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Editor Hugh O'Mahony
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Design/Production Manager Sandy Defraine
Group Sales Director John Payten
Advertisement Production Manager Stephen Bell
Marketing Manager Adelaide Proctor
Publisher Mark J Staunton-Lambert

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The Royal Institution of Naval Architects
Editorial & Advertisement Office:
10 Upper Belgrave Street
London SW1X 8BQ, UK
Telephone: +44 (0) 20 7235 4622
Telefax: +44 (0) 20 7245 6959
E-mail editorial editorial@rina.org.uk
E-mail advertising advertising@rina.org.uk
E-mail production production@rina.org.uk
E-mail subscriptions subscriptions@rina.org.uk

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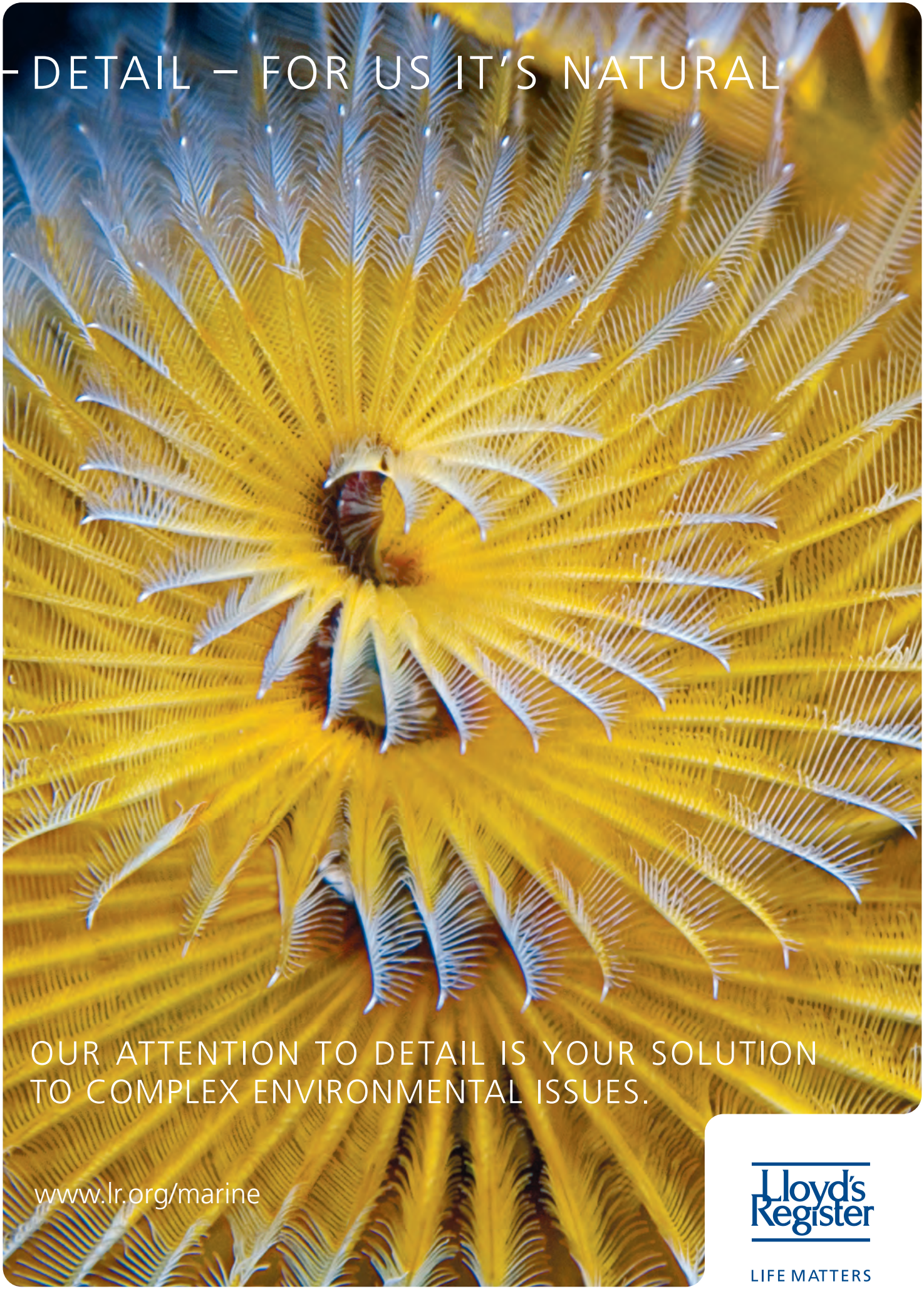
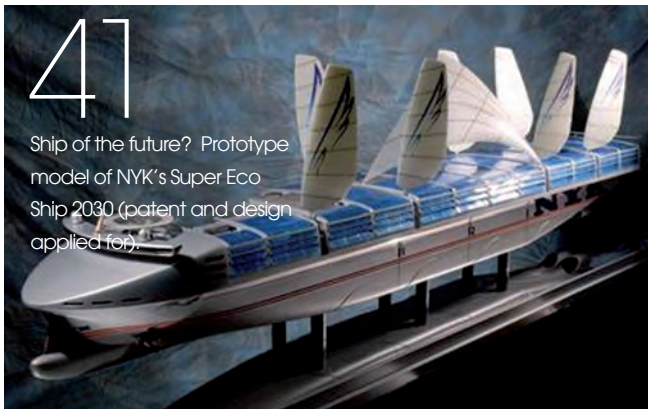


Lloyd's Register

LIFE MATTERS

Christmas tree worm, Caribbean Sea. The detailed spirals are the ocean worm's highly-developed respiratory structures.

39-82 Features



41 Ship of the future? Prototype model of NYK's Super Eco Ship 2030 (patent and design applied for).

52 New generation multi-purpose heavy-lift ship being built for Columbia Shipmanagement.

On-line Edition

The Royal Institution of Naval Architects is proud to announce that as of January this year, *The Naval Architect* journal has gone digital. We are very pleased to inform the maritime industry that each issue will be published online, on the RINA website. Visit www.rina.org.uk/tna and click on the issue cover you wish to view. This means that the entire publication, including all editorials and advertisements in the printed edition, can be seen in digital format and viewed by members, subscribers, and (for a limited time) any other interested individuals worldwide.

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A Class apart

Regulators may talk of continuous improvement in the regulatory environment, but Richard Sadler says the situation is, in fact, "deteriorating".

With class under investigation by Europe's Competition Directorate at the same time as individual societies face weakened influence by virtue of the EC Directive on common rules and standards for ship inspection and survey organisations, now would seem an unlikely time for leading classification societies to be talking about widening their roles.

However, Lloyd's Register chief executive, Richard Sadler had some pithy, if subtle remarks for regulators on just this subject in his address to Intertanko's recent Tokyo meeting on the future role of classification in the shipping industry.

Few could take issue with the early part of his speech, as Mr Sadler put the role of class into context. "Simply put, real class societies must consistently offer today's technical service requirements while always keeping an eye on developing the requirements of the future," he said..

"We may be technicians, but our first responsibility is to society. We fulfil that by setting the technical standards and verification regimes that reduce risk. And that risk-management service is continuously improved by feeding the findings of our life-cycle inspections back into new, improved regulations. Those findings contribute to a continuous improvement in the way we interact with the environment, while also improving the economics and the social conditions of our industry."

However, as the speech developed, it became clear that Mr Sadler believes the role of class needs to be significantly expanded.

"As the leader of Lloyds Register, I often wonder if we have the balance right to meet our mission statement," he said. "As some of you in the audience know, I have been very open in my views on the state of the shipping regulatory environment. I do not believe it is continuously improving. I believe it is deteriorating: deteriorating in its duplication, in its complexity and in the lack of recognition of technology and design advancements.

"Are Classification societies concentrating on the right areas to assist in continuous improvement of shipping regulation? If the majority of accidents are caused not by technical failures, but by human and management failures, then our focus should reflect that, proportionately. Certainly, our roles in auditing ISM compliance and in understanding the requirements of the forthcoming ILO Convention demonstrate the breadth of our capabilities.

"But with our Human-Element work, we intend to go far beyond our technical role and the role we play to ensure the implementation of regulation. We intend to significantly enhance maritime safety by focusing on the contribution people make to improve performance

"This is an example of the proactive capability of class and its contribution to the industry. We have many stakeholders to consult to ensure that our contribution to continuous improvement remains appropriate."

Shipowners, shipbuilders, government regulators, charterers and ultimately, the public, (even though many do not realise it) relied on class, Mr Sadler said, although their demands may vary in the pursuit of continuous improvement. "They all have a different, long-term interest in the balance between economic, environmental and social improvement. Yet these differences must be overcome, if we are to avoid replacing an environment of continuous improvement with one of growing complexity, and a confused culture."

Class had historically been about prescriptive rules; but this had certainly changed, Mr Sadler said. "We are now able to help with political issues, management systems and ergonomics as much as technical issues. All of which continue to have room for improvement.

"The boom and bust cycles we live through are exciting and, for many, provide the spice in shipping. There has been a definite improvement in the economics of shipping in the last few years – but how much of that finance has been reinvested in the continuous improvement of the environment and social systems? Probably, not enough."

As further food for thought, Mr Sadler left his audience with two quotes. The first, from Tom Peters, runs: "Excellent firms don't believe in excellence, only in constant improvement and constant change."

The second, he said, was particularly relevant to the regulators: "I am opposed to the laying down of regulation lest the improvement of progress tomorrow is shackled by the mistakes of today." *NA*

Safety

Ahead of floodable curve

The RINA Safety Committee has judged the papers submitted to the annual ship safety competition that invites industry and academia for proposals to improve the safety of ships, seafarers, passengers and the environment.

This year's winning entry in the Industry Category was awarded to Burness Corlett -Three Quays Ltd. for the paper: A Floodable Length Surfaces (FLS) Tool – for ship subdivision design. The award was accepted by author Daria Cabaj, consultant naval architect, Burness Corlett-Three Quays.

It noted that marine accidents, such as the *Titanic, Herald of Free Enterprise* and *Estonia*, have underlined the importance of subdivision and the vulnerability of safety critical ships. However, these risks can be significantly reduced if a ship is designed with an adequate level of subdivision.

Traditional floodable length curves have served the naval architecture profession for nearly a century. However, with the introduction of IMO's new harmonised probabilistic regulation in 2009, the traditional approach has become officially out-of-date. Although the new regulations are comprehensive, they do not provide guidance for the preliminary design stage and the optimal subdivision is hidden in the attained index A. The designer faces a difficult decision: He/she must either rely upon intuition or use extremely inefficient-minor damage indication for placing the bulkheads.

The consequent need for a direct method providing a quick and straightforward assessment of subdivision has led to the development of a design tool - Floodable Length Surfaces (FLS). The FLS software tool aims to support design of ship subdivision in a direct manner by establishing the optimum number/position of bulkheads in order to achieve the maximum level of survivability. This achieved by maximising the attained index A to give a better protection in case of flooding.

The use of the FLS tool is totally transparent and allows the naval architect to understand the implications of adding, deleting or moving transverse and longitudinal bulkheads. The philosophy embedded in FLS software has the potential to become a major tool in the advancement of naval architecture and ship design. It is the only existing method which, is compatible with the probabilistic regulations and allows a direct approach for the design of ship subdivision.

The judges commented: "A well thought out and interesting concept, ready to become a commercial software product. The FLS software gives the future designer extra capability of achieving optimum bulkhead positions at the conceptual stage without expensive changes down-stream in the design."

Daria Cabaj receiving her award from Stephen Payne, RINA president (left) with (right) Alan Gavin, marine director, Lloyd's Register.

Whilst a commercial prototype is under development, the new FLS tool is being used internally by Burness Corlett Three Quays, and a major naval architecture software provider has expressed an interest in the distribution of the product.

The winning entry in the Academic Category was awarded to Tristan Smith and Kevin Drake, Dept. Mechanical Engineering, UCL, for their paper 'Validated tools for the analysis of structural loading on a damaged ship'.

Environment

Green car carrying

The 8000 car capacity pure car and truck carrier *Tijuca*, named in Melbourne in May, is imbued with a number of 'green' credentials worthy of note.

The new Wallenius Wilhelmsen Logistics ship, built at Daewoo Shipbuilding and Marine Engineering, is being billed as a ship that can reduce CO_2 emissions by 15% per transported unit, as well as reducing emissions of SOx and particulate matters. She also has a very low NOx emission engine that

Tijuca.

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is able to use bunkers with as low as 1% of sulphur content. This dramatically improves her performance, reducing NOx emissions 35% below current international regulations.

In addition, the new vessel has a number of built-in measures that will help WWL reach its ambitious environmental targets for 2009 and beyond. They include a state-of-the-art ballast water treatment system, using biodegradable oil in all hydraulic systems, and using a Marinfloc Bilge Water Flocculant Plant system which exceeds current international regulations.

Cruiseships

TUI converted

Mein Schiff (My Ship), the first ship in the new TUI Cruises fleet, was named on 11 May Hamburg, Germany, in a celebration that marked a significant step for the joint venture between Royal Caribbean Cruises Ltd and TUI AG.

The new brand is designed to serve the Germany cruise market, where some 906,000 Germans took cruises in 2008, and where that number is forecast to increase by 11% in 2009.

Following a short inaugural cruise, *Mein Schiff* will sail in the Baltic for the 2009 summer season (May through October). She will offer two- to 14-night sailings from ports such as Kiel and Hamburg, Germany, and Palma de Mallorca, Spain. The ship then will reposition to the Caribbean for winter (November 2009 through April 2010), home-porting in Santo Domingo, Dominican Republic.

The 1914-guest *Mein Schiff* was formerly Celebrity Cruises' *Celebrity Galaxy*. The ship left the Celebrity fleet on 16 March, 2009, in San Juan, Puerto Rico. Her transformation began during her crossing from the Caribbean to Europe and was completed in 38 days.

Design

Non-shipshape from ABS

Class society ABS has provided its basic design approval for Petrobras' Mono-Column Floater, Production, Storage and Offloading Unit (MPSO) intended for ultra deepwater operation in the Gulf of Mexico (GOM). The approval is said to be significant as it consolidates the MPSO design concept as one viable option for the next phase of the Cascade Chinook field.

The MPSO is a short cylindrical mono-column floater that is also being considered for sites offshore Brazil.

The MPSO concept is a non ship-shaped floating production storage and offloading facility (FPSO) that breaks with the tradition of converting existing tankers into FPSOs. It is a short cylindrical mono-column floater being considered for sites offshore Brazil as well as the Gulf of Mexico.

"A round FPSO design was unheard of ten years ago," said Luiz Feijo, ABS project manager for the MPSO. "Today we are not surprised by the designs being put forward for classification review. If we are not able to review a design to prescriptive rules then we take a risk-based approach for determining criteria," he added.

For example, the MPSO has some characteristics of a Spar but a much shallower draft. The design is such that it minimises heave and pitch making it more suitable for the application of steel catenary risers (SCRs). With water depths pushing the 10,000ft mark in some field developments, industry has voiced some concern with the possibility of riser fatigue caused by the motions of the FPSO assigned to the field.

Mr Feijo says this new Petrobras hull design is intended to reduce heave thus lessening the fatigue on the SCRs.

The MPSO was designed to be permanently moored to the seabed, remaining on station for its operational life. This presents a major advantage over the traditional ship-shaped FPSO which would require a disconnectable turret due to the environmental characteristics of the Gulf of Mexico.

The MPSO was assessed by ABS for its hull strength by evaluating load components, conducting fatigue assessments and reviewing the global motions and stability reports. ABS also conducted a Hazards Identification Study (HAZID) to identify possible safety issues associated with the offloading system. Mr Feijo says the intent is for offloading to be carried out using dynamic positioning (DP) class 2 shuttle tankers. ABS provided its approval of the DP system on the shuttle tanker design as well.

Environment

USCG can see clearly now

PSM ClearView Overboard Discharge Monitoring Equipment is reckoned to be the first USCG-accepted remote watchdog to be installed on a vessel in mitigation of offences under Marpol 73/78 marine pollution.

With many ships illegally discharging waste oil, 18 countries including US, Japan are signing up to the Paris Memorandum of Understanding (MOU) to onerously enforce Marpol pollution regulations.

Generally the current level of overboard discharge monitoring equipment focuses only on the oil content (PPM) and status of the discharge valve and does not therefore prevent the willful bypassing of the oily water separator system or "Magic Pipe" syndrome, as it has become known.

This practice has led to penalties for first time offenders that include custodial sentencing of senior officers and fines of many millions of dollars. Violation of MARPOL I alone has accounted for 17 years of

incarceration of senior shipboard officers, engineers and the responsible shore-side managers, plus, over $200 million of corporate fines since 1998. Avoidance of detection is not an option. Satellite photography and spectrographics easily spots offenders and the summons can be issued before the vessel docks in port. USCG in particular hasdeclared that proceedings will commence even based upon suspicion of an event taking place, or where the Oil Record Book (ORB) appears to have been falsified. Ships and operators will need to have clear proof of innocence. Clearview monitors and compares a range of parameters that can include status of all bilge wells, bilge holding tanks, sludge / sludge separator tanks, dirty oil tanks, uncinerator status and operation, as well as the normal PPM value and valve status. PSM argues that unless all interrelated functions are compared in this way it will always be possible to bypass the system.

Shipbuilding

Agnetha debut

Nordic Seaarland Tankers BV has named two new 37,500dwt product/chemical tankers building at South Korea's Hyundai Mipo yard. *Nordic Agnetha* was delivered on 8 May 2009, while *Amy* will be delivered in July.

Both vessels will be managed by Netherlands-based Seaarland Shipping Management, and will be entered into the Handytankers pool.

The two vessels bring the fleet of the Nordic Seaarland joint venture to five modern product/chemical carriers.

Business

Delta tango

Deltamarin Ltd and Deltamarin Contracting Ltd, both subsidiaries of Delta-Sigma Ltd, are being merged into the holding company. Delta-Sigma Ltd will change its name to Deltamarin Ltd.

All operations continue under Deltamarin Ltd. The assets, loans, projects and personnel of the holding company Delta-Sigma Ltd and the subsidiaries Deltamarin Ltd and Deltamarin Contracting Ltd will be transferred to Deltamarin Ltd without liquidation. Also all the responsibilities of these companies will be taken care of by Deltamarin Ltd.

Mika Laurilehto will continue as managing director of Deltamarin Ltd. The managing director of Deltamarin Contracting Ltd, Jarmo Tuhkanen will act as the director of administration for Deltamarin Ltd.

Shipbuilding

Baltic Queen sails in

STX Europe has delivered *Baltic Queen*, the latest cruise ferry built for passenger and cargo shipping company AS Tallink Grupp.

Built at the Rauma yard, the vessel is the sixth of Tallink's ro-pax series to have been delivered. The 212m long, 29m wide cruise ferry has a capacity of 2800 passengers and 1130 lane metres for vehicles, and will replace *Romantika* on the Stockholm–Tallin route. As with her sistership *Baltic Princess*, delivered last year, *Baltic Queen* will be one of the largest cruise ferries in the Baltic. In addition to the five cruise ferries, the Tallink ro-pax series also includes the fast ferry Star, which entered into service in 2007.

Baltic Queen **is delivered.**

CAD/CAM

Napa opens subsidiary in Korea

Finnish-based software company Napa Group has established a subsidiary company, Napa Korea Ltd, in Busan, South Korea. The purpose is to strengthen Napa's local services to the Korean market. Young-Woon Jang will continue to head operations in Korea, now as managing director of the locally registered company.

The newly established company focuses on local services for NAPA and Onboard-NAPA users. Sales and marketing will be handled together with Napa's staff in Helsinki.

Contact Napa Ltd, PO Box 470, Helsinki FI-00181, Finland.
Tel +358 9 22 813 1
Mobile +358 40 8228 793
Fax +358 9 22 813 600
www.napa.fi

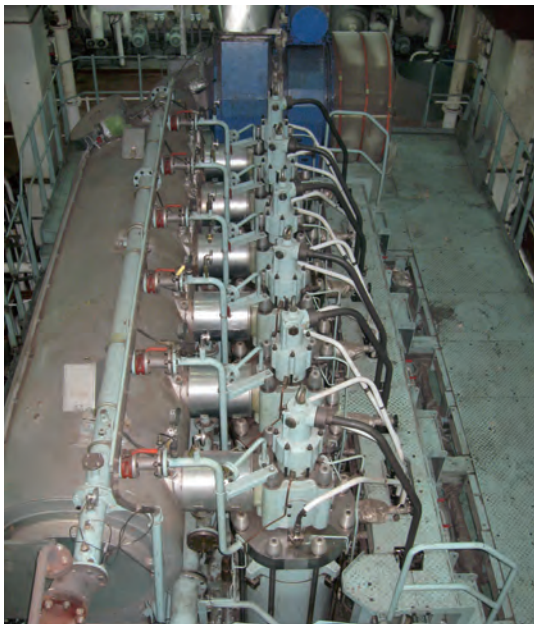
Propulsion

MAN has standards

MAN Diesel has announced that its first S40ME-B electronic engine has entered service. Yielding 6810kW at 146revs/min and a mean effected pressure (mep) of 21bar, the engine was built by STX in South Korea and is one of six ordered by Intership Navigation, Cyprus to power a series of vessels.

The ME-B engine is the main engine aboard *Pacific Adventure*, a multi-purpose vessel built at Huanghai shipyard in China, which recently passed sea-trials. The new engine has an increased maximum cylinder pressure, giving rise to an improved fuel consumption that is 2g/kWh lower than existing, small-bore engines. The ME-B design utilises a camshaft-operated exhaust valve and an electronically controlled fuel-injection system. The electronic control of the engine's parameters will allow the ME-B to meet the new Tier-II emission requirements.

The S40ME-B engine was produced at STX Heavy Industries at its Changwon works in South Korea.



The MAN B&W S40ME-B prime mover pictured aboard the *Pacific Adventurer*. *Pacific Adventure* is a 25,000dwt multi-purpose vessel operated by Intership Navigation and registered in Limassol, Cyprus listed on the DAX share index of the 30 leading companies in Germany.

Contact MAN Diesel, Teglholmsgade 41, DK-2450 Copenhagen SV, Denmark.
Tel +45 3385 1100
Fax +45 3385 1030
E-mail mandiesel-cph@mandiesel.com
www.mandiesel.com

Propulsion

Wärtsilä cuts power…

Wärtsilä Corp has responded to the weakened global marine market situation with proposed job cuts. Negotiations will affect all of Wärtsilä Ship Power's personnel in all functions globally. The number of staff the group seeks to cut is between 400 and 450, of which approximately 80 are in Finland.

Wärtsilä said it was looking for annual savings of approximately €30 million. The effect of the savings would start to materialise gradually from the second part of 2009, and would take full effect by the end of 2010.

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"The situation in the shipping industry has changed dramatically during the past six months, and we have taken all possible measures to avoid job cuts," said Jaakko Eskola, group vice president, Ship Power.

"As the market outlook continues to be very challenging, we must find cost-saving measures that ensure the Ship Power organisation's ability to maintain its competitiveness and efficiency, while at the same time, not jeopardising customer commitments."

In the period January-April 2009, the order intake of Ship Power plunged to €135 million, a drop of 86% compared to the corresponding period a year earlier. There is overcapacity in all major vessel segments. In addition to lowered demand, there are risks related to delivery of existing orders as well as order postponements. Wärtsilä said it saw a potential risk of Ship Power order cancellations amounting to approximately €1 billion. During the period January-April 2009, cancellations of €75 million materialised and were deducted from the order book.

Propulsion

…renews in Croatia

Wärtsilä Corp and 3. Maj Shipbuilding Industry Ltd of Croatia have signed a 10-year renewal of the existing licence agreement for the marketing, sale, manufacturing and servicing of Wärtsilä low-speed marine diesel engines. The low-speed engine business of 3. Maj is handled by 3. Maj Engines & Cranes Joint Stock Company in Rijeka, Croatia.

The licence agreement will see the continuous transfer of diesel engine technology and technical assistance for manufacturing from Wärtsilä to 3. Maj. In addition to sales to the domestic Croatian market, the agreement also secures access to key export markets in Europe and North America.

3. Maj has focused in recent years on building engines in the 480mm to 720mm bore range. In 2009, 3. Maj will deliver 14 engines of the Wärtsilä RTA48T-B and RT-flex50 types.

Contact Wärtsilä Corporation, John Stenbergin ranta 2, P.O. Box 196, FI-00531 Helsinki, Finland.
Tel +358 10 709 0000
Fax +358 10 709 5700
www.wartsila.com

Ancillary equipment

Hughes upgrade's QM2

Kelvin Hughes has installed navigational upgrades onboard *Queen Mary 2*, in the process installing the largest number of screens supplied for a single vessel in its history.

The *Queen Mary 2* (*QM2*) now utilises 14 MantaDigital displays. Kelvin Hughes replaced each of the 10 navigation displays formerly used onboard and added extra screens to meet additional operational requirements, which had come to light since the ocean liner entered service in January 2004.

One of the two magnetron-based S-band transceiver's has been replaced with Kelvin Hughes latest SharpEye solid state unit, together with MantaDigital, which will allow the *Queen Mary 2's* bridge team to view radar, electronic charting or the KH HAP (Harbour & Approach Pilotage) information on three primary bridge consoles and at a number of remote workstations.

Kelvin Hughes has also added a bow docking radar that will provides better close range target detection when entering harbour. The vessel now has a total of six independent radars.

Original navigation processors have been upgraded to the new MantaDigital common-core system. The radar offers a dual-PPI facility that enables two radar screens to be displayed overlaid with vector chart information and meets the latest Chart-Radar performance standards.

Contact Kelvin Hughes Limited, New North Road, Hainault, Ilford, Essex IG6 2UR, UK.
Tel +44 20 8502 6887
Fax +44 20 8500 0837
E-mail marketing@kelvinhughes.co.uk
www.kelvinhughes.info

Ancillary equipment

Comfort from Noise

Noise Control Engineering (NCE) Inc., Billerica, MA, has received external specialist certification in Ambient Environmental Testing from class society ABS.

NCE claimed to be the only company in North America and only one of four companies in the world to acquire such a certification, which includes measurements of noise, vibration, lighting, temperature and relative humidity.

NCE was required to develop detailed procedures for testing the parameters listed above, along with a quality assurance plan and instrument calibration procedures. However, a more rigorous methodology and process was put in place for ABS.

The certification allows NCE to conduct testing to ABS standards: "Guide for Crew Habitability on Ships", "Guide for Crew Habitability on Offshore Installation",

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Tel +1 978 670 5339
Fax +1 978 667 7047
www.noise-control.com

Ancillary equipment

Allweiler keeps it clean

Allweiler AG has added a new opto-electronic module for clean and secure operation to its range of screw pumps.

The opto-electronic system immediately detects any liquid that may escape around the mechanical seal and will trigger electronic signals that may be integrated into a centralised control system, and forwarded to a monitoring station, or produce a visual or acoustic alarm. Depending on the specific installation, the leaking pump may be switched off automatically and operation simultaneously switched over to a reserve unit.

"ALLSEAL" will provide safety against uncontrolled leaks and detects wear of the mechanical seal as soon as it begins. The solution is available on Allweiler's vertically installed screw pumps and eliminates unacceptable leakage in the engine room. Furthermore, it will eliminate unpleasant surprises caused by sudden or gradual leaks and minimises the risk of unexpected failure, resulting in costly interruptions.

Latest development, "ALLFUEL" will see reduced operational costs of screw pumps and ensure high system reliability. The latest generation of three-screw pumps, is suited for use as a fuel transfer and injection pump. Available as a single pump or twin unit, it has very low space requirements and is easy to integrate into onboard installations. A filter with a large surface area improves reliability and extends the service life of the pump. The vertical filter has a unique "inside-out" flow to keep particles inside the filter. The filter itself can be quickly replaced without the inconvenience of draining and refilling the pump.

Adding to the package will be the "ALLREADY Box" which, will continuously monitor a pump's condition and will improve the safety and efficiency of processes.

Contact Allweiler AG, Allweilerstr. 1, 78315 Radolfzell, Germany
Tel +49 7732 86 343
Fax +49 7732 86 854
E-mail e.braun@allweiler.de
www.allweiler.de

Ancillary equipment

Beyond compliance with Victor

Victor Marine reports that owners and operators are being persuaded to go beyond regulatory compliance in applying bilge oily water separator technology to existing vessels.

Victor Marine says that, since 2005, it has supplied over 300 of its latest generation range of separators that meet the provisions of IMO MEPC 107(49) rules.

"Although most of these units have been fitted to new vessels since the rules only currently apply to new vessels and re-installation vessels, there is a considerable amount of interest from shipowners and ship-operators to upgrade their current systems," Victor Marine said. "With the recent media coverage of shipowners/operators penalised and fined for non-compliance to MARPOL regulations, they have placed extra importance and attention to these systems."

Victor Marine said that the problem with bilge water today is that bilges do not only contain a mixture of oil and water but a cocktail of ingredients including cleaning agents, solids and bacteria which produces an emulsified mixture. Victor Marine is now offering two types of OWS designed to treat "more realistic" bilge water. Its VM MiniSep Series was developed for the optimal efficiency and maximum usage of consumable items, while the CS MiniSep Series was developed to be compact for the retrofit and small vessel market. Both use a three stage treatment process, with each stage treating a different type of oil.

Victor Marine has developed a unique clay-based adsorption process called Advanced Granular Media (AGM) filtration, which removes emulsified oil and grease, low solubility organic compounds, heavy metals and carbon. The primary ingredient in this media is a montmorillonite, which has been chemically modified to exhibit a strong affinity for organic compounds while being completely hydrophobic. Bilge water is passed through this adsorptive media in much the same way as activated carbon but with the special platelet structure of the organophilic clay used the adsorption ability is raised to over 60% compared to 5%-10% for activated carbon.

Victor Marine's systems come in capacities of 0.25m^3/hr to 5.0 m^3/hr with separation of below 15ppm achieved. During the IMO test conditions. Its VM Series units achieved below 1ppm results, whilst the CS Series achieved below 5ppm consistently throughout.

Contact Victor Marine Limited, Arisdale Avenue, South Ockendon, Essex, RM15 5DP, United Kingdom
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The rise of the 'neo-Panamax'

A lesson from history provided a starting point for a joint ABS/Herbert Engineering Corp study to design a shallow-draught, high capacity containership suitable for the Atlantic trade and able to navigate the upgraded Panama Canal locks.

The late 1970s and early 1980s – like the mid-2000s – was an era of rapidly rising oil prices, leading many in the shipping industry to conclude that the era of high-speed containerships would founder on cost disadvantage.

Among them was Malcom Maclean, founder of Sea-Land Service and pioneer of the container shipping industry. After selling Sea-Land in the early 1970s, he saw rising fuel oil prices as a fresh opportunity for innovation, purchasing US Lines with a plan to reshape it into a low cost, highly fuel-efficient operator.

This he thought, would give him a clear market advantage while enabling him to control fuel costs and generate greater profitability than his competitors. To this end, US Lines ordered 12 of the largest containerships of the time – the Econ Jumbo class – from South Korea's Daewoo Okpo yard.

The ships were designed to achieve maximum capacity within Panamax constraints, with a design speed of 19knots on 9m design draught and 18knots at 11.68m load line draught, relatively slow then, as now, for ships of this size.

In order to maximise deadweight and container capacity, and considering their slow speed, the vessels had a relatively high block coefficient (Cb) of about 0.78 with a hull form similar to a bulk carrier. They had a volumetric capacity of 4614TEU with a five-high on-deck profile, several hundred TEU more than comparable Panamax vessels.

Mr MacLean also believed that an eastbound around-the-world service would provide shippers with low cost, competitive rates on all the major trade routes between the economic hubs of the US, Europe and East Asia – a plan that assumed sustained high oil prices for its success.

Sealand Pride – one of the converted AVC/SL31s.

By the time the vessels were delivered in the mid 1980s, the severe economic downturn and a precipitous drop in the oil price eliminated their cost advantage over higher speed vessels. Instead, shippers judged the ships slow and inefficient with freight rates similar to their faster competitors.

Mr Maclean's around the world concept had too many legs, insufficient cargo and great difficulty in balancing container flows with many empties transported. US Lines tried cutting rates to attract customers, but increased volume failed to offset the lower revenue per container and the company went bankrupt about

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# Wide on Deck	16
# Wide in Holds	14
# 40ft Bays	16
LOA (m)	269.1
LBP (m)	255.1
Beam (m)	39.8
Depth (m) [8 high in holds]	21.7
Depth (m) [9 high in holds]	24.3
Design Draft (m)	11.5
Scantling Draft (m)	13.0

ABS/HEC neo-panamax vessel design - principal dimensions.

Block Coefficient	0.55	0.60	0.62	0.65	0.70	0.75	0.80
Service Speed	27.8	25.8	25.0	23.8	21.8	19.8	17.8
Slot Capacity (TEUs)	5,234	5,350	5,397	5,464	5,568	5,674	5,773
Lightship (tonnes)	14,623	14,818	14,892	15,000	15,170	15,329	15,481
Main Engine MCR (MW)	71.6	58.7	53.1	45.8	36.4	27.5	20.5
Construction Cost ($ millions)	107.2	100.3	97.2	93.1	87.7	82.3	78.0
Loadable TEUs @ 9.0t	4,632	4,700	4,748	4,816	4,922	5,030	5,106
Loaded Draft (with 9.0t/TEU)	12.6	11.7	11.3	10.8	10.1	9.4	8.8
Cb at Loaded Draft	0.57	0.60	0.62	0.64	0.68	0.73	0.78

Design Data (39.8 m Beam – 14 wide in hold – 16 wide on deck – 8-high in holds).

Block Coefficient	0.55	0.60	0.62	0.65	0.70	0.75	0.80
Design Service Speed	27.8	25.8	25.0	23.8	21.8	19.8	17.8
Voyage Speed	25.8	23.8	23.0	21.8	19.8	17.8	15.8
Req'd Freight Rate (US$/TEU)	$442	$380	$359	$336	$306	$281	$268

Required Freight Rate (US$ per TEU moved) (39.8 m Beam – 14 wide in hold – 16 wide on deck – 8 high in holds).

two years after the Econ Jumbo ships entered service.

After a year in lay-up, the ships were bought at a deep discount by Sea-Land Service and ultimately ran on the Atlantic in a vessel sharing agreement with P&O Lines, Nedlloyd and OOCL as Atlantic Class Vessels (AVC). This arrangement operated profitably for over 10 years until the end of 1999 when Sea-Land was acquired by Maersk Line. Maersk's size and volume requirements meant it has been able to solely operate the vessels since then, keeping them in the transatlantic service with some also running to the Middle East.

This lesson from history was a useful starting point when classification society ABS and naval architects Herbert Engineering Corp jointly studied design options for a shallow-draught, high capacity containership suitable for the Atlantic trade and able to navigate the upgraded Panama Canal locks.

A first phase study concluded that the desire to increase the capacity of 32.2m beam vessels by increasing depth and length led to relatively inefficient designs. A recent addendum suggested that instead, use of a higher Cb would deliver considerable fuel savings and CO_2 emission reductions while also lowering the slot charter rate required for profitability.

The research evaluated a range of block coefficients for a vessel with a 39.8m beam and 11.5m draught, capable of carrying 16 rows of containers on deck and 14 rows in the hold. It concluded that a 6176TEU vessel with a high 0.80 block coefficient and a 17.8knot service speed could realise a 25% reduction in required freight rate compared to a vessel of 5617TEU 0.62 Cb and a service speed of 25knots.

The required freight rate used in the calculations is computed by dividing total voyage expenses by the number of TEU moved. It assumes 100% ship utilisation both eastbound and westbound and therefore, the number of TEU moved for the roundtrip is taken as twice the loadable TEU. Actual utilisation will be less, depending on various factors such as the service, shipping company philosophy, seasonality and market conditions.

The high Cb design would be cheaper to build than its faster counterpart thanks to a smaller main engine and reduced machinery costs. Reduced fuel oil storage would mean more space could be given over to under-deck slot capacity. A ship with a Cb of 0.80 and a service speed of 17.8knots would consume 55% less fuel in terms of tonnes per TEU than the finer-formed vessel, providing very significant reductions in greenhouse gas emissions.

With the dimensions of the Panama Canal set to grow, ABS considered it important to identify the next generation of ships that might emerge for specific trade lanes – ships that will have to operate within ever tougher constraints on environmental impact and probably pay an additional carbon penalty.

The ABS-HEC 'neo-Panamax' ship design would not be suitable for every trade lane, but slower speed and shallow draught would make its high Cb ideal for high volume transatlantic operations. But the study also concluded that despite the improvement in earning power offered by the fuller, slower ship, emitted carbon will probably be less a factor in ship design than fuel prices.

Assuming $25 per tonne of carbon against a baseline of $500 per tonne of heavy fuel oil and $900 for MGO, it calculated a carbon cost per tonne of $77.85 and $80.15, or 16% and 9% of their respective prices. Though a CO_2 levy could involve paying substantial sums, it will have a relatively small impact on basic hull parameters: the fuel price still dominates and it will likely be the more significant factor in determining future ship speeds and hull designs.

The main lesson to be drawn from the experience with operating slow speed, high block coefficient containerships like the Econ Jumbo vessels, is that they offer economic advantage under the right circumstances. They require a significant premium for low fuel consumption and the ability to differentiate from other, faster vessels, working at lower freight rates or offering some perceived 'green' advantage and no significant competitive advantage to shippers for faster transit times.

One of the reasons the Econ Jumbo worked in the Atlantic was that the shorter crossing distance made the slower speed of the vessel less apparent to the shipper: the difference in transit time was only about one day, less significant in the normal two to three week door-to-door transit times for containers in this trade. *NA*

DE gets down to fine detail

Small but significant steps on the regulation of ship design took place at the latest International Maritime Organization (IMO) sub-committee meeting.

Opening the the 52nd session of the sub-committee on Ship Design and Equipment meeting, International Maritime Organization secretary-general Efthimios Mitropoulos had a clear message for anyone tempted to use the terrible freight market as an excuse to cut maintenance costs.

Just as the financial crisis should not be invoked as an excuse to scale back efforts to protect the environment, compromising safety by deferring essential maintenance or postponing training might result not only in loss of life and damage to the marine environment but also deal a blow to the image of shipping, he said.

Priorities for DE 52 included work to prevent accidents with lifeboats, the finalisation of the guidelines for maintenance and repair of protective coatings and further work on the proposed new Solas regulation introducing mandatory corrosion protection of cargo oil tanks of crude oil tankers and the associated performance standard.

Mr Mitropoulos thanked IACS for its contribution on the latter items and the Industry Joint Working Group for its efforts to develop the associated performance standard. "All these joint efforts of Governments and industry alike go to the heart of one of IMO's objectives [to promote] a functional approach to regulation, on the goal-based concept".

Ice-covered waters

His observations on work to finalise draft revised guidelines for ships operating in Arctic ice-covered waters, for approval by MSC and MEPC and subsequent adoption by the next Assembly presaged discussion of a particularly sensitive subject. Extending the guidelines to include the sea area off Antarctica raised not just questions of safety but also the adequacy of search and rescue services.

Debate in plenary centred around whether the guidelines could be treated as mandatory in their current form. Interventions from the UK, Russian Federation and the Cruise Lines Industry Association among others warned as to their suitability and short-comings including safety in multi-year ice and a general criticism that the guidelines were a one-size-fits-all solution to a nuanced problem with geographic discrepancies that demanded a risk-based approach.

After deliberation by the working group, the guidelines were extended to include the Antarctic using the term 'polar waters' without qualifications. It was agreed that future guidelines should be made performance-based but the working group stopped short of re-naming them as a code in order to reflect their recommendatory nature.

Amendments to the guidelines included rating of life saving and fire equipment in anticipated temperatures, attention to ice build-up in ballast tanks and sea chests and a requirement that all ships of polar class should be able to withstand flooding resulting from hull penetration due to ice impact. Residual stability after ice impact should be as in Solas Regulation 2. Main machinery installed propulsive power should be sufficient to ensure safe navigation and effective icebreaking capability, without the risk of structural damage or pollution under the designed ice, weather and anticipated operational conditions.

> "Financial crisis should not be invoked as an excuse to scale back efforts to protect the environment, or compromise safety by deferring essential maintenance or postponing training"

The group accepted that distance from SAR resources would require additional contingency planning but environmental protection and damage control should take account only of national and international rules and regulations related to discharges, emissions, use of heavy oils, ballast water management and anti-fouling.

The sub-committee also agreed a draft assembly resolution on adoption of the guidelines which a number of NGOs urged should reflect the Antarctic Treaty Experts' view that the guidelines should apply for all ship types and sizes. A new work programme item will be requested from MSC 86 as an urgent item, with a view to developing the guidelines into a mandatory code.

The working group on measures to prevent accidents with lifeboats had a wide-ranging task that went to the heart of its remit but still emerged having made progress. The task of finalising amendments to the Life Saving Appliances (LSA) Code and Solas Chapter III were completed for the issue of lifeboat on-load release hooks but not for other items.

On-load release

Going into the working group its members were aware of strong demand for uniform requirements and training for use of the 70 types of on-load release hooks currently available, following a plenary debate that at one stage considered a complete check and replacement of the installed base.

The suggestion that all hooks be assessed with a view to retrofitting would have created an unmanageable problem in the view of the group's chairman, so it was instead directed to explore areas for further improvement and replacement of existing hooks with units of a higher standard, with no call for total replacement.

Interventions from OCIMF and its presentation on accidents during drills which it attributed to lack of 'change management' when hooks are upgraded, ensured the group would consider safety of lifesaving appliances in a holistic and integrated manner.

The group considered criteria for the safety of on-load release hooks with a view to replacing those of poor and unstable design, which it defined as: hooks that transfer loads to release cables; hooks that have locking devices that may turn to open due to forces from the hook load and; hooks made of material requiring paint or galvanising in the hook/hook attachment release mechanism.

New hooks should be made of corrosion-resistant materials and lack of an automatic reset of hydrostatic interlock device activated when lifting from the water should also be considered an additional criterion for replacement or modification.

Its amendments to the LSA Code prescribed that the safe operation of on-load release hooks should not be reliant on maintenance of critical manufacturing tolerances.

The means to release should only be at a safe height and fall prevention devices would be permitted, but only as a temporary risk mitigation measure pending the introduction of new hooks, with locking pins and strops both allowed. Improvement and standardisation of the layout of on-load release mechanisms should be considered urgently with reference to the human element in order to derive an approach to production of lifeboats and their launching devices as an integrated system.

Given the complexity of amending Solas Chapter III because of the likely information sharing between administrations needed to develop a central database, the group agreed the development of an MSC circular with a footnote referencing the new draft regulation should be developed at the next session.

Protective thinking

The working group on maintenance and repair of protective coatings, cargo oil tank coating and corrosion protection was tasked with finalising its draft MSC circular on the maintenance and repair guidelines, drafting a new Solas regulation on corrosion protection for oil cargo tanks and developing the draft performance standard for protective coatings.

The draft MSC circular on the guidelines proved uncontroversial and the draft Solas regulation for crude oil tankers above 5000dwt, included an amendment requiring all oil cargo tanks to be either coated during construction or protected "by alternative means if corrosion protection or utilisation of corrosion resistance material to maintain required structural integrity for 25 years, in accordance with the performance standard", text which allowed for corrosion protection and corrosion resistance to be used.

For the draft performance standard, it was decided to instruct the correspondence group with input from IPPIC, Intertanko and IACS to work on technical guidelines for a coatings test protocol by 2010. The group will also consider a number of minor issues such as compatibility between cargo and coating systems, stripe coatings tables, surface treatment, acceptance of alternative coating systems and referenced standards. *NA*

Three years to IMPROVE design

The three year European Commission-supported 'IMPROVE' ship design research project is heading towards delivery.

The final report on the three year IMPROVE research project is due for formal launch at an event in September*, with a view offering European shipbuilders a new rationale for making decisions pertaining to the design, production and operation of three new ship generations.

Coordinated by ANAST, University of Liege, IMPROVE has involved 17 partners, including shipyards such as STX Europe (St Nazaire) and Uljanik of Croatia, plus owners Exmar, Grimaldi and Tankerska Plovidba Zadar, class society Bureau Veritas, three other universities, two ship design companies, two engineering companies and two software companies, as well as WEGEMT (European Association of Universities in Marine Technology and Related Sciences).

IMPROVE has aimed to use advanced synthesis and analysis techniques at the earliest stage of the design process, considering structure, production, operational performance, and safety criteria on a current basis. The nature of shipbuilding in Europe is to build small series of very specialised ships. Thus, the IMPROVE project has addressed ships which, with their complex structures and design criteria, are at the top of the list for customisation.

Three new concept vessels are set to emerge from the final IMPROVE report, due in September.

The specific objectives of the project have been to:

a) develop improved generic ship designs based upon multiple criteria mathematical models,
b) improve and apply rational models for estimation of the design characteristics (capacity, production costs, maintenance costs, availability, safety, reliability and robustness of ship structure) in the early design phase,
c) use and reformulate basic models of multiple criteria ship design, and include them into an integrated decision support system for ship production and operation.

The operators buying specialised ships generally plan to operate them for the majority of their lives. This means that the maintenance characteristics of the design are very important. For this reason, IMPROVE has focused on designing for a reduction in operation costs (particularly relating to painting and corrosion). Designing ship structures in such a way as to reduce the problems, for instance, of structural fatigue can help in this cause. Additionally, designing for minimal operational costs can help in increase the structural reliability and reduction of failures thus increasing safety.

The targets have been to increase shipyard competitiveness by 10% to 20% and reduce manufacturing costs by 8%-15%, production lead-times by

*The invitation is open for those wishing to attend the final workshop of the IMPROVE FP6 research project: "Design of Improved and Competitive Ships using an Integrated Decision Support System for Ship Production and Operation", which will be held on 17th, 18th and 19th of September 2009 at the Centre for Advanced Academic Studies (CAAS), Don Frane Bulica 4, Dubrovnik, Croatia (http://www.caas.unizg.hr). Further details of the IMPROVE Project can be found at: http://www.improve-project.eu/final.html.

The invited speakers will be Prof. Kai Levander, who will present "Ship Design for Performance", and Prof. Dr. Owen F. Hughes, who will present "Next Generation Ship Structural Design"

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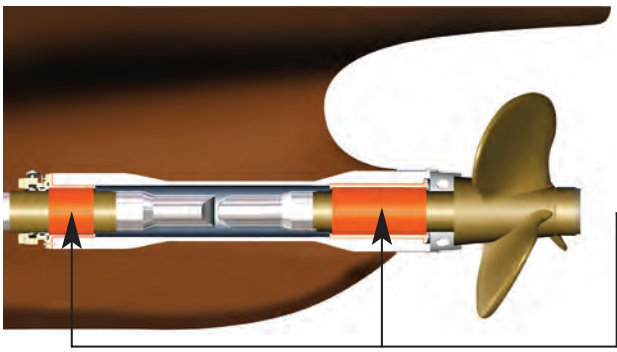

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Kai Levander, Professor, Dr. H.C.

Kai Levander (pictured), who graduated as a naval architect from Helsinki University in 1967, went on to a career that has taken work at Aker Yards, Kvaerner Masa-Yards and Wärtsila Marine. His responsibilities have included research and development, concept development, feasibility studies and newbuilding projects in the cruise and ferries business areas. Since 1995 Kai Levander has been Associated Professor in Ship Design at the Norwegian University of Science and Technology in Trondheim. In After nearly 40 years in the shipbuilding business Kai Levander retired in September 2008 and is now an independent consultant.

In his paper "Ship design Performance", Prof Levander says: "Naval architects need a methodology for ship design that guides them through the design process. This methodology needs to be open for new solutions and innovations. The capacity and performance of alternative solutions are evaluated against a few major design criteria to optimize the ship for the intended mission. Key performance indicators are used to select the most suitable design. Today energy efficiency and reduction of emissions have become very important among these performance indicators."

E-mail kai.levander@gmail.com

10%-15%, and to find benefit of 5%-10% on maintenance costs related to structure (painting, corrosion, plate replacement induced by fatigue).

Front and centre of the IMPROVE project, however, has been the three specific ship types selected for the study.

The first of these is an 220 000m^3: capacity LNG Carrier, designed by STX Europa (France).- see *The Naval Architect*, May 2009, pp17-19.

The second ship type is a large ro-pax ship, with capacity for 3000 lane metres of freight and 300 cars, plus 1600 passengers, with design by Uljanik Shipyard (Croatia).

To achieve defined objectives an existing line of vessels, as designed by Uljanik shipyard and Grimaldi Group have been re-assessed (structural limit states, production cost, maintenance assessment) to help to tune the new tools/ procedures within Uljanik and Grimaldi design/maintenance environments..

In this case, the arrangement of cargo space without pillars will require sophisticated structure solutions. Reducing height of deck structure is said to be a very demanding task, but can result in many benefits regarding general ship design, e.g.:

- Lower VCG (better stability).
- Reduced light ship weight (increased deadweight)
- Smaller Gross Tonnage

The challenge has been to improve Rule structural design at the concept stage and to find optimal design solution using tools developed within IMPROVE and continue the design process at the preliminary stage (where more detailed FEM calculations are performed) with the better starting point/design). Cutting production costs has been the relevent design objective. Regarding general ship design, other targets have been:

- Selection of resistance friendly hull form
- Smaller propulsion engine for same speed
- Reduced fuel oil consumption
- Selection of hull form in order to reduce length of engine room (increased length of cargo space)

This application also used TRIDENT, a fully integrated CAD/CAM solution based on PTC® CADDS®5i product database developed in Uljanik Shipbuilding Computer Systems (USCS). It has all the advantages of the CADDS®5i environment (full interactive, 3D, modern user interface, subsystems integrated in the same data bases), and it integrates all project and construction activities.

The third ship is a 40,000dwt chemical tanker, designed by Szczecin Shipyard (SSN, Poland).

Here, the IMPROVE project has engaged in treating numerous characteristics of the tanker's structure either as constraints or as objectives, depending on the assumed available information, resembling therefore a possible scenario in the early stage of design development.

The early design stage is characterised by missing information on e.g. precise loading, or structural details, while the boundaries of some requirements, such as weight, vertical centre of gravity, nominal stress levels or length of weld meters are not precisely defined. In general it has been considered useful to venture into analysing the correlation between them, thus investigating their sensitivity for the considered structural arrangement. This can then assist the designer in making optimal decisions.

To perform this task, IMPROVE has considered exploiting a novel approach based on vectorisation and 'omni-optimisation'. Vectorisation assumes converting constraints into additional objectives and their optimisation alongside original objectives. Precisely, vectorisation has shown capability to significantly improve the search for the optimum design alternatives (Klanac and Jelovica 2007a, 2008), but it has also allowed for an easy handling of design criteria, thus

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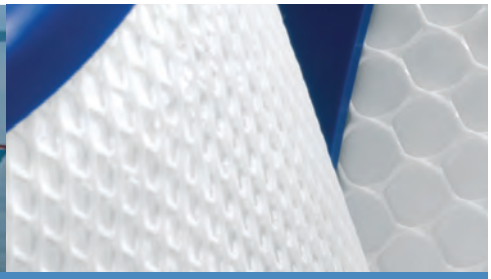

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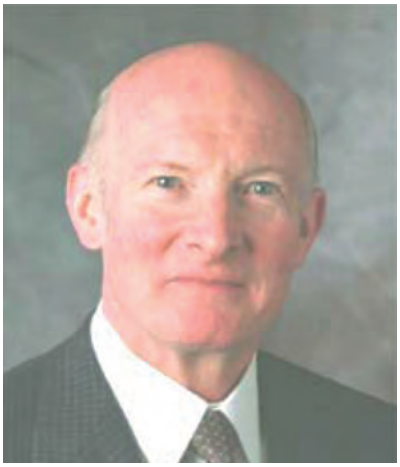
Owen F Hughes, Professor, Dr.

Dr. Owen F. Hughes (pictured) is Professor of Ship Structures, Department of Aerospace and Ocean Engineering, at Virginia Tech. He is recognised as a pioneer in the field of first-principles structural design, having been one of the first to achieve a synthesis of finite element analysis, ultimate strength analysis and mathematical optimisation. In doing so he has made several fundamental developments in all three of these areas. His book Ship Structural Design, published in 1983, presented an entirely new method of ship structural design. He also implemented the method in a computer program called MAESTRO (Method for Analysis, Evaluation and STRuctural Optimization).

Dr. Hughes has been NavSea Research Professor at the US Naval Academy, chairman of the SNAME Panel on Design Procedures and Philosophy and chairman of the ISSC Committee on Computer-Aided Design.

Of his paper "Next Generation Ship Structural Design", Dr Hughes says: "Ship structural design continues to pose challenges for the design team to effectively address inherent complexities, evolving performance requirements from owners and regulators, and need for efficient integration with the overall ship design process. Next generation ship structural design tools and methods must further unify structural design process sub-elements into a more efficient and higher fidelity process that supports the realization of engineering integrity with optimized performance for the owner/ operator. Advances in design tool architecture, geometry and topology modelling, loads analysis, and structural evaluation must be better unified in order to achieve progress toward these objectives."



benefiting the objective of this study. An algorithm that can solve a vectorised structural optimisation problem is called an omni-optimiser; while the process of its application is called omni-optimisation.

The IMPROVE project used the 40,000dwt chemical tanker as its example to obtain reasonably good design alternatives with respect to hull steel weight and weight of duplex steel. From that point on, the request was to increase the safety of the structure, so that the corresponding adequacy was maximised. If scantlings of deck strakes are maximised, there will be less probability of crack initiation. This objective caused an increase of hull and duplex weight, and fairly distributed Pareto front between them was achieved.

However, in looking behind the designs themselves, it is important to focus on the methodology driving the IMPROVE study. The IMPROVE Project's remit has taken in innovative approaches to shipbuilding, which include:

1. Maintenance/repair and production oriented life-cycle cost/earning model for ship structural optimisation during conceptual design stage.

Here, the aim has been to investigate the effect of the change in structural weight due to optimisation experiments on life-cycle cost and earning elements using the life-cycle cost/earning model, which was developed for structure optimisation. The relation between structural variables and relevant cost/earning elements has been explored in detail. The developed model is restricted to the relevant life-cycle cost and earning elements, namely production cost, periodic maintenance cost, fuel oil cost, operational earning and dismantling earning. The maintenance/repair data was collected from three ship operators and was solely used for the purpose of regression analysis.

2. Multi-objective optimisation of ship structures: using guided search versus. conventional concurrent optimisation

Here, structural optimisation has been considered in the context that it regularly involves conflicting objectives, where beside the eligible weight reduction, increase in e.g. safety or reliability is imperative. For large structures, such as ships, to obtain a well-developed Pareto frontier can be difficult and demanding in terms of time. Non-linear constraints, involving typical failure criteria, result in complex design space that is difficult to investigate. Evolutionary algorithms can cope with such problems. However, they are not a fast optimisation method.

In this case, IMPROVE has aimed to improve their performance by guiding the search to a particular part of Pareto frontier. For this purpose it has used a genetic algorithm called VOP. Beside weight minimisation, an increase in safety has been investigated through stress reduction in deck structure. The proposed approach suggests that in the first stage one of the objectives is optimised alone, preferably the more complicated one. After obtaining satisfactory results, the other objective are added to optimisation in the second stage. The results of the introduced approach are compared with the conventional concurrent optimisation of all objectives utilising a widespread genetic algorithm NSGA-II. Results show that the guided search brings benefits particularly with respect to structural weight, which was a more demanding objective to optimise. *NA*

The potential to cut CO_2

A review of available technology that can reduce carbon emissions in the global maritime sector, by K.-H. Hochhaus and J. Peterseim*.

Sea and air transportation as well as the automotive industry are being challenged to increase efficiencies due to the implementation of a carbon trading scheme (allocation plan) in Europe. Similar schemes are likely to be adopted by other countries in the near future, e.g. Australia.

Within the framework of the Kyoto Protocol the EU is committed to reduce greenhouse gas emissions by 8% by 2012 and by 20% by 2020 (compared to 1990 emissions).

In absolute terms, maritime traffic contributes annually 2.5%-5% of global carbon emissions [1] - more than global air traffic emissions. However two facts need to be considered:

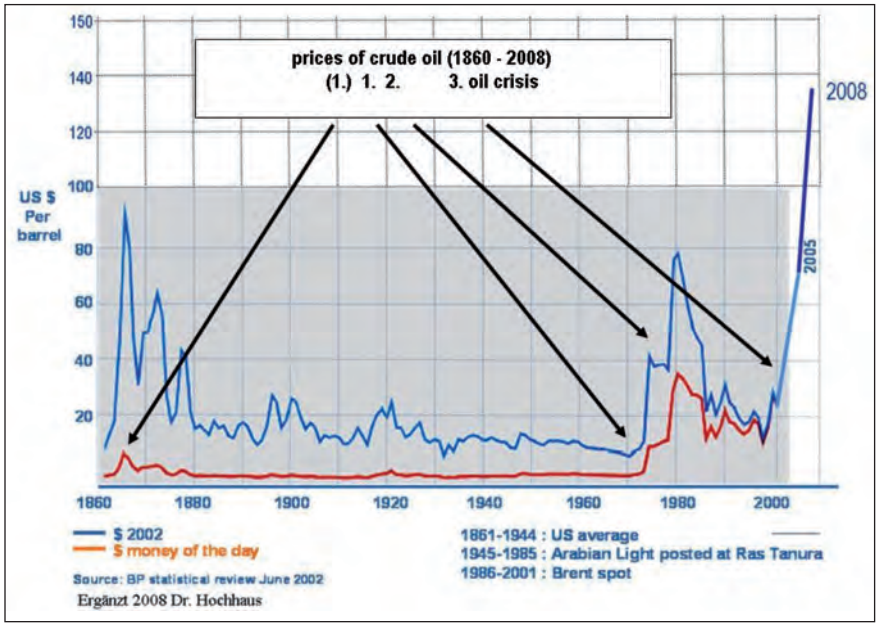
A. air traffic emissions count 200% to 300% more due to their presence in high air layers; and B. more than 90% of the world's trade items are transported on vessels.

Considering these facts, the specific CO_2 emissions caused by maritime traffic are between 5g-20g CO_2 per tonne kilometre, depending on the vessel type. This low level of emissions is unparalleled. By comparison, air traffic emits 300g-600g CO_2 per tonne kilometre. To burden all fossil fuel consumers equally it is expected that the EU will impose carbon costs on fuels consumed by airplanes and vessels in the near future (2012).

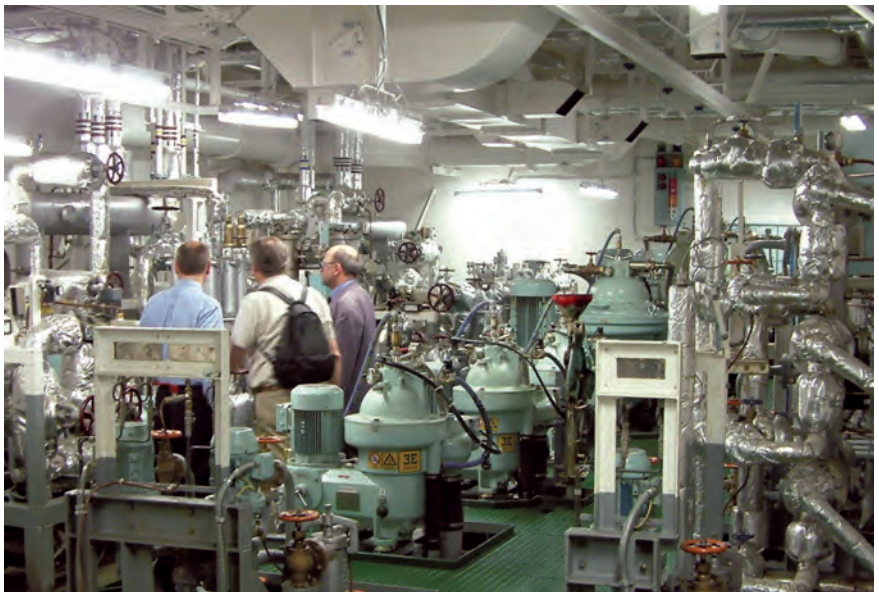
The greatest factor affecting fuel reduction potential is a vessel's sailing speed. The speed is determined by the freight to be transported, the sailing distance and the fuel to building cost ratio. The sailing speed affects the driving power and carbon emissions by a cube factor (n^3). In the last 100 years the average vessel speed has doubled (excluding cruiseships). Today's container vessels operate at 20knots-25knots. At such speeds the largest container vessels emit up to 250,000tonnes of CO_2 per year. Bulk carriers (tanker and bulker) instead are still today seldom faster than 15knots.

Next to fuel consumption shipowners also look at the fuel price and costs caused by fuel storage and conditioning. Due to the fact that fuel prices decrease with increasing fuel viscosity, piston engines have been operating with highly viscous and sulphur-rich fuels (heavy fuel oil) since the 1960s. On average

Figure 1: Crude oil price development absolute and inflation-adjusted to the year 2002 (source BP 2002, updated by Dr. Hochhaus).



View inside an auxiliary engine room containing separators, filters and heat exchangers for heavy fuel oil conditioning and preheating (courtesy of Albers).



*Footnote: the authors are: Dr.-Ing. Karl-Heinz Hochhaus, Technische Universitaet Hamburg-Harburg, Raum 012, Eißendorfer Straße 38 (O), 21073 Hamburg, Germany; and Juergen Peterseim, ERK Eckrohrkessel GmbH, 38 Taylor Street, Darlinghurst, NSW, 2010, Australia.

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such fuels cost half as much as high value fuels. Today even the auxiliary piston engines for power generation run predominantly on heavy fuel oil.

Onboard cargo ships fresh water is produced by evaporating sea water (figure 5). The evaporation takes place below atmospheric pressure and at temperatures below 50°C. Because of these parameters it is possible to use the engine's high-temperature cooling water to operate the evaporation system. A part of the fresh water is further processed to drinking water quality. Using combined heat and power cycles (waste heat boiler and sea water evaporator) modern vessels can achieve overall efficiencies of 55%-60%.

It is not sufficient to propose technologies able to reduce fossil fuel throughput and carbon emissions. Many ideas have been discussed and a variety of papers have been published. However, only few have actually penetrated the market over the last 50 years. Partly to blame for the poor efficiency development are the highly volatile crude oil prices since 1972 (figure 1). These fluctuations do not offer a reliable planning basis for shipowners. It is essential for shipowners to recover the investment in additional equipment within a few years either by fuel savings or higher charter rates as they are operating in a highly competitive environment.

To reduce carbon emissions the overall efficiency of the vessel has to be considered, which is a function of the hull shape and the efficiency of the equipment being used, e.g. main engine, propeller, auxiliary systems (figure 2). At present only a part of the exhaust and cooling water available is used. Accepting the challenge to recover these energy sources will help to reduce fuel costs and carbon emissions. The shipping industry itself has experience of this, but other industries can contribute as well.

Heat recovery

Over the last 50 years, heat recovery systems have been optimised several times [2]. The focus of interest was optimising system design, performance, fouling and controllability. Variable pressure systems enhanced the systems' self-management [3, 4, 5] and made it easier to adjust the steam demand to the main engine load. Another development for smoke tube boilers, currently the subject discussed

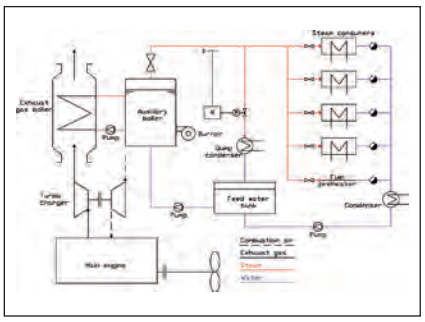


Figure 2: Schematic proposal of a system to produce steam for heating purposes.

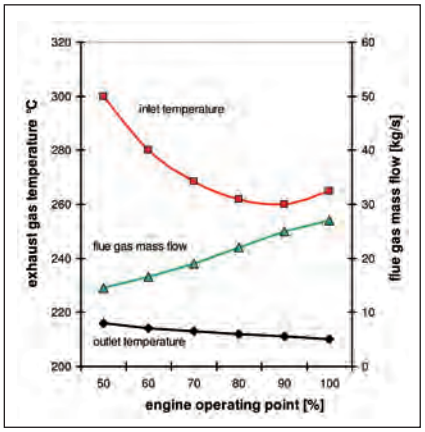


Figure 3: Characteristic curves of exhaust boilers onboard the container vessel *SHAHE* with a driving power of 11,500kW (2 stroke engine) and an exhaust boiler steam capacity of 2.5t/h (4).

by expert groups, are structured tubes, as they offer the potential of reducing boiler weight, volume and investment by up to 30%. Not yet verified is the fouling behaviour which also prevented the wide implementation of compact finned tubes boilers.

Water tube boiler developments include changing the exhaust flow against the heating surfaces from cross to parallel flow as this reduces fouling significantly. Onshore first boilers are already in operation and this might be a future trend to be seen on vessels.

The influence of the main engine has to be considered from the construction, operational and environmental point of view. Exhaust boilers, for example, have to comply with the engine manufacturer's pressure drop requirements. Increases in the main engine's thermal efficiencies caused a decrease in the exhaust temperature and mass flow. Environmental conditions, especially air and water temperatures, affect the overall efficiency as well. Low water temperatures increase losses in bunkers and fuel tanks, whereas low air temperatures reduce the engine's exhaust temperature and thereby the exhaust boiler's steam output.

Important to consider are the high sulphur contents in fuels used by ships. Undercutting the dew point causes corrosion to skyrocket and must be avoided by all means. Therefore boilers having to cope with flue gases from HFO are designed for flue gas exit temperatures of 180°C-200°C.

Figure 3 shows the characteristic curves of an exhaust boiler in relation to the main engine capacity (two stroke engine). The values for the exhaust mass flow, entry and exit temperature are valid for stationary operation points only. The data were recorded during sea trials and at known ambient conditions. In service a variety of ambient conditions occur as vessels pass different climate zones. This causes changes in the characteristic curves aforementioned. These changes have to be considered during the system design (cold and tropical climate zones, ISO conditions). Usually, the exhaust boilers are designed for exhaust data from the main engine at 85% or 90% MCR.

Steam balance

In recent years overall efficiency increases in drive systems have been achieved by supplying almost all onboard heat consumers with energy from the main engine's exhaust. The majority of the heat consumers are operated by steam, rarely thermal oil or electricity. Some with low temperature requirements use the high-temperature cooling water.

To pinpoint the vessel's steam demand a steam balance has to be prepared, considering all consumers. Only with these data is the precise design of the exhaust and auxiliary boiler possible. The steam balance has to include the steam requirements for the following modes of operation:

1. Operation at sea
   stationary continuous operation of the main engine
2. Harbour operation
   main engine shut-down
3. Manoeuvring
   changing main engine load

On vessels with very large engine capacities the generation of electricity is recommended, as the potential steam output exceeds the steam demand for preheating working

Flash evaporator using cooling water or steam (courtesy of Serck-Como).

fluids. Several suitable circuitries have been developed, e.g. two pressure systems. Some systems also changed the heat source, to preheat fuel bunkers, from steam to cooling water [2, 6].

Electricity generation

There are two ways of producing electricity from the main engine's exhaust, direct and indirect. The direct way is using exhaust-driven turbogenerators connected in parallel to exhaust-driven turbochargers [7, 8]. The indirect approach is to supply the exhaust boiler's steam to a steam turbine. Two operating container vessel classes of the shipping company A. P. Moeller prove that a water-steam-cycle with electricity generation through a steam turbine is economically viable. The systems operate behind a 12K98ME/MC main engine with a nominal capacity of 68,640kW at 94revs/min. The steam turbine is driven by superheated steam at 270°C and 7bar. The exhaust-driven turbogenerator produces around 3-3.5 % of the main engine's capacity in electricity (main engine at 85 % MCR). Such systems are called Thermo Efficiency System (TES) and are able to achieve fuel savings of 7.5%-8% (main engine at 85% MCR, ISO conditions). This is a very interesting option for vessels with high electricity demands.

Modern cruise ships operate 4-8 diesel generators to power the electric propulsion system and the auxiliary systems. Currently, the exhaust from the main engines is predominantly used for heating, fuel preheating and drinking water production (figure 3). However, the exhaust potential is higher and operating the air conditioning system as well as electricity generation are possible options. Implementing a well working heat recovery system onboard ferries or cruise ships is a complex task as these vessels normally have a day-night-rhythm, causing strong fluctuations in the main engine load. Usually, the vessel is in the harbour during the day and travelling towards the next port overnight. Optimising the different systems involved to meet these requirements will create further fuel throughput reductions.

While berthed the energy demand decreases, depending on the ambient conditions, to 15%-20% of the demand at sea. This means that only a fifth of the piston engine driven generators are in operation to produce power and exhaust.

To further reduce the demand of auxiliary generators, all available heat sources/fuels available should be used. The waste incinerators are a very useful heat source as they produce exhaust gases at temperature above 850°C. This is very suitable to produce steam and feed it into the steam net. Large cruise ships have two incinerators (one operating and one in standby) with firing capacities of up to 2.5MW each. Due to the fact that their exhaust energy is currently discarded, the potential exists to adapt land based applications to vessel requirements.

A potential fuel to further raise the steam output from a heat recovery boiler behind a waste incinerator is oil sludge. Depending on the vessel type and size between 1-2 tonnes can be generated per day and it is possible to burn this sludge in the waste incinerators. A commercial benefit taken into account is the reduction of oil sludge disposal costs.

Using the example of a diesel-electric driven cruiseship with an electric capacity of 60,000kW it becomes clear that heat recovery systems are commercially and environmentally attractive [12]. To operate the vessel at sea (propulsion and auxiliary equipment) four heavy fuel oil powered generators operate at 85 % MCR. During the passage the steam flow from the exhaust boilers exceeds the demand significantly. This changes when entering the harbour as the main engines operate at low MCR or are shut down. This requires the oil fired auxiliary boiler to take over.

Air conditioning on cruiseships

Usually the air conditioning system onboard a cruiseship consists of two main assemblies, the centralised cooling units with a high energy demand and the cold water cycle (figure 7). Today's cruise ships accommodate between 2,000-4,000 passengers and up to 1,500 staff. Therefore 4-6 screw or turbo compressors (2,000kW-4,000kW) are necessary to satisfy the cooling demand. As distinct from screw and turbo compressors, absorption chillers use heat instead of mechanical energy to provide cooling (figure 4).

Absorption chiller references are very rare on vessels but well implemented onshore. When reefers first appeared on the shipping market absorption chillers, using the refrigerant/absorbent mixture ammonia/water, were used for freight cooling. Further references can be found onboard US nuclear submarines operating a special absorption chiller using steam and water/lithium bromide.

The use of absorption chillers for the German navy was theoretically analysed and subsequently tested to identify the effects of the vessels movements on the system. Issues caused by motions of the sea were mostly eliminated by constructive

Waste incinerator with a firing capacity of 2.4 MW (by courtesy of Deerberg Systems).

changes. Consequently, absorption chillers fulfilled the maritime Classification's and Maritime Employers' Liability Insurance Association's requirements [11]. With rising fuel prices these systems will become commercially attractive and contribute to further carbon emission reductions.

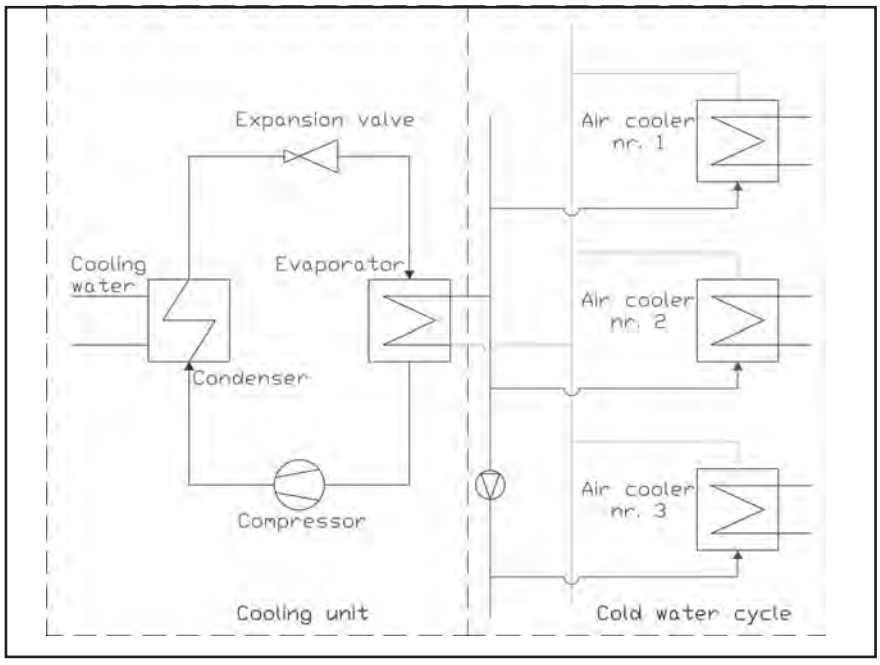
The energy in the high-temperature cooling water, used to produce drinking water, also exceeds the demand at sea and when berthed. This demonstrates that even modern vessels have the potential to use its exhaust energy and high-temperature cooling water far more efficiently, as surplus steam is available at sea and surplus high-temperature cooling water is available when berthed. At sea 8000kW could be used to power an absorption chiller or 2000kW when berthed.

The air conditioning system is very interesting as it is a suitable consumer for the extra energy available. Depending on the mode of operation 40%-60% of the vessel's air conditioning demand could be provided by absorption chillers as there is always surplus heat from the main engine, either on sea or berthed. The remaining demand could be provided by electrically-driven screw compressors. Therefore it would make sense to install an absorption chiller and screw compressor cooling capacity of 60% each of the overall cooling demand.

As shown several ways exist to increase the efficiency of vessels. The possibilities range from absorption chillers to heat recovery systems behind waste incinerators. With oil prices expected to rise after the economic downturn such approaches have to be undertaken to provide shipowners with vessels that satisfy their sailing speed and operating cost requirements.

The good news is that some references already exist onboard a couple of vessels. However, these systems are fully implemented onshore and adaptations should allow the mass use onboard vessels in the near future. *NA*

Figure 4: Principle of a single-stage absorption chiller.



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Shutting up ships

A review has been undertaken of how technologies can be used to reduce underwater noise from the loudest commercial vessels.

Concern is increasing over the contribution made by shipping to underwater noise pollution. The EU's recently established Marine Strategy Framework Directive makes explicit reference to the issue, while the International Maritime Organization's Marine Environment Protection Committee last year incorporated "noise from commercial shipping and its adverse impact on marine life" as a specific work programme.

The International Fund for Animal Welfare (IFAW) has identified that significant reductions in ambient noise can be made by reducing the noise output from the noisiest vessels. Resulting from this, IFAW recently commissioned Renilson Marine Consulting Pty Ltd (RMC) to undertake a brief desk top study into technologies that may be used to reduce the underwater noise output from the loudest commercial vessels.

The study found that there is considerable difference in the noise propagated by the noisiest and the quietest conventional merchant ships (excluding those designed specifically for low noise). It concluded that it is reasonable to develop a cautious note of optimism that the noisiest ships can be quietened using existing technology without reducing their propulsive efficiency.

The review made a number of recommendations, which will be discussed at the forthcoming meeting of the MEPC in July 2009. There are still many data gaps in the understanding of noise output from large commercial vessels, and a considerable need for further research. It is hoped that governments and the industry will facilitate work to address these research needs. In addition, it is hoped that governments will encourage a review of their merchant fleets in order to identify vessels that would benefit most from efficiency improving technologies that are also likely to reduce underwater noise output.

The full report is available from (www.ifaw.org/oceannoise/reports) and further information can be obtained from IFAW by contacting Russell Leaper at rleaper@ifaw.org. *NA*

Alongside renewal shows allure

Shipowners are increasingly being persuaded that deck and tank top renewal alongside saves time out of service and costs.

The Consolidada de Ferrys vessel *Concepcion Marino* is to become the latest ro-ro ferry to benefit from a new alongside deck renewal service for ship operators unwilling to drydock vessels because they are urgently required back in service.

The ship is due alongside at Puerto la Cruz, Venezuela on 1 June , when a team of specialists from Intelligent Engineering will start work on a quick turnaround project that will see the SPS Overlay technique used alongside. The resulting panel fully restores or enhances the strength of the original structure.

Shipowners with demanding operating schedules are increasingly looking to time efficient alongside renewal services, rather than diverting tonnage from their operating routes, or waiting for hard to come by drydock space.

Concepcion Marino is to become the latest ro-ro ferry to benefit from a new alongside deck renewal service using SPS Overlay.

Concepcion Marino will be the third Conferry vessel to be renewed since November 2008 using SPS Overlay, and the second to benefit from the highly flexible renewal alongside approach . The 6500gt *Maria Rosario* and the 2640gt *Cacica Isabel* had their vehicle decks reinstated at the end of 2008. In the case of *Cacica Isabel*, five separate areas of the vehicle deck, totaling 361m^2, were repaired with SPS Overlay as the vessel lay alongside the owner's terminal at Puerto La Cruz.

Talking of the work undertaken to date, SPS Overlay project manager Paul Casey, said: "This project is an example of our ability to undertake repairs anywhere. We used the national Dianca yard facility to repair *Maria Rosario*, whilst work on *Cacica Isabel* was carried out alongside at the owner's terminal."

Conferry's Rafael Antonio Martinez Tovar said: "These were very effective repairs carried out nearby with minimum disruption. SPS Overlay has given us the opportunity to extend the lives of these vessels and ensure their ongoing safe operation in the future."

In offering the time sensitive service to operators of merchant ships, the SPS Overlay team has drawn on experience it has developed working afloat in renewal projects involving hard to access floating storage production and offloading vessels.

Successful projects offshore include steel repairs onboard the FPSO *Conkouati*, in the Yombo Field off the coast of Point Noire in the Republic of Congo, for example. Here, steel diminution over time had meant that the offshore unit required steel reinforcement in various areas of the hull, but the costs of halting production offshore and dragging the vessel into a yard would have been prohibitive.

Instead, mobile injection equipment was shipped offshore, whilst the FPSO continued in normal operations. A total of 616m^2 of SPS Overlay was used to reinstate steelwork in various areas of the hull. Four areas of side shell vulnerable to impact damage from fenders and offloading tankers were strengthened on the unit's port side by injecting 24 newly created cavities. A further 124 cavities next to the hull in Number 5 Port and Starboard cargo tanks were also injected to reinforce hull steelwork.

Klervi Keryhuel, a marine engineer from Perenco said: "The repairs were not intrusive and were carried out on station whilst normal operations onboard continued. The equipment used for the job was small and portable and meant that its movement did not cause major inconvenience or involve many people."

Now, the same kind of capability is being exploited on commercial shipping routes. SPS Overlay marine manager, Americas, James Bond, said that operators in the merchant marine were increasingly being persuaded by the fact that the service could be offered alongside, without vessels having to deviate from their normal trading routes.

The 15,840gt Interorient Marine Services-owned ro-ro vessel *Crowley Ambassador*, for example, operates a regular regional liner service linking the USA, Central America and the Caribbean.

"We were able to offer this service for *Crowley Ambassador* in such a way that work was undertaken at the Panama container terminal as part of the vessel's final call in its normal route," said Mr Bond. "Time was also saved by ordering the steel and polyurethane required in the USA, and loading it onto the ship when she called in Florida, in order that her normal schedule was not disrupted."

Where work for Conferry was a first in Venezuela, the *Crowley Ambassador* project represented a breakthrough for SPS

Overlay in Panama. Coinciding with other routine repairs on board the ship, *Crowley Ambassador* had 2,322m^2 of deck renewed over a 19 day period, in a job SPS Overlay orchestrated with local project partners Marine Engineers Corp.

Mr Bond estimated that, in working alongside, the project was executed between five and six days more quickly than would have been the case had the ship been required to drydock. As well as the inconvenience of drydocking itself, he said that little things, such as the ease with which workers were able to enter and leave the ship, added up to tangible savings.

Interorient Marine Services fleet manager, Alan Mitchell, added: "The repair has been successful and is definitely a time saver compared to cut and renew."

In taking the alongside service to new customers in the Americas, SPS Overlay is rapidly building on experience it has already gained in a slew of projects at Baltic ports.

DFDS Tor Line, P&O Ferries and Stena Line have used SPS Overlay to repair large areas of steel onboard a number of ferries and ro-ro vessels over recent months, and the desire is growing for work to be carried out close to or within their ports of call.

Exemplary was the deck reinstatement work carried out onboard the DFDS Tor Line ro-ro vessel Tor Baltica, which saw 670m^2 of SPS Overlay fitted in a nine day period at Gotaverken Cityvarvet, Gothenburg, Sweden, close to the vessel's operating routes.

The fast-turnaround project, which involved SPS Overlay steelwork partner SRC Europe, also led to improvements to the ship's main deck, enabling it to accommodate heavier point loads.

"We are delighted with the results. Both the steel work and the injection process were undertaken quickly and effectively and the outcome was minimal downtime," said Tore Falk, DFDS Tor Line technical superintendent.

Looking once again to new markets, Mr Bond said he had high expectations that the alongside renewal offering would prove attractive to those operating bulk carrier tonnage through the Panama Canal in need of tank top renewal.

In fact, SPS Overlay has already made inroads in the bulk carrier market in offering this service, and one particular project would not have gone ahead at all, had it not been for the time and costs savings made available by carrying out work alongside.

Captain Mathew Mazhuvanchery, SPS Overlay business development director, said the approach had proved critical in reinstating tank-tops onboard the 1982-vintage bulk carrier *Edco Star* which, until 2008, had lain idle alongside in Alexandria for two years. She required a range of repairs including significant tank top steel reinstatement across seven holds to secure Lloyd's Register class approval.

"While the owner was committed to going ahead with the work, Alexandria's own shipyard facilities were not felt to be suitable for the project, while moving the ship to another yard would have proved prohibitively expensive," said Mr Mazhuvanchery.

Using the alongside approach, 3433m^2 of tank tops and bulkheads were reinstated using SPS Overlay in a 30 day period, in a job undertaken in collaboration with Clarkson Technical Services.

Captain Mazhuvanchery said: "The alongside approach saved on relocation expenses, up to 50 days of shipyard time, and attendant docking expenses."

"I was amazed by the speed, quality and simplicity of the repair," said Captain Gulbir Suri, of Clarkson Technical Services (CTS), which provided steelwork services to the project. "We returned this vessel to work in less than half the time it would have taken to complete a conventional crop and replacement repair."

Earlier this year, SPS Overlay was involved in another bulk carrier project, where the speed of tank top renewal outside a shipyard facility also proved significant. In this case, the 1987-built, 11,901dwt vessel *Sea Amethyst* was suffering from significant dishing and steel diminution, which required reinstatement across all four of her holds. This involved coverage of 1266m^2 of tank tops with SPS Overlay.

The work was completed ahead of schedule, within 14 days, despite stormy weather and sub-zero temperatures, as a turnkey project alongside in Tallinn, Estonia.

If conventional crop and replace procedures had been used to repair the tank tops, the project could have taken months and may not have been economically feasible.

"The speed of the SPS Overlay on the *Sea Amethyst* exceeded our expectations," confirmed Trevor Kingsley-Smith, managing director of owner Stephenson Clarke Shipping.

With dock space ever-more limited, Captain Mazhuvanchery said that owners in different locations would increasingly come to see the benefits of repairing alongside using SPS Overlay.

Backing up his claim, he said that work was set to start in Dubai on maindeck renewal on the 1978-vintage accommodation barge *Malaviya* 33.

Other projects soon to go ahead involved another dry bulk carrier, and two drydock facilities, Captain Mazhuvanchery said. *NA*

Sea Amethyst, a bulk carrier whose tanktops were renewed alongside.

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Voice of experience from SAJ

Caution critical for the future of shipbuilding, according to The Shipbuilders' Association of Japan.

Latest pronouncements from the Shipbuilders' Association of Japan on future prospects are understandably downbeat, but the body has at least been able to report that no orders have been cancelled among its members as a result of global recession.

According to a report compiled by Japan Ship Exporters' Association (JSEA), the tonnage of orders for export placed in the first quarter of 2009 amounted to 26 ships. Amounting to at 0.57 million cgt, this represented an 80% fall against the same period last year (2.69 million CGT).

"The worldwide financial turmoil has sent the shipping market plunging and discouraged the customers' willingness for the new order placement. Under these circumstances the new order contracts still remain at very low level," SAJ said.

"The newbuilding contracts will grow stagnant for some time in the future, given the current situation that the shipping companies are now taking the measures such as demolition, idling and lay-up to ease the over-tonnage increasing in certain ship types."

Despite the gloom, the SAJ said that "Japanese shipbuilders are not so much concerned as to the operation this year, because we have a substantial backlog equivalent to Japan's three to four year production. The freight movement, now showing the weakness, will surely increase in the foreseeable future with the world economic recovery."

SAJ members had been fortunate in not seeing any cancellations, "while a number of orders have reportedly been cancelled at some emerging shipyards, mainly in the Republic of Korea and China".

Looking back as his two-year term as SAJ chairman came to an end, Masamoto Tazaki reflected on other challenges. "From the end of 2007 through the end of 2008, Japanese shipbuilders faced the shortage of steel plate supply," he said. "To overcome it we had no other alternative but to adopt such measures as the operational schedule re-arrangement, or the requests for stable supply of steel plates to the related government ministries and industrial association.

SAJ chairman, Masamoto Tazaki: "In the serious conditions that the supply-demand gap is widening, there is a movement among certain countries to learn from Japan's past experiences."

In addition, from the April through September 2008, we were hard hit by the greater-than-expected price hikes in steel plates. As a result we were forced to revise steeply down the projected account profits in the first half of FY2008.

"However, the risk of steel shortage is now decreasing since the beginning of this year. And the fall in demand of raw materials is strongly expected to reduce the steel price to a fair level."

While noting that few orders had been placed at Japanese shipbuilders since the fourth quarter of 2008, Mr Tazaki said: "Since Japanese shipbuilders have a substantial backlog, we are in the relatively better position compared to other industries. Of the major shipbuilding countries Japan's backlog seems most unlikely to be cancelled, because the orders for speculative purpose are very few. However, due to the current freight movement stagnation, the possibility of the order cancellations or the requests for the delivery delay might not be ruled out completely.

"Many predict that for a few years to come, the newbuilding demand will not return to the high levels shown in the past [for] some years. History indicated that a few players' excessive business mind caused market disruption in a time of sluggish demand. SAJ hope that kind of history will not repeat in the future."

He noted that the unprecedented shipping boom over the last five years had stimulated a significant number of the new shipyards being established, "and the large investment for the existing facilities was also done. While the demand for ships during that period was basically attributed to the industrial globalisation and the economic growth especially in BRICs [Brazil, Russia, India and China] countries, considerable orders for speculative purposes were also placed.

"At the last JECKU meeting in Miyazaki, Japan, SAJ strongly appealed to senior executives from the leading shipbuilding companies for the importance of the level-headed forecast and rational business judgment. In the serious conditions that the supply-demand gap is widening, there is a movement among certain countries to learn from Japan's past experiences - surplus facility cutbacks implemented twice in the 1980s.

"For the sound and sustainable development in the shipbuilding industry which is a world single market, it should be essential to share and develop the internationally common awareness of the supply-demand balance among the world shipbuilders. In this sense, SAJ highly welcome those who seem to be showing the interests in learning our past policy. *NA*

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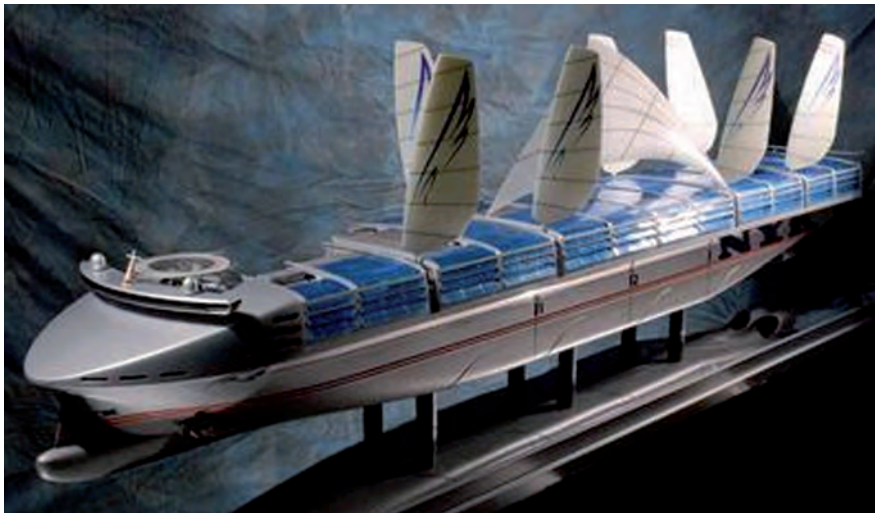
NYK gives glimpse of future

Will future ships draw on a combination of environmentally-friendly technologies?

NYK Line has given a glimpse of its future thinking on containership design, following the release of the 'initial exploratory' *NYK Super Eco Ship 2030*, which the shipping line characterises as an "energy-efficient ship expected to emit far fewer CO_2 emissions than current vessels".

The design, which foresees exploitation of technologies that are yet to be fully commericalised, was created by NYK subsidiary MTI (Monohakobi Technology Institute), alongside Italian ship designer Garroni Progetti s.r.l, of Genoa, and Finnish marine technology consultancy firm Elomatic Marine.



Ship of the future? Prototype model of NYK's Super Eco Ship 2030 (patent and design applied for).

NYK Line said the *NYK Super Eco Ship 2030* would make use of progressive technologies that have the potential of being realised by 2030. The power needed to propel the ship could be reduced by decreasing the weight of the hull and reducing water friction, the shipping line said, without going into further detail. Propulsion power could be increased through use of LNG-based fuel cells, solar cells, and wind power, all of which will lead to a reduction of CO_2 by 69% per container carried.

However, NYK Line gave a direct comparison of the vessel envisaged after its research with that of a conventional 8000TEU capacity container vessel operational today. It said that, where today's ships of this capacity were 338m long, 45.8m across the beam and drew a draught of 13m, it envisaged a ship of 353m long, 54.6m wide and drawing a draught of 11.5m.

NYK suggested that, where today's ships generate 195g/TEU in the form of CO_2 emissions per mile travelled, the ship of tomorrow could achieve 62g/TEU over a distance of one mile.

Where today's ships of this size are driven through the water by engines drawing on 54MW of power running on heavy fuel oil, and no 'natural' power, NYK envisaged a ship drawing on LNG fuel cells, where chemical energy is converted into electrical energy and heat when the fuel is combined with oxygen, to contribute up to 40MW of power, without combustion. At a smaller scale, this process is reckoned to be two to three times more efficient than an internal combustion engine in converting fuel to power. Elomatic said that LNG had been selected for the Super Eco Ship, because it had been decided that hydrogen storage on the large scale required did not seem feasible by 2030.

The development of one single fuel cell of 40 MW by 2030 does not seem feasible either, according to the terms of reference of the project, but several smaller units could be combined to achieve the power required. "We estimated the development of fuel cells to be such that 16 units each the size of a forty foot container would produce the required power by 2030," said Elomatic business director, Peter Albrecht.

This fuel cell main power would be supplemented by solar power generating 1MW – 2MW, plus wind sails yielding a further 1MW – 3MW.

"When considering the total power that can be collected by solar cells, the ship's route, time of the year, time of the day and weather conditions (clouds) must be considered," said Mr Albrecht. "In addition the expected efficiency by 2030 of the photovoltaic cell has been considered. The ship's cargo area is totally covered with solar cells, and in addition the sails (when used) collect the solar power. This contributes on average 1MW-2MW in power, while the maximum power on a clear sunny day at the equator is close to 10MW. Although the solar cells do not contribute so very much to the total power, they still reduce emissions with up to 5%."

As noted, wind power also has its part of play. Sails could not be utilised in light winds (less than 7m/sec) for speeds of 25knots, while very high wind speeds also set limits when close-hauled because of heeling force. This is why the contribution of wind power to the total power of such a ship will be so low.

In passing, rotary sails were also studied as part of this project. Because these require power to rotate the cylinder, it was concluded that the total gain would not be very big. "The rotor does not work along the wind, and in head winds they add to wind resistance as they cannot be folded in, as can sails," said Mr Albrecht. "In addition the rotors are quite large and disturb the cargo area." *NA*

Boss cap tops performance

Further refinement of the fuel efficient Propeller Boss Cap Fin, which has already been installed on 1700 ships.

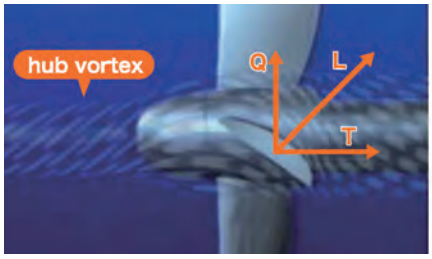
As noted last month (*The Naval Architect*, May 2009, p12), Mitsui O.S.K. Techno-Trade, Ltd recently applied for an extension of the patent covering the Propeller Boss Cap Fins (PBCF) system jointly developed by MOTech, Akishima Laboratries(Mitsui Zosen)Inc., and Mitsui O.S.K. Lines, Ltd.

The new patent covers innovations that developers say make the PBCF more effective in saving fuel and protecting the environment.

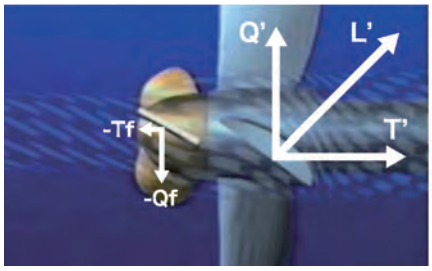
Already applied to 1700 vessels trading worldwide, the PBCF is made of the same material as the propeller and installed at its rear, breaking up the hub vortex that forms behind the propeller. Without PBCF, the difference in the flow velocity between the upper and lower surface of the propeller blades results in a strong 'down flow' from the trailing edge of the propeller blade. The down flow from each blade cumulativelty generates a hub vortex, which is reckoned to lose around 10% energy.

Inclusion of the PBCF reduces the torque of the propeller by an estimated 3%, and increases thrust by over 1%, boosting fuel efficiency by 3% to 5%. Alternatively, a 2% speed increase has been demonstrated. At the same time, noise and vibration levels generated by the propeller are reduced, as is erosion of the rudder surface.

Even before the proposed refinements, developers say that the PBCF achieves return on initial investment within 12 months.



Hub vortex before installation of the PBCF.



Hub vortex after the installation of the PBCF.

The PBCF – easy to install and made of the same material as the propeller.

The latest improvement of the PBCF efficiency stems from the redesigned length and shape of the device. Compared to the previous model, these changes allow more reliable control of the hub vortex, boost propeller thrust, and reduce torque. The original PBCF patent application was filed in Japan in July 1987. Since then, the PBCF has been patented in Japan and 11 other countries.

MOTech plans to install the new PBCF system on an MOL-operated vessel that will be completed at the end of 2009 and conduct performance tests. At the same time, the company will conduct research on final design and manufacturing, aiming to bring the enhanced PBCF to market in 2010. *NA*

Nippon Foundation honoured

Yohei Sasakawa (right), chairman of The Nippon Foundation, receives the 2009 International Maritime Law Institute Award from Efthimios E Mitropoulos (left), Secretary General of the International Maritime Organization and chairman of the governing board of IMLI. They are joined by Ambassador Lino Vassallo (centre), representing IMLI's host state, the government of Malta.

The Award is presented annually for a "meritorious contribution towards the development, interpretation and Implementation of International maritime law." This year the presentation was made at the commemorative seminar to celebrate the 20th anniversary of IMLI, held on Tuesday 5 May at the IMO Headquarters in London.

Yohei Sasakawa receives IMLI award.

Equipment makers renew vows with Wärtsilä

Japanese marine equipment suppliers extend and deepen their relations with ship power specialist Wärtsilä Corp.

Further evidence of the strengthening ties between Japanese marine equipment manufacturers and Wärtsilä Corp came in April, at the official inauguration of the new QMD low-speed engine factory in Qingdao, Shandong province.

The joint venture company Qingdao Qiyao Wartsila MHI Linshan Marine Diesel Co., Ltd. (QMD) is owned 50% by CSIC, 27% by Wärtsilä, and 23% by MHI.

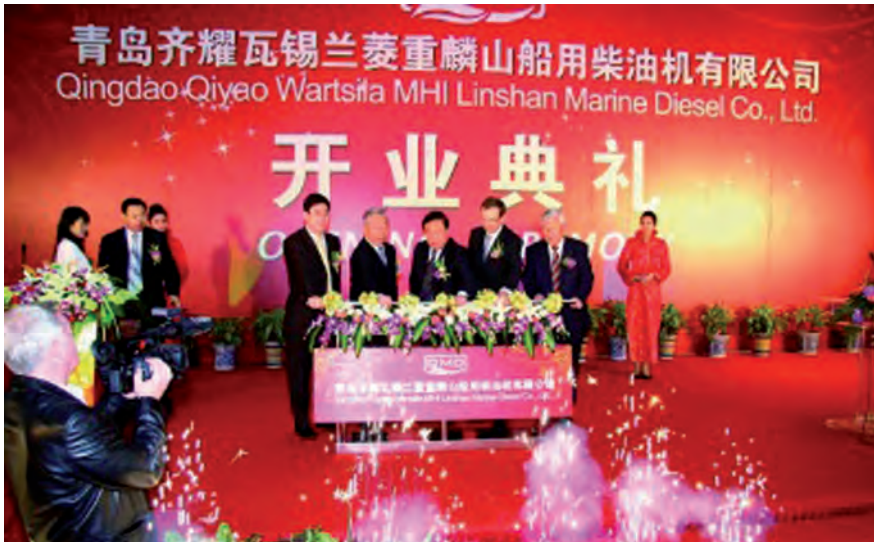
QMD features a modern welding shop, machine shop, assembly shop, and a testing shop, as well as facilities for heat treatment, blasting and painting. The automated equipment and processes, the flexible use of test beds, the possibility to test two large engines at full load in parallel, together with the efficient internal logistics, make this one of the most efficient engine production factories in the world.

Civil construction of the factory started in May 2008. Within 10 months, most of the construction work, equipment installation and commissioning were completed, with the factory becoming operational in March 2009. When totally completed, the factory will represent an overall investment of approximately €100 million with a production capacity of one million BHP.

QMD has an orderbook worth €200 million. The engines on order are mainly of the Mitsubishi UEC50 and the Wärtsilä RT-flex50, RT-flex60C and RT-flex82C engine types. All of these engines are destined for Chinese shipyards.

"QMD is an important addition to the two-stroke engine building capacity in China, and in close cooperation with other Chinese engine builders, will contribute to increasing the supply of domestically built engines to Chinese shipyards." says Rien Hoogerbrugge, QMD chief executive.

The factory will have a total of around 500 employees by the end of this year. Located near the Haixiwan area on the Bohai Sea, the QMD factory has been developed as an important part of the CSIC Haixiwan shipbuilding and repairing base, primarily serving China's growing shipbuilding industry. However, it is also set to export engines to other shipbuilding markets.



The QMD factory in Qindao, China was inaugurated in mid-April. From left to right, Qin Min, The standing member of Qingdao municipal CPC Committee, vice mayor of Qingdao Municipal Government; Li Chang Yin, general manager of China Shipbuilding Industry Corporation; Yan Qi Jun, standing member of the Shandong Provincial CPC Committee, and the secretary of Qingdao municipal committee; Ole Johansson, president, Wärtsilä Corp and Yoshiaki Tsukuda, director and executive vice president of Mitsubishi Heavy Industry Ltd.

QMD manufactures and services low-speed marine diesel engines under licence from Wärtsilä and Mitsubishi. The first engine has already been produced at the new factory, in the shape of a seven-cylinder Wärtsilä RT-flex60C, which passed its factory acceptance test in March to the satisfaction of classification requirements, the shipyard, and the ship owner. The factory offers the full range of low-speed engines, with bore sizes from 50cm upwards, of the Wärtsilä RTA and RT-flex engine types and the Mitsubishi UE engine types. It has the capacity to build engines of up to 96cm bore. The manufactured engines will be branded as QMD-Wärtsilä and QMD-MHI engines respectively.

Additionally, QMD will focus on the research, development, and prototype manufacture of the new generation of energy-saving and environmentally friendly low-speed marine diesel engines, which use the technologies of Wärtsilä and Mitsubishi.

Relationship goes deep

The inauguration symbolises the ever-deepening relationship between MHI and Wärtsilä, which companies earlier this year signed a 10-year extension to their existing cooperation agreement for the sale, manufacturing and servicing of Wärtsilä low-speed marine diesel engines. Mitsubishi is the longest-standing member of the Wärtsilä family of low-speed engine licensees, with the first full license for

Sulzer low-speed marine engines signed as long ago as 1925. Sulzer diesel engines were incorporated in the Wärtsilä engine programme in 1997.

The cooperation agreement is a basis for the exchange of diesel engine technology between Wärtsilä and Mitsubishi, defining and regulating intellectual property rights, and the delivery and feedback of technical information and support.

Over the years, Mitsubishi has contributed to the development of Sulzer and Wärtsilä low-speed engines and often built the first examples of new engine types. Most recently, the two companies jointly developed the Wärtsilä RT-flex50 and Mitsubishi UEC50LSE two-stroke engine types, both available since the start of 2006.

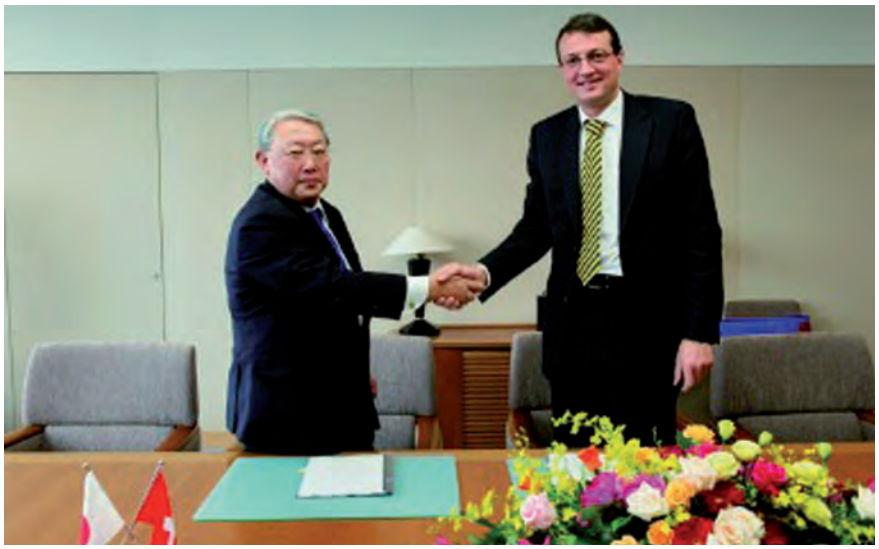
A further joint project was agreed last year, covering the design and development of new small, low-speed marine diesel engines of cylinder bores of 350mm and 400mm and a power range of 3500kW –9000kW. Mitsubishi is taking a significant role in this project based on its experience in this small bore sized engine range. Each is available as Wärtsilä RT-flex electronically-controlled common-rail and Wärtsilä RTA mechanically-controlled engine types. Based on the RTA engine designs with these two bore sizes, Mitsubishi is developing its own UEC-LSE series engines.

CRP cooperation

Elsewhere, IHI Marine United and Wärtsilä recently signed an agreement to incorporate the Contra-Rotating Propeller (CRP) systems developed by IHIMU into Wärtsilä's propulsion systems for diesel-electric driven ships offered to European customers.

The IHIMU CRP system is said to improve propulsion efficiency by 10% over a conventional diesel-electric propulsion configuration, and is relevant to all vessels from small ships to large LNG carriers. This efficiency improvement translates into significant fuel savings, enabling a short return on investment, as well as reduced greenhouse gas emissions.

In the future, the application of the CRP system could be extended to include hybrid (mechanical driven and electric driven) propulsion systems, and four-stroke mechanical systems.



Koichiro Anzai, senior managing director, Hitachi Zosen Corporation (left) and Dr Martin Wernli, president, Wärtsilä Switzerland Ltd, renew the agreement between the two companies for the next 10 years.

The cooperation agreement mainly covers the European market, where the environmental demands on shipping operations are becoming increasingly stringent.

The IHIMU CRP systems have been installed over a period of more than 20 years onboard VLCC and bulk carrier vessels.

On signing the agreement, Lars Anderson, vice president, merchant, Wärtsilä Ship Power, said: "The fuel savings and lower emissions of the IHIMU CRP system makes it a perfect fit for Wärtsilä's propulsion solutions offering. It will enhance our company's strategic goal of being a total solutions provider, while at the same time boosting our ability to help ship operators and owners meet the challenge of reducing CO_2 emission levels. It is also important to note that the payback time for the CRP system is rather short, which is an important economic aspect for owners."

Other extensions

In a separate announcement, Wärtsilä and Hitachi Zosen Corp have signed a 10 year renewal of the existing cooperation agreement for the marketing, sale, manufacturing and servicing of Wärtsilä low-speed marine diesel engines. Hitachi's low-speed engine business is handled by the group company Hitachi Zosen Diesel & Engineering Co Ltd at its Ariake Machinery Works in Kumamoto Prefecture, Japan.

The licence cooperation agreement is a basis for the exchange of diesel engine technology between Wärtsilä and Hitachi.

Hitachi's low-speed engine business is handled by the group company Hitachi Zosen Diesel & Engineering Co Ltd at its Ariake Machinery Works in Kumamoto Prefecture, Japan.

This cooperation is also a basis for the exchange of diesel engine technology between Wärtsilä and Hitachi. It defines and regulates intellectual property rights. It sets out the delivery and feedback of technical information and support

The partnership with Hitachi goes back to an agreement signed in November 1956. More recently, it was reinforced in 2008 when Hitachi began the manufacture of RT-flex low-speed marine diesel engines, which incorporate electronically-controlled common rail technology. Hitachi is currently focusing on the manufacture of electronically-controlled engines (RT-flex types) and is building a series of RT-flex50 engines for installation in new ships being constructed in China and Brazil.

This is, in fact, one of three renewal agreements concluded in Japan in recent months by Wärtsilä. Diesel United Ltd signed a similar 10-year extension agreement in October 2008. *NA*

LNG calls for Japanese expertise

Japanese expertise looks set to play a key role in the future of Russian liquefied natural gas carrier construction capability.

Three leading Japanese enterprises have signed an agreement to undertake a feasibility study on behalf of United Industrial Corp (OPK), in order to investigate which of two St Petersburg yards has the most promising future as a builder of LNG carriers.

One of Russia's largest diversified corporations, OPK has stated ambitions to develop LNG-building capability, having already mooted plans to build up its Severnaya Verf-based shipbuilding complex in St Petersburg, in order to deliver LNG carriers, icebreakers, ice-going cargo ships and offshore drilling platforms, as well as all types of military surface ships, including aircraft carriers. The annual production capacity of the new complex has been mooted at 500,000dwt.

However, it also has plans to develop the nearby Baltiysky Zavod yard, and it is understood that the three Japanese partners have been charged with weighing up the prospects for each yard to move ahead. The one year feasibility study will investigate the character and potential of existing facilities, and the challenges which would face either yard should a plan be taken forward.

The three Japanese partners said they had been engaged to study the modernisation of shipbuilding facilities to enable the construction of large-size LNG carriers, and that their role would extend beyond the build plan to "businesses related to future Russian LNG projects".

In a joint statement, the companies said: "From the perspective of shipbuilding as well as ship ownership and operation, the three Japanese firms view natural resources and energy as one of Russia's most important sectors destined for expanded development. Given that resource- and energy-related transportation, including LNG projects, is expected to expand in Russia in the coming years, the three companies seek to leverage this opportunity to support the modernization of shipyards in Russia toward their vigorous participation in that country's resource- and energy-related sector."

It is understood that the feasibility study is focusing on the potential to build Moss-type LNG carriers. *NA*

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BigLift takes flexible approach

Flexibility will characterise five new 'D-4' 17,500dwt heavy-lift ships under construction for Dutch company BigLift.

Make no mistake, five new 'D-4' ships due delivery between July and December 2010 from China's Zhejiang Ouhua Shipbuilding Co will be dedicated heavy-lift ships. They will come equipped with two 400tonne capacity cranes (offering 800tonne capability in tandem), one apiece mounted midships and aft on the starboard side, plus an auxiliary 120tonne capacity crane, fitted portside forward.

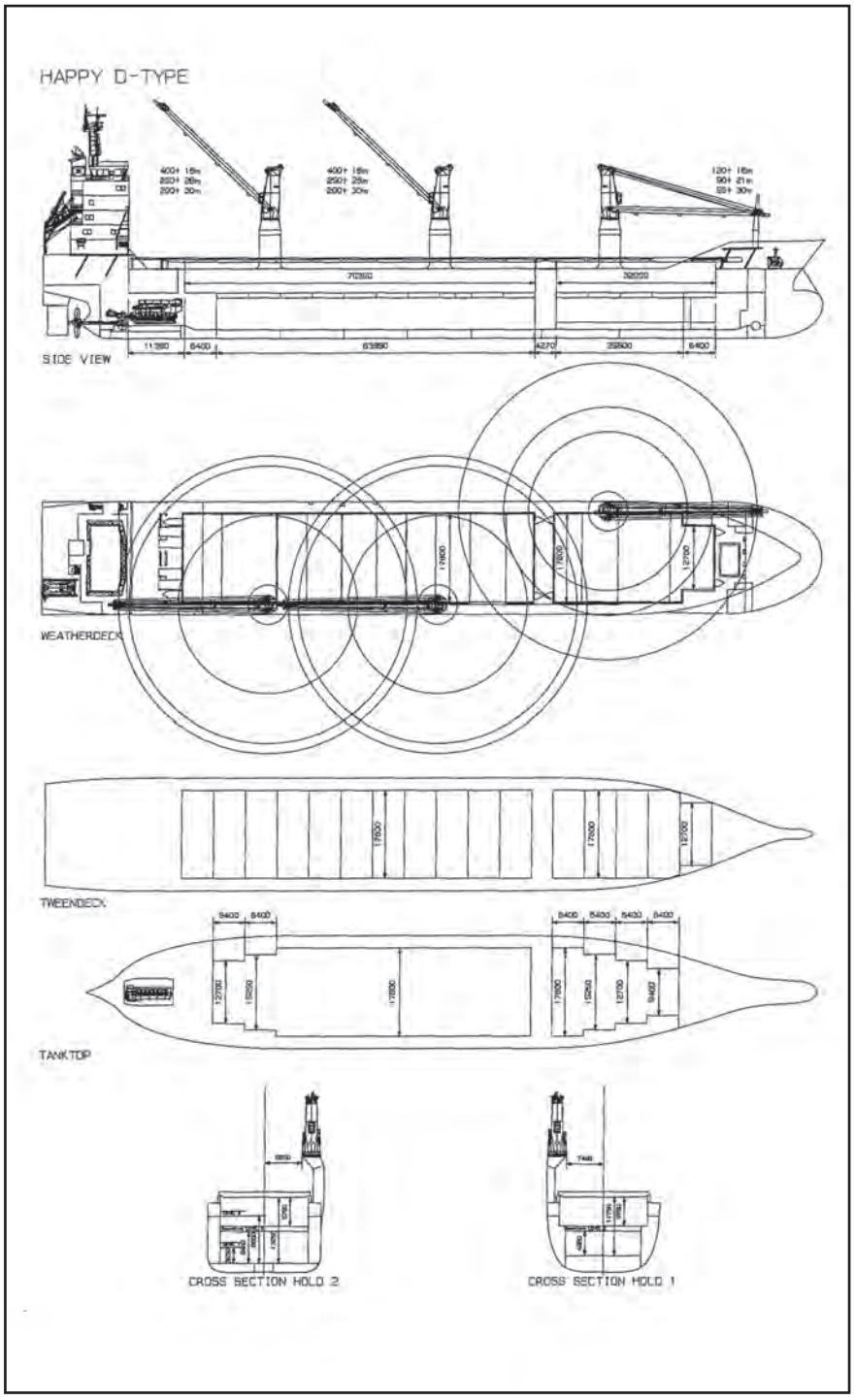
However, the D-4 type design is described as a further development of the seven 18,500dwt 'D-gracht' multi-purpose vessels ordered by BigLift Shipping parent Spliethoff, and also under construction in China. Both the D-gracht and D-4 ships feature a twin hold configuration, where the main hold measures 70.4m long in the tweendeck position. The configuration is based on an identical hull design, while

TECHNICAL PARTICULARS

BigLift D-4 ships

Length overall	156.90m
Breadth moulded	22.80m
Breadth extreme	23.30m
Height in hold as SID Hold 1	11.75m
Hold 2	13.25m
Height in lower hold	as TWD Hold 1 4.96m
Hold 2 3 heights	3.25m, 6.46m or 9.60m
Height in tweendeck as TWD Hold 1, Hold 2	3 heights 9.00m, 5.79m or 2.65m
Summer draught	10.25m
GT	13400
NT	5920
DEADWEIGHT all told max	summer draft 17500dwt/16900dwt (exl/incl TWD)
CAPACITY grain=bale	
Hold	1 5360m^3,15780m^3
CONTAINER INTAKE	
Hold units	450TEU
Deck units	599TEU
Total units	1049TEU
Maximum size height up to 9ft 6in, width up to	2500mm
limited quantity alternative dimensions such as length	45ft
Power available for reefer connections up to	850kW
MAIN ENGINE Wärtsilä 8400kW, Bowthruster	850kW
Speed Ballast	18knots/Laden 17knots

Pocket plan for BigLift's 'Happy D-4' type heavy-lift ship.



both ship types also draw on a propulsion system delivering 8400kW of power.

The D-gracht ships feature three 120tonne lift capacity cranes operating at maximum outreach of 16m. To address heavy-lift requirements, the D-4 ships will feature a 22.8m beam - 2m greater than their D-gracht counterparts - plus greater deck strength and ballast water capacity.

BigLift managing director Arie Peterse emphasised the need for flexibility. "We do not want to be 100% dependent on the heavy-lift market," he said. "Our links with Spliethoff mean that, if a heavy-lift cargo is not available, we are able to book dry cargoes through commercial channels. As part of our existing operations, we hardly make any ballast voyages."

These requirements had specific consequences for ship design, Mr Peterse said. Hatch covers needed to be especially watertight, while hydraulic, rather than pontoon-style hatchcovers were specified, because commercial cargoes required quick turnaround. Furthermore, BigLift heavy-lift ships benefited from air dryers, for hold ventilation.

Each ship in the D-4 class will benefit from a second command station mounted on its forebody, to address issues arising should visibility in the main wheelhouse be compromised by high profile heavy loads.

Classed by Lloyds Register to +100A1, the ships will be strengthened for heavy cargoes and suitable for regular discharge by grabs, container cargoes in holds,on upperdeck and upperdeck hatchcovers, timber deck cargoes, to Ice Class Finnish/Swedish 1A.

Alongside the crew complement, the vessels will each offer additional accommodation, a classroom and a training bridge for 10 cadets, who will live, work and follow classes onboard as part of their maritime education.

With so much heavy-lift tonnage due to enter the market over the next 24 months, flexibility could be critical. According to Mr Peterse: "There is a great danger of the market being overtonnaged. Project cargoes have held up when compared to other markets, but volumes are dropping quickly, and it is not clear that they will rise before all this tonnage enters the market."

BigLift also has two larger, 18,900dwt heavy-lift vessels – *Happy Sky* and *Happy Star* - under construction at Indian yard Larsen & Toubro, which will feature two 900tonne capacity cranes apiece, with each thus offering 1800tonne tandem lift capacity. These ships are due delivery 2009-2010. *NA*

Designed for stability

'Second generation' heavy-lift design from SDARI finds favour with Columbia Shipmanagement.

An order for 10 x 31,000dwt multi-purpose heavy-lift vessels from Huanghai Shipbuilding Co of Rongcheng for delivery between 2009 and 2012 speak volumes for the confidence that Columbia Shipmanagement has in the forward market for project cargoes.

The last major building of tweendeck heavy-lift vessels was about 25 years ago, the company notes, and these vessels are now in need of replacement. In the past eight years a new generation of more efficient and versatile tweendeck vessels has started to emerge.

Among these is a 'second generation' multi-purpose and heavy-lift ship design from SDARI Shanghai for Schoeller Holdings/Columbia Shipmanagement, with 10 ships to be operated by Austral Asia Line (AAL) on its South East Asia and Australasian routes.

CSM, headquartered in Cyprus, says that the world requirement for heavy cargoes for major projects remains stable. "Project term spans for hydro plants, thermal generator plants, refineries, bridges, mining, steel mills, to mention a few types of projects are not so prone to the effects of market ups and downs," says the company.

"From inception to fulfillment, a major project span can be 10 years and this covers completely the normal cycles of boom and burst we have seen for many decades. The need for transport of heavy machinery by specialised vessels does not decrease."

To meet their schedules, project managers involved in these trades need to programme in heavy lifts well in advance. Some lifts are booked two years in advance so that there is no possibility of delay to the overall project.

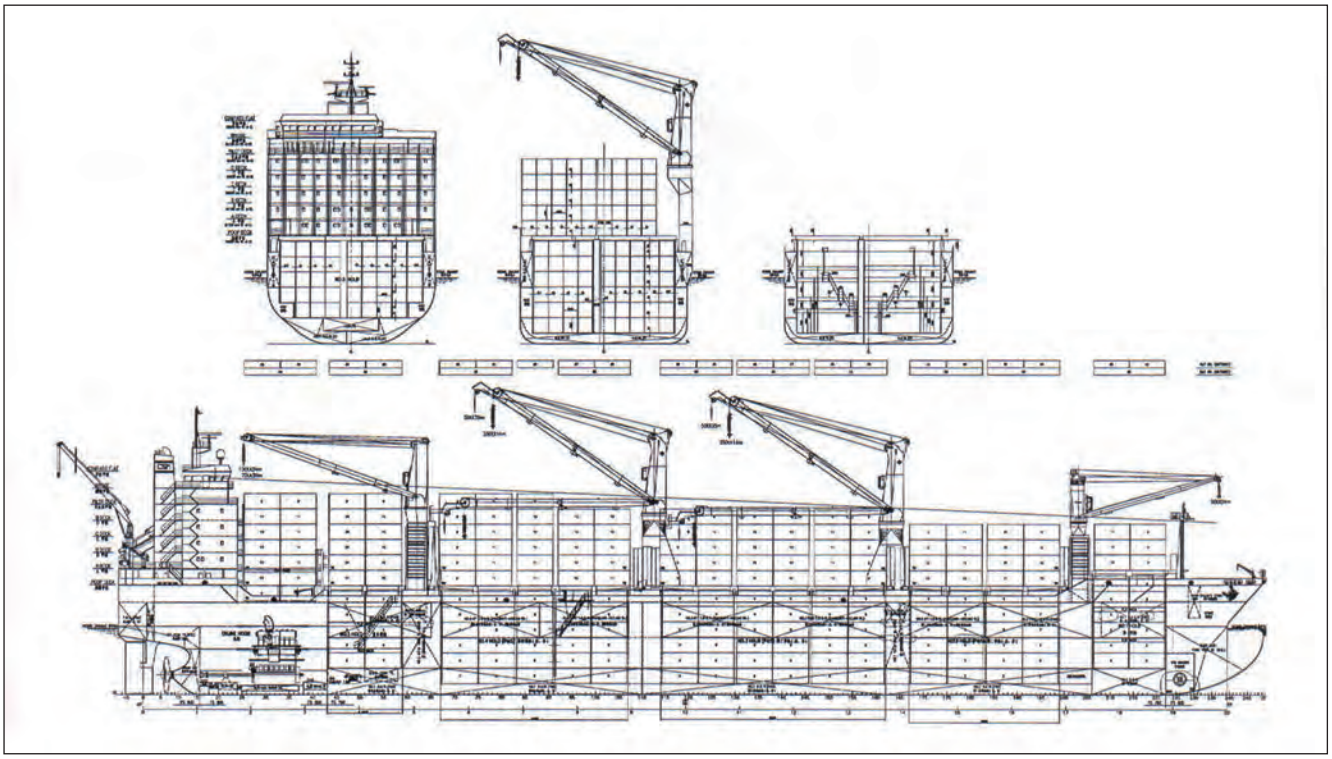
Huanghai is one of the older yards in China, having previously focused on fishing vessels and small ferries. However, a few years ago the yard expanded into river sea vessels and smaller multi-purpose vessels mainly for Chinese owners. Experience with multi-purpose vessels has grown and Huanghai Shipbuilding Co has constructed a series of 26000dwt and 28000dwt units for local owners. Expanding slowly over the last few years, the yard added a new slipway to accommodate ships of 31,000dwt and over.

New generation multi-purpose heavy-lift ship being built for Columbia Shipmanagement.

These ships will be operated by Austral Asia Line (AAL) on its South East Asia and Australasian routes.

To meet market expectations, Columbia Shipmanagement's 31,000dwt multi-purpose vessels will command tandem lift capability of 700tonnes by virtue of two side-mounted 350tonne cranes, to place loads on the tank top covering hold No.3, which will be 37.9m x 12.8m wide.

Hatch cover design is without obstruction so very long items can be



GA of new 31,000dwt heavy-lift ships for Columbia Shipmanagement.

accommodated. The ships will also have capacity to carry 2014 ISO containers.

Of special interest in design terms has been the close attention paid to stability. These ships will have top side ballast tanks to reduce the G.M. when heavy cargoes are carried in the holds, in order to provide a slow roll and prevent heavy cargo shifting in bad weather.

Conversely, sufficient stability must be maintained when loading heavy lifts and the angle of heel controlled. Accordingly, these ships will feature five pairs of anti heeling tanks and an automatic system to maintain a 2 degs list to one side during heavy-lift operation. The ship's main ballast pumps will be arranged automatically to transfer the water.

These 'second generation' SDARI design ships will feature slightly larger holds than their predecessor, and are to be two knots slower. Their main engines will be smaller to achieve considerable reduction in daily fuel consumption.

CSM says that the higher speed of the first vessels was never fully used in its liner service. "The distance between ports was too short and in heavy weather the vessels have to slow down dramatically to safeguard the deck cargoes".

The main engine will be a seven cylinder Wartsila 50 flex engine. This electronically-controlled engine will enable good fuel efficiency from 25% loads up to 100% without compromising combustion at low powers. All fuel whether for main engines, boilers and auxiliary engines will be IFO 380 (heavy fuel oil).

"The lower speed allows for a hull which is less prone to excessive rolling to be designed," adds CSM.

Tank top strength in all holds has been increased to 22tonnes/m^2, except in Hold No.1. This allows heavy aggregates to be carried in the lower holds and discharged by heavy grabs. If needs be, it will be possible for one side of any one of Nos. 2,3&4 holds to be loaded with aggregate, while the vessel will still meet its damage stability criteria.

The hull in way of shell plating and ballast tank structure is designed with rule plus 10% to increase safety margins.

Onboard these ships, it will be possible to arrange tweendecks at four different heights in Nos. 3&4 holds and at two heights in No. 2 hold. Nos 3&4 holds will be almost totally box-shaped, except for the aft part of No. 4 hold.

Holds will be dehumidified so that high voltage alternators switch gear and sensitive equipment, etc can be safely carried without deterioration in the harsh marine environment. Dehumidification is arranged for Nos. 2, 3&4 holds.

Accommodation is all aft and is designed for officers, crew and eight passengers. The first two vessels will have the passenger cabins and the spare cabin turned into cadet cabins together with a lecture room and an additional cabin for a training officer.

Hamburg-based SAM Electronics, in association with its Chinese subsidiary, SAM Taihang Electronics, has been awarded a contract to supply and install NACOS 54-5 integrated navigation command systems featuring radar-controlled trackpilots, Ecdis and other sensors aboard these ships. SAM will also supply compass systems as well as GMDSS and satellite communications equipment together with associated consoles. *NA*

RollDock on a roll

RollDock signalled its intention to enter the heavy-lift market in 2006. Now, The Netherlands-based company awaits its first vessel delivery.

RollDock, established in 2006, is set on an aggressive three year growth strategy, with eight semi submersible ro-ro/container vessels due delivery between 2009 and 2012.

"To be a player in the heavy-lift market you need a couple of heavy-lift vessels to start with." said RollDock, chief operational officer, Mr W. van der Zwan.

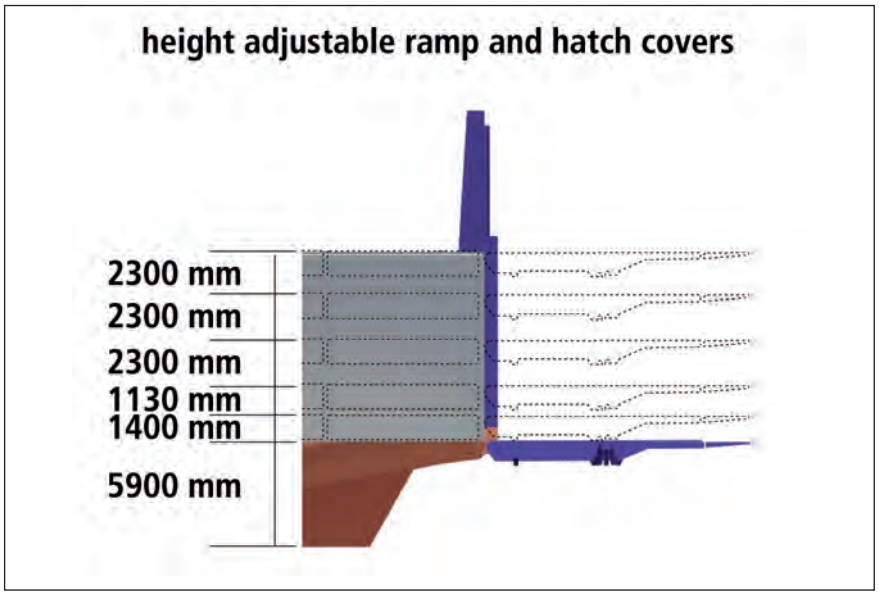
RollDock believes that it will provide a refreshing approach to the heavy-lift market through being flexible, intelligent and creative, and focusing on clients needs. The fleet will consist of eight new identical multi-functional heavy transport vessels.

"We need to be flexible to cater for our clients' needs." Mr van der Zwan said.

Accordingly, the vessels will have three loading modes, adaptable to various situations; whether lift-on and lift-off, with two heavy-lift cranes capable of working in tandem; or float-in and float-out, as the vessels are semi-submersible and roll-on roll-off, due to the special feature of the ramp and the cargo deck which can be set at various levels. There will be no cargo height restriction, due to the open hold capabilities of the vessels.

The vessels will be built at Larsen and Toubro's shipyard in Hazira, Surat, India and will be 8250dwt, offer a cargo capacity of 17,000m^3 and will be able to carry 830TEU as containers. They will be able to achieve a service speed of 18knots when fully loaded.

Rolldock's ramp system.

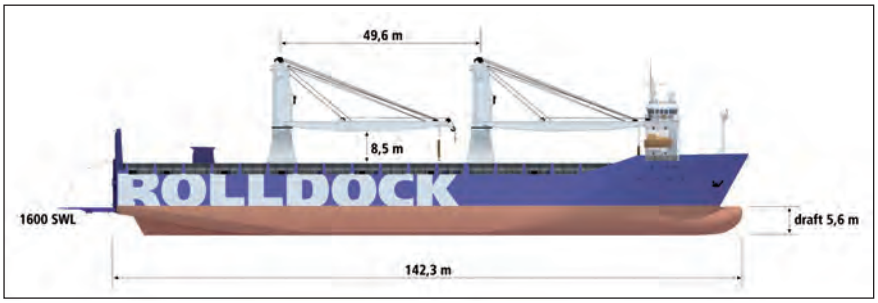


Rolldock's latest heavy-lift design.

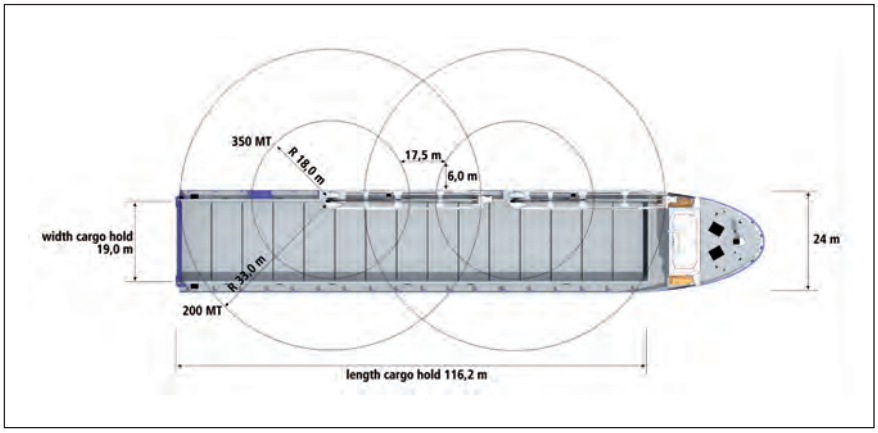
TECHNICAL PARTICULARS

RollDock Heavy-lift vessel

Type:	Multi functional heavy transport Roll-on roll-off/ lift-on lift-off / float-in float-out
Flag	The Netherlands
P&I/ H&M	UK P&I club/ Nieuwe Rotterdamse Lloyd
Class	GL +100A5 E2 BWM (ice class E2) Semi-submersible heavy-lift ro-ro multi purpose dry cargo ship, strengthened for heavy cargo. Classed as 'open vessel'
Speed	18knots
Length o,a	142.3m
Length b,p	130.2m
Beam	24.0m
Draught max (summer)	5.6m
Draught min (shallow draft)	3.5m
Deadweight	8300tonnes open 7400tonnes closed
Depth to main deck	5.9m
Submerged draft of vessel	11.9m
Submerged draft in hold	6.0m
1 hold fully box/ dims	116.2 x 19.0 x 8.1m
Hold capacity	17,000cbm
Ro-Ro ramp dims	19.0 x 9.5m (excluding 2 mtr. Flaps)
Ro-Ro ramp swl	1600tonnes, allowing ro-ro loads up to 4000tonnes on/off board
Deck (tank top) strength	12tonnes/sqm
Weather/tw deck covers	7tonnes/sqm (increasable up to 15tonnes/sqm)
Cranes Liebherr	2 x 350tonnes (combi 200tonnes)
Outreach cranes	350tonnes/ 18m & 200tonnes/ 33m
Main engines	2 x Wärtsilä 9L32/ 9000kW installed power
Propulsion	2 variable pitch propellers, 2 rudders
Auxiliary engines	3 x Caterpillar C18
Bow thrusters	Wärtsilä Cpp.700kW



Side view of vessel.



Top view showing reach of cranes onboard.

The shallow draught is 5.6m (summer draught), which will allow vessels to call at ports with limited water depths. The vessels will be equipped with two Wärtsilä 9L32 engines, two variable pitch propellers and two rudders plus a Wärtsilä 700kW bow thruster.

Delivery of the first vessel was due in July this year but will now be delivered in October/November, due to yard delays. This has had a knock on effect to the other seven vessels, which will now see the second vessel delivered in May/June 2010 with the third vessel in October/November 2010 and vessel four in the first quarter of 2011. Vessels five through to eight will be delivered in 2012, at four month intervals.

The vessels will all be sister ships, although often they may not look like it, given that one of their special features involves hatchcovers that can be positioned at six different heights, allowing the vessels to be more flexible in the loads that they carry.

The first vessel will be used for a project in Asia transporting modules. *NA*

Deltamarin scales in as heavyweight

Deltamarin makes new impact in the heavy-lift market with new contracts.

Finnish consultancy and engineering firm Delatamarin Ltd has boosted its current haul of design projects involving ships with high lifting capacity to three units, following a pair of new contracts signed in March.

Already well underway towards completion is a 50,000dwt semi-submersible heavy-lift ship for Cosco, being built at the Guangzhou International Shipyard. This 216.6m long ship (211.6m between perpendiculars) will feature a moulded breadth of 43m, moulded depth of 13m, and a submerged scantling draught of 26m. The new ship will be able to submerge her main cargo deck up to a depth of 13m in order to load large floating structures.

Deltamarin has been contracted by the owner to provide design services from concept to basic design, including the coordination of model testing. The basic design element includes hull structure, outfitting, machinery, piping and electrical installations.

TECHNICAL PARTICULARS

Cosco 50,000dwt heavy-lift

Length overall	216.16m
Length bp	211.6m
Beadth moudled	43m
Depth moulded	13m
Draught at dwl	10m
Draught scantling (submerged	13m

Another reference

Then, at the beginning of March 2009, Deltamarin secured a contract to provide basic design and engineering services for a project to build another 50,000dwt semi submersible self-propelled heavy-lift vessel to be delivered to China Offshore Engineering Co.

"Deltamarin won this contract due to our extensive references and experience. One of the most recent similar references is under construction in China. Further, we have very good relations with COOEC, although this relation is very young," said Deltamarin sales director Offshore, Timo Granberg, who has been involved in the project and contract negotiations from the very beginning.

COOEC project manager Li Zhilei said: "Deltamarin is aspiring to cooperate with COOEC and we believe they will be doing their best for this project. We believe that we will have more common projects via this cooperation."

The vessel to be designed is a self-propelled, DP2 capability, semi submersible flat top transport vessel, which will serve mainly for offshore oil and gas exploration and development. Its navigation and service range will be unrestricted ocean service.

The vessel's approximate main dimensions are: length overall 219m, moulded breadth 42m, moulded depth 13m and draught 10m.

The design and construction of the vessel will meet CCS (China Classification Society) rules and regulations, as well as the latest requirements of SOLAS and IMO.

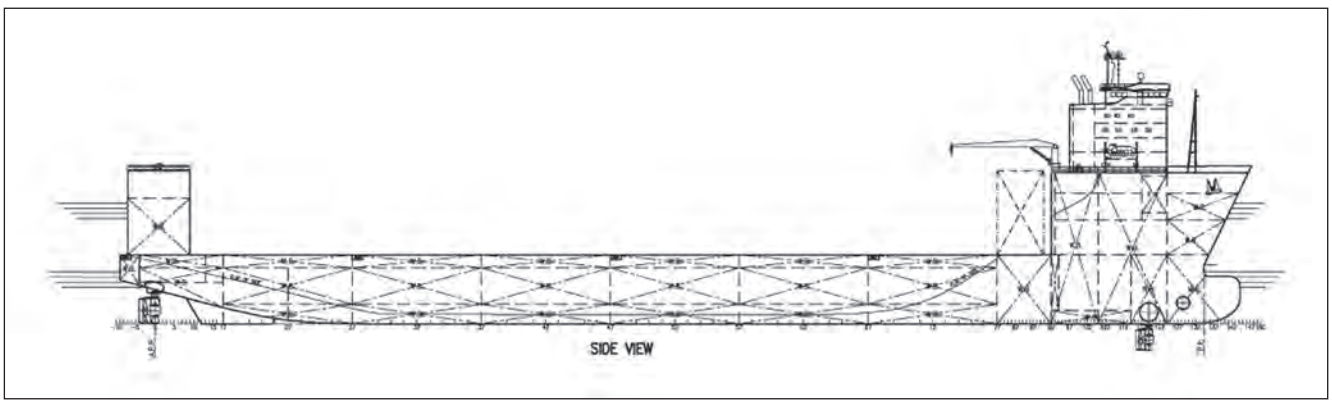
The biggest of them all

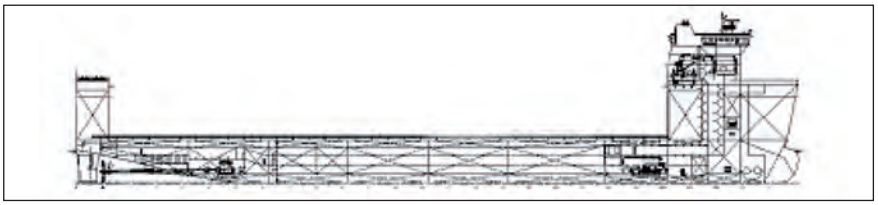
Also in March, Deltamarin was contracted by Swiss-based Allseas Group to undertake detailed design for the highly specialised platform decommissioning vessel *Pieter Schelte*, whose lifting capabilities far outstrip any comparable vessel in the water. Naval architecture and engineering work equivalent to 200 man years will be demanded of Deltamarin to meet requirements set by Allseas for this massive heavy-lifting, platform decommissioning vessel.

The contract comprises naval architecture, structural engineering, accommodation and system engineering, including piping; electrical and instrumentation; heating, ventilation, and air conditioning. The work will be carried out with modern 3D model engineering systems to allow smooth continuation for developing the production information once the yard has been selected and fabrication starts.

While not a 'heavy-lift' vessel per se, *Pieter Schelete* will have high lift capacity by virtue of requirements set by its primary role of decommissioning platforms, topsides and jackets in the offshore oil and gas fields. The vessel will also be equipped for pipelaying

GA of 50,000dwt heavy-lift ship to be built for COOEC will benefit from Deltamarin design.





Cosco 50,000dwt vessel being built in Guangzhou racks up another design reference for Deltamarin in this specialised market.

and other offshore construction work. The main dimensions are very large and the systems onboard unique. The ship will be 382m long, 117m wide and will be able to accommodate 577 persons.

Deltamarin managing director Mika Laurilehto said: "This is the largest individual engineering package contracted by Deltamarin so far. With the current planning there will be more than 230 specialists working at the peak periods on the second half of this year. Total duration of the contracted engineering phase is one year."

The build yard for the hull has yet to be determined, although construction is likely to take place in Asia.

"We are committed and prepared to take on this task to do our part in this remarkable *Pieter Schelte* project," Mr Laurilehto went on. "The execution will involve Deltamarin Group companies and our global partner network in addition to our own staff in Finland. The key to success is to manage the distributed work packages properly so that everyone in the project has the up-to-date information. Deltamarin has long experience in executing large engineering packages for the marine industry in a networked environment, and we believe this was the factor that convinced our client to award this work to us.

"This contract also strengthens Deltamarin's position in the offshore oil & gas related market. We have been focusing on expanding our services into this segment during the last few years to complement the traditional offering for our shipping and shipbuilding customers. There are natural synergies and the knowledge accumulated in naval architecture and marine systems engineering can be fully utilised."

Pieter Schelte will have tensioning capacity of 1361tonnes in pipelay mode, far outstripping anything currently in the water. For field abandonment operations, she will be equipped to handle topsides lifts of up to 48,000tonnes and jacket lifts up to 25,000tonnes - in line with coming requirements for North Sea decommissioning. *NA*

Newbuilds muscle in

Confidence is high among the majority of heavy-lift ship operators that the project cargo market will remain more resilient than container and bulk counterparts.

Few are making a greater commitment to expanding their presence in the heavy-lift market than Rickmers Linie. The German company now has no fewer than 18 orders outstanding for ships of this specialised type.

In October 2007, Rickmers-Linie announced the start of its fleet renewal and expansion programme, with parent Rickmers Group placing orders for six 19,000dwt vessels and four 17,000dwt vessels at China's Tongfang Shipyard. Each of these ships will be equipped with two 240tonne cranes, capable of working in tandem to lift 480tonnes. They are planned for delivery in January, April, June, July, October and December 2010.

A further four newbuildings were announced in 2007. These are 17,000dwt ships, and have been ordered by a Rickmers partner from Xinshun Shipyard and will be chartered by Rickmers-Linie. They will be equipped with two 150tonne cranes, which can be combined for a maximum lifting capacity of 300tonnes. A third crane will offer an 80tonne lifting capacity. Deliveries in this series are planned for December 2009, July 2010, November 2010 and April 2011.

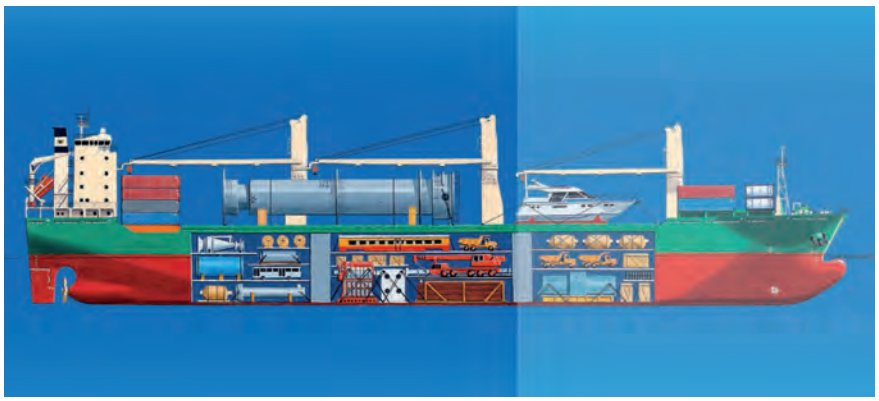
Then, in July 2008, Rickmers announced orders for four "Superflex Mumbai Max Class" heavy-lift vessels to be built for Polaris by Wuhu Xinlian Shipbuilding, Designed for the carriage of breakbulk, heavy-lift and project cargo, these 24,000dwt vessels will have an overall length of 175m, a beam of 26.5m and a scantling draught of 10.3m. They will be fitted with variable height tweendecks for maximum cargo flexibility. Each vessel will be equipped with three cranes, one capable of lifting 120tonnes and two 350tonne units that can be combined to handle loads of up to 700tonnes.

The service speed of the ships will be up to 18knots and the electronic control of the main 11,200kW engine will utilise the latest in technological development for the reduction of bunker consumption and CO_2 emissions. The vessels will furthermore be classed in accordance with the 'Environmental Passport' standard.

These vessels are perceived as filling a gap in the market. Although a final routing for these ships has yet to be announced, they are destined for liner services, and their 'Superflex Mumbai Max Class' nomenclature reflects the fact that their dimensions have been dictated by the existing lock gates at Mumbai, suggesting that they will find their way into liner services connecting Europe, the Middle East and the Indian Subcontinent.

In September 2008, Rickmers Group company Polaris ordered four more 'Superflex Mumbai Max Class' ships from China's Guangzhou Wenchong. Delivery of the first of this last quartet is scheduled for May 2011 and by December 2011 all four will be in service.

Rickmers Linie 'Superflex Mumbai Max Class' heavy-lift ship.



Newbuilds on track

Already well advanced in its newbuilding programme is US-based Intermarine, which recently took delivery of the heavy-lift ship *Industrial Egret* - the second in a series of four new sisterships entering the fleet this year.

Designated as the Eagle class vessels, these 10,000dwt ships feature dual 250tonne cranes that may be combined for 500tonne lifts. With an overall length of 139m and beam of 20m, the ships have a similar hull design to seven Century and six Diamond class vessels already operated by Intermarine services, but with increased cargo carrying capacity. The third in the series, *Industrial Edge*, was due delivery at time of writing, while the fourth ship is due delivery by the end of August.

Meanwhile, Danish concern Combi Lift is due to take delivery of the first of six 10,000dwt multi-purpose cargo ship from Chinese shipbuilders in June, especially strengthened for heavy cargoes. At 133m long (122.85m bp), these ships feature a moulded breadth of 23m and a design draught of 7.25m. They will feature two cranes offering 450tonnes of lift capacity (900tonnes combined) at an outreach of 17.5m.

Combi Lift is also part way through taking delivery of its series of four, Lloyd Werft-built 'Combidock' semi-submersibles which, at 162.3m long and 25.4m across the beam, are equipped with two 350tonne capacity cranes apiece, capable of a combined 700tonne lift.

SeaMetric stumbling block

Some, however, are not having such a smooth ride. Slow progress on construction has prompted SeaMetric to seek greater control over a contract

TECHNICAL PARTICULARS

Intermarine E-Class Vessels

Type: .....Heavy-Lift, Box-Hold, Multipurpose Dry cargo ship
Class: .....Germanischer Lloyd GL + 100 A5 "E" G – equipped for carriage of containers – Strengthened for heavy cargo - SOLAS II-2. Reg. 19 + MC AUT "E"
Service Speed: ..... 16.5 Knots
LOA: 139.00m
Beam: 20.00m
Draught: 7.70m
DWT: 10,000tonnes
GRT/NRT: .....8445 / 2534
Holds / Hatches: 2
Grain/Bale capacity: .....About 15,482.62m^3
Free height in holds: 12.05m
Hold ventilation: .....6 renewals per hour basis empty hold
Adjustable tweendecks: ..... Yes – 3 positions in Hold No.2
Longest hold/hatch: .....Hold 2 has a 74.719m x 16.306m hatch
Cargo gear: .....Two electro-hydraulic cranes with the following capacities
Crane one: ..... Aft – TTS crane with capacity of 250tonnes /14m – 60tonnes/30m
Crane two: .....Forward - TTS crane with capacity of 250tonnes/ 14m - 60tonnes/30m
Heavy load lifting capacity .....500 tonnes / 7.5m from ship side
Hatch covers: hatch one: ..... 13.195 x 10.976 / 16.306 2 panels
Hatch two: ..... 74.719m x 16.306m 7 panels
Container intake: ..... Number of 20ft containers (8ft 6in in height) In Hold: 274
On deck: 354
Total: 628

Intermarine's *Industrial Egret*.

to build two 'Twin Marine Lifter' system heavy-lift ships. Construction is underway at the PetroChina-controlled China Petroleum Liaohe Equipment Company (CPLEC) shipyard in Panjin, China.

SeaMetric said it was seeking an arrangement with the main contractor and the shipyard in which, SeaMetric would take over the main contractor's role. Such an arrangement would involve SeaMetric entering into a new shipbuilding contract directly with the CPLEC shipyard.

SeaMetric said it had found the progress made on the project to date unacceptable. "The current structure of the shipbuilding contracts, with the main contractor ESSCA acting also as management contractor and the CPLEC shipyard acting as subcontractor to ESSCA, has proved unsatisfactory in achieving progress recovery," the company said.

SeaMetric was thus seeking an arrangement with ESSCA and CPLEC in which SeaMetric would take over ESSCA's rights, obligations and interests in connection with the vessel construction subcontracts. "An agreement between the three parties is included in the contract as provision for such a situation," SeaMetric said.

Such an arrangement would include a mutually agreed new construction schedule, a revised payment schedule and an agreed strengthening of manning, project management and quality control systems.

During recent months, SeaMetric representatives have held several meetings in China with representatives from the shipyard and the PetroChina organisation. The discussions at these meetings have not yet reached conclusions on the main topics.

The CPLEC shipyard has issued a statement on its website, entitled "Statement of stopping the work on the vessels for HTV project". SeaMetric said that the statement was "not correct". "Work on the vessels has not been stopped, and SeaMetric engaged personnel reports that the work is continuing. SeaMetric views the statement from the shipyard to be part of the ongoing negotiations. At this stage 86 of the total 220 blocks for the two vessels have been completed, of which 26 have been painted and made ready for erection."

One of the issues discussed between the parties is the payment of the third instalment of the contract. SeaMetric said it disputed that payment of the third milestone instalment was due. "SeaMetric's position is that such milestone payment would require a vessel construction status (i.e., a certain number of blocks completed) which the shipyard has not yet achieved."

In addition to the above mentioned ongoing negotiations, SeaMetric said it was considering the possibilities for the provision of financing from the CPLEC shipyard and/or the PetroChina group to ensure the completion of the vessel construction. ***NA***

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Coats for conservationists

Despite legislation banning the use of tributyltin in antifouling paints entering into force last September, the driving force behind hull coatings development continues to come from environmentally-friendly energy efficiency. Patrik Wheater reports.

Global emissions from shipping will be reined in by the recession as more and more vessels are laid up, but never before have shipowners been so driven in their efforts to improve energy efficiency and reduce fuel consumption, and thus emissions. And while many look to replace outdated engines or retrofit more efficient propulsion systems, another key link in the chain is the relationship between the synergy between hull coatings and friction through water.

Most marine coatings manufacturers are now either developing or already marketing lower friction/resistance, energy-efficient coatings that meet the surging demand for systems that can help reduce a vessel's fuel bill and its carbon footprint.

Cruise ferry operator Grandi Navi Veloci (GNV) has now recoated all of its vessels with Intersleek having first used the antifouling in 2005 on the 32,700gt *Majestic*.

Smooth to the touch

Japan's Nippon Paint last year launched its next generation hull coating with claims of significant fuel savings. These claims were verified when the manufacturer coated six American Eagle Tankers-owned Aframaxes with its new LF-Sea antifouling paint and found that vessel operations using the solution resulted in 4% less fuel being consumed and fewer NOx, SOx and CO_2 being emitted than when the vessels were operating with their usual coating system.

The trials corroborated earlier experiments, conducted by the manufacturer in collaboration with Osaka and Kobe universities, which found that the paint reduced hull resistance by up to 4%, compared with other antifouling paints then on the market. Further tests, carried out over a 12 month period on a number of vessels operating in Japanese coastal waters also confirmed the paint's fuel saving attributes.

However, according to Niko Yamanoue, Nippon Paint's European marketing manager, depending on the ship type, and the energy efficiency attributes of a vessel's propulsion system, fuel savings of up to 6% can be attained. But, according to Mr Yamanoue, the beauty of the system is that: "The coating can be applied over the existing self-polishing copolymer (SPC) antifoulings without full hull blasting or applying a sealer coat. No extra time and no extra costs are required for application compared with normal SPCs".

The new paint incorporates a novel "water-trapping" technology that retains a thin film of water between the interface of the seawater and the paint film to provide a more streamlined flow to a vessel as it slices through the sea.

The trapped layer of water does not maintain its original form and its convex surface is removed by adjacent water flow, but the water layer on the concave surface stays. It is this process that contributes to the reduction in friction. The water is retained in the concave paint film crevices by way of "hydro-gel" technology, which also makes smoother the self-polishing surface.

SPC or foul-free

As of January 2009, the LF-Sea coating had been applied to 117 vessels of varying types, including high speed craft and containerships. But, what is particularly interesting about the new Nippon Paint is that while it uses as the copper biocide to self-polish, it is said to mirror the performance attributes of silicone-based foul-release systems, despite having completely different physical and mechanical properties.

Silicone-based foul release systems, according to the purveyors of these coatings, yield far greater fuel savings than their SPC cousins. Tests carried out in 2007 on Hempasil, the silicone-based coating from Denmark's Hempel, for instance, showed a staggering 10.6%

Cunard Line, has selected the fluoropolymer for *Queen Mary 2*.

Hempel has taken the extraordinary step of offering its latest coating with a fuel saving guarantee and a specially developed onboard reporting tool, called SeaTrend.

improvement in fuel savings for a large container vessel. However, it is the company's third generation Hempasil X3 that looks set to make a greater mark on cost-conscious shipowners. Indeed, by the time this article is published, the industry will know whether the coating has won any one of the three environmental awards for which it has been nominated this year (The Seatrade Award, The Green Ship Technology Award, and Ingeniørens Product Award).

Hempasil X3, which, interestingly, uses the same hydro-gel silicone technology intrinsic to Nippon Paint's LF-Sea, maintains the functionality of its second generation silicone coating but with added features said to secure a prolonged foul-free period even at low speeds down to 8knots.

Hydro-gel technology

It is this hydro-gel micro-layer that is the key to its potential success. The technology is ostensibly a network of water-insoluble polymer chains that are super absorbent and highly flexible. Non-reactive, these polymers are added to the paint to create an invisible barrier between the solid silicone in the coating and the seawater. As a result, marine organisms perceive the undulating hydro-gel to be a liquid to which they are unable to attach themselves.

Towing tank tests carried out by Force Technology verified the coating's ability to significantly reduce friction and consequently save more than 8% in fuel consumption, irrespective of ship type, hull shape, the wetted area or, indeed, the operational envelope of the vessel.

In the towing tank studies Hempasil X3 was compared to older second generation technologies and also benchmarked against tin-free self-polishing coatings. The coatings were applied to 2.5m long test panels representing varying degrees of hull roughness. The panels were then towed at speeds corresponding to 20knots in a 240m long towing tank. Skin friction was estimated in comparison to the total ship resistance including wave, wake, and air resistance, for as realistic an evaluation as possible.

However, whilst the test results suggested that second and third generation foul release coatings have the same fuel saving potential – since both paints produce a very smooth surface – "a number of owners have experienced premature and extensive slime problems after two and a half to three years with the second generation technologies on the market," explained Hempel Group product manager Torben Rasmussen.

Hempasil X3 is apparently different in that it is able to maintain the same initial conditions over an extended period of time simply because of the dual working mechanism of the hydro-gel silicone and the product's self-cleaning ability. Thus, high fuel savings can be maintained for a much longer period than hitherto.

What's more, Hempel has taken the extraordinary step of offering this coating with a fuel saving guarantee and a specially developed onboard reporting tool, called SeaTrend.

The software, designed by Force Technology, monitors the in-service performance of the coating and provides the operational data required to allow the vessel operator to maximise fuel savings and optimise overall efficiency.

Sleek at slow speed

UK-based International Paint's contribution to energy efficiency through silicone based

antifouling systems goes back to 1996, when the company introduced Intersleek 425, then the first commercially available biocide-free, foul-release technology for fast craft. This was followed in 1999 with the introduction of Intersleek 700 for deep sea ships, and then, in 2007, Intersleek 900, a unique biocide-free, foul-release coating based on fluoropolymer chemistry.

When International Paint launched this last product, it was thought to be the first effective silicone-based foul release coating available for any ship type operating at ship speeds as low as 10knots.

In terms of reduced CO_2 emissions and improved fuel efficiency, Intersleek 900 was found to be an improvement on the earlier mix. Tests and in-service performance analysis showed the paint could gain a further 2% in fuel savings when compared against the earlier 700 product, but when used instead of a traditional biocide-containing SPC, fuel savings of 6% or more were found attainable, although in-service experience on a range of other vessel types has shown savings can be higher than this.

Speaking in August last year, Mercator Lines' General Manager Amit Agrawal said: "We had monitored fuel consumption closely. At corresponding engine speeds, the vessel was consuming up to 6% less fuel, depending on weather conditions, after the application of Intersleek 900. We originally calculated projected savings based on a bunker price of $450 and found we were saving nearly three tonnes of fuel a day."

International Paint calculates that for a 5000TEU containership coated with an SPC antifouling, the application of Intersleek 900 could mean savings of over 12,000 tonnes of fuel, almost 40,000tonnes of CO_2 and US$3 million over a five-year period. Significant reductions in NOx and SOx emissions would also be achieved.

Such is the potential for cost savings in these economically uncertain times, that a number of shipowners have already opted to change to the Intersleek system. For example, cruise ferry operator Grandi Navi Veloci (GNV) has now recoated all of its vessels with Intersleek (See The Naval Architect, April 2009, p10).

Hardcoat guarantee

While silicone has been the focus of much research and development into more energy efficient hull coatings, work has also been going on to develop hard coat solutions that not only save fuel but also, potentially, costs associated with paint recoats and drydockings.

One such example is the paint supplied by Belgium-based Subsea Industries. Its Ecospeed coating, a vinyl ester with a high concentration of embedded glass platelets, is typically applied in two coats of 500µm dry film thickness. The high film thickness and the presence of glass platelets, which act as an impermeable barrier, are said not only to afford excellent anti-corrosive properties, but also make the coating extremely durable. It is this durability that Subsea Industries says will see the paint last a lifetime. Indeed, in contrast to traditional antifouling paints where a new application is necessary during each drydocking, Ecospeed requires only one application, so the cost of any future repainting and drydocking is potentially eliminated.

According to Subsea Industries' sales manager, Kristof Adam: "Ecospeed is a one-off coating that will probably last the life-time of the vessel. It is guaranteed for 10 years. How many other paint companies provide such guarantees?"

Unlike some other systems that leach chemicals and copper biocides into the surrounding sea, Ecospeed is entirely pollution-free and can reduce ship emissions by up to 10% due to the smoothness of the coating.

To date, Ecospeed has been applied to well over 50 vessels operating in clement and inclement locations, including a number of Disney-operated cruiseships.

According to Subsea Industries: "Research has shown that viable alien macro organisms do not spread to foreign regions if ship hulls coated with Ecospeed are regularly cleaned underwater. Systematic monitoring during the cleaning operations offers a further guarantee that no fully grown alien organisms are present. Ecospeed therefore effectively prevents the spreading of invasive alien species."

One possible way of addressing this regular requirement to clean hard coatings underwater could be by via the "robotic vacuum" technology under development at Newcastle University. This concept is based on an automated and magnetic robot that continuously cleans the hull and sucks up marine life as the ship moves through the water.

Coats for tomorrow

Meanwhile, the development of new, more environmentally friendly antifouling technologies continues apace. In the US, Maine-based MariCal has been granted a $99,000 grant to research a non-toxic coating that uses calcium sensing

Research into ultrasound technologies could negate the need for a hull coating altogether (pictured is the Ultrasonic Antifouling system).

receptors to inhibit the settlement of invertebrates on marine surfaces, for example, while Californian researchers believe that understanding more about the chemical mechanisms that allow a mussel to cover its anchoring fibres with a hard, durable coating will lead to the development of much tougher coatings.

Research into ultrasound technologies could, however, negate the need for a hull coating altogether. In March, Ultrasonic Antifouling announced the launch of what it said was a revolutionary way to protect small craft from fouling, using high frequency, low power sound waves to destroy algae and therefore prevent weed and barnacle growth.

The solution, currently only offered to vessels up to 20m in length, consists of a control box and either one or two transducers bonded to the inside of a vessel's hull. The control box sends a variety of pulsed ultrasonic signals to the transducer(s), which, in turn, emits a series of low power, high frequency sound waves that are virtually inaudible to the human ear. They create a wall of moving water molecules over the whole surface of the submerged hull, and a micro-environment that kills algae and prevents barnacle growth. The science is in the creation of the correct frequencies and the harmonics that are set up as a result.

While this technology is new to the marine market, it is an established method used to prevent fouling in lakes, ponds, reservoirs and even greenhouses.

Agent with a mission

Another technology developed initially for the small boat market, but which has the potential to be applied to the merchant fleet, is a patented, metal-free antifouling agent capable of controlling a wide range of invertebrate fouling organisms at a significantly reduced level compared to conventional antifouling biocides.

According to its manufacturer, Janssen Preservation & Material Protection, ECONEA is extremely and rapidly degradable in seawater, and therefore does not accumulate in the marine environment like copper biocides.

The antifouling agent can even be used in conjunction with copper-based paints either to reduce the copper level while retaining an equal antifouling performance or to enhance the antifouling performance of copper-based paints. In order to obtain complete fouling protection, ECONEA should be used in conjunction with an algaecide.

The Belgian company says that major paint manufacturers have already invested in ECONEA so as to develop their antifouling paints, several of which will be commercially available in the near future. *NA*

The Royal Institution of Naval Architects

WARSHIP 2009: AIRPOWER AT SEA

BMT Defence Services
"Where will our knowledge take you?"

17 - 18 June 2009, London, UK

Second Announcement

With conflicts increasingly taking place far away from land based air support, the role of naval based air power and the need to deploy a comprehensive range of naval based aircraft has become ever greater. RINA's 2009 conference in its highly successful Warships series will focus on Airpower at Sea.

Aircraft have developed rapidly in recent years and each generation of planes and helicopters present a new set of requirements and challenges to be met by the vessels carrying them. This is especially true of the latest trend towards Unmanned Air Vehicles (UAVs). These are now common for reconnaissance and surveillance and are on the brink of moving into a direct combat role. The vessels that carry these aircraft have long service lives and must be designed to take account of future developments with both minimal time spent out of service and cost due to updates.

RINA invites papers on all aspects of naval airpower from, designers, builders, equipment manufacturers and operators on the following topics:

- Design: new aircraft-ready vessels and retro-fit
- Operation: aircraft handling, deployment and retrieval
- Future aircraft requirements and their strategic context
- Integrated ISTAR from distributed assets
- Vessel and crew safety
- Lifecycle analysis: designing for change and the environment
- Seakeeping: stationary and underway
- Future-proofing
- Challenges of integrating UAV's into current platforms

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PSPC and the meaning of equivalence

Safinah outlines some alternatives to meeting the ballast tank coating rules.

The International Maritime Organization (IMO) resolution governing coating performance standards in seawater ballast tanks and the prospect of similar rules for other critical areas, such as crude oil tanks, continues to challenge yards, owners and surveyors.

While PSPC (Performance Standards for Protective Coatings) details the need for coating ballast tanks to achieve a 15 year target life, it does not specify exactly the type of system that has to be used to meet the requirement, suggests coatings consultant Safinah.

The current preferred solution is based on epoxy liquid coating systems, but the term in the rules "or equivalent" specify what alternatives would meet the requirement. The system described in the PSPC achieves the target life of 15 years by surface preparation, a two- coat scheme with two stripe coats, and planned maintenance requirements (yet to be defined). However, Safinah has examined a number of alternatives and identified possible equivalent technologies that may emerge in the near or distant future.

For instance, Safinah believes an 'equivalent' may be achieved with alternate epoxy schemes, say, by removing stripe coats, reducing to one full coat or some combination of these. The implication though is that the technology involved in application needs to be improved and perform consistently to assure the quality of a single coat application. The edge retention problem would need to be resolved and surface preparation quality to remain at least the same.

Looking at these options, Safinah said that while there are products from many leading paint companies that offer a single coat solution and already have a five-year track record in the field. It considered it unlikely that a solution along this route would find ready acceptance as an equivalent.

A number of systems are in the market that offer ease of checking single coat integrity either by a colour change or by the use of luminous pigments. These have been considered for a number of years and have some limited application in practice.

A ballast tank.

The issue for build yards is clearly one of cycle time – of how to move blocks through paint facilities as quickly as possible. Consequently one possible solution is that the scheme applied is a multi-coat scheme as required by the standard but that the first coat is very thin to give adequate coverage and quicker drying. The second coat could then bring the scheme up to the IMO required dry film thickness.

Epoxy chemistry has been the back-bone of marine coatings for many years but, of course there are alternative technologies. Some of these alternatives have been used for ballast tanks. Urethanes, most notably, have over the years enjoyed a mixed reputation, but a recent US Navy initiative that recognised the rapid and predictable cure times of these products showed a possible route for their return. In addition, these technologies have some serious big raw material suppliers behind them, which would very much like to increase market share in marine.

It is likely that such systems could be considered as equivalent to epoxy systems and would be subject to similar testing regimes for approval (as for epoxy paints), as long as they fell into the category of liquid paints. In addition, they would need to provide yards with a degree of predictability with regards to cycle times and curing times , as they can be formulated to cure independently of DFT and temperature in a consistent manner.

The IMO resolution does not discuss the use of sacrificial anodes. These have long been a part of the standard corrosion protection system in ballast tanks as a chemical process that can aid in the arrest of corrosion.

It is unlikely, however, that the use of anodes alone or in any format would provide a 15-year target life and hence they will be only used a supporting technology to other systems (coating or otherwise). Thus, it is likely that they will remain a contributor to epoxy based systems and that the IMO resolution will not have any real effect on their use.

For many years Nippon Steel and others have supplied corrosion resistant steels and this technology is still being pursued. Nippon Steel recently had a product approved for a 100-year life in land-based housing construction. It is possible in the future that alternative materials and structural configurations may provide solutions that require no or very little corrosion protection in the form that we currently think about them. However Safinah does not see these solutions emerging in the short to medium term.

Even so, it could be that a combination of such steels and reduced coatings (say one coat application) could result in equivalence.

Some of the ballast water treatment systems under development to meet the Ballast Water Convention operate on a de-oxygenation principle, by stripping oxygen out of the ballast water and further making the ballast tanks partially inert. In theory these systems should assist in arresting corrosion and there is some evidence to that effect. On that basis it may be acceptable to use such a system in conjunction with a reduced coating specification to achieve the equivalent 15-year target life. Some of these systems have undertaken trials with coatings (Epoxy) and shown positive results. *NA*

The Royal Institution of Naval Architects

DESIGN AND OPERATION OF BULK CARRIERS

26 - 27 October 2009, Athens, Greece

First Notice & Call for Papers

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INTERCARGO

In recent years the industry has been through a commercially unprecedented period and been subject to major regulatory change. Both commercial and regulatory influences have presented many technical challenges and many more lay ahead.

Designers, classification societies and owners have faced the challenges posed by the introduction of the Common Structural Rules. Goal Based Standards have been developed further at IMO with the final elements expected to be finalised this year. Also at IMO, new schedules have been added to the IMSBC Code (formally BC Code) which will become mandatory in January 2011 and the BLU Code is currently under review to include grain and consider issues associated with high loading rates.

Environmental regulation is also moving forward with the revision to MARPOL Annex VI placing further restrictions on emissions of NOx and SOx. The development of the IMO Energy Efficiency Design Index is aimed at stimulating technical innovation in propulsive efficiency as the industry strives to reduce its CO_2 emissions.

RINA invites papers from designers, operators, class societies, suppliers and builders on all aspects of bulk carrier design and operation including:

- Cargo Handling
- Propulsive Efficiency
- Coatings
- Rules and Regulations
- Crew Operations
- Ship Design and Structures
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Is your coat thick enough?

Nearly one year after the Performance Standard for Protective Coatings entered into force, shipowners and inspectors continue to struggle with the dry film thickness measuring regime it requires.

Today's coatings inspector has to take one coating thickness measurement reading per $5m^2$ area on flat surface areas and one gauge reading at 2m or 3m intervals, as closely as possible to tank boundaries, but not further than 15mm from the edges of tank boundaries.

Measurements have to be taken around openings and additional spot checks may be required for longitudinal and transverse stiffener members, primary support members and complex areas.

This mammoth task is compounded by the fact that 90% of all thickness measurements have to be greater than or equal to nominal dry film thickness (NDFT) and none of the remaining 10% measurements can be below 0.9 x NDFT. Not only is this one of the hardest standards to calculate and almost impossible without the aid of print outs, calculators or computers - more than 300,000 readings may need to be taken and recorded to meet the requirements.

However, there are now a number of electronic gauges available that can make light of the requirements and the 90/10 rule. Some even feature Bluetooth wireless communication for quick and easy uploading of data.

US-based DeFelsko Corporation, for instance, has redesigned all of its PosiTector 6000 gauges to comply with the rules and the new version offers an advanced IMO PSPC feature set in its memory. This allows the user to enter a target thickness value from which the gauge will automatically ensure compliance as each measurement is taken. It comes complete with PosiSoft software and USB cable to download the report including the specified thickness criteria, each individual reading, and a Pass/Fail statement. Additionally, stored results can be viewed on the display or printed to an optional IR printer.

Similarly, the Elcometer 4563 Coating Thickness Gauge gives the user PSPC results for the 90/10 rule as a "Pass or Fail" as the measurements are actually taken.

The Elcometer 4563 Coating Thickness Gauge gives the user PSPC results for the 90/10 rule as a "Pass or Fail" as the measurements are actually taken.

The unit is supplied with Bluetooth wireless technology and ElcoMaster Software which allows the user to produce professional inspection reports – instantly. However, to answer all the questions raised by the shipping industry for coatings management, not only for PSPC but for the whole ship, Elcometer has developed ElcoShip, an effective solution for coatings data management.

ElcoShip provides a framework for the planning and recording of coating inspection tasks associated with a particular ship by name. The software is divided in to seven sections to aid the planning and creation of inspection tasks. These include: Coating System, Register of Inspectors, Permissions, Inspection Regimes, Ship Structure, Inspection Tasks, and Daily Log. A further five operational features for managing the inspection tasks and creating the coating technical files are included.

Once created, the inspection tasks can be scheduled and allocated to a specific inspector and the system can implement this process using Personal Digital Assistants (PDA's) so that the work can be allocated and carried out remotely from the computer for maximum efficiency.

Dorchester-based Tritex NDT has also launched a new useful gauge for surveyors of coatings.

Dorchester-based Tritex NDT, meanwhile, has also launched a new and useful gauge for surveyors and coating monitoring. Its new Multigauge 5500 is a multiple echo ultrasonic thickness gauge for checking corrosion which allows measurements to be taken through coatings of more 6mm.

Coatings have a different velocity of sound than metal and it is important they are not included in the measurement. The company's "Triple Echo" technology ensures all coatings are completely eliminated from the measurement. A transmitted ultrasound pulse travels through both the coating and the metal and reflects from the back wall. The returned echo then reverberates within the metal, with only a small portion of the echo travelling back through the coating each time. The timing between the small echoes gives us the timing of the echoes within the metal, which relate to metal thickness. The returned echoes need not be consecutive, as the gauge will interpret them automatically and calculate the thickness. A minimum of three echoes are checked each time. *NA*

The Royal Institution of Naval Architects

Air Cushion Vehicles & Surface Effect Craft

17 - 18 November 2009

First Notice & Call for Papers

As part of the celebrations marking 50 years since the launch of the SRN-1, the UK's first hovercraft, RINA will be running another of its successful conferences on the subject of hovercraft and surface effect craft. This will not only be an opportunity to look back on 50 years of development, but more importantly a chance to look forward to the current and future developments in the field.

The conference will also cover the latest developments in design, manufacture and operation of surface effect craft.

The merits of such vehicles over other marine vessels are becoming increasingly clear especially with the new problems related to climate change, rising global sea levels and major natural disasters. This diversification of roles brings new challenges for both designers and operators.

RINA invites papers relating to both Surface Effect Craft and Air Cushion Vehicles, covering all aspects of Design, Operation, Development and Regulation.

RINA invites papers on all related topics including:

Design and Construction
Control systems
Propulsion
New applications
Regulation

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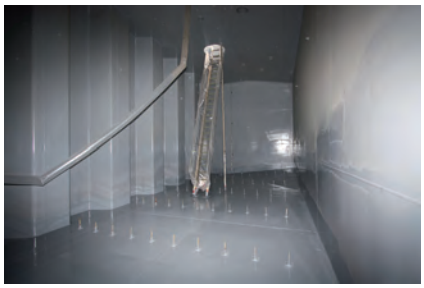
Costs cannot be glossed over

Some argue that cargo tank protection will be better achieved by eschewing coatings that may fail over time and specifying stainless steel tank walls, but shipowners concentrating on the bottom line may beg to differ.

Advanced Polymer Coatings (APC) has come right out and said it: carbon steel tanks coated with its MarineLine product "cost less than one-sixth of the price for an equivalent tank fabricated in stainless steel," the company says.

The supplier says that shipowners are specifying MarineLine as the cargo tank lining of choice for all types of aggressive chemical cargoes, CPPs, and edible oils. "MarineLine technology is based on a tightly knit, cross-linked organic-inorganic polymer structure that creates a nearly impermeable barrier," says APC. "The coating resists chemical attack from a wide range of aggressive cargoes and assures product purity from port to port, virtually eliminating tainted cargoes from being discarded, which can occur with conventional coatings. This is a real plus for the environment."



The MarineLine coating being heat-cured at a shipyard.

MarinLine's smooth, hard, slick surface makes tank cleaning an easy process, the company says. "During port changeover, no extensive cleaning chemicals are needed to wash the tank walls, thus greatly reducing the use of cleaning chemicals, requiring less fuel consumption for cleaning equipment, and lowering emissions, all excellent green advantages. Faster cleaning also leads to prompt turnaround, so chemical carriers can go back into service quickly, maximising the usage of the vessels, another 'green' concept."

MarineLine, which is sometimes referred to as 'liquid stainless steel' is coated directly onto the carbon steel substrate of the ship's tanks. "This replaces the need to fabricate tanks made of stainless steel which can be very costly," the company says. *NA*

Mixed messages

Split picture for dry bulk trades heralds uncertainty for future ship deliveries.

Looking for bright spots in the dry bulk market has been easy in the first quarter of 2009 and the story is a familiar one. Record levels of iron ore buying by Chinese steel mills as well as strong coal and grain movements to the region have delivered some much needed optimism.

But where the optimists see an upturn, pragmatists, among them SSY analysts John Kearsey and Peter Norfolk, offer caution. For a start, China is about the only bright spot amidst the carnage in other trades.

"It is a bit of a split picture but within that, any growth is in China and perhaps India," says Mr Kearsey. "The risk is how do we know there is any strength to recovery? The [government] stimulus will have effect but in the case of iron ore we think it's overcooked. Traders have been looking to take advantage of cheap spot ore in anticipation of the stimulus."

That suggests a slowdown over the next three to six months, with an upward correction possible before the end of the year. "There is domestic demand for steel but the export trades have collapsed," says Mr Norfolk. "We don't feel the first quarter pace can be sustained but if the stimulus package works then we could see volumes going up by the fourth quarter."

With Capesize and Supramax ships most in demand, Panamaxes have fared the worst in terms of 2009 earnings, with a slight lift from the South American grain season in March.

In assessing the orderbook, Mr Kearsey again points to a glimmer of light; that the newbuilding schedule was always going to suffer slippage, such is the technical pressure on yards. Slippage for Capes and Handies has been chronic, with some newer yards in China and South Korea failing to deliver any of the ships slated for first quarter 2009 completion.

He is less confident on the scale of cancellations. "The truth is nobody knows. Even when owners cancel or delay, some yards are taking the ships on and finishing them. State intervention in China and Korea adds a big element of uncertainty."

SSY data assume that for 2009 about 30% of the dry bulk carriers due to enter the fleet won't appear, but more thanks to slippage than cancellation. For 2010 that increases to 40%. "Even before the crash hit there was going to be slippage. We were sceptical that output could increase as much as forecast," adds Mr Norfolk. "We're expecting an acceleration of deliveries as the year goes on, but no one really knows yet."

Uncertainty ahead?

> "SSY: We're expecting an acceleration of deliveries as the year goes on, but no one really knows yet"

With reportedly less than half the orders beyond 2009 fully financed, more cancellations and delays are likely and the macro-economic outlook, China aside, does not look encouraging. "We modelled an assumption of fleet growth in 2009 and 2010 with 50% non-delivery and you still see an acceleration in fleet growth in capes and Supras this year and next, compared to the previous two years," says Mr Norfolk.

With more cancellations and 'reasonable' levels of demolition, the Panamax and Handysize sectors could come under control the fastest but no-one should confuse this for optimism. Kearsey says other SSY theoretical models combined extreme levels of cancellations and scrapping and still required a V-shaped recovery in global economic output for any sustained earnings growth inside two years. *NA*

Lloyd's Register in crack analysis

The commonly accepted profile of bulk carriers as the workhorses of world trade belies the need for continuing innovation in their design and maintenance.

Condition monitoring of hull structures is a recurring theme in the operational life of bulkers. More recent is the interest in improving propulsion efficiency, as much for reasons of fuel efficiency and thus emissions management than a desire for greater speed.

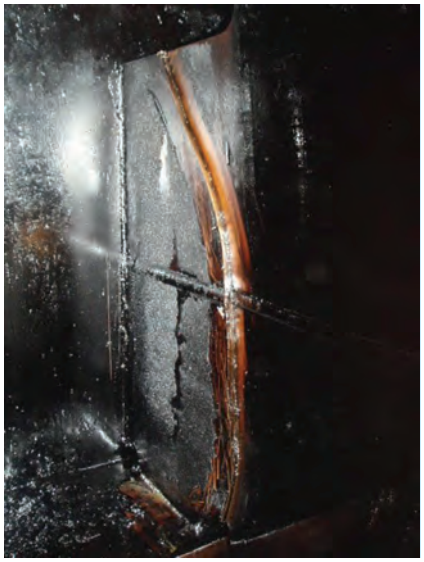
Lloyd's Register continues to conduct a comprehensive programme of research into factors encountered on bulk carriers, using emerging techniques to analyse common issues, improve risk management and performance.

Research has been ongoing since 2004 into assessing the viability of hull monitoring using acoustic emission techniques. To explore the integrity of a structure with confidence it is necessary to be able to both detect and locate active cracks and since the 1990s, it has become apparent that a new generation of acoustic emission techniques would be necessary to fulfil this objective.

Lloyd's Register subsequently collaborated with British Aerospace to develop an advanced capability to detect crack propagation in steel structures. A third partner, Ultra Electronics joined the consortium and the result was the multi-sensor system which fulfilled the basic requirements of the three organisations.

Ship structures, like those of aircraft, are highly compliant and damage tolerant and the fatigue design assessment of a ship's hull structures depends heavily on the results of appropriate fatigue endurance (S-N) curves for the different weld configurations present.

S-N curves are, nevertheless, only a statistical representation of probable failure within a confidence interval. Moreover, the mere presence of a crack in the structure does not necessarily imply impending failure, due to the compliant nature of the structure. For example, a crack may start to grow for some time in a steel member only to arrest itself later when the general stress distribution in the structure rearranges itself to compensate for the change in structural continuity.



Fatigue life usually implies the crack propagation life, based on the premise that defects encouraging the crack will be present in the structure.

In such a situation the crack tip stresses may no longer be sufficient to drive the crack further and the 'damage' then becomes benign. Naturally, the danger in this situation may be that it continues to grow, albeit at a different rate. The important issue, therefore, is to know which cracks are active during the ship's operational cycle.

When cracks are detected in ship hull structures they may be large, extending through the wall thickness and across the plane of the component. At this stage the growth determining factor is the residual strength of the cracked structure as a whole, not the crack depth, through the wall thickness and the remaining ligament length – which are usually the current basis for evaluating critical cracks.

Fatigue life usually implies the crack propagation life, based on the premise that defects encouraging the crack will be present in the structure and as such, the critical factors determining the fatigue life are the existence of potential weld anomalies, particularly when these coincide with regions of high local stresses, the stresses induced in a structure during a welding procedure and the loading environment through the working life for the ship.

The study initiated in 2004 by Lloyd's Register set out to assess the feasibility of an acoustic emission approach to hull condition monitoring in three phases. The first was to answer whether crack-like acoustic emissions were detectible in a ship structure. With this successfully resolved, the second phase posed the question of how many sensors would be required for a large ship such as a bulk carrier. The final phase looked at the operation of the technique under sea going conditions to determine where either the seaway or the loading conditions can promote creation of cracks. Lloyd's Register describes the results of phase three as 'very promising', building on its conclusion that use of acoustic emissions is feasible in defining hull crack methodologies.

Lloyd's Register has also built on its experience in the application of computational fluid dynamics techniques across a wide range of bulk carrier types: either in the analysis of details or for the entire hull form.

When considering the complete hull form analysis, the ship's wake field and other components of resistance can be defined and combined with its range of propeller analysis codes to define optimum effect for the propulsion efficiency and minimisation of emissions.

Additional to the optimisation process is ensuring the controlled development of cavitation over the propeller blades to control erosion and minimise the hull surface pressures radiated by the propeller. Lloyd's Register has an active research programme examining optimisation of propeller efficiency once fracture mechanics of erosion processes are better understood. *NA*

FKAB builds on midsize Caper

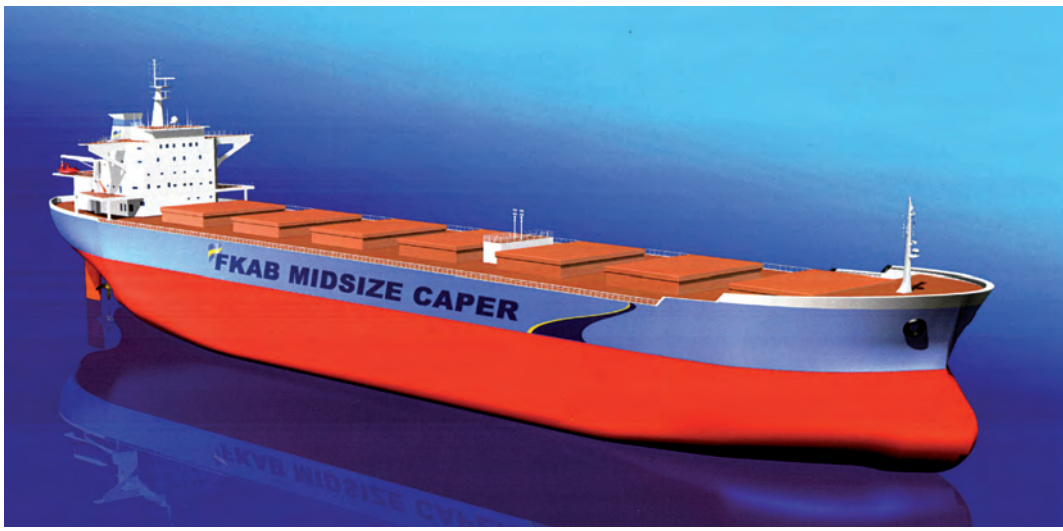
Growing demand for midsize Caper tonnage lies at the heart of the new relationship between Swedish company FKAB Marine Design and Indian yard Goodearth Shipbuilding Pvt Ltd.

FKAB signed a design contract with Goodearth Shipbuilding at the end of 2008, looking to build an initial four of a new 110,000dwt ship type. While this is the largest single design contract secured by FKAB to date, Goodearth has let it be known that it expects demand to rise to around 20 such ships. The first ship to the new design will be completed in 2011.

The B12 midsize Caper design was developed by FKAB in cooperation with Fernley's in 2006 and envisages a ship of 245.0m in overall length with a breadth of 43.0m and depth of 23.70m. Such ships will be capable of a service speed of 14.5knots.

"The order is significant for FKAB since it is based on our own assumptions of the future shipping market," says Claes Claeson, FKAB chief executive.

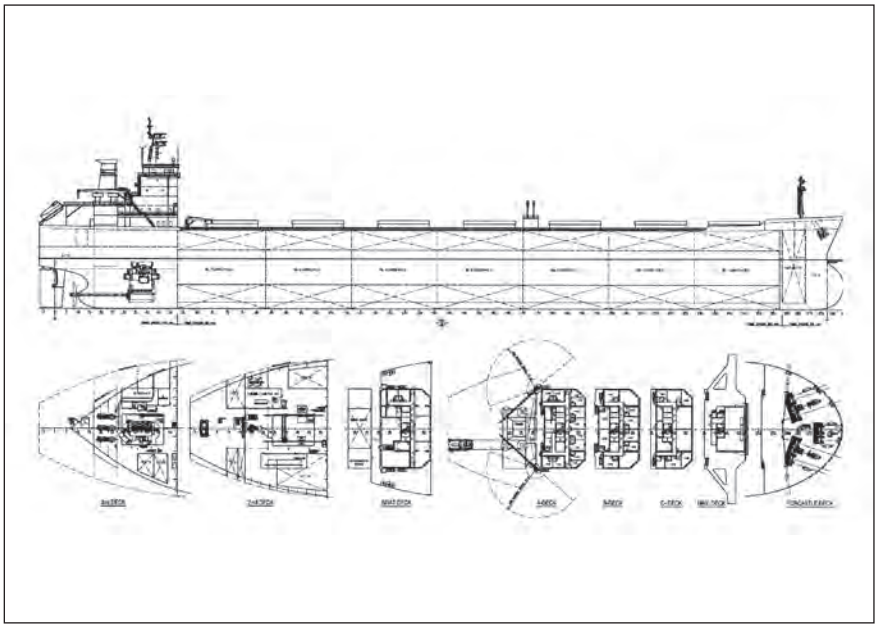
The vessel design combines a high carrying capacity of 5 million ft^3 with main particulars adapted to cater for most ports in Europe, India and South America. The design fully complies with the new CSR rules and all aspects of environmental standards have been taken in to account, with provision made for ballast water treatment, for example.



FKAB's midsize Caper design.

Goodearth Shipbuilding Pvt Ltd is a fully owned subsidiary to Goodearth Maritime Ltd, an Indian shipowner with a number of bulk carriers of different sizes. Today the shipyard pursues its shipbuilding activities at Hindustan Shipyard Ltd but, since 2006, a new and fully owned shipyard in Cuddalore, on the South East coast of India has been planned. Initial steps for construction of the new yard are currently under way and according to the schedule, will see shipbuilding activities start at the new site in 2010. *NA*

TECHNICAL PARTICULARS	
FKAB B12	
Length o,a	245.0m
Length b,p	235.3m
Breadth mld	43.00m
Depth mld	23.70m
Draught design	15.0m
Corresponding deadweight	110,000dwt
Draught scantling	17.00m
Corresponding deadweight	130,000dwt
Cubic capacity	5,000,000ft^3
Equals	5,000,000ft^3
Heavy Fuel oils capacity	4500m^3
Ballast water capacity	55,300m^3
Main engine	MCR 13 560kW x 105rpm
Service speed	14.5knots
Endurance	25,000nm
Accommodation	25 persons



Big bore increasingly electrified

Fewer engine cylinders and larger bores onboard eight new very large ore carriers from Dalian Shipyard call for electric vibration compensators from Danish specialist Gertsen & Olufsen.

Vibration compensation specialist Gertsen & Olufsen has received a DKK10 million (US$1.81 million) order for eight electric vibration compensators from Chinese state-owned shipping company China Shipping.

The compensators will be installed in eight 300,000 dwt VLOCs being built at Dalian Shipyard. The 310m long VLOCs, which will be 55m wide and draw draught when fully laden of 25m, will carry ore between China, Australia, and India.

"This is a wave-breaking order," said Jens Ulrik Nielsen, sales director, Gertsen & Olufsen: "This is our first stint at vibration compensation in the growing segment for fuel efficient, fewer cylinders, large-bore-engines."

The deployment of vibration compensators extended the use of lighter and thus more CO_2-friendly construction in shipbuilding, G&O said, as well as reducing the number of moving parts needed, and the amount of maintenance support.

"vibration compensators extended the use of lighter and thus more CO_2-friendly construction"

The need for electric vibration compensators was on the rise, Mr Nielsen said.

"One trend in construction of container, tank, and bulk ships is fewer cylinders and larger bores in order to increase fuel efficiency and reduce emissions of CO_2. But fewer plugs and larger holes also mean more vibrations and this is where we can effectively assist the shipbuilders."

Including fewer cylinders still represented a large leap of faith for many ship builders, he said. "It goes against what we have learned. If you dare, however, step over the conventions, use of electric vibration compensators can lead to the use of much more fuel efficient and CO_2-friendly engines in an array of new application types. Using our compensator, as an example, on a five cylinder engine reduces the vibration below levels of a conventional seven cylinder engine." *NA*

More space for Mitsui

Two recent bulk carrier deliveries to the Mitsui 56 design bear witness to the enduring attractions of this high carrying capacity ship in the bulk carrier market.

Antoine, for Palma Trading Corp, and *Tomoshio*, delivered to Moon Rise Shipping Co, are respectively the 82nd and 83rd ships to the '56' design to emerge from Mitsui Engineering and Shipbuilding facilities.

These Handymax bulk carriers are characterised by their 70,000m^3 capacity cargo holds, and their appeal is confirmed by the fact that more than 150 units of this series have been ordered from MES.

At 189.99m long (182m between perpendiculars), these ships feature a moulded breadth of 32.26m and a depth of 17.9m, drawing a draught of 12.55m. They are driven by Mitsui-MAN B&W 6S50MCC main engines, generating 9480kW at 127revs/min, to achieve 14.5knots.

"more than 150 units of this series have been ordered from MES"

Built to IACS URS25 standards, these ships a geared with four cranes and feature five cargo holds, whose hatches are longer and wider than any comparable vessel, while each cargo hold has sufficient clear length to load long pipes and has been strengthened to load heavy cargoes, such as hot coils.

These latest completions follow on from the delivery of the first 'Dunkerque-max' 177,000dwt bulk carrier by MES *Cape Garland*, delivered to Libera Holdings.

In spite of having cargo holds bound by a double-side skin, in accordance with SOLAS requirements, the cargo capacity of this 292m long ship is equivalent to that of a conventional single skinned Capesize bulk carrier. *NA*

Diamond shines through

First Diamond 53 finally floats out from Hindustan dock.

After an extensive delay, March saw the floating of first 53,000dwt bulk carrier in the 'Diamond' series to be built for Chennai-based Goodearth Maritime Limited (GML) at the building dock of Hindustan Shipyard Limited.

This is the biggest vessel ever floated out in the history of HSL from the covered building dock. The double-hull ship is 190m long and offers cargo handling capacity of 65,900m^3. It will be able to achieve speeds up to 15.2knots. Local reports said that the ship was likely to be delivered to GML by the end of the third quarter, 2009. The ships had originally been contracted with delivery envisaged as from summer 2007 onwards.

Goodearth entered into a 15 year ship-building agreement with HSL, of Vizag, India in 2005. In the first phase the company has taken delivery of four 30,000dwt bulk carriers, with six 53,000dwt vessels now due to follow. No information is available regarding options for a further three ships in the series.

The Diamond 53 is a geared, wide hatched, Handymax bulk carrier with double-hull, and was designed by Carl Bro following extensive consultation with DNV for structural and regulatory issues and Graig Shipping from an operational point of view so that there is a balance between the theoretical and the commercially practical. Diamond 53 is designed to accommodate the latest trends and developments within the Handymax bulk carrier trade, extensive focus has been dedicated to economic operation and maintenance, loading flexibility and robustness, safety and hull integrity, and environmental friendliness.

Graig has been providing Archean Group shipping arm Goodearth with yard supervision, assistance with equipment procurement and yard consultancy.

Wärtsilä is delivering six-cylinder RT-flex50 common-rail low-speed engines for each ship, with a maximum continuous power of 9720kW at 124revs/min, plus a fixed-pitch propeller and three 645kW Auxpac gensets. *NA*

TECHNICAL PARTICULARS

Diamond 53

Length overall	190m
Length between perpendiculars	183.05m
Breadth moulded	32.26m
Depth to upper deck	17.5m
Design draught	11.1m
Scantling draught	12.62m
Deadweight	53,000tonnes
Cargo capcity	65,900m^3

Imabari weighs in with new giant

Very large ore carriers are ever increasing in size, and Imabari Shipbuilding Co. Ltd. has raised the bar once more, having developed the 335,000dwt *IS Brastar* concept, which will result in a new size of ship for iron ore transportation between Brazil and Asia.

The vessel will have five cargo holds and nine single panel hatches to shorten the time required for cargo handling, and adequate hull strength will be provided for loading dense iron ore. Fuel oil tanks will be protected by double-hull construction to ensure the prevention of marine pollution.

The ship will be driven by the latest model of MAN Diesel 7S80MC-C (Mark VIII) diesel engine to achieve a service speed of 15.15knots, which will secure stable and punctual transport service. An energy saving device will be installed at the leading edge of the rudder.

The first IS Brastar (Imabari Shipbuilding, BRAzil, and STAR) vessel is expected to be completed by 2014. All that will be left to do then is wait for the even larger 400,000dwt vessles slated for Vale.

TECHNICAL PARTICULARS

IS Brastar

Length, o.a	339.9m
Length, b.p	330.00m
Breadth, mld	60.00m
Depth, mld	28.80m
Draught, mld	21.65m
DWT	335,000t
GT	167,500
Main engine:	B&W 7S80MC-C (Mk VIII)
	diesel x 1 unit MCR: 29,260kW
	x 78rpm Service speed: 15.15knots

IS Brastar **– the largest VLOC of them all so far.**

Bulkers ripe for green scrapping

Bulk carrier scrapping is the immediate target, after Siba Ships and Seaarland launch the Green Recycling Initiative.

Already answer has emerged as to what to do with all that spare bulk carrier capacity. Italy's Siba Ships and Seaarland Shipping Management of The Netherlands are the inaugural investors in the 'Green Recycling Initiative', which is looking to raise $300 million to buy up bulk carriers in particular, in order to scrap them.

Run through Siba Ships affiliate fund Pearl Minerals and Metals Ltd, of Australia, The GRI is itself based in Singapore and has been formed to buy and recycle ships and to trade steel scrap on a global basis. It is looking to attract investment from shipowners, shipbuilders and steel producers, in a plan that would, for the first time, see direct linkage between those scrapping ships, those performing the scrapping, and those consuming the scrap.

On the beach, but the Green Recycling Initiative is looking for an alternative approach for up to 120 bulk carriers.

The aim of the GRI is "to integrate the needs of shipowners to recycle ships in a more environmentally friendly manner and the needs of steel producers to be able to produce ethically sourced steel," according to an official statement.

The GRI will seek up to 150 investors, and plans to establish a fund to buy around 120 bulk carriers during 2009/10. It sees particular opportunities in the Panamax and smaller Capesize sectors.

The partners said that the GRI planned to begin recycling at established environmentally friendly ship recycling yards run by the International Ship Recycling Association, with a view to building its own recycling facility.

Backers are known to have held discussions with shipowners in Japan and Greece, with moves also afoot to involve Norwegian owners. Some owners may be able to 'invest' ships they want to scrap in the GRI, rather than cold hard cash.

Mauro Balzarini, chairman of Siba Ships, said: "Good shipowners want to recycle their ships ethically, and good steelmakers want to use ethically produced scrap. IMO has introduced the International Convention for the Safe and Environmentally Sound Recycling of Ships, which in time will put an end to beach scrapping. The bulk carrier market in particular now is ripe for major scrapping, and when the world economy gets moving again demand for steel will take off quickly. So we have a historic opportunity where the market, public concerns and regulatory change are all working together. The Green Recycling Initiative is an opportunity for shipowners and steel makers to join a sound, clean, green and long term business which will make shipping and steel making more environmentally friendly, and also produce good returns for those quick enough to see the opportunities."

Antonio Zacchello, managing director of Seaarland, added: "We are committed to running an environmentally sound shipping business, and clearly the way we recycle ships has to be part of that. GRI is a very useful vehicle which will ensure ships are recycled in an ethical and clean way and we are proud to be founding investors in the business."

Brett Salt, managing director of GRI, said: "We have identified a number of owners and a number of steel mills who share our high environmental standards and who want to be able to demonstrate traceability in the recycling of ships and the sourcing of scrap for new steelmaking. We are offering them the opportunity to invest in the business and so generate a return while owners can see their vessels complying with Green Passport requirements right to the point of recycling, and steelmakers can have an auditable Green Passport for their steel. We shall be signing base load contracts for scrap supply with several EAF steel mills in Asia in the near future and be sourcing tonnage to meet that demand. And we are actively studying potential sites for recycling yards which will be able to provide a safe haven for laid up ships while waiting recycling, and also be designed from scratch to provide clean, cost-effective recycling using properly trained and protected workers."

It is understood that Siba has been exploring opportunities to establish a green recycling yard in China, Pakistan and the Middle East. *NA*

NYK fixes on PMA alternative

Class NK has given its approval for a new bulk carrier hold inspection device - Mente-san.

An alternative 'permanent means of access' inspection device for bulk carriers jointly developed by Osaka-based Meihan Senpaku Co. Ltd, NYK Global Bulk Corp and Monohakobi Technology Institute, known as Mente-san, has been given approval by Class NK as being in line with SOLAS (The International Convention for the Safety of Life at Sea) requirements.

Mente-san can be easily assembled and installed and offers secure footing safety by virtue of its combination of a multi-stage ladder and scaffolding, in a configuration reminiscent of those generally used on construction sites on land. The device is held firmly to the frame of a ship's hull by use of steel clamps and is said to thus dramatically improve safety for inspectors. This enables them to carry out inspection work speedily and properly, contributing to a reduced burden for those performing inspections and measurement in high and hard to reach places.

In addition, Mente-san can be reassembled as a tower-type movable maintenance ladder – the Rakuraku Ladder Noboru-kun1 previously developed by MTI. As both devices include common parts such as the ladders and scaffolds, carriers will not be required to keep different devices for inspection work and maintenance work. Both Mente-san and Rakuraku Ladder Noboru-kun are protected by industrial property rights

The Mente-san alternative permanent means of access for inspection and maintenance purposes.

The SOLAS Convention was amended with the aim of improving the safety of oil tankers and bulk carriers. It required setting up PMA for easier access to high places inside the holds to all the bulk carriers of 20,000gt or more constructed after 1 January, 2005. To meet this requirement, PMA such as vertical ladders that were permanently fixed inside holds were initially adopted although these tended to cause abrasive damage to cargo, and to trap some cargo in the space between the PMA and ship structures. Consequently, other portable-yet-securable types of PMA were developed, but they had high cost consequences, as they could not be diverted to other uses such as maintenance.

With all this in mind, Mente-san was designed to be used as an inspection tool, but also for daily maintenance. A demonstration of the product was carried out in the presence of ABS, Bureau Veritas, Det Norske Veritas, Lloyd's Register of Shipping , and Nippon Kaiji Kyokai (NK) in May 2008 and, at the IACS Survey Panel in September 2008, Mente-san was introduced and validated as a portable alternative PMA that meets the SOLAS Convention requirements.

NYK said it would introduce the new PMA to its fleet of bulk carriers over time through 2009. Meihan Senpaku Co. Ltd is acting as the agent in charge of sales and delivery of new orders. Prices start at Yen2 million ($20,800) for the basic installation (excluding tax and delivery cost). *NA*

Best practice from DNV

Det Norske Veritas has introduced a "CSR Bulk Best Practice" tool to provide practical support for knowledge sharing amongst its approval centres. This tool is accessed from the global DNV intranet and guides approval engineers through the entire hull approval process by showing them how to deal with the various calculations, as well as describing the verifications needed. The whole hull approval process is covered - from when the first drawing is received until the last drawing is stamped and approved.

The Best Practice includes interpretations of unclear rule requirements, instructions on how to carry out the different calculations, hints on how to use the software efficiently, checklists for verification, etc. The Best Practice also includes links to the relevant calculation tools, either Nauticus Hull or other calculation tools. The work process is designed to match a logical hull approval sequence, starting with the establishment of design parameters and followed by a review of the drawing packages for each area of the hull structure.

An important module in the DNV Best Practice tool is a database containing all the rule interpretations from the IACS Knowledge Centre. The Knowledge Centre contains more than 500 questions about the interpretation of CSR Bulk Rules. These questions originate from both the industry and the different class societies, and are answered by an IACS rule maintenance group.

Ema Muk-Pavic, naval architect.

Engineering has never been far from the thoughts of Serbian-born Ema Muk-Pavic.

"Even when I was in high school I knew that I would do engineering," she said, "I just didn't know which one. I come from an engineering family, my two parents are engineers and all the women in my family going back to my grandmother have worked, so it was the norm that I would work and that I should practice something that I liked."

Ms Muk-Pavic studied Naval Architecture and Marine Engineering at Belgrade University. In her third year, for her work experience, she focused specifically on naval architecture, a decision which led to her career path.

"My first job was in a shipyard, Brodotehnica, Serbia. I was lucky to be in a design office of a shipyard and we were doing the whole process from initial design through to delivering the vessels. That was really rewarding because you can actually see your project, how they are built and all the issues and all the flaws you need to fix. It's a special feeling when you see the results in your hand."

In 2006 Miss Muk-Pavic secured her Msc in Naval Hydrodynamics at Belgrade University.

She recalls that when she was studying naval architecture she was very ambitious and full of aspiration. Her career started out in the area of research and development, "I wanted to take all this research and development information and put it to a practical use. When you see it in conferences and technical papers, it doesn't seem to filter through down to the drawing board," she said.

As a working naval architect, Ms Muk-Pavic said she faced an early challenge at Brodotehnica in participating in the development of a river gun boat for the Serbian Navy. "I managed to learn so much. I had to figure out how the other engineering skills actually worked together and how it all interconnected. It was the first opportunity to have hands-on experience, coordinating and designing. It was also important for my career as it made me think a little more about what I actually wanted."

Although working in this area was interesting, Ms Muk-Pavic quickly went back to the design side of naval architecture. She said that, for a naval architect to be good, it is important to have the whole picture of the industry, gaining knowledge and experience in more than one sector. To date, she has worked for six different companies.

In 2001 Ms Muk-Pavic and her family moved to Canada, where she started work as a project manager/ senior engineer at Oceanic Consulting Corp. Ltd in St John's. She said that she enjoyed her time in this role as she gained experience working across a broad range of vessels in the field of numerical simulation, as this was the area that she was looking to progress in, and gave her the chance to use the skills that she had learnt in Computational Fluid Dynamics (CFD) from her Masters in Naval Hydrodynamics.

> "I wanted to take all this research and development information and put it to practical use"

Then, last year, she and her family moved to England with her family last year, where she said, she received four job offers. She said that, even though she did not accept one of these, "the highlight" of her career came when she was offered a job by Marin in The Netherlands.

Instead, she was attracted to what she considered a more open-ended naval architecture role at Houlder. Ltd; where she started in May 2008. She explained: "Our technical director, he was the person who gave me the impression that my options are open, if I want to work, how I want to work, where I want to work. I saw in all other companies that I would need to adjust myself to the task ahead; whereas here it is clearly open to the way I work and to my experience."

After her years of hard work, Ms Muk-Pavic said she now found herself readily accepted as a

naval architect, suggesting that in some cases, she was given levels of respect that may even exceed that accorded to her male counterparts. She put her success in engineering down to having "high confidence as a woman in engineering". "When you first start in naval architecture the first step is hard, but with development and practice, it gets easier," she said.

She is active in the Semta (Sector Skills Council for Science, Engineering and Manufacturing Technologies) Women at Work course, which she said was important for young people coming into the industry. The Women at Work course shows women what they can achieve and also offers guidance within the course on topics such as management.

Ms Muk-Pavic is also an ambassador for the Science, Technology, Engineering and Mathematics Network (STEMNET), which involves her working with schools as a mentor and attending careers fairs and giving insight to young people who may be looking in to a career in engineering. She highlighted the fact that girls are very capable, but that they do not seem to be encouraged to enter this field of work and, in looking back to the beginning of her own professional career, paid a warm tribute to a mentor of her own - Gojko Andrijasevic. *NA*

For more information about Semta 'Women at Work' www.semta.org.uk and STEMNET www.stemnet.org.uk

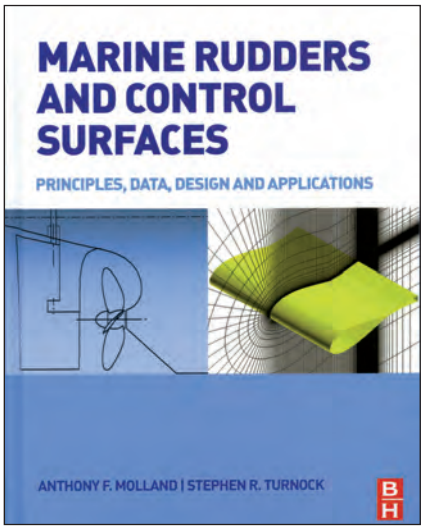
BOOK REVIEW

Marine Rudders and Control Surfaces

Review by E C Tupper

Marine Rudders and Control Surfaces
Principles, Data, Design and Applications

By Anthony Molland and Stephen Turnock, published by Butterworth-Heinemann, Elsevier as a hardback, 2007, 448 pp. ISBN 978-0-7506-6944-3, £69.



Tony Molland is Emeritus Professor of Ship Design at the University of Southampton and Stephen Turnock is Senior Lecturer in Ship Science at the same university. Both are highly regarded in the profession. Hence it can be said that this textbook, the only one devoted to marine control surface design, comes with a good pedigree. It is arranged in four sections.

Part 1 deals with the general principles of the subject, including a history of the use of rudders to control water borne craft and starting with the side-mounted steering oar. It outlines the various types of control surface, including stabilisers, transom flaps and interceptors, and explains the physics of their operation. A ship must be able to maintain a steady course and manoeuvre. Directional stability and the measures of manoeuvrability are discussed.

Part 2 reviews the experimental data available and how that data is presented. Included are rudder/hull/propulsor interactions, free surface effects and the significance of cavitation. It concludes with a review of theoretical and numerical methods available for the analysis of the performance of rudders and control surfaces, including lifting line theory, surface panel or boundary element methods. Reynolds-averaged Navier-Stokes (RANS) methods, large eddy simulations and direct numerical simulation methods. It points out that the simpler lifting line theories can give good accuracy.

Part 3 deals with design strategy and methodology and covers rudders, fin stabilisers, hydroplanes and pitch damping fins. The effects of shallow water and bank interaction on manoeuvring are discussed.

Part 4 is devoted to design applications covering both large ships and small craft.

Finally there are two appendices. The first presents tabulated test data and the second lists rudder and propeller design software available. More details are available through the publisher's web site. This online companion site, which contains an extensive modelling data library together with software for theoretical control surface design, is based on over 25 years of research at Southampton University.

The book is comprehensive in its coverage. It is logically and clearly written with over 300 illustrations in black and white and eleven colour plates. More than 360 references, linked to the appropriate chapters, give readers the chance to look at sources used and to follow up individual topics in even more detail should they so wish. *NA*

Herald for a multi-hull solution

Dear Sir,

I do not agree with the analysis of Herald of Free Enterprises over-heeling, *The Naval Architect*, April 2009.

The main reason for the disaster was the open bow door. If the bow door is closed (and it is water-tight really), none of the other 29 additional reasons can lead to the ship damage, and nor can the colour of the sailors` caps…

The bow doors (with stern ones) are the best technical solution to minimise the time of wheeled cargo loading-unloading. And if a ship has bow doors, such tragic mistakes of sailors can be avoided only by [suggesting] other architecture for this type of ferry and ro-ro ship: the maximum safety of such ships can be ensured only by multi-hull ship application.

Firstly, the car deck of a monohull ferry cannot be arranged far enough from the design water-plane area, because the big height of the deck from the base plane means a lot of empty compartments in the hull, which cannot be used for the main (wheeled) cargo. Besides, the big distance of the car deck from the base plane means higher mass centre placement, i.e. the need for higher transverse metacentric radius, therefore – bigger beam and correspondently higher residual and towing resistance.

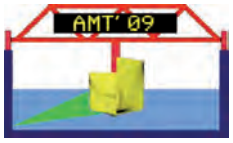
And the car deck of a multi-hull ferry is placed on the level of upper common deck of the ship, i.e. at the height no less, than 3%-6% of length (for permissible value of the distance between the design water-plane and wet deck). But the possibility of water-level height in waves depends on the noted level as exponent function for constant vertical motion; for example, twice bigger deck height means smaller at 7.39 times possibility of wave water level coinciding with deck plane.

Secondly, multi-hull ships can have a sufficiently higher transverse stability in a comparison with any monohulls (up to ten times bigger, if it is needed). This means, even if the car deck is far enough from a multi-hull base plane, the necessary stability can be ensured simply enough.

I do not note the evident advantage of any monohulls from deck area per a tonne of full displacement, i.e. a principal possibility of a multi-hull ship displacement decreasing for constant car deck area.

I am very surprised and aggrieved why a majority of shipbuilders and owners cannot understand and realize the evident advantages of multi-hulls as ferries and ro-ro ships – firstly from a safety point of view.

Dr. Victor A. Dubrovsky. FRINA.



AMT'09

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1st – 2nd September 2009

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The Venue

The AMT'09 conference will be held from Tuesday 1st to Wednesday 2nd September at Ecole Centrale de Nantes, France.

For further information please contact the Conference Secretariat AMT09@ncl.ac.uk or visit the conference website at: www.amt09.eu. Alternatively, contact the conference co-chairs: Prof Mehmet Atlar of Newcastle University (Tel: +44 191 222 8977) and/or Dr Jean-Paul Borleteau of SIREHNA (Tel: +33 2 51 86 02 93).

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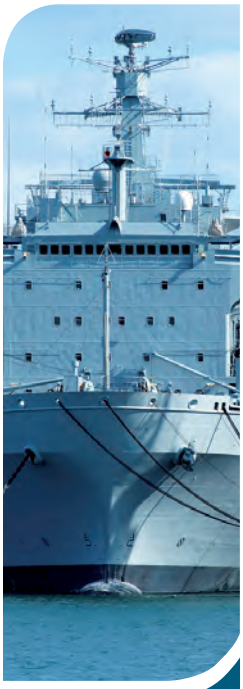

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In the scope of their long-term research cooperation, the **American Bureau of Shipping (ABS)** have decided to fund a 3-year PhD scholarship at the **Centre for Marine Technology and Engineering (CENTEC) of Instituto Superior Técnico (IST), Technical University of Lisbon, Lisbon, Portugal.**

ABS will fund a PhD scholarship during a period of 3 years to work in the area of Ship Structural Reliability, starting in September 2009.

The successful candidate is expected to have an appropriate background and to attend the doctoral programme in Naval Architecture and Marine Engineering at IST, conducting research in the field of Ship Structural Reliability, leading to a PhD dissertation. The working language is English. The selection of the candidate will be based on their CV and aptitudes.

The conditions of the fellowship are those set out in IST's rules and regulations governing research fellowships and grants, which in turn are based on the regulations of the Portuguese Foundation of Science and Technology.

Send your application with full CV and covering letter to:

Prof. C. Guedes Soares
Centre for Marine Technology and Engineering
Instituto Superior Técnico
Technical University of Lisbon (UTL)
Av. Rovisco Pais – 1049-001 Lisboa - Portugal
Tel: +351 21 841 7468 Fax: +351 21 847 4015
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Contact
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Member price: UK £36.50 EUR £36.50 OVS £37.50
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SEA OFFICER
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