of resolving the situation at source.

"With so much power on cruise ships being used for the hotel side of the operation, energy management is vitally important to keep costs down"

"One of the key aspects of this programme is the emphasis it places on understanding human behaviour. Individuals respond to stress in very different ways and when crowds gather there is always the potential for disorder if an emergency should happen. Fear, anger, aggression are all basic instincts and it is the responsibility of the muster team to understand how these fundamental reactions come into play during emergency situations and how best to deal with them."

In response to the revised STCW Code resulting from recent events, Videotel has worked closely with Princess Cruises to develop a new training video package demonstrating



The Oasis class gets its wireless capacity upgraded

the importance of a professional and effective passenger evacuation procedure for crew members of passenger cruise ships, ro-pax and passenger ferries.

With so much power on cruise ships being used for the hotel side of the operation, energy management is vitally important to keep costs down.

Classification society RINA has launched InfoSHIP EM, a real time tool for monitoring and optimising the hotel power demand on cruise ships.

RINA's analysis shows that a 115,000gt cruise ship will be using 61% of its power for propulsion while underway, and around 17% for air conditioning. In port the percentage of air conditioning is around 44%.

In both states air conditioning is the biggest non-propulsion component of the power distribution and therefore the obvious target for reducing energy use. But, other auxiliary power users such as lighting and galley services are also significant, with galley demand 2% of the overall power load at sea and 9% in port.

RINA says there is a margin for significant savings in managing the AC plant on cruise ships, due to oversizing of the system in the design stage and the difficulty of fine-tuning the operations of the HVAC Chillers. It is important that energy monitoring and management on board should be simple and not require extra resources or increase crew workload.

The Wärtsilä 46DF dual fuel engine



All the relevant parameters for constant monitoring should already be available through the automated engine room system. Infoship EM works because it captures that information in a simple, free standing PC or a virtual machine running on the ship's main computer system and continuously compares the HVAC chiller status with a target value. It is a simple approach but has the virtue that the target value is always being updated by feedback in operation.

The baseline for the target value is also easily adapted for different numbers of passengers onboard.

The system has been demonstrated in real voyage conditions on a major modern cruise ship. It showed a 15% reduction in yearly HVAC chiller load, equating to a saving of around €250,000 (US\$345,000).

Meanwhile engine manufacturer Wärtsilä has introduced its new Wärtsilä 46DF dual fuel engine. The fuel-flexible Wärtsilä 46DF engine has been specifically developed for the high-output market segment, including cruise ships and is capable of operating on natural gas, heavy fuel oil, or marine diesel oil. This fuel flexibility enables reduced operational expenses, compliance with the most stringent emission standards, and full redundancy to ensure uninterrupted operation.

The Wärtsilä 46DF consists of two different versions to meet specific customer needs. The high efficiency version offers drastically lower fuel consumption with a cylinder power of 1,045kW, while the high power version is capable of a cylinder power of 1,145kW with "excellent engine thermal efficiency" the company says.

When operating in gas mode, the Wärtsilä 46DF engine is already compliant with IMO Tier III regulations without any secondary exhaust gas purification systems. When fuelled by gas, the sulphur oxide (SO_x) and carbon dioxide (CO₂) emissions are notably reduced, and smokeless operation is attained, the manufacturer says. In liquid fuel oil mode, the Wärtsilä dual-fuel engines are fully compliant with the IMO Tier II exhaust emission regulations set out in Annex VI of the MARPOL 73/78 convention.

Royal Caribbean meanwhile has been

investing in technology to improve the wireless capacity available to passengers on board its ships *Oasis of the Seas* and *Allure of the Seas*. The company claims that its investment will mean passengers on the two ships will have more wireless capacity than "every other cruise ship in the world combined".

According to Royal Caribbean, CEO, Adam Goldstein: "Matching or exceeding the best on-land service was a tough challenge when the nearest cell tower or cable hook-up was 1,000 miles away. That meant we needed some real breakthroughs, not just incremental increases. But real breakthroughs are what we do."

"O3b, our satellite communications partner, calls it 'fibre speed with satellite reach,' and this is exactly the result we are seeing in our tests," says chief information officer, Bill Martin. He says the key to unlocking a land-like experience was reducing satellite latency – the time it takes for something to happen after you hit 'enter.' This breakthrough technology solves that problem, reducing latency from 750 milliseconds to approximately 140 milliseconds. And with each ship's overall capacity exceeding 500mbps during system tests, there will be more than enough bandwidth to go around.

Dragutin Radobuljac, the chief electrical engineer on *Allure of the Seas*, has described the new Kongsberg Information Management System (KIMS) as a "revolutionary upgrade," with significant influence on vessel operations. KIMS is a

customised data management system that operates over a global, secure and highly scalable infrastructure.

It features a suite of applications within a single web portal providing high level vessel data access to engineers and management. The user interface, known as the IMS Portal, is available on board and on the RCCL office network in Miramar, Florida. KIMS data is also accessed onboard using tablets and is displayed on a large screen in the engine control room on *Allure*.

KIMS provides the ability to review statistical data, condition-based monitoring, alarms and events, and ship performance monitoring data. Condition-based maintenance on *Allure* provides a long-term overview of the equipment performance and mechanical degradation, which supports preventative maintenance. Alarms and events reporting provide the ability to review the most commonly repeating alarms and fix issues with equipment before they become emergencies.

According to Hans Ellingsen, manager of information management systems at Kongsberg, fuel efficiency was a key driver behind the installation of KIMS: "The Chief Engineer requested a report which would show how much fuel was being consumed since noon the previous day. The report includes all the heavy consumers as line items so the data can be used to help with decisions about which consumers should be kept running and consuming power and which may be shut off. Consequently, the vessel can be operated at a lower fuel cost."

The KIMS solution on *Allure* is a triple redundant data access and storage system with servers located in three zones – two onboard and one in a hosted cloud service. This configuration enables RCCL management to access the vessel's data without having to use satellite communications, thereby saving on communication costs. A malware protection system to filter out any malicious attacks from the web or via USB onboard is included.

Environmental regulation has also been a key driver for cruise lines. Norwegian Cruise Line announced recently that it would be installing 28 scrubbers on six ships in the line's fleet. The company has contracted with Green Tech Marine for the outfitting of the scrubbers on *Norwegian Breakaway*, *Norwegian Dawn*, *Norwegian Jewel*, *Norwegian Gem*, *Norwegian Pearl* and *Norwegian Sun*. The installation programme is set to be completed by the end of 2016.

Green Tech Marine also supplied the scrubbers on the line's Hawaii-based *Pride of America* last year and will deliver 10 scrubbers to the company's two newbuilds, *Norwegian Escape* and *Norwegian Bliss*, being built at the Meyer Werft yard in Germany.

"We remain committed to environmental protection at Norwegian Cruise Line," says Kevin Sheehan, Norwegian Cruise Line's CEO. "Therefore, it is important for us to invest in new technologies, such as Green Tech's innovative scrubber systems, in order to reduce fuel emissions, overall energy consumption, and the company's environmental footprint"

Meanwhile Ecospeed has been singing the praise of its hull coatings saying that they solve a number of problems including toxic hulls, build-up of hull fouling, problems with in-water cleaning, extended time in drydock and the like.

Cruise line customers who have switched to Ecospeed are experiencing none of these problems, the company claims.

It cites one cruise line as saying that they are saving 10% on fuel costs with Ecospeed compared to the earlier TBT coating, which they replaced. Another cruise ship found that they gained 1.5knots over sea trials speed when they replaced their hull coating with Ecospeed. Drydock time is significantly reduced rather than increased. One Ecospeed customer recently noted that he was able to

get his ships out of drydock several days sooner than usual due to the Ecospeed coating, the company says.

Costa Cruises meanwhile has announced the launch of MyCosta Mobile, a free application for smartphones and tablets that offers Costa passengers free and unlimited minutes and texts on board the 14 ships in the fleet when connected to the WiFi network.

Before embarking on a cruise, passengers need to simply download MyCosta Mobile from the App Store or Google Play Store and then connect to the ship's WiFi network once on board to register and launch the app. MyCosta Mobile allows guests to socialise with each other by calling or texting whenever they like, and the App can also be used to contact a cabin or any of the numerous shipboard amenities such as the restaurants, Spa, tour office and much more.

Available on iPhones and iPads using the iOS 5.0 operating system onwards, and smartphones and tablets using Android 2.3 and onwards, the app comes in six different languages; Italian, English, French, German, Spanish and Portuguese. **NA**

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Fresh thinking from DNV GL

The buzz word for modern, energy efficient ships is optimisation, adjusting certain factors to make a ship run even better. DNV GL has released its latest methodology for optimisation, which looks to take the art to a different level

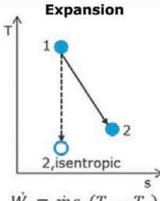
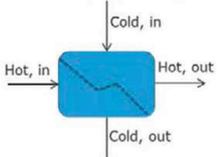
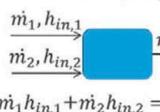
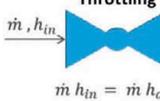
DNV GL's latest approach to optimisation will allow shipowners and managers to assess the onboard energy efficiency in a consistent manner, by not just analysing the ship's energy output, but also its energy losses, or as the company has called it 'exergy'.

The exergy methodology is based on the two laws of thermodynamics, where it states in the first instance that the change in (internal) energy of a system is equal to the difference between the heat added to the system and the work done by the system, and in the second instance that heat can never pass from a colder to a warmer body without some other change, connected with that exchange, occurring at the same time.

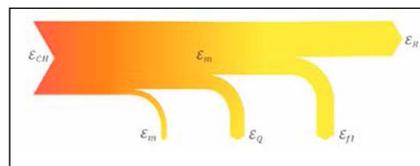
Based on the second law, DNV GL has then developed two concepts the first is entropy, which is the state of a thermodynamic system, broadly defined as a measure of the disorder or distance from thermodynamic equilibrium. The second concept is for characterising energy quality where the higher the temperature the more thermal energy can be converted to work. From this a metric that describes the maximum work potential that can be derived from a system in any given state, is exergy.

The methodology that has been based on this foundation can be adjusted to suit newbuilds still in the design phase of operating ships, and is also designed to help managers make the most out of their ship energy efficiency management plans (SEEMP). Using both onboard measurements and the DNV GL modelling suite COSSMOS, energy losses throughout the ship including hull, propulsion power train, machinery and electrical systems are quantified and ranked.

Nikolaos Kakalis, manager, DNV GL Research & Innovation explains the difference of the latest methodology compared to other optimisation tools on the market: "Our methodology is based on exergy. Therefore, accounts directly for the quality of energy, i.e. the maximum useful

Process	Energy efficiency	Alternative Efficiency metric	Exergy efficiency
Expansion  $\dot{W}_T = \dot{m}c_p(T_1 - T_2)$	$\eta = \frac{\dot{W}_T}{\dot{m}c_p(T_1 - T_2)} = 1$	$\eta_{is} = \frac{T_1 - T_2}{T_1 - T_{2,is}}$	$\zeta = \frac{\dot{W}_T}{\dot{\epsilon}_1 - \dot{\epsilon}_2}$
Heat exchange  $\dot{Q}_H = \dot{m}_H c_{p,H} (T_{H,in} - T_{H,out}) =$ $\dot{Q}_C = \dot{m}_C c_{p,C} (T_{C,out} - T_{C,in})$	$\eta = \frac{\dot{Q}_C}{\dot{Q}_H} = 1$	$\eta_{eff} = \frac{T_{C,out} - T_{C,in}}{T_{H,out} - T_{C,in}}$	$\zeta = \frac{\dot{\epsilon}_{C,out} - \dot{\epsilon}_{C,in}}{\dot{\epsilon}_{H,in} - \dot{\epsilon}_{H,out}}$
Fluid mixing  $\dot{m}_1 h_{in,1} + \dot{m}_2 h_{in,2} = \dot{m}_3 h_{in,3}$	$\eta = \frac{\dot{m}_3 h_{in,3}}{\dot{m}_1 h_{in,1} + \dot{m}_2 h_{in,2}} = 1$	n/a	$\zeta = \frac{\dot{\epsilon}_3}{\dot{\epsilon}_1 + \dot{\epsilon}_2}$
Throttling  $\dot{m} h_{in} = \dot{m} h_{out}$	$\eta = \frac{\dot{m} h_{out}}{\dot{m} h_{in}} = 1$	n/a	$\zeta = \frac{\dot{\epsilon}_{out}}{\dot{\epsilon}_{in}}$

Energy and exergy efficiency of some elemental thermodynamic processes



Qualitative exergy flow diagram in a marine energy system

energy that can be attained by a process/component/system. In that way, we can provide an accurate and consistent picture of efficiency and losses for ship machinery systems, avoiding many shortcomings and ambiguities of traditional approaches."

The methodology addresses the complete energy and exergy flows within a ship energy system. Out of this exergy-based methodology DNV GL attains a

$$\Delta S = - \oint \frac{\delta Q}{T} \geq 0$$

Where S is the entropy, δQ is the path-dependent heat transfer, and T is the temperature. ΔS is the entropy change in a cyclic thermodynamic process

mapping of all the sources of useful energy losses (exergy losses) within the system. "We also of course get at the same time the useful products of the system such as propulsion power output, electricity production, etc," adds Kakalis.

"This development is part of a family of tools under the DNV COSSMOS computer

framework that introduces a systems engineering approach in shipping. Our focus, when we are addressing optimisation problems, is in the overall integrated system rather than in the individual components," says Kikalas.

The methodology has been applied to three projects that have looked at a waste heat recovery system, the fuel cell system onboard *Viking Lady* and the main engine of an Aframax tanker. "Out of our exergy-based methodology, a shipowner/operator will get: The complete mapping of the sources of useful energy losses for the system under study, which looks at the components/sub-systems/processes that contribute the most to the losses (which will rank the main contributors). The identification of focus areas for implementing efficiency improvement measures," explains Kikalas.

Using an exergy-based methodology will also mean that optimisation will be viewed

"Our focus, when we are addressing optimisation problems, is in the overall integrated system rather than in the individual components"

in a different way, as an exergy diagram gives a different picture of what is going on with the systems. "This exergy-based analysis sets the priorities for efficiency improvement measures (and ultimately greenhouse gas [GHG] emissions reduction) in a formal and consistent way that meets the challenges, alleviates many

shortcomings and lists ambiguities that often appear in traditional energy-based analyses," says Kikalas.

He also adds that due to these methodologies, both exergy-based analysis and systems engineering approaches as a whole will change the way we gain insight, design and optimise ship machinery systems. These approaches promote the shift from focusing on individual components to the complete system. This can yield significant benefits both in fuel savings and emissions reductions.

The methodology is already being applied to a number of research projects. Pilot application studies, in the form of joint industry projects, with selected DNV GL customers are also underway. Upon successful completion, it is intended that the methodology will be streamlined further and be incorporated in to the DNV GL ship energy management services portfolio. *NA*

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BWMC: IMO versus USCG

The ballast water management convention still lies unratified, but with the USCG about to introduce its own set of regulations it has intensified shipowners' and operators' concerns over the differences between the two sets of regulations

Last year the US Coast Guard (USCG) announced that it would be bringing its ballast water discharge standards in-line with the IMO's, after concerns that the USCG would stipulate that the discharge standard would have a much higher rate than that of the IMO's. Even so, this still hasn't quelled the fear over the USCG raising the standards again in the future.

Capt. Peter Lundahl Rasmussen, senior marine technical officer at BIMCO, said in the ballast water presentation during a BIMCO webinar that one of the differences between the IMO and USCG discharge standards was that where the IMO stipulates viable organisms, the USCG has opted for living organisms.

John Morris from the USCG explains how the difference in the rules has come about through the questioning of the abilities of different treatment systems, such as UV and filtration: "Recently the USCG has responded to rumours that ballast water management systems that incorporate ultraviolet radiation (UV) as a disinfection process will not meet Coast Guard type approval requirements. The Coast Guard has made no decision regarding the general acceptability of UV as a treatment process, or the specific acceptability of any UV-based BWMS [ballast water management system] for purposes of type approval."

He added that the USCG is not aware of a validated testing method to determine the viability of the many types of organisms in ballast water after undergoing treatment by a UV-based BWMS, but have anticipated that new testing methods and approaches would arise over time. Therefore, 46 CFR 162.060-10 (b)(1) allows the USCG to consider proposed alternative approaches to the published testing requirements.

In response to requests from UV BWMS manufacturers, a UV technical panel is evaluating an alternative method for testing UV BWMS that will ensure an equivalent level of protection consistent with the approach of the current ETV protocol. Representatives from UV manufacturers, the USCG, academic



USCG regulations over ballast water discharge still raise concerns for shipowners

and private sector research communities, and BWMS testing facilities are actively engaged in this effort.

AMS or type approval?

Many ballast water treatment manufacturers are saying that they are actively looking to get systems USCG type approved, with Wärtsilä's system being one BWMS that has received alternative management system (AMS) certification. However, having an AMS certificate is not the same as a US type approval and it is not expected that any type approvals will be seen before 2015.

"The alternate management system programme was developed to provide short-term acceptance (not approval) of foreign type-approved systems that were installed prior to the new Coast Guard regulations, and continue to be installed prior to availability of US type-approved BWMS," explains Morris.

The AMS application requires submittal of an "informal" type approval application to help identify data gaps and other issues that may prevent or delay US type approval in the future. However, AMS and US type approval are separate programmes: AMS acceptance

does not guarantee US type approval, does not directly assist in obtaining US type approval, and is not required for US type approval, he also added.

As for when the USCG approved systems will be seen Morris explains that the Independent Laboratories (IL) must be accepted by the Coast Guard in order to conduct type approval testing. These are private-sector entities, “so the Coast Guard cannot force them to apply.”

Since the new regulations were published in 2012, the USCG has accepted two ILs to carry out type approval testing of BWMS, NSF International and DNV, and is in contact with other interested test organisations around the world. A BWMS manufacturer may submit

existing data, but must still work with an IL to evaluate the data for US type approval.

Adding to this is the grandfather clause, a five year allowance that shipowners can apply for if a vessel will not meet the standards required for type approval. Morris explains the clause further: “If an individual vessel has installed an AMS prior to its compliance date, it may use the AMS in lieu of ballast water exchange while in waters of the US, for a period of up to five years, it would otherwise have to meet the discharge standard.”

The rule’s Implementation Schedule explains how individual vessels determine their compliance dates with the ballast water discharge standard. New vessels, those with keel laid dates on or after 1 December

2013, must comply on their first visit to the USCG Compliance dates for existing vessels, those with earlier keel laid dates, are based on their first scheduled drydocking after 1 January of either 2014 or 2016 depending on ballast water capacity. “Underwater surveys/UWILD or emergency dry-docking would not trigger this requirement,” Morris adds.

The new USCG regulations came into effect on 21 June 2012, whereas the revised Environmental Protection Agency (EPA) vessel general permit (VGP) came in to effect on 19 December 2013. Further information about this update can be accessed via <http://homeport.uscg.mil/ballastwater> or <http://www.epa.gov/npdes/vessels>. **NA**

EU aims to add cohesion to industry’s efficiency drive

Energy efficiency and environmental considerations drive today’s shipping industry. Economic pressure and international legislation require a sensitive use of energy resources and a reduction of the associated emissions. In response the EU has established a system to aid the implementation of change

Often accused of talking the talk, but not walking the walk the EU has responded to the mass of maritime research by establishing an organisation to identify research gaps and further develop new work into fully operational industrial applications.

The EU has established Maritime Europe Strategy Action (MESA) to address the difficulties surrounding the R&D function at the European level and to plug any R&D gaps.

As such MESA has been divided into four development lines or Thematic Technology Groups (TTG’s), Energy Efficiency (TTG 1), Safety (TTG 2), Production and Materials (TTG 3) and e-Maritime (TTG 4).

According to the MESA website: “The objectives of the Thematic Technology Groups are to:

- Establish a network of Maritime actors to improve cooperation between the stakeholders and to strengthen the effectiveness of the research and innovation capabilities

- Cluster relevant research projects (EU and National) and assess the state-of-the-art of the technology and its development
- Identify technology gaps and research and development needs for updating the WATER-BORNETP Strategic Research and Innovation Agenda and Implementation Plan
- Improve the visibility of the research activities and dissemination of the results achieved; identify show cases and successful demonstration activities.”

The Energy Efficiency group, TTG 1, will continue the work originally started by GreenSeeNetwork. Since autumn last year, a structure in the form of a catalogue of topics relevant for the energy efficiency of ships has been created together with a first collection of relevant R&D projects and the first results were shown during a project workshop on 5 March 2014 in Brussels.

In the first instance TTG 1 will identify all the relevant areas that affect the energy efficiency of ships creating a catalogue of energy efficiency related elements with the technology specifications dividing them into sub-sections and identifying group leaders.

Each sub-group will then analyse the relevant EU, national and private (industrial) research available as well as review the applications of the work and marry the relevant networks and organisations active in the field.

Following this analysis the sub-group will report on the current state of the art, which will result in a “technical” Gap Analysis and define the global assessment criteria to evaluate the impact of relevant technologies, according to MESA.

The ultimate aim of the TTG’s is to establish a network of Maritime actors to improve cooperation between the stakeholders and to strengthen the effectiveness of the research and innovation capabilities. **NA**

Ironing out the kinks

Yukio Hama, Masanori Sano, Michihiro Kawaji, Naikai Zosen Corp, Japan, along with Yasuo Katayama, Hidekazu Murakawa, Yasuhisa Okumoto, Sherif Rashed, Osaka University, Japan, take a look at how deformations occur in superstructure block welding

Superstructures of passenger ships and car ferries are built using thin steel plates in order to reduce weight and lower the ship's centre of gravity. When welding such thin plates, the structure shows large welding-induced deformation, locally on the plate panels level, and overall on the subassemblies, assemblies and blocks levels. Straightening of local panel deformation causes an increase of overall deformation. In many cases, assemblies and blocks have small overall stiffness and such welding/straightening-induced deformation can be quite large.

Furthermore, when fitting members together, gaps and misalignments are usually found between these members. These gaps and misalignments are usually corrected or reduced by applying forces that bring members closer to each other and by trimming where necessary. The gap closing process is arbitrary and depends on the worker in charge at the time. Such uncontrolled fitting may cause unpredictable deformations of the resulting assemblies and blocks. An appropriate fitting strategy needs to be established and enforced on the shop floor.

Such large overall deformation of assemblies and blocks may cause problems and delays in superstructure assembly process as blocks must be trimmed to correctly fit in place. Such loss of time and work hours is unavoidably reflected in shipyard profitability.

Appropriate selection of fitting strategies, welding and straightening sequences of each subassembly and assembly in a block may considerably reduce welding/straightening-induced deformations and contribute to a shorter assembly time and reduce assembly costs.

In the work presented in this article, a superstructure block of a sea going car ferry is considered. Different fitting strategies and welding and straightening sequences are considered. Finite element analyses are carried out to predict welding/straightening-induced deformation. The effect of these construction parameters on block deformation is

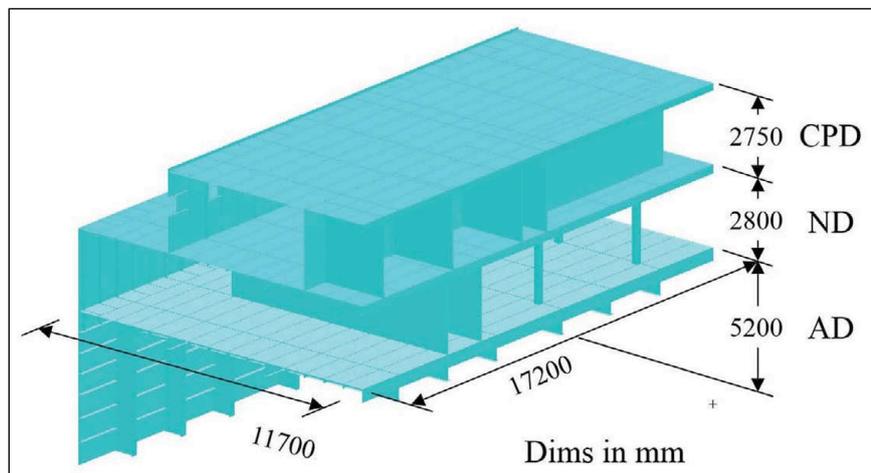


Figure 1: Starboard side of the considered ferry superstructure block

demonstrated in order that the shipyard can make informed selections of fitting strategies, welding and straightening sequences.

Ferry superstructure block overview

The starboard side of the considered ferry superstructure block is shown in Figure 1. The block is symmetric with respect to the ship centre plane except for a few details. The block is built of three assemblies, AD, ND and CPD. AD consists of the promenade deck and the structure below it. ND consists of the Navigation deck and the structure below it up to the promenade deck, and CPD consists of the compass deck and the structure below it up to the navigation deck. The plates' thicknesses vary from 9.5mm for AD side plate to 6mm for most of the block.

Block assembly

First, flanges are welded to webs to fabricate the built up web frames of AD assembly. Then, for all the three assemblies, side frames and longitudinals are welded to their respective side plates, and deck beams and longitudinals are welded to their respective deck plates to create subassemblies (stiffened panels). Internal structures and stiffened panels are also

fabricated at this stage. In the next stage, the two side panels, deck panel and any internal structure panels of each assembly are welded together. In the final stage, ND is fitted on top of AD and welded. Then CPD is fitted on top of ND and welded.

Fillet welds have leg lengths varying from 3mm to 5mm. Gaps and misalignments are treated by a combination of trimming, pulling members together and filling up remaining small gaps.

Straightening is limited to correction of transverse bending. It is carried out by applying two simultaneous oxy-acetylene heating lines on plate surface opposite to weld toes. Straightening is carried out after completion of all welding. This is due to the concern that if straightening is carried out in early stages, subsequent welding may cause deformation of already straightened panels. This, however, leads to longer block assembly schedules, and prevents several other processes, such as painting, from being commenced at the early stages.

Alternative welding and straightening sequences

Three welding and straightening sequences, modified from the sequence mentioned



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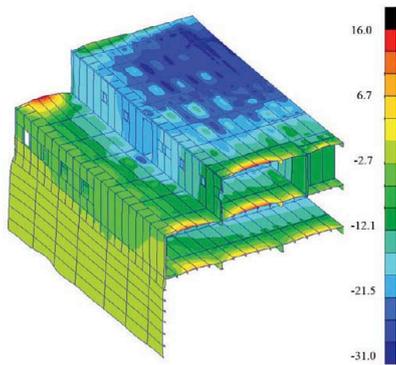


Figure 2: Vertical displacement contours plotted on the deformed shape. Deformation scale 10:1.

above, are considered. In sequence one, straightening of side panels is carried out after welding completion of each assembly. Straightening of AD deck panel is carried out after completion of welding ND to AD. Straightening of ND and CPD deck panels is carried out after completion of welding CPD to ND. In sequence two, straightening of each side panel is carried out after welding of the panel. Straightening of deck panels is carried in the same way as in sequence one. In sequence three, straightening of each side or deck panel is carried out after the welding of the panel.

In all sequences, two different fitting strategies are investigated. In the first, “Closed Gap” strategy, all welding is carried out after closing gaps and transverse misalignments. Longitudinal misalignments are kept unchanged. In the second, “Keep Gap” strategy, welding of subassemblies and assemblies is carried out after closing gaps and transverse misalignments, and keeping longitudinal misalignments unchanged, while welding of assemblies together to create the block is carried out after correcting transverse misalignment only and keeping gaps and longitudinal misalignments unchanged.

This adds up to six alternatives, that is, three sequences and two gap treatment strategies in each sequence.

Methods of analysis

Finite element elastic welding deformation analysis [1] is carried out using the inherent deformation method. Interface elements are inserted between members to be welded to represent the correct joint

state, free (no joint), fitting (positioning and tack welding), and welded.

In this study, welding and straightening inherent deformation of each welded joint and each straightening heating line is evaluated based on thermal elastic plastic analysis results and physical tests results.

Analysis and results

Analysis of the six alternatives is carried out. Displacements are predicted and compared to each other. Figure 2 shows, as an example, predicted vertical displacement contours of sequence one with closed gap fitting strategy. Displacement contours are plotted on the deformed shape, with deformation scaled up by a scale of 10:1. Overall panels’ displacements of up to 36mm, and much smaller local plate fields’ deflection between stiffeners may be observed.

Figure 3 shows Deflection (out-of-plane displacement) of CPD deck along line G-H in Figure 2 in all six cases after block assembly completion. Vertical grid lines are at the locations of deck longitudinals. From this figure it may be seen that the plate fields’ deflection in sequences 1 and 2 are a few millimetres, well within allowable deflection levels. In sequence 3, where deck straightening is carried out just after completion of deck panels welding, excessive deflection and buckling of some plate fields may be observed.

This shows that later welding may cause already straightened panels to show large deflections. However, in the case of this ferry superstructure, side panels may be

straightened once they are welded. Gap keeping or closing did not seem to give rise to considerable plate field deflection differences in sequences 1 and 2. The shipyard may select its gap treatment strategy based on factors other than welding deformation. *NA*

Conclusions

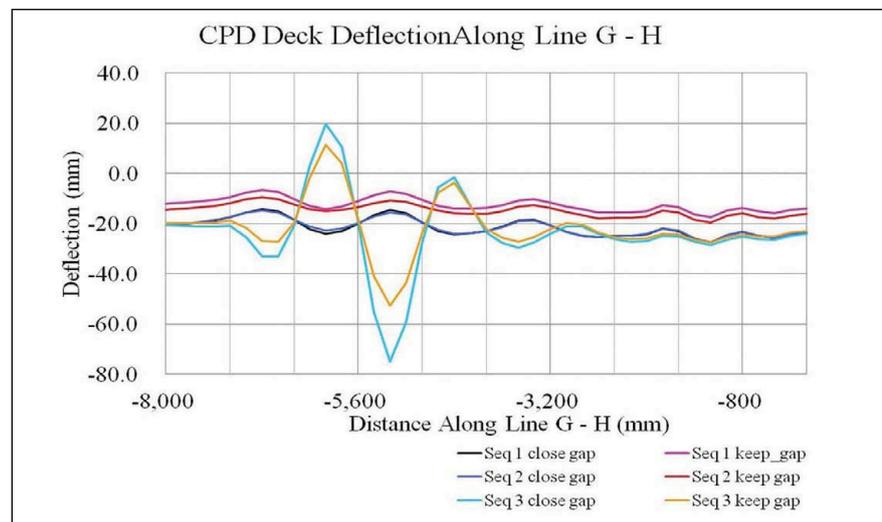
Elastic finite element welding deformation analysis using the inherent deformation method is utilised to predict deformation during, and after completion of welding and straightening in three different sequences and two different fitting strategies. Analysis results show that, for this superstructure block;

- Straightening of side panels can be carried out just after welding of these panels.
- Deck panels, if straightened just after they are welded, may develop large plate field deformation due to subsequent welding.
- Fitting strategies, closed-gap or keep-gap do not seem to have a significant effect on plate fields’ deflection. However, overall deflections are somewhat affected.

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1. Hama, Y., Sano, M., Kawaji, M., Katayama, Y., Murakawa, H., Y Okumoto, Y., Rashed, S., ‘Prediction and control of car ferry superstructure blocks deformation Induced by welding and Straightening’, ICCAS 2013, Busan, Sept 24-26, 2013

Figure 3: Deflection (out-of-plane displacement) along line A-B in Figure 2 after block assembly completion



New, wider Panama Canal an opportunity for TTS

Since designing car carriers for the wider Panama Canal began some years ago, TTS has won contracts to supply cargo access equipment for no less than 30 Post-Panamax car carriers. Close cooperation with long-term customers and continuous development of efficient cargo access solutions are the major keys to the success

The list of customers to choose TTS Marine AB in Gothenburg as equipment supplier for their new series of Post-Panamax Pure Car and Truck Carriers (PCTCs) is impressive: Eukor Car Carriers, Glovis, Höegh Autoliners, Ray Car Carriers, Wilh. Wilhelmsen and Wallenius Lines.

TTS says that it is one of the most experienced players in the car carrier technology, design solutions and ro-ro equipment sector. The equipment provided for these series of vessels, under construction mainly at yards in China and Korea, typically consists of large quarter ramps, side ramps, internal hoistable ramps and covers, liftable or hoistable car decks, various doors and hydraulic or electric operating systems.

But, success by no means came overnight, according to Björn Rosén, vice president sales & marketing at TTS Marine AB: “Longstanding, strong relations with all these end users constitute the foundation of our robust performance. We have built a solid market position based on mutual trust, reliable products, comprehensive support, during development of new PCTC concepts and strong presence at new-building site, not least to mention our commitment to first-class life-time services.”

The upgraded canal restrictions have given naval architects new possibilities to elaborate with ship’s dimensions, designing more efficient ships and this has given new proportions also to car carriers. The length of the vessels has remained around 200m, but the vessel’s width has increased from 32.31m to about 35.5-36.5m giving a larger flexibility choosing one or two pillar arrangement and



The widening of the Panama Canal opens further opportunities for TTS

engine room arrangement, all adding more flexibility and cater for greater variety and capacity of cargo. The capacity of the new vessels is between 7,000-8,500CEU compared to the 6,000CEU (car equivalent units) of previous car carriers. The new main dimension ratio has also given potentials for a significant increase in hull efficiency with improved fuel economy. TTS is supporting this development with innovative cargo access solutions to maximise the utilisation of the ship cargo hold and optimise cargo handling operations.

“We are constantly suggesting new and improved solutions for the ship’s layout, our product design and control systems, whenever we can see benefits for our customers in their line of

business. We are also working with more long-term innovation projects, often together with the shipowners and shipyards, especially when the focus is on efficiency. Our company’s technical knowledge and innovation capability can in many ways have an impact on the ships’ design and lead to increased economical and operational value for the shipowners, as well as a more eco-friendly environment”, says Henrik Westermark, R&D manager at TTS Marine AB.

The first ever Post-Panamax car carrier *Glovis Spirit* was delivered in September 2013 and the world will in the nearest years see a long row of wide beam new designed car carriers enter into operation, many of them featuring TTS cargo access equipment. **NA**

Improved guidelines for sprinklers on ro-ro decks

The IMO has updated its guidelines for the design and installation of sprinklers on ro-ro decks. SP Fire Technology says this is a direct result of the Swedish IMPRO project and several other research projects over the years

According to the requirements in SOLAS Chapter II-2, vehicle decks and ro-ro cargo areas that cannot be closed off, together with other areas classified as “special category”, must be protected by a manually activated water spray system. “Special category” areas are enclosed vehicle decks to which passengers have access. Detailed requirements for the design and installation of water spray systems are set out in IMO Resolution A.123(V), published in 1967. Some of these detailed requirements which can be specially mentioned are:

- The system capacity must be capable of delivering a discharge density of at least 3.5mm/min in deck areas with a maximum height of 2.5m, and of at least 5mm/min in higher deck areas
- The system must be divided into sections, with each section (with certain exceptions) extending across the full width of the vessel
- Each section must be at least 20m long, and the system pump capacities must be sufficient to supply water either to the entire deck or to at least two sections
- Section control valves must be installed outside the protected area.

Outdated and questioned recommendations

During the latter half of the 1990s and the first few years of the 2000s, SP Fire Technology conducted a number of research projects investigating and illustrating the feasibility and potential of modern sprinkler technology on ro-ro decks. Nevertheless, despite several approaches, IMO did not respond to proposals

“the design capacity of water spray systems was not sufficient to counter the risk of fire on ro-ro decks presented by modern cars, coaches and heavy goods vehicles”

for improvements. In 2006, the UK Maritime and Coastguard Agency (MCA) published a report which concluded that the design capacity of water spray systems was not sufficient to counter the risk of fire on ro-ro decks presented by modern cars, coaches and heavy goods vehicles.

The report also concluded that a programme of large-scale fire trials should be carried out in order to improve the understanding of the behaviour and progress of fires on ro-ro decks. In 2008, funding from VINNOVA, the Swedish Mercantile Marine Foundation and the Swedish Fire Research Board opened the way to a Swedish project to investigate this particular area. The project, under the name “Improved water-based fire suppression and drainage systems for ro-ro vehicle decks” (IMPRO), performed both small-scale and large-scale fire trials.

Several serious fires have occurred on ro-ro decks in recent years, including those on *UND Adriyatik* in 2008, *Vincenzo Florio* in 2009 as well as on *Lisco Gloria* and *Commodore Clipper* in 2010. In several of these fires, damage has been very extensive, thus increasing the need for understanding

Fire safety guidelines get updated as more studies get conducted with fire safety devices



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Type of system	Minimum water discharge density (mm/min)	Minimum coverage area (m ²)
Wet pipe system	6.5	280m ²
Dry pipe or pre-action system	6.5	280m ²
Deluge system	5	2 × 20m × B1

Table 1: Minimum water density and protected area for decks with free heights up to and including 2.5m. 1) B = Full breadth of the protected space.

Type of system	Minimum water discharge density (mm/min)	Minimum coverage area (m ²)
Wet pipe system	15	280m ²
Dry pipe or pre-action system	15	365m ²
Deluge system	10	2 × 20m × B1

Table 2: Minimum water density and protected area for decks with free height between 2.5m and 6.5m. 1) B = Full breadth of the protected space.

Type of system	Minimum water discharge density (mm/min)	Minimum coverage area (m ²)
Wet pipe system	20	280m ²
Dry pipe or pre-action system	20	365m ²
Deluge system	15	2 × 20m × B1

Table 3: Minimum water density and protected area for decks with free height between 6.5m and 9.0m. 1) B = Full breadth of the protected space.

how fire spreads so that sprinkler systems are improved.

New recommendations in MSC.1/Circ. 1430

A correspondence group discussed revision of IMO Resolution A.123(V), starting from the results from the IMPRO project, and a proposal was sent to the IMO fire protection sub-committee, IMO FP55, in July 2011. The sub-committee drew up a document which was in due course approved at the meeting of the Maritime Safety Committee in 2012 and

published as MSC.1/Circ. 1430 in May 2012. It contains recommendations for entirely replacing IMO Resolution A.123(V). However, systems that were installed in accordance with the earlier rules will be permitted to remain, as long as they are in full working order. As opposed to IMO Resolution A.123(V), MSC.1/Circ. 1430 permits automatic wet-pipe systems, dry-pipe systems and pre-action systems. In addition, group-activating systems (deluge systems) are still permitted. System design capacities are based on the type of system and the deck height, as given in Tables 1-3.

The recommendations in MSC.1/Circ. 1430 are a big step towards improved fire safety on ro-ro decks on ships. However, several member countries in IMO have expressed fears that alternative sprinkler systems, such as water mist systems, can be fire tested by a method that indirectly applies considerably less demanding requirements on system efficacy than do the detailed requirements given in MSC.1/Circ. 1430. In the longer term, it may be necessary to update the requirements in this documentation as well. **NA**

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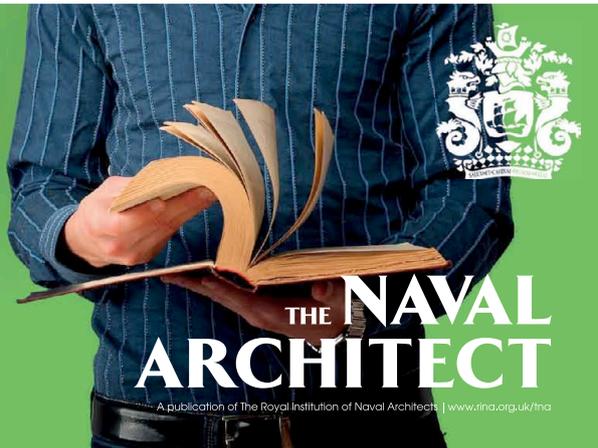
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FSG delivers hybrid ro-ro

Flensburger Schiffbau-Gesellschaft is set to deliver its first hybrid propulsion ro-ro ferry to Scottish-based Caledonian Maritime Assets Limited

The Scottish ferry operator has been updating its fleet over the last couple of years to both meet with better environmental standards and also lower operating costs. One of the first developments saw Caledonian McBrayne (CALMAC), part of Caledonian Marine Assets Limited (CMAL); upgrade its fleet with the delivery of *Hallaig* in 2012, its first hybrid car ferry with the second in the series *Lochinvar* delivered in 2013.

This year, in July, will see Flensburger Schiffbau-Gesellschaft (FSG) deliver the next generation of hybrid concepts for the ferry operator, with *Loch Seaforth*. The 116m vessel will link the mainland of north-western Scotland with the Isle of Lewis in the Hebrides on the Stornoway-Ullapool route. The vessel will replace two older ferries currently sailing on the route and will operate 364 days a year.

With shipowners looking to alternate fuels, especially LNG, CMAL have not in this instance opted for the fuel. "We could



Hybrid-powered *Loch Seaforth*, the latest addition to the CMAL fleet

TECHNICAL PARTICULARS

Loch Seaforth

Length oa:.....	117.76m
Length bp:	11.45m
Breadth moulded:.....	19.20m
Draught	
Design:.....	4.80m
Scantling:	4.90m
Depth	
Moulded to main deck:.....	7.00m
Deadweight:	1,500kW
Design speed:	19.2knots
Main engines:.....	2 x 4,000kW
HGV lane metres:	376
Car capacity:.....	143
Passengers:.....	700
Classification society	
and notations:.....	LR +100 A1, Passenger
and vehicle Ferry, Domestic British	
Waters EU (B), LI, *IWS, ECO	
(IHM), +LMC, UMS, NAV1,	
PCAC 22, Green Passport	

have done this vessel as LNG, but CMAL was not ready," explains Raimon Strunck, vice president of sales, FSG. One of the big issues for the company was fuel supply in the area in which the vessel will operate and it was deemed as too risky with the lack of infrastructure at the moment. However, Strunck says that CMAL have said that they will look at LNG for their next project.

Loch Seaforth will be powered by an electrical mechanical hybrid unit, which will allow both propeller shaft lines to be driven through the main engines, or in the case of an engine failure the auxiliaries can also be used. There is also a third option for a 'power boost' where the auxiliaries can be used on top of the power that is delivered by the main engines, allowing the vessel to achieve a speed of up to 21knots.

To enable the vessel to sail all year round and to meet the challenges faced by the Scottish coastline, Strunck explains that it can sail in all sea states as certified by its class notation. "You also need to look at what point will passengers not want to

use the ferry, due to comfort", at this point *Loch Seaforth* will be fitted with stabiliser fins and has also been modelled for good seakeeping abilities. "We had to adjust the ship's length to fit the wave length, which has allowed us to design it for specific sea states allowing the vessel to sail all year round," adds Strunck.

One of the challenges of designing the vessel was reducing the fuel consumption. "Despite the size of the vessel and its speed it only consumes 5,560kW at the propeller," says Strunck. FSG also optimised the propeller and have installed a couple propeller from MAN that has the winglets to improve the efficiency of the propeller. This in combination with the optimised hull shape has allowed FSG to reduce the power consumption quite substantially, the company notes.

A high level of redundancy has been designed into the vessel, with Imtech Marine supplying the systems onboard. The cargo flow of the vessel has also been optimised to create a faster flow of cargo in the constraints of the shore facilities that it will operate at. [NA](#)



Marine Heavy Transport & Lift IV

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Call for Papers

The marine heavy transport and lift sector has enjoyed a buoyant and growing market due to the boom in offshore renewables and large project cargo work. The rapidly growing Wind Farm sector in particular has increased the number of offshore projects requiring transportation, installation or removal of a wide range of structures and modules. The project cargo transport market has been growing, particularly power generation and refineries work in US, South America, Africa, India, Pakistan and China.



As the structures and cargo become bigger and heavier and destinations seemingly more difficult to access the market is looking for more and better equipped vessels. There are also increasing safety and greater environmental concerns for all aspects of marine operations. The new generation of heavy lift vessel designs are responding to the demand for higher lifting capacity and larger outreach. There are also an increasing number of new design concepts aimed at servicing this increasing demand in the marine heavy transport and lift industry.



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Brittany Ferries opts for LNG

Brittany Ferries is renewing its fleet with an order for an LNG ferry, code named PEGASIS

STX France has signed a contract with the French owner Brittany Ferries for a LNG ferry. Due for delivery at the end of 2016, this ship will set major milestones in the field of motorisation and energy storage and opens the way to a new generation of environmentally friendly ships, the company says.

The ship bearing the name code PEGASIS (Power Efficient GAS Innovative Ship) is one of the 34 projects of the New Industrial France and results from ECORIZON programme. STX France added that the vessel's development has come about through several years of cooperation with Brittany Ferries (BAI).

The project which has also received support from Gican, French Maritime Cluster and Regional Council of Pays de la Loire and is set to exceed the new regulatory requirements in terms for exhaust gas emissions set by the MARPOL convention which will be enforced from 1 January 2015. To be able to meet with those requirements the ferry will be fitted with dual-fuel engines that will use LNG as the main source of energy, which in turn will cut out the vessels SOx emissions and will reduce NOx emissions by 80% and CO₂ by 20%.

Sebastien Le Boulluec, project manager, STX France explains why the owner opted for LNG: "PEGASIS (Power Efficient GAS Innovative Ship) will be the leader of

Brittany Ferries' fleet and that they want to fully convert into an environmentally friendly and economically efficient one. With the new MARPOL rules in the background, for that purpose, they have selected the gas option for the retrofit of their more recent vessels and for this new prototype."

LNG as propulsion is still in its infancy with further development of infrastructure and supply of the fuel needed and also in regulatory terms. Le Boulluec explains the main challenges faced by the shipyard in the construction of the vessel: "It is mostly LNG storage and propulsion, of

"LNG as propulsion is still in its infancy with further development of infrastructure and supply of the fuel needed"

course. Because this is the technological breakthrough, the new thing - although hundreds of LNG carriers (sometimes carrying 150,000m³ of LNG, and some of

TECHNICAL PARTICULARS	
PEGASIS	
Length oa:.....	210m
Breadth:.....	31m
Draught:.....	7m
Gross:.....	53,000gt
Service speed:.....	24.5knots
Total passengers:.....	2,400
Propulsion:.....	Dual-fuel/electric
Total installed power:.....	45MW

them built in our yard) and a few ferries have already paved the way."

STX France says that as yet it has not been established how the vessel will be refuelled, the owner is working on various alternatives, but the target is to use a bunker vessel as an LNG feeder. The LNG onboard will be stored in a 1,300m³ membrane type tank. The four dual-fuel diesel generators and the two electrical propulsion motors will be installed in two separate machinery compartments, to comply with the Safe Return to Port regulation.

The vessel will be 210m long and about 31m width, this ferry will be provided with 675 passenger cabins, including 12 Commodore Suites, 51 Deluxe cabins, 15 cabins for disabled persons and 30 cabins dedicated to pet owners and will have passenger capacity of 2,600. The vessel will also have various public spaces; bars, lounges, shops, cinemas, outside decks, and restaurants.

The vessel will have three garage decks (among which a mobile car-deck) for HGVs and light vehicles. The maximum cargo capacity will be 80 trucks, and in mix-cargo configuration, the ship will be able to carry 40 trucks and 650 light vehicles. This large cargo area spreads over three decks (including one movable car-deck), with both stern and bow doors / ramps. *NA*



STX France to build Brittany Ferries latest LNG ferry

Nordana's next generation ro-ro

Nordana will be receiving its latest multipurpose ro-ro this month that has been designed by Italian NAOS Ship and Boat Design

Nordana is looking to replace its older tonnage with more modern and efficient ships. *Weddelsborg* is currently a one off, but the company has options for additional ships, it says.

The latest multipurpose ro-ro is scheduled to be delivered in 2014 from Visentini yard in Italy. The ship's design has been developed by Visentini and NAOS ship and boat design in a close and constructive co-operation with Nordana.

"*Weddelsborg* is a straight-forward ro-ro vessel with a very classical layout. Compared to previous Visentini buildings, cargo space and lanes layout have been improved. The stern ramp has been significantly widened, allowing simultaneous loading of vehicles," says Roberto Prever, naval architect – president, NAOS.

NAOS says that compared to the previous Visentini series of vessels, the cargo lanes have been substantially improved by a reduction of the casing/



Nordana renews it's tonnage with latest efficient ro-ro

engine spaces above the main deck. The design of those areas has been performed to allow the usage of all spaces available below the fixed ramp, which has also been reduced from 9m to 4.5m in width; the elimination of the main vertical trunk containing the ventilations for the lower hold, allows the vessel to have continuous straight lanes to the extreme fore end at each cargo level.

Nordana says that the vessels' hull design and machinery is setting new standards for fuel economy, which includes the latest proven achievements to be applied to limit Sulphur Oxides, Nitrogen Oxides and Carbon dioxide emissions and the vessel will meet performance standard for protective coating and ballast water treatment regulations.

Weddelsborg has an increased capacity of about 35% compared to Nordana's present tonnage, and a higher service speed that will allow the service to improve with faster transit times to all the main ports serviced, while reducing fuel costs due to greater engine efficiency. "The ship has been designed to achieve a very low fuel consumption, which is stated to be 30tonnes/24hrs at design conditions," adds Prever.

To achieve this NAOS has carried out extensive CFD studies (based on the FutureShip code) on hundreds of different hull shapes. Prever highlights that the vessel design has a free-flow aft form and a revised FlexBow, since the Froude number is lower compared to the previously constructed Visentini ro-pax series. Tank and cavitation tests have been carried out at the Brodarski Institute, Zagreb.

"The FlexBow on a previous ro-pax was designed to perform at 23-23.5knots, while here the optimisation speed is 19knots. At lower Froude numbers it has been proved to be better than a slightly more conventional bulbous bow, although the waterline has a very small entrance angle," adds Prever.

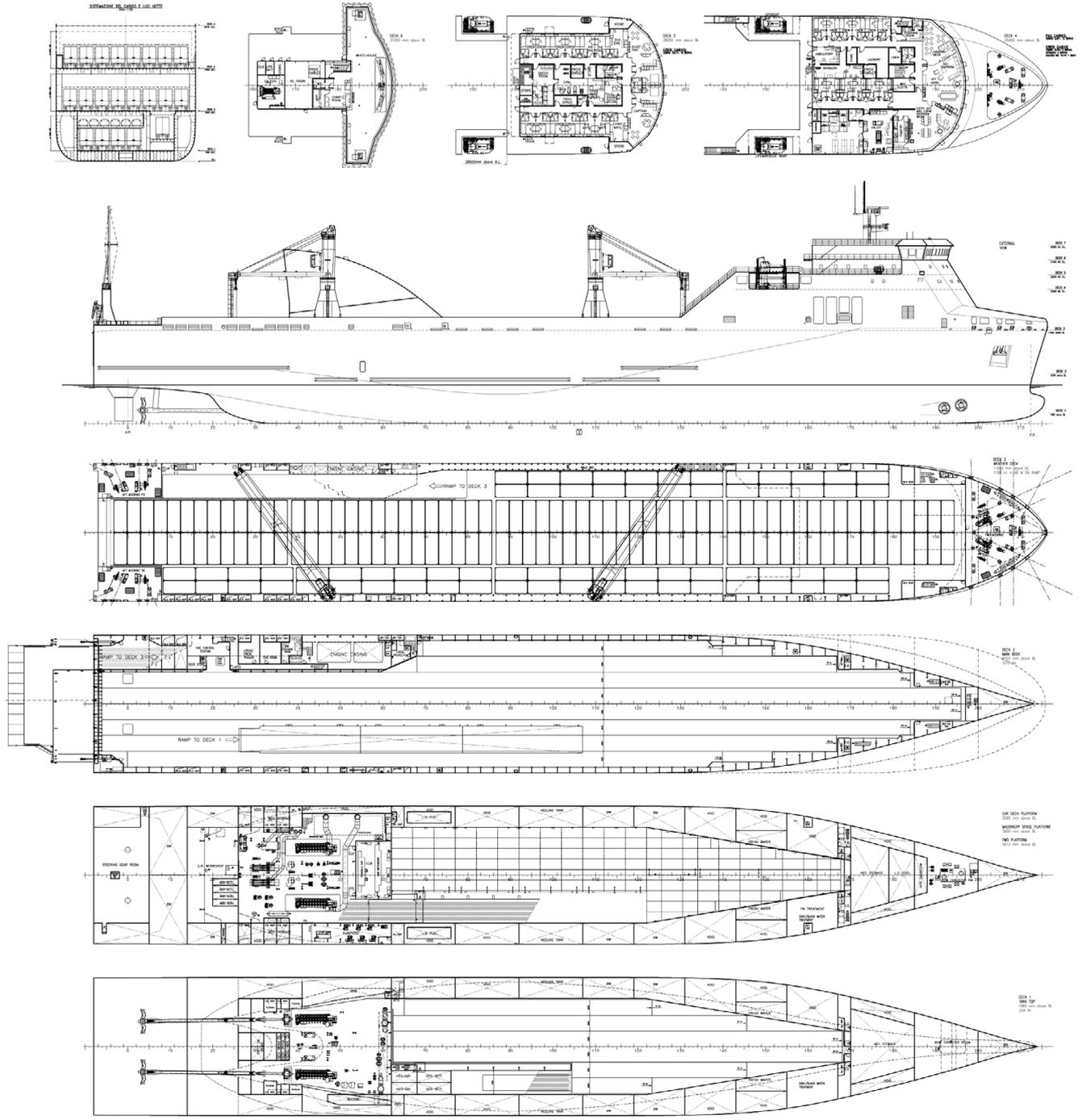
The vessel is powered by two MAN Diesel & Turbo 9L32/44CR that has an output of 5,040kW. In addition extra capacity for low sulphur fuel has been installed, along with the HFO and MDO. *Weddelsborg* also has reserve space for a scrubber.

Nordana added that it has not installed a scrubber as yet as it has not selected a supplier for the equipment. "It is still a novel solution and we don't know which one will meet with the US approval in the future. There are lots of factors to consider, whether you will be able to use a system that discharges dirty water or whether it will have to be a closed loop system, for instance," says Rene Siverson, Nordana.

Added to this a NAOS propulsion system (NPS) has been installed on the vessel. The NPS is a propulsion concept, which has been tested during a two-year research project in co-operation with SVA Potsdam. "This has produced a propulsion efficiency improvement of about 6% compared with the best standard," says Prever. "NAOS has teamed up with MAN-Alpha for the final design of the propeller according to the NPS concept." He also highlights that by giving the propeller tip a large clearance from the hull it will reduce the vibrations from the propeller. **NA**

TECHNICAL PARTICULARS	
<i>Weddelsborg</i>	
Shipbuilder:	Cantieri Navali Visentini
Owner/operator:	Nordana
Designer:	NAOS Ship and Boat Design
Length oa:	178.80m
Breadth moulded:	26.50m
Depth moulded	
To main deck:	9.50m
To upper deck:	17.60m
Draught	
Scantling:	7.60m
Gross:	18,491gt
Deadweight:	11,630dwt
Service speed:	19knots
Main engines	
Design:	MAN Diesel & Turbo
Model:	9L32/44CR
Number:	2
Type of fuel:	HFO
Output of each engine:	5,040kW

GA of Weddelsborg



LR expands its LNG experience

UECC has ordered two ships that they claim are the first of their kind. The ice classed dual-fuel, HFO / LNG, pure car and truck carriers which will be built in China are some of the few, but increasing numbers, of deepsea ships powered by LNG fuel

United European Car Carriers (UECC), jointly owned by Nippon Yusen Kabushiki Kaisha (NYK) and Wallenius Lines, has signed a contract to construct two Lloyd's Registers (LR) classed dual-fuel pure car and truck carriers PCTCs. The contract has been signed with Kawasaki Heavy Industries (KHI) and the vessels will be constructed at the NACKS shipyard in Nantong, China, which is a joint venture between KHI and China Ocean Shipping (Group) Company. Deliveries of both the vessels will be in the second half of 2016.

The vessels will be 181m long with a 30m beam. Both the vessels will have 1A super Finnish/ Swedish ice class, facilitating year round trading in the Baltic area. Approximately 3,800 standard sized cars spread over 10 decks will be accommodated onboard. A significant part of the cargo capacity can also be used to transport high and heavy cargo and any other cargo loaded on to mafi trailers. The deck configuration is optimised for both

present and predicted future cargo mixes. The vessels are capable of operating with LNG fuel or heavy fuel oil and marine gas oil, providing greater flexibility and efficiency. They are the first PCTCs of their kind to be fitted with an LNG fuel propulsion system, and can complete a 14-day round voyage in the Baltic using LNG fuel alone, including main engine and auxiliary power generation.

LR says that it has been winning a significant number of the LNG fuelled projects as interest in gas as a fuel spreads beyond the small ferry niche. LR's Global marketing manager, Luis Benito comments: "We are now seeing deep sea capable ships being ordered with gas as fuel systems. These exciting new orders by UECC show how important niche trades such as those supported by vehicle carriers are looking to capture the benefits of gas energy."

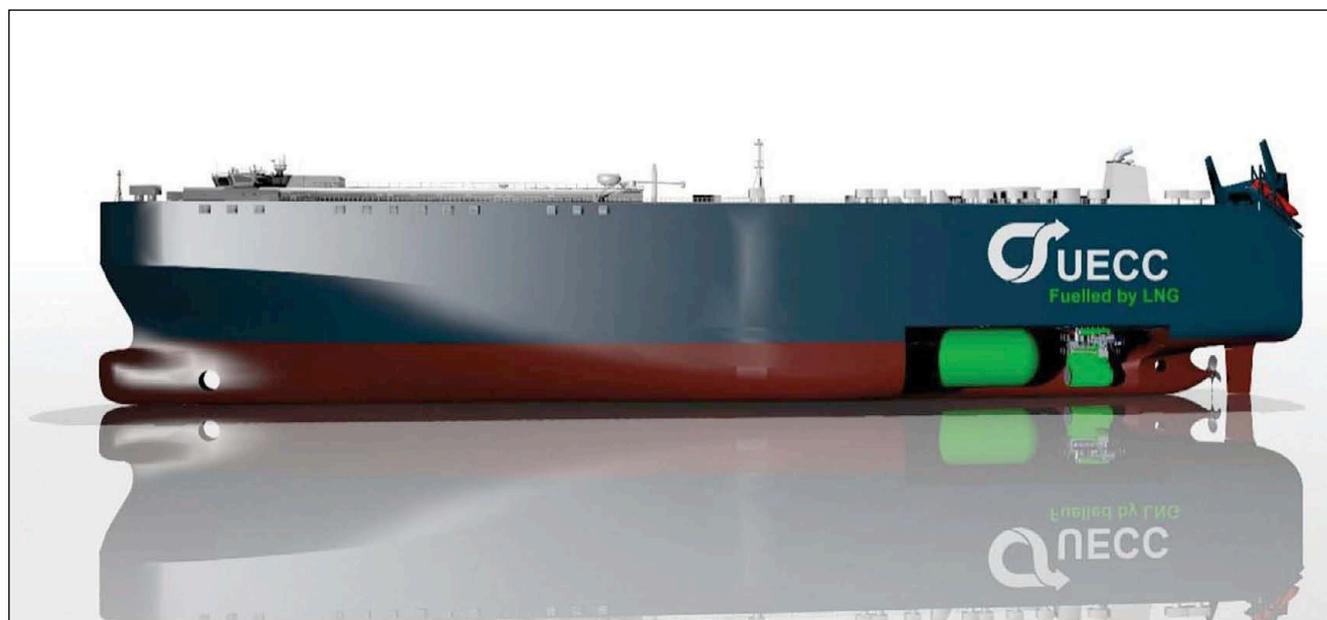
These ships will be quite advanced with a lot of challenging and new applications in their gas for fuel systems, says Anders Höfnell who is part of LR Business

Development team in the Nordic Area. The design drove several challenges regarding safety and best practice for the tanks, connections and piping to emerge.

The International code for Gas fuelled Ships, the IGF-code, is still in its draft version so it is difficult for any shipowner or designer to find their way currently with the gas for fuel technique in the absence of some of the basic prescriptive requirements. "LR was able to provide subject matter experts to advise and recommend workable solutions to this demanding project for meeting both the statutory and LR's own requirements for gas fuelled ships", Anders continues.

LR says that it is quite happy to have supported UECC in their pre-contract work, and that it looks forward to continue the support with detailed, in-depth risk assessments as the next step, the construction surveys during building at the yard in China and finally to see the vessels in operation in the emission controlled North Sea- and Baltic ECA area. *NA*

UECC's latest LNG PCTC's





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Call for Papers

From the trader junks of China to the battleships of WW2, historic ships are an important link to our seafaring past. And as the skills and techniques used to construct and operate our historic ships fade out of living memory, now is an important time to highlight the struggles of researchers, enthusiasts and engineers as they preserve and restore our maritime heritage.



RINA's Historic Ships conference returns for a fourth instalment that will not only focus on the restoration and preservation of historic vessels, but also the research and investigation into the engineering and efficiency of historic designs through modern naval architecture techniques.

Papers are invited from naval architects, academics, and enthusiasts on all related topics, including:

- Analysis of historic designs, including investigations into their hydrodynamic efficiency and structural design
- Research into historic shipbuilding and sailing techniques
- Restoration and preservation
- Maintenance of craft skills and training
- Replicas and their concession to the modern world
- Recent archaeological discoveries



Selected papers may be published in the Transactions of the Royal Institution of Naval Architects

www.rina.org.uk/Historical_Ships_2014

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WTS takes aim at energy efficiency

Wilhelmsen Technical Solutions has introduced its engine room energy management technology that has been fitted on the ro-ro vessel *Tønsberg*. Director Magnus Hansson, Wilhelmsen Technical Solutions explains how owners will save energy

The twin requirements of reducing energy consumption to save bunker costs and lower emissions to meet environmental compliance targets continue to be priority items for shipowners. But as has been seen over the last few years, the complexity of meeting these challenges has made employing smart solutions increasingly attractive.

While the impact of big ticket changes to vessel design, layout and arrangement are still being evaluated, owners and operators are increasingly targeting easy to implement, 'no-brainer' improvements that can add up to significant savings.

In tackling a combination of increased fuel prices and continued pressure to meet environmental sustainability regulations, energy management solutions are a crucial part of the solution in optimising energy consumption to reduce costs.

Modern engine rooms are ventilated to maintain an adequate temperature and to supply the diesel engine with combustion air. The diesel engines are cooled by a water system that keeps the engine room machinery temperature at a set point. Typically ventilation and combustion air systems are powered by single or dual speed fans, with the cooling water system powered by single-speed pumps.

Both these systems are designed to work at the most severe outside ambient conditions and when the vessel is sailing at full service speed. However, the engine load, the room temperature and location of the ship will vary greatly during the ship's operation, regularly resulting in overcapacity of the fans and pumps, leading to the wastage of large amounts of energy in benign conditions.

The solution to this problem, developed by Wilhelmsen Technical Solutions (WTS), is Engine Room Energy Management Technology or ER-EMT. WTS originally developed the EMT system for Heating, Ventilation,



Wilhelmsen Technical Solution's ER-EMT being installed onboard a vessel

Air Conditioning (HVAC) systems on cruiseships and ferries.

Having spent an increasing amount of time onboard these vessels installing the system convinced the company's engineers that engine room ventilation and other fluid systems could also be targeted for energy savings through system retrofits.

ER-EMT uses the TrueDemand concept that automatically responds to the varying conditions of the engine room. The system is expandable to integrate other engine room machinery and reports the energy savings, enabling operators to set benchmarks and analyse the return on investment. It alters the ventilation and combustion air supply to meet the demand for fresh air to the engine room and varies the sea water pumps to the actual cooling demand of the diesel engine at any given time.

ER-EMT is a 'total solution' for managing supply/exhaust fan and sea water pump control and delivering enhanced equipment performance. It utilises remote monitoring and system optimisation to relieve dependence on manual systems and includes a smartphone app for efficient survey, since collection of the correct data from the ship is crucial for the project success.

Just as importantly, ER-EMT is suitable for retrofit on all types of vessels, with payback as short as six months to two years, depending on vessel type.

Although ER-EMT is not mandated by regulations, it supports the calculation of a vessel's Energy Efficiency Design Index value and is applicable to reduced energy consumption under the Ship Energy Efficiency Management Plan.

Based on experience of completed installations, ships with ER-EMT solutions installed can save more than 50% of the power supplied to fans and pumps, resulting in a 5-10% saving of the total electric power produced.

Results, verified by the shipowner using a third-party energy meter show that, dependent on vessel type, a reduction in energy consumption between 500,000-3,000,000kWh per year is achievable, equating to fuel savings of more than 100-200 tonnes per year. The secondary result is that the ship's carbon signature can be reduced by 300-700tonnes of CO₂.

WTS installed an ER-EMT systems on the ro-ro vessel *Tønsberg*, for shipowner Wilh. Wilhelmsen. The impact of the system was analysed in four operating modes, full speed, eco-mode, when manoeuvring and in harbour/at anchor. In each case, WTS was able to demonstrate reductions in the ship's power consumption in kilowatts.

Requirements for better energy efficiency will continue to increase, even if freight rates show a sustained improvement. The cost of marine fuel and the dynamics of the market suggest that owners will still need to look for ways to optimise power consumption in a bid to reduce costs.

ER-EMT has an important role to play in this process, turning complex problems into smart and user-friendly solutions that deliver efficient operations and proven results with a fast return on investment. **NA**

Ulstein take orders for two OCV's

Transatlantic cooperation bears fruit for Ulstein as Island Offshore and Edison Chouest order offshore construction vessel designs

Edison Chouest Offshore and Island Offshore have ordered two next-generation offshore construction vessels (OCV), which will be built to ABS class at shipyards in Norway and the US.

The ships, ordered by the joint-venture company Island Ventures II LLC, will feature Ulstein's new SX165 design; the first ship is scheduled for delivery in the third quarter of 2015 from the Norwegian firm's main shipyard in Ulsteinvik.

Island Ventures II has purchased the design and engineering packages to enable the second ship to be built at Edison Chouest's LaShip yard in Houma, Louisiana.

"The cooperation between our companies is excellent and we look forward to working with Ulstein on the construction of these



Ulstein's latest vessel design the SX165 offshore construction vessel

multi-functional vessels," says Edison Chouest Offshore's, CEO, Gary Chouest.

The newly developed SX165 design is 28m wide and 145.7m long with the potential to accommodate 200 people. It is equipped with two cranes that can lift 400tonnes and 140tonnes.

It has three 'moon pools' – hull openings

through which tools and instruments can be lowered into the sea; the biggest moon pool measures 11.2m by 12m, while the two smaller pools feature remotely operated vehicles installed in a centrally located hangar.

"This is a demanding and challenging construction project," says Kristian Sætre, managing director, Ulstein Verft. "We are pleased to work with ABS, and we are looking forward to expanding our cooperation into new markets for these types of vessels."

The design offers three separate engine rooms to optimise the vessels' operational reliability: if one engine rooms fails, they retain most of their operational capacity. On the environmental front, the vessels will be equipped with selective catalytic reduction systems to limit NOx emissions. **NA**

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Brodosplit broadens its horizons

Croatian-based Brodosplit shipyard has seen varied projects come to its yard, allowing the yard to expand upon its shipbuilding experience

In March Brodosplit and Fincantieri signed a contract that will see Brodosplit shipyard construct the grand blocks for a 133,500gt, 321m cruise vessel.

The company highlighted that this is a unique project for the shipbuilders who have become an equal business partner of Fincantieri Group, one of the major shipbuilding groups in the world, in the joint building of luxury cruise ships.

“Brodosplit took the next step in shipbuilding by focusing on ships with a high added value. We wanted to make contact and offer our services to the companies that share the same vision and Fincantieri has recognised our capability and wide range of opportunities that will benefit to us both,” explains Josip Jurisic, public relations, Brodosplit.

Brodosplit are contracted for the building of the ship’s forward hull sections, a total of 1,750tonnes of steel, equipped with pipe and locksmith components, as well as with electric routing. It is a very demanding part of the ship’s hull, the so called bulb, forward part with three bow thrusters, the company has said.

Jurisic adds that: “The main challenge is the coordination of work between different companies that are building the vessel. The vessel will be built in several blocks that must fit together when assembled and the connection must be perfect otherwise there will be much on-site modification that would slow the project.

“Brodosplit is, among the other parts, building one of the most complex parts of the vessel, the bow. Curved surfaces require precise design and manufacturing and the most skilled designers and productions engineers with experience are involved,” he says.

The steel cutting of the blocks will begin in May this year and delivery is scheduled for November. The four blocks will then be loaded on a barge and tugged to Fincantieri’s shipyard in Monfalcone.

In addition to Brodosplit’s cruise ship order it also received a contract last June for the construction of a river cruiser with the Premier Cruises Limited company, British



Brodosplit’s LNG containership design



Brodosplit re-enters the Russian waterway market with its latest river cruise ship order

Virgin Islands. The vessel is a passenger cruise ship intended to serve the Volga-Don inland Russian waterways with prevailing tours between Moscow and St. Petersburg.

Jurisic explains the significance of the order for the yard: “Building a passenger cruise ship will give Brodosplit wider knowledge and shipbuilding experience. River ships have different design requirements and with this project our design and manufacturing engineers will be more experienced in taking part on some future river ship project.”

The vessel will be 105m length with a 16m beam and will be able to accommodate on four decks 160 passengers in the 82 luxury equipped cabins, while the crew will have 39 cabins, with 69 crew members. It will have a speed of 14knots with three high-speed diesel propulsion engines that have an output of a total of 2,200kW. The vessel is to be built in accordance with the rules and regulations of the Russian River Register with the delivery planned for the first half of 2015.

The vessel design is from Flisch and it has differing features from other river cruise vessels such as an elastic superstructure mounting and ship hull shape.

Brodosplit is also entering the LNG market with its latest design of a multipurpose container vessel. This is important because the container vessels with LNG fuel will be more attractive in the global shipping market due to the national and international regulations

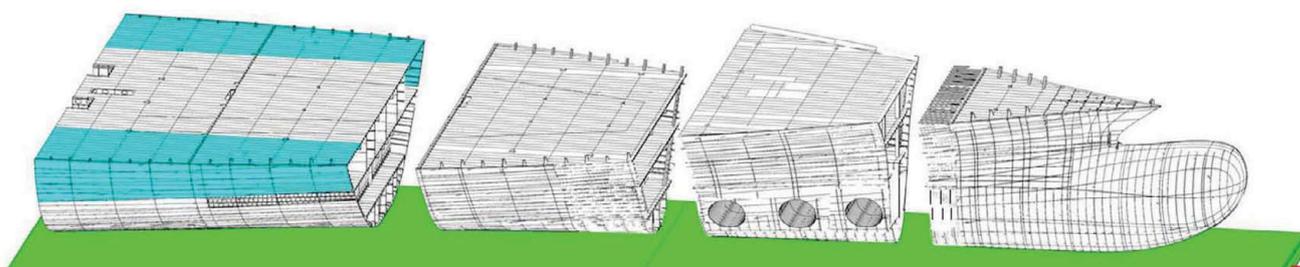
that will prescribe the permitted emissions of NO_x, SO_x and CO₂, which is being gradually introduced, the company says.

“Brodosplit is looking forward to seeing LNG as fuel that would power future ships. There are still some barriers worldwide that need to be broken in order to completely turn to green energy, but our views are optimistic and our main company focus is looking that way,” explains Jurisic about the future of LNG development.

The Brodosplit container vessel will have low speed two stroke dual fuel (LNG/HFO) engines that will have a higher efficiency (lower energy) and work at a lower rpm, resulting in lower maintenance costs and a longer life span.

According to Brodosplit the container vessels from its shipyard will have costs that are four to five times lower per mile than the other ships of this class, and will be less polluting for the environment by up to 30-50 times. **NA**

Brodosplit joins forces with Fincantieri on its latest cruise ship project



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MEB stays at the forefront of design

Ukraine-based Marine Engineering Bureau saw 30 new vessels of its designs, with a total deadweight of 163,000tonnes, built and put into operation in 2013. In addition the company has also been developing new inland designs

Amongst the latest Marine engineering Bureau (MEB) designs has been the development of the RST05 tankers, with the first of its type, *Narva*, delivered in 2013. February this year saw the delivery of the second of the series, *Istra*. MEB says that the main feature of these tankers (and also RST26) is that their main dimensions are at the maximum for passing through the White Sea-Baltic channel (“White-Baltic max” class according to the classification accepted by the Russian Maritime Registrar of shipping).

“The main cargo traffic from Russian rivers continues to go through the southern waterway (Volga-Don channel) to Azov and the Black Sea and through the Northwest (Volga-Baltic way) to the Baltic Sea. The traffic capacity through the sluices on both of the waterways is practically full. The alternative is the Northern way - through the White Sea-Baltic channel in the White Sea,” says Igor Ilnitskiy, deputy director general, chief designer, MEB.



Narva set sail in 2013, the first of the RST05 tanker design

February also marked the occasion of the keel laying ceremony for the latest PV09 design of a high-comfort cruise passenger vessel, *Solem*, which took place at Brothers Nobel Shipyard, Russia. *Solem* is a river- sea-going vessel that will run on diesel-electric power.

The design of the vessel has been optimised so that the vessel's air draught allows it to sail under bridges on the Moscow River. The vessel is a triple deck type, with vertical stem and transom aft end, with a double-tier middle located deck-house, with

Solem, MEB's diesel-electric PV09 design



the wheel-house located fore, and the engine room located aft. A diesel-electric power unit and two fully turning rudder propellers and bow thrusters allow the vessel to be certified with the "Ice 20" ice category.

Movement and manoeuvrability of the vessel is provided by the two stern full-circle rudder propellers with double fixed-pitch propellers. There are two propulsion motors of 1,200kWt electrical capacity each; mechanical power on each drive shaft is 1,100kWt. The main power for the vessel is delivered by a diesel-electric unit, which consists of four main diesel-generators of 830kWt electrical capacity each; they serve the vessel's main electrical system.

"Diesel-electric propulsion (with rudder-propellers) allows the ships to manoeuvre effectively in small rivers (Oka, Moscow, Volkhov) and shallow waters of 1.4-1.8m with various speeds from 10 up to 25km/h. In addition, there is an opportunity to reduce noise and vibration levels in comparison to direct diesel-drive

"Portable tanks allow delivery of LNG fuel to a vessel by railway or road vehicles without the necessity of classical bunkering operations "

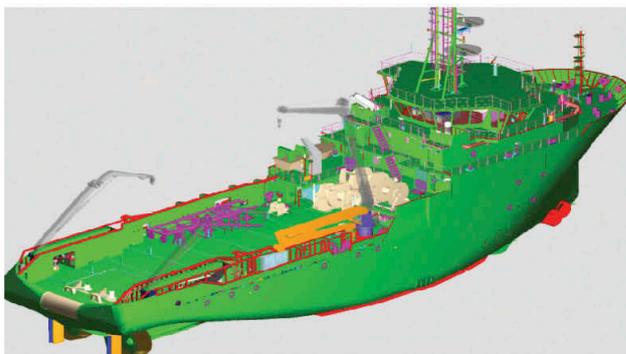
installations. And lastly, the consumer structure allows power to be redistributed effectively," explains Ilnitskiy about the development of the diesel-electric design.

To improve manoeuvrability of the vessel at low speeds, when the ship is passing through narrow waters and during mooring operations a bow thruster of the "screw in the pipe" type with a fixed-pitch

propeller with input capacity of 55kW will be fitted.

Further to this, MEB is looking into alternate fuels. "We have studied an LNG-fuel concept on the basis of tanker RST27 project," says Ilnitskiy. With reference to the RST27 project design two possible variants of cryogenic fuel tanks have been considered.

The first design looks at two Wärtsilä cryogenic tanks, LNG-Pak 308 type, fixed on deck with 277m³ LNG capacity each. "This variant ensures 20 days of fuel autonomy under all conditions that the main engines, boilers and diesel-generators work on LNG," explains Ilnitskiy. The second option looks at LNG in portable cryogenic Tank-Containers. "Portable tanks allow delivery of LNG fuel to a vessel by railway or road vehicles without the necessity of classical bunkering operations (only replacement of tanks). Four cryogenic Tank-Containers (40' standard) ensure five days of fuel autonomy (eight containers – 10 days)," he adds. *NA*



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Marine Design

3-4 September 2014, Coventry, UK



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).

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RMS QUEEN MARY 2: 2003 onwards

Eric C. Tupper

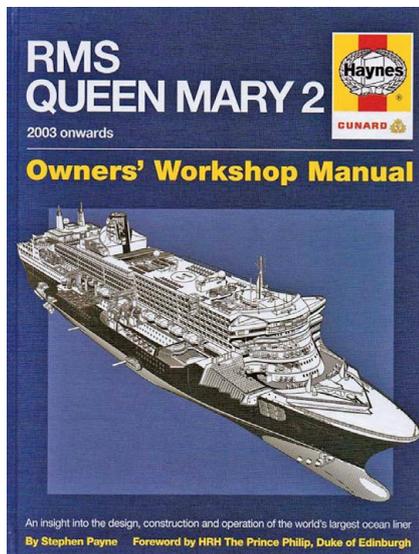
Owner's Workshop Manual

Written by Stephen Payne,
published by Haynes Publishing,
Yeovil, UK, as a hardback,
2014, 180 pp.
ISBN 978-0-85733-8-244, £21.99.

Stephen Payne is the principal naval architect of the Cunard Line and he is the designer of *Queen Mary 2*. One could summarise the book by saying that it is an account of two success stories. The first is that of a young lad who went on to fulfil his early ambition to design and build a superliner, who also became President of the RINA. The second success story is that of the ship itself, which is the most famous and fastest passenger ship in operation today.

This book marks the 10th anniversary of *Queen Mary 2* becoming Cunard's flagship on completion of her maiden transatlantic crossings in April 2004. It has a Foreword by HRH The Prince Philip, Duke of Edinburgh.

The Introduction explains the author's childhood fascination with ships and his writing to Blue Peter after they said that the *RMS Queen Elizabeth* would be the last of the line for superliners. Next the book summarises the history of Cunard and its North Atlantic liners, beginning with the paddle steamer *Britannia* in 1840 and going on to the *Queen Mary 2*. It is a roll call of illustrious names some of them holders of the coveted Blue Riband of the Atlantic – *Mauretania* held the Riband for 22 years. Over the period advances in naval architecture led to larger, faster, ships until Cunard could offer a weekly transatlantic service with a departure in each direction using only two ships rather than three. The *RMS Queen Mary* and *RMS Queen Elizabeth* will be remembered with affection by



those who sailed in them. Linked to the ships was the development of the port facilities in Southampton and New York. On board the *Queen Mary 2* is a "Heritage trail" depicting this history, highlighted by various mementoes and artefacts.

Four chapters deal with the story of the *Queen Mary 2* herself, designing an ocean liner, building the ship and her sea trials. The ship was built at *Chantiers de l'Atlantique Shipyard* in France. Although describing the particular case of *Queen Mary 2* the comments on design, model testing, build and trials are relevant to those activities for any ship. Naval architects will find them both interesting and informative. They are written in a clear way that a layman will understand. Indeed all will find the distinctions between a cruise ship and a liner most illuminating. It was this distinction which the author had to get across to the Cunard Board as it was so vital to the economic arguments for proceeding with the project.

Next a grand tour of the ship describes the layout, explaining why she was designed in this particular way. This tour shows vividly the myriad of things to be considered by a designer – some apparently minor, but

nevertheless important to the comfort of the passengers or to the safety and operation of the ship. Changes made since the original build are described. For the ship herself, her attributes read like a list of superlatives. They include:

- The ship is five times longer than the *Britannia* of 1840.
- *Queen Mary 2* is 22 feet longer than the original *Queen Mary* (1,109ft) and longer than 36 London buses.
- Its height is 237 feet from keel to top of funnel.
- In the course of 200 transatlantic crossings passengers consumed 8.4 million cups of tea, 644,000 eggs, 481,000 bottles of champagne and 960,000 litres of milk.

The author goes on to describe life onboard for both passengers and crew. Included is a typical voyage routine for a transatlantic crossing, setting out "events" for both and the dress code. Passenger events include the Captain's Cocktail reception and a Masked Ball. Many crew events are related to safety drills.

A final chapter is devoted to the "Power behind the Throne" giving a range of technical information – the power plant, stabilisers, the bridge and so on.

As is expected for books from the Haynes stable the book is very well illustrated with diagrams and photographs, including the customary cut-away drawing which is a double page spread.

The book contains a number of personal reminiscences which give the book a very human side. There was the "Bloody Mary Medal" presented to those in the shipyard who had made some notable contribution and the saga of the illuminated ship's name.

It makes for very good reading and can be recommended to both the technically minded and the layman. The only problem is that having read it you will wish you could make a trip in the ship herself – and why not? **NA**

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One-Day Seminar

16th September 2014, London



Following the success of the first Intellectual Property Rights (IPR) and the Small Craft Designer Seminar held in 2012, RINA will be holding a second Seminar on 16 Sep 2014, in London.

Intellectual Property Rights (IPR) are an increasingly important part of a company's value. As developed countries increasingly move to knowledge based economies, protection of IPR becomes both more difficult and more important for the small craft designer and builder, particularly in a more competitive market. In a global marketplace, international protection of IPR is complex and generally not well understood by the small craft designer and builder.

The one-day Seminar will provide designers and builders of small craft with an understanding of IPR law and the extent to which it protects inventions and designs. The seminar will consist of a number of sessions in which presentations on various aspects of IPR will be given by experts and practitioners, followed by discussion. The Seminar will also include case studies - examples of IPR battles won, lost or in progress. For more information visit:

www.rina.org.uk/IPR_Seminar_2014

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IMPROVING SHIP OPERATIONAL DESIGN Compiled By The Nautical Institute Ref: ISOD

This book has been prepared to assist with the feedback from the user and is based upon a survey of the Institute's membership and the solutions advocated by experienced practitioners. The book is essential reading for all those involved in the design process whether in a shipping company, independent design office or shipbuilder. Also sea staff will understand more fully their essential role in communicating with design staff, particularly when standing by a new building.

Price: UK £20.00 EUR £23.00 OVS £25.00
AMAZON PRICE: £26.25

LAMENTABLE INTELLIGENCE FROM THE ADMIRALTY

By Chris Thomas

HMS Vanguard sank in thick fog in Dublin Bay in September 1875 rammed by her sister ship. No lives were lost (except perhaps that of the Captain's dog) but this one event provides valuable insight into naval history of the late nineteenth century. Chris Thomas examines what happened, setting it in the context of naval life, the social and economic situation of officers and ratings. He describes the furore caused by the unjust verdict of the Court Martial, vividly illustrating the joys and trials of the seagoing life in the Victorian era, and the tragic effect on the life of Captain Richard Dawkins and his family.

Price: UK £9.00 EUR £10.00 OVS £12.00
AMAZON PRICE: £12.74

SD14: THE FULL STORY

John Lingwood

The SD14 is almost extinct, and this book is a fitting tribute to a much-admired British designed cargo

ship. Indeed, it should become the definitive history of the SD14 its derivatives. It provides a first-hand account of the SD14's conception and planning from a member of the design team, with many personal insights into the shipbuilding industry of the 1960s. Included are full career details of every SD14, the Prinasa-121s, the SD15 and the three SD18s: a total of 228 ships built wby seven yards in four countries. Every ship is illustrated, usually at several stages of its career, 99% in full colour.

Price: UK £16.00 EUR £17.50 OVS £19.00
AMAZON PRICE: £19.95

SHIPS AND SHIPBUILDERS: PIONEERS OF SHIP DESIGN AND CONSTRUCTION

By Fred Walker FRINA

Ships and Shipbuilders describes the lives and work of more than 120 great engineers, scientists, shipwrights and naval architects who shaped ship design and shipbuilding world wide. Told chronologically, such well-known names as Anthony Deane, Peter the Great, James Watt, and Isambard Kingdom Brunel share space with lesser known characters like the luckless Frederic Sauvage, a pioneer of screw propulsion who, unable to interest the French navy in his tests in the early 1830s, was bankrupted and landed in debtor's prison. With the inclusion of such names as Ben Lexcen, the Australian yacht designer who developed the controversial winged keel for the 1983 America's Cup, the story is brought right up to date.

Price UK £12.50 EUR £16 OVS £18
AMAZON PRICE: £21.25

SHIP KNOWLEDGE 6th Edition

By Klaas Van Dokkum

Ship Knowledge is the book that tells you all about

ships and shipping. The parts and systems which together form a modern ship are dealt with, from design drafts up to the finished construction, including paint systems and legal aspect. Detailed descriptions of the various subjects as well as the use of many drawings, cross-section drawings and pictures, all in full colour, make the book perfectly readable for everybody interested in shipping.

Price: UK £50.00 EUR £52.00 OVS £61.00
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THE ROYAL INSTITUTION OF NAVAL ARCHITECTS 1860-2010

Published to commemorate the 150th anniversary of the founding of the Institution, The Royal Institution of Naval Architects 1860-2010 provides a history of the Institution as reflected in the development of the naval architecture profession and the maritime industry over that time. In the book, members give their personal views on the development of their sector of the maritime industry and how it will develop in the future.

Price UK £5.50 EUR £6 OVS £7
NOT ON AMAZON

WAVES OF CHANGE

By John E Robinson

Waves of Change is the first in a new series of books commissioned by The Nautical Institute to explore Maritime Futures. In this remarkable book the author sets out to explain how innovative technologies, particularly information systems, are impacting on industrial practices.

Price: UK £14.50 EUR £15.50 OVS £16.50
AMAZON PRICE: £17.00

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Period	12 Months	24 Months	36 Months	Ref: J6
Inland:	£167	£290	£419	
Europe:	£175	£306	£436	
Overseas:	£187	£327	£470	

2014 SUBSCRIPTION

Period	12 Months	24 Months	36 Months	Ref: J7
Inland:	£127	£223	£318	
Europe:	£134	£233	£336	
Overseas:	£153	£267	£385	

2014 SUBSCRIPTION

Period	12 Months	24 Months	36 Months	Ref: J8
Inland:	£58	£103	£146	
Europe:	£64	£112	£163	
Overseas:	£72	£122	£178	

May 13-14, 2014

Digital Ship Korea, international conference, Busan, Korea.
www.thedigitalship.com

May 13-15, 2014

Europort Romania, international conference, Constanta, Romania.
www.europort.nl

May 13-16, 2014

Basic Drydock Training Course, course, London, UK.
www.rina.org.uk/basic-drydock-2014

May 19-20, 2014

Structural Response under Fire & Blast Loading, international conference, Glasgow, UK.
www.maritime-conferences.com/ASRANet

May 20-21, 2014

The UK Maritime Industries: Business Opportunity in the Drive for Exports, international conference, Bristol, UK.
www.maritimeindustries.org/Annual-Conference-2014

May 21-22, 2014

Design & Operation of Container Ships, international conference, London, UK.
www.rina.org.uk/containerhip2014

May 20-22, 2014

Navalia, international conference, Vigo, Spain.
www.navalia.es

May 21-23, 2014

Torsional Vibration Symposium, symposium, Salzburg, Austria.
www.torsional-vibration-symposium.com

June 2-4, 2014

Finite Element in Marine Structures, international conference, Glasgow, UK.
www.maritime-conferences.com/ASRANet

June 2-6, 2014

Posidonia, international conference, Athens, Greece.
www.posidonia-events.com

June 10-12, 2014

UDT, international conference, Liverpool, UK.
www.udt-global.com

June 10-12, 2014

Seawork, international conference, Southampton, UK.
www.seawork.com

June 16-18, 2014

Offshore Floating Structures Design, international conference, Glasgow, UK.
www.maritime-conferences.com/ASRANet

June 18-19, 2014

Warship 2014: Naval Submarines & UUVs, international conference, UK.
www.rina.org.uk/warship2014

June 23-24, 2014

Dynamic Positioning ASIA Conference & Exhibition, international conference, Singapore.
www.rina.org.uk/Dynamic_Positioning_Asia

July 31- Aug 4, 2014

Sydney International Boat Show, international conference, Sydney, Australia.
www.sydneyboatshow.com.au

August 12-14, 2014

Navalshore, international conference, Rio De Janeiro, Brazil.
www.ubmnavalshore.com.br

September 3-4, 2014

Marine Design, international conference, Coventry, UK.
www.rina.org.uk/marine-design2014

September 5-7, 2014

Indonesian Maritime Expo (IMP), international conference, Jakarta, Indonesia.
www.reedexpo.com/en/Events/3194/Indonesia-Maritime-Expo

September 9-12, 2014

SMM, international conference, Hamburg, Germany.
www.smm-hamburg.com

September 11-12, 2014

IMPA, international conference, London, UK.
www.impalondon.com

September 12-21, 2014

Southampton Boat Show, international conference, Southampton, UK.

www.southamptonboatshow.com/2013/home.aspx

September 16, 2014

Intellectual Property Rights Seminar 2014, seminar, London, UK.
www.rina.org.uk/IPR_Seminar_2014.html

September 16-18, 2014

Seatrade Med, international conference, Barcelona, Spain.
www.cruiseshippingevents.com

September 16-18, 2014

IBEX, international conference, Kentucky, USA.
www.ibexshow.com

September 24-25, 2014

Influence of EEDI on Ship Design, international conference, London, UK.
www.rina.org.uk/ship_eedi

September 25-27, 2014

Icelandic Fisheries Exhibition & Awards, international conference, Kópavogur, Iceland.
www.icefish.is

September 28-30, 2014

Seatrade Offshore Marine & Workboats Middle East, international conference, Dubai, UAE.
www.seatrade-middleeast.com

October 1-2, 2014

Ship Efficiency: The Event, international conference, London, UK
www.fathomshippingevents.com

October 7-9, 2014

Contract Management for Ship Construction, repair & design course, course, London, UK.
www.rina.org.uk/contract-management-oct2014

October 15-17, 2014

HSMV 2014, international conference, Naples, Italy.
www.rina.org.uk/HSMV_2014

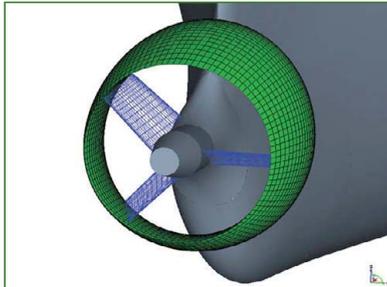
October 21-24, 2014

Shiptec China, international conference, Dalian, China.
www.shiptec.com.cn



Influence of EEDI on Ship Design

24-25 September 2014, London, UK



Second Announcement

The reduction of CO₂ 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 CO₂ 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 has invited papers from naval architects, class societies, regulators, operators, and researchers on all related topics, including:

- Hull efficiency
- Propulsion efficiency
- Vessel Operation
- Economic impact
- Limitations
- Future regulatory amendments

Selected Papers may be published in the Transactions of the Royal Institution of Naval Architects

www.rina.org.uk/ship_eeedi

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