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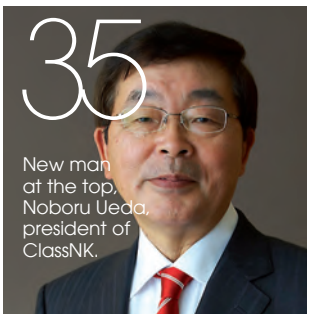

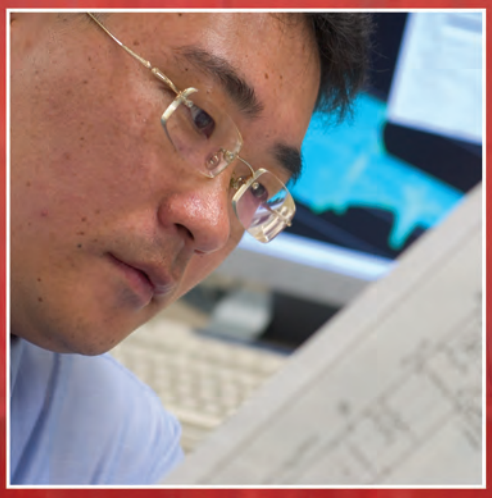

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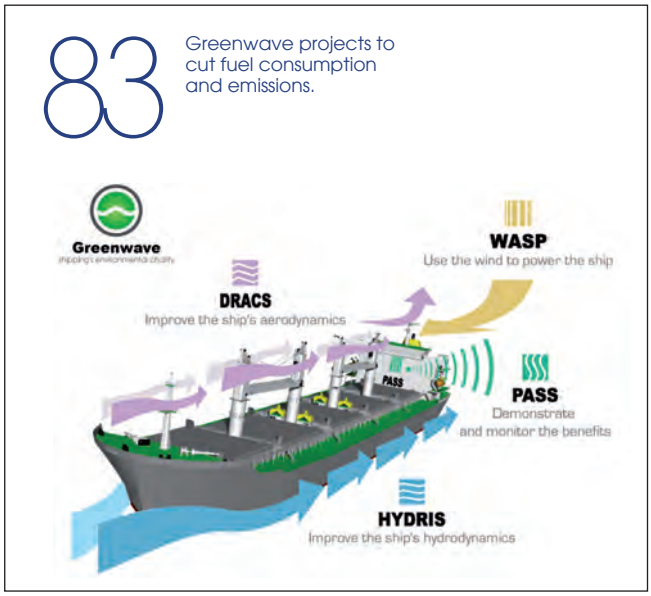

On-line Edition

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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Three cheers for shipping's real Greens

With their Mark 5 ro-ro, Wilh. Wilhelmsen & Wallenius Lines lift the bar when it comes to environmentally-friendly ship design.

At a time when shipping's green credentials are seldom far from scrutiny, it is refreshing to report that, rather than repeating well worn aspirational clichés, real shipowners are taking real and practical steps towards developing more environmentally-friendly ships.

This month's *Naval Architect* includes an exclusive report on the progress of the 'Greenwave' project (pp82-83), whose Greek shipowning backers were, at time of writing, due to unveil a host of practical ship modifications designed to cut fuel emissions to an unsuspecting Posidonia audience.

Also included in this issue is a report on Japan's marine industries, but space constraints mean that due attention is not given to a very significant project to develop what will be the world's largest ro-ro carriers, whose design has been conceived with maximum environmental friendliness in mind.

Four ships, which will be delivered in 2011 and 2012, have been ordered by Wilh. Wilhelmsen and Wallenius Lines from Mitsubishi Heavy Industries. Owners and shipyard alike have stressed the collaborative nature of a project that has proved 'special' from both sides.

The 76,500gt (32,100dwt) ships will be 265m long, 32.26m across the beam, and feature a depth to the upper deck of 33.22m. Major design objectives have included optimising the hull shape to give good form stability and low resistance, efficient and safe cargo handling, and minimum environmental impact.

Wilhelmsen technical project manager and naval architect, Gunnar Amlen, said that one of the principal a aims in their design has been to maximise carrying capacity, while minimising fuel consumption, and thus emissions.

The 'Mark 5' ro-ro carriers will have a cargo volume of 138,000m^3, close to 10% more than the WW/OW partnership's most recent (Mark 4) ro-ro carriers. To maximise capacity, decks are to be arranged with completely flush bulkheads or horizontal cargo support rails to support efficient stowing of breakbulk cargoes on all decks. Generally, longitudinal single row pillars are spaced about 15m apart.

The ships have been designed with high and heavy rolling cargo in mind, as well as cars, and to operate in regular liner services at speeds of up to 20knots. Deck and ramp strength are higher than has ever been seen in a ro-ro ship. Ramp capacity, for example, is given as 500tonnes, while these ships will be able to load cargoes up to 7m high.

The design is distinguished by a slender hull form, to minimise fuel consumption, with the bow section optimised to suppress excessive flare. Reduced resistance together with increased capacity improves the transportation efficiency by 10% - 15% compared to the Mark 4 series.

While powered by a conventional electronically-controlled slow-speed, two-stroke main engine (MAN L70ME-C8) and propelled by a single fixed pitch propeller, the ships will also benefit from exhaust gas energy recovery, using steam turbines to generate the entire electrical need at sea. This 'Turbo Generator' heat recovery system will, it is estimated, cut the total fuel annual consumption by about 5%-6%, cutting emissions of CO_2, SOx and particulates by a commensurable amount, and NOx emissions by about 3%.

In addition an advanced ballast treatment system (not yet decided on) will be installed.

> "The design is distinguished by a slender hullform, to minimise fuel consumption"

As well as six fixed cargo decks, three hoistable decks are included for flexibility and maximum utilisation. Electrical winches will be used on the Mark 5 to eliminate the risk of hydraulic oil spills entirely.

All fuel oil tanks shall be protected against grounding and collision. Potential leakage from hydraulic cylinders shall be collected in drip trays as far as possible.

Other systems and equipment have also been designed to minimise energy consumption. Examples include chill water air conditioning system, extra insulation in the accommodation block, dual speed water ballast pumps, and several separate light zones in the cargo hold.

It is, then, at the detailed level of early design work where real progress is being made in developing shipping's real green credentials. *NA*

Bulk carriers

MOL in ore carrier splurge

Mitsui OSK Lines has announced plans to construct 20 more iron ore carriers to meet rising demand for iron ore transport, bringing its total on order to 53.

The plans, which stretch to 2014, will see the delivery of four 300,000dwt ships, two 250,000dwt ships, seven 230,000dwt ships, one 200,000dwt ship, some 27 170,000dwt ships, 10 110,000dwt ships, and two 80,000dwt ships.

Already the world's largest operator of iron ore carriers, MOL said that worldwide demand for iron and steel was expected to show stable growth, with countries such as China continuing to produce more crude steel. 'Increased steel production will naturally boost demand for efficient, reliable transport of raw materials.'

The company said it had already concluded mid- and long-term contracts for 40% of the 53 newbuilding vessels, and eventually 60% of the new ships will sail under mid- or long-term arrangements.

MOL's operated iron ore carrier fleet amounted to 125 vessels, including Capesize and Panamax types as of 31 March 2008. The fleet will total around 160 by the end of March 2014, including about 135 Capesize vessels and about 25 Panamax ships.

Cruise ferries

Cruise 5 is alive

The keel of the large cruise ferry 'Cruise 5' has been laid at Aker Yards, Rauma, with the ship due delivery to Tallink in spring 2009.

This vessel will be a new development of the Galaxy-type cruise ferry built by Aker Yards. *MS Galaxy* has been operating since spring 2006, and a second ship in the series, *Baltic Princess,* is under construction at Aker's Helsinki yard.

The 212m-long by 29m wide 'Cruise 5' will be one of the biggest and fastest cruise ferries in the Baltic Sea, having capacity for 2800 passengers and operating at a speed of 24.5knots. The guiding principle in designing the vessel has been paying attention to the comfort and luxury of present-day passengers, and the builder says that 'high-tech solutions onboard' will be maximised.

The ship will feature over 900 cabins, several restaurants and places to entertain, as well as a conference centre with over 450 seats.

Artist's impression of the 'Cruise 5' large ferry project.

Classification

ABS raises concerns…

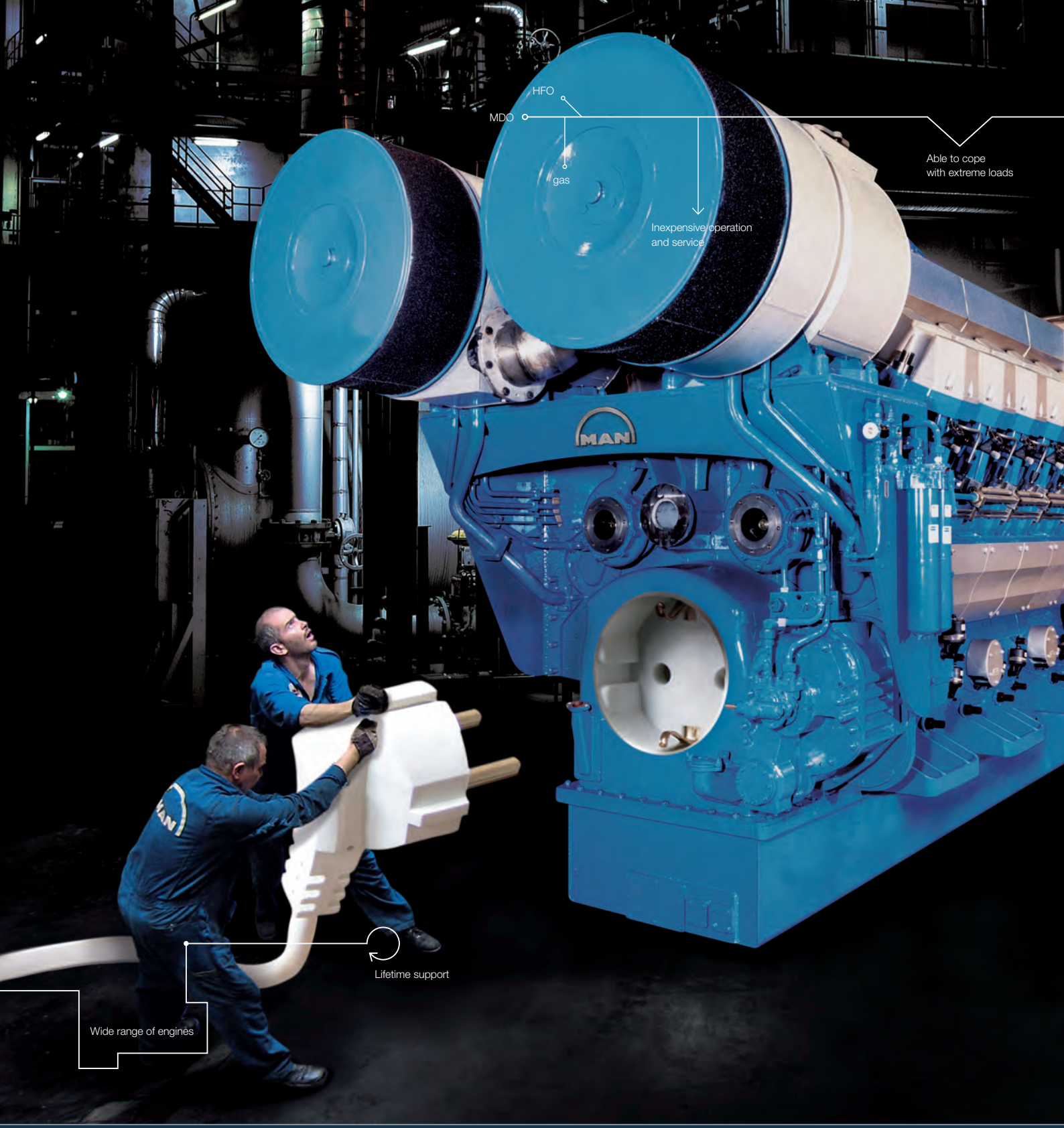
Reflecting on 'a truly remarkable' 2007, ABS chairman, Robert D Somerville nonetheless took time out to raise concerns over the way Class Societies are structured and the way they are being dealt with by the European Commission, in his address to last month's ABS 146th Annual Members Meeting.

He reported that, in the 12 months to end-2007, the ABS classed fleet grew by 9million gross tons to yet another record of 135.4 million gt. The year-on-year growth was almost double that of each of the previous two years. The growth has been sustained through the first quarter of the current year, pushing the fleet to 137.3 million gt at the end of March.

Despite the good news, the ABS chairman reminded members of important issues that, he said, threatened the self-regulatory mechanism of classification. In particular, he highlighted negotiations with the EC and European marine equipment manufacturers over mutual recognition of class certificates for critical machinery and equipment that is placed aboard a ship.

'We continue to believe this proposal compromises maritime safety and would place ABS in a legally exposed position, subject to future claims for the failure of equipment that we have not certified but have been forced to accept on a vessel for which we issue an ABS class certificate,' he said. 'I can only hope that common sense and due regard for safety ultimately prevail.'

Mr Somerville also expressed concern over recent changes in the ownership structure of other prominent class societies, one of which became a publicly traded company in 2007 and the other subject to a buy-out by a venture capitalist with wide-ranging financial holdings. 'The implications of these actions have yet to play out,' he said, 'but they do raise a number of interesting and possibly unsettling scenarios. How, for example, does a publicly traded company reconcile its duty to maximise returns for its shareholders with its duty to promote maritime safety as a classification society? Safety is not, and never should be, for sale.'



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Classification

…and offers LNG solutions

ABS has been selected by Teekay Corp to provide technical evaluation to the basic design concept of a floating offshore gas liquefaction unit. The contract calls for review through to front end engineering and design (FEED) with the award of ABS classification to the facilities once a suitable project has been confirmed.

The LNG/LPG liquefaction facility's topsides process is being designed by Mustang Engineering of Houston, Texas. Samsung Heavy Industries (SHI) of Korea will design and construct the hull for the floating LNG vessel.

Initial design concepts call for the unit to have a combined storage capacity for LNG and LPG in excess of 200,000m^3. The containment system has not yet been selected and will be greatly determined by the site specific conditions.

ABS project manager John Soland says Teekay's project will utilise one of Mustang's proprietary LNG Smart liquefaction solutions, designed to improve the commercial viability of LNG terminals, liquefaction plants, and floating regas and liquefaction facilities to help satisfy the global demand for clean and economical liquefied natural gas.

ABS' evaluation of a floating gas project is based upon the application of prescriptive requirements, sea-keeping studies, structural and fatigue analysis of the structure, containment and station-keeping systems, plus a series of overall risk analysis and special studies. Specialised required analysis and technical studies will include: mooring analysis, containment system sloshing analysis, gas dispersion and heat radiation analysis; cryogenic liquid spillage and structural protection study; vibration studies to analyse impact of the topside processing facilities on the hull; as well as other detailed process and marine systems studies.

Classification

KR tops 30 million gt

For the first time in its 28 year history, the Korean Register of Shipping's classed fleet has reached 30 million gt, with expectations that its fleet will grow to 33.5 million gt by the end 2008, and to reach well over 40 million gt by 2010.

The surge in fleet size – up almost 4 million gt from last year – has been driven largely by 2007's healthy newbuilding market and includes a wide range of vessels including bulk carriers and tankers (to be built according to IACS Common Structural Rules), containerships, VLOCs, and PCTCs.

KR chairman, Oh, Kong-gyun said: 'We've been focusing on international growth and the Chinese market has been a particular target. We've expanded our resources in China to provide a wide range of technical support to the local shipyards and opened two additional Chinese branch offices in Nanjing and Ningbo. As a result, of the 143 new KR-classed vessels being build outside Korea, 69 are to be built in China.

Plans are in place to extend KR's international network in Mumbai, Durban, New Orleans, Taipei, and Tianjin to bring its total number of branch offices to over 50. It also has plans to establish regional head offices in China and Europe later this year.

Drillships

IHC ties with Huisman

Dutch-based design and construction companies Huisman and IHC Merwede have extended their cooperation beyond work to develop offshore construction vessels, to the provision of integrated offshore drilling vessels.

Huisman has extensive experience in designing and building equipment for the offshore industry, ranging from pipe-handling equipment to heave compensation systems, from pipelaying systems to heavylift cranes. In addition, the company has become an active player in the drilling market during the past few years.

Huisman and IHC Merwede have broadened their cooperation to take in drillships.

Examples of current Huisman equipment under construction include two sets of drilling equipment for the Frontier/Shell Bully drillships.

For its part, IHC Merwede is one of the leading yards in The Netherlands and constructs 'one-off' or 'limited' series of ships, where the fulfilment of customer-specific requirements demands the implementation of innovative and modern engineering solutions.

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Huisman and IHC Merwede have a long history in jointly delivering highly efficient pipelay, reel-lay, and flex-lay vessels for the offshore construction industry. Upcoming new projects include a well intervention vessel, two deepwater construction vessels, and two diving support vessels.

Environment

Power in the wind

British company Shadotec is working with Norwegian firms Wilhelmsen Marine Consultants (WMC) and Petroleum Geo-Services AS (PGS) on a joint research project investigating the potential of Shadotec wingsail propulsion for commercial ships, using the energy of ocean winds.

The consortium, backed by funding from the Norwegian National Research Council, has commissioned CFD norway, based in Trondheim, to estimate the potential savings in fuel consumption (and pollution from exhaust gas emissions) achievable by employing Shadotec wingsail thrust units to assist in the propulsion of ocean going vessels. The Norwegian Marine Technology Research (Marintek), will contribute to evaluate manoeuvrability and seakeeping.

The initial project aim has been to investigate the feasibility and potential of fitting two fully automatic computer-controlled Shadotec wingsail thrust units on a very high technology Ramform seismic exploration vessel owned by PGS, 102m long, fitted with the massive 30,000bhp engine power needed to pull many kilometres of hydrophonic streamers.

The initial investigation by CFD norway has now been completed, and its CFD analysis estimates that a PGS vessel fitted with two Shadotec wingsails, towing a typical array of hydrophonic cable assemblies at its standard speed of 5knots, in a typical North sea wind, could save more than 5% of its fuel consumption, while reducing pollution emissions by the same amount. These savings could amount to hundreds of thousands of dollars per ship over the course of a year.

When the cables are wound in and the ship relocates to its next field of exploration CFD norway has confirmed that the fuel and pollution savings might be up to double the savings projected when towing at 5knots.

Shadotec chairman, John Walker, was the designer of the computer-controlled wingsail fitted to the 6500dwt dry cargo vessel *Ashington* which, while almost exactly the same length as Ramform, needed only around 2000bhp to steam, fully loaded, at her 12knot service speed.

Captain Roger Francis, onetime master of *Ashington*, is marine consultant to Shadotec plc. His reports confirmed that *Ashington's* fuel savings averaged around 8%, and under favourable circumstances up to 15%-20% had been logged.

'We see this project as a promising and important part of the WW group's long term strategy for energy and emission reductions,' says Per A Brinchmann, managing director of WMC.

Tim Mak, senior CFD specialist at CFD norway, says: 'We at CFD Norway are excited to offer our expertise in aerodynamics, computational fluid dynamics, and ship design to help develop viable ways of saving fuel and reducing harmful emissions. We believe there is great potential for harvesting the natural power of the wind in the quest to make shipping cleaner, given the increasingly worrying evidence of climate change.'

Environment

Biofuel requirements

Whether as a cargo or for use in the engineroom, biofuels would have to be taken into consideration at vessel design stage, in order to incorporate them into marine systems. Political pressures to find alternative bio energy in shortening timescales may accelerate the process.

These views were expressed by Lloyd's Register chief executive Richard Sadler.

Currently, vessels are constrained by legislation that would create poor designs if biofuel becomes a large scale energy source, he said. New standards may be required to meet essential safety and environmental needs and an early start is essential to meet these challenges.

Ship designs will also have to be flexible in future in order to incorporate the use of biofuels. Initial oil tanker designs for vessels which are being constructed at the moment would need to be able to be converted in the future to take advantage of the growing biotrade.

If second or third generation biofuel technologies are successful, then the demand created would overwhelm the world fleet with the logistical demands, and it is estimated that 400 Handysize equivalents would be needed by 2030 to cope with these requirements. Whether first or third generation, whether biodiesel or bioethanol, shipping will be at the heart of the supply chain, and anticipatory investment will have to be made by the industry. *NA*

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Software

Abu Dhabi has designs on AVEVA

Abu Dhabi Ship Building (ADSB) has chosen AVEVA Marine software to support the design, fabrication, and construction of its new projects. Its decision to select the programme came after rigorous studies and benchmarks of other commercially available systems.

ADSB specialises in the construction, repair, refit, and upgrade of naval, military, and commercial ships at its yard in Mussafah. Major Waleed Al Tamimi of ADSB commented: 'ADSB is implementing world-class production technologies and modern working practices and AVEVA Marine is an important component of us being able to do these.'

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Propulsion

Doosan hits 50 million bhp

MAN Diesel's Korean licensee, Doosan Engine Co Ltd, passed the 50 million bhp milestone for its cumulative engine production in April. It has reached this total over 24 years, and is reckoned to be only the third engine-builder to do so.

The achievement was reached with the completion of a 25,300bhp MAN B&W 6S70ME-C engine which is destined for a 210,000m^3 LNG carrier being built by DSME for Qatargas.

Boosted by the global demand for shipping, Doosan Engine has now almost completed a construction programme of new assembly shops, including one dedicated to medium-speed engines, which are forecasted to raise annual capacity from 9 million to 14 million bhp upon completion.

Pictured in front of the engine that broke the 50 million bhp barrier are (from left): Y S Han of DSME, David Jones of Qatargas, Lee Sung-Hee, president of Doosan Engine, and Ole Grøne of MAN Diesel.

Contact MAN Diesel A/S, Teglholmsgade 41, 2450 Copenhagen SV, Denmark
Tel +45 33 85 11 00
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www.mandiesel.com

Water management

Lamor runs to Hyde

Environmental technology group Lamor, based in Finland, has bought out American ballast water treatment manufacturer Hyde Marine, Inc. The acquisition is part of Lamor's growth strategy.

Lamor currently focuses on the oil spill response market, but wants to increase its ability to grow in the ballast water treatment sector. In 2007 it recorded a turnover of €33 million.

The Hyde Guardian ballast water treatment system is currently undergoing IMO type approval through the UK Maritime and Coastguard Agency, in cooperation with Lloyd's Register.

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Software

FLUENT in version 4.0

ANSYS Inc has released version 4.0 of its FLUENT for CATIA V5 rapid flow modelling software. The computational fluid dynamics technology has been improved with new physics models that add to its analysis capabilities and extend the types of products for which performance optimisation is possible.

A new species transport model allows the modelling of mixtures and fluids with different properties. A further additional feature is cavitation modelling, which enables users to predict when cavitation may occur in a variety of systems.

Version 4.0 also has the ability to add multiple symmetry planes without the need to modify original geometry, saving users time while creating the model and performing the calculations. An algorithm to build prismatic boundary layer meshes

next to solids is claimed to increase the simulation accuracy.

Other general improvements include an optimised memory management system to handle large models efficiently and new options that let users easily control the initial conditions for unsteady calculations.

Contact ANSYS, Inc, Southpointe, 275 Technology Drive, Canonsburg, PA 15317, USA
Tel +1 724 746 3304
Fax +1 724 514 9494
E-mail ansysinfo@ansys.com
www.ansys.com

Ancillary equipment

Wärtsilä boils with ICE

Wärtsilä has acquired Danish company International Combustion Engineering (ICE), which specialises in project engineering and the service and repair of steam boilers and ancillary burner systems. This accession will expand Wärtsilä's capabilities into the category of boiler services.

ICE is reckoned to have a strong market position, particularly with merchant vessels, and the company also has a trading division that supplies spare parts for boiler and burner systems. The company's annual net sales amounted to €6.3 million in 2007.

In Denmark, ICE currently employs 30 full time staff, and the business will be integrated into Wärtsilä services, with all personnel becoming Wärtsilä employees. The value of the deal has not been published.

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Tel +358 10 709 0000
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www.wartsila.com

Software

Root causes from ABS

ABS Nautical Systems has released version 5.3.5 of the NS 5 fleet management software, including a new vetting module and expanded root cause analysis tools. The NS 5 module was developed with input and guidance from tanker operator Overseas Shipholding Group, an existing client.

The module has been designed to assist tanker, bulk, and barge operators with improving the timeliness and accuracy of their responses to observations made during a vetting inspection, while also encouraging better preparation for future inspections through the improved use of data.

According to ABS NS vice president, Joe Woods: 'Integration with the Quality & Compliance and Maintenance & Repair modules within NS 5 provides one trail for users to follow the actions around an inspection, including the inspection report, the equipment involved, any maintenance required, and the closing of associated corrective action requests.'

The module has the ability to use multiple vetting guideline documents, and all details are included in NS 5's replication, and therefore available on both ship and shore.

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Fax +1 281 877 5701
E-mail ns-info@abs-ns.com
www.abs-ns.com

Ancillary equipment

MacGregor grows in China

Following the establishment of an Offshore division, MacGregor Group opened a factory in Tianjin, China, in March this year. The aim is that these premises will be able to guarantee equipment deliveries to the offshore sector, even during busy times.

From left: Olli Isotalo, president of the MacGregor Group; ambassador of Finland to PRC, H E Antti Kuosmanen; Tianjin City Political Commerce vice chairman, Liu Chang Xi; and Henrik Vildenfeldt, general manager of MacGregor's Offshore division, at the Chinese factory opening ceremony.

The plant will initially employ around 150 staff and has the capacity to produce over 1000 sets of deck equipment per year. Half of the sets will be delivered to yards in China, including anchor handling towing winches, anchor windlasses, capstans and mooring winches, power packs, and control accessories.

Among the reasons for choosing Tianjin as a location were the availability of skilled workers and well-established foundries, machine shops, and structural steel companies.

Contact MacGregor Group, Sörnäisten rantatie 23, PO Box 61, FI-00501 Helsinki, Finland
E-mail marketing@macgregor-group.com
www.macgregor-group.com

Materials

Esthec on deck

Composite material Esthec, from Bolidt, has been installed as decking upon the displacement yacht *Bolwerk*. Esthec mimics the look and feel of teak, while simultaneously eliminating the maintenance costs of teak.

Laying and seam-sealing to prevent leakage are claimed to be quicker, and due to computer-controlled processing, the end result is fully under control. Esthec is said to be easy to clean, lightweight, and does not absorb water, limiting the growth of moss and algae.

The deck is rough, and therefore intended to be safe in heavy weather conditions. A choice of patterns is also available.

Contact Bolidt Kunststoftoepassing BV, Postbus 131, 3340 AC, Hendrik-Ido-Ambacht, The Netherlands
Tel +31 78 684 54 44
Fax +31 78 684 54 00
www.bolidt.nl

Ancillary equipment

Huisman grabs Bodewes

Bodewes Winches has been incorporated into the Huisman Group. Bodewes will still continue operations as a designer and producer of large mooring and towing systems under the same trade name.

Huisman's more than 75 years of experience in heavylifting, transport, and offshore equipment is intended to guide Bodewes and create a solid working environment.

Contact Bodewes Winches BV, Kortenoord 41, 2911 BD Nieuwerkerk a/d IJssel, The Netherlands
Tel +31 180 391919
Fax +31 180 316068
E-mail winch@bodewes.com
www.bodewes.com

Business

Certex for Forankra

Axel Johnson International has bought Certex UK, a leading distributor of lifting equipment for the shipping industry. Parent company Certex agreed to sell its UK concern to Axel Johnson's Swedish subsidiary, Foranka International AB, for an undisclosed sum.

The purchase is being seen as a growth opportunity for both parties, with Certex UK now having the financial backing of Forankra, which is made up of three business areas: Allsafe, Certex, and Forankra. A further nine Certex companies are currently owned by Forankra, including branches in Denmark, Finland, Norway, Sweden, and Germany.

Certex UK will retain its name, current autonomous infrastructure, directors and senior management team, and new purpose-built premises in Harworth, Nottinghamshire.

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E-mail sales@certex.co.uk
www.certex.co.uk

BMT Handymax to slot right in

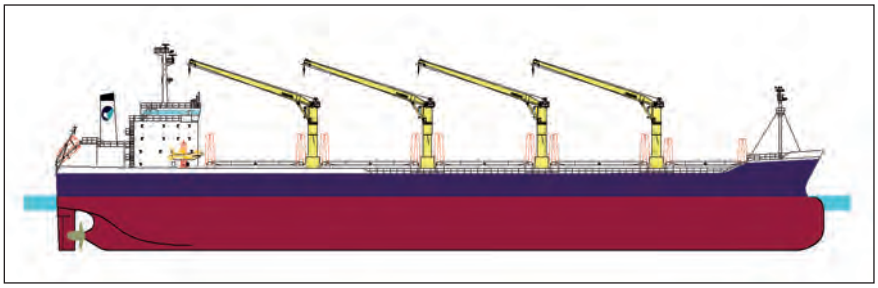
BMT Ship Design has identified a market need for a new double hull Handymax dry bulk carrier.

In the coming year, BMT plans to be very active in China's shipbuilding segment, said company chief executive Peter French, and a key area of interest will be bringing on the company's new dry bulk carrier design.

BMT International Engineering, which incorporates BMT's Ship Design Centre at Wallsend, is to benefit from new joint venture BMT Triton, a collaboration between BMT and Hong Kong-based Triton, the latter company being accustomed to introducing interests with technical know-how to Chinese manufacturing partners.

Mr French said that, after consultation with Clarkson, BMT had identified the market's need for a new geared doublehull Handymax bulk carrier, with the joint venture approaching Chinese shipyards and brokers alike.

The collaboration between Cardiff-based Graig and Carl Bro in developing 'Diamond class' bulk carriers for construction in China and Vietnam has shown the appetite for new designs from emerging yards, but Mr French pointed out that the preponderance of Chinese-built bulkers continue to be based on designs from SDARI (Shanghai Merchant Ship Research and Design Institute), which has taken older, Western designs and adapted them to their own requirements. He said BMT's new double hull Handymax would be forward-looking.



BMT Ship Design Centre's 36DHBC double hull dry bulk carrier – 36,000dwt and now ready for construction in China.

The 36,000dwt BMT ship, dubbed the 36DHBC, would be lighter and more fuel efficient than any comparable bulk carrier delivered from China to date, Mr French said.

Under the development brand 'Nautilus', the ship is of the wide-hatched variety.

Featuring a high efficiency hullform fully model tested and optimised for maximum performance without compromising deadweight, the rudder/propeller combination has also been fully integrated into the hull for maximum efficiency, while the ship will feature high performance hull coatings, reduced engine power requirement for equivalent deadweight, reduced emissions, separate low sulphur bunker tanks, high quality accommodation for crew comfort, and of course double hull for increased safety and improved survey capability in all load conditions.

Jim Knott, BMT Ship Design managing director, said that the Zheghe Shipyard, south east of Shanghai, had already been identified as the first potential partnering yard. An initial four slots had been reserved at the yard to build the first 36,000dwt ships, with the first delivery envisaged in early 2010. These first ships, and possibly those to follow, will be built to Bureau Veritas class.

Zhejiang Zheghe Shipbuilding Co was established in 2004 and covers an area of 212,000m^2 along quays of 740m, on Ce zi Island, Zhousan City, Zhejiang Province.

Zhenghe delivered one 20,000dwt bulk carrier in 2006, which the yard said 'laid the foundation for shipbuilding companies to build large size vessels in Zhoushan'. As of the end of 2007, the company had effective orders of two 8000dwt log carriers, two 26,800dwt bulk carriers, 14 x 33,000dwt bulk carriers, and eight 57,000dwt bulk carriers.

Building BMT's innovative 36DHBC double hull dry bulk carrier will see the yard take forward its ambitions in the international arena.

Each ship will come equipped with four cargo cranes capable of lifting a safe working load of 30tonnes each at an outreach of 28m. Each of the five main holds will be equipped with hydraulically-operated, watertight, transversely folding steel hatch covers.

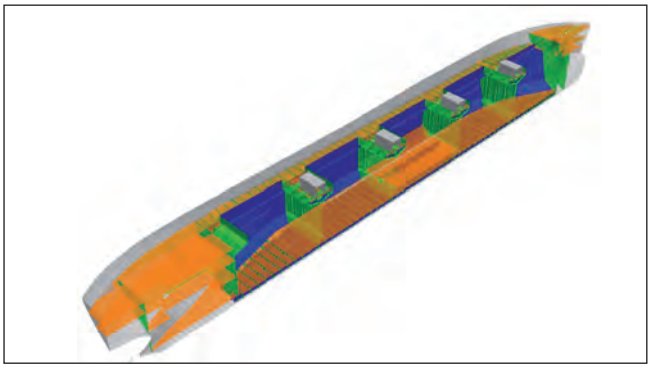
BMT Ship Design had preferred to maximise deadweight in its design, Mr Knott said. In terms of size, the BMT ship would achieve maximised fuel efficiency, he explained. Operating at 14.5knots at 80% MCR, a 15% sea margin pointed towards fuel consumption equivalent to 25.5tonnes per day, with endurance given as 25,000nm.

'We know we have an efficient hullform here,' said Mr Knott. 'Its parent hull is the

TECHNICAL PARTICULARS

BMT Handymax dry bulk carrier

Dry Bulk Cargo Carrier for worldwide services. V I+ HULL, Bulk Carrier, CSR	
Deadweight, scantling abt	36000tonnes
Main diesel engine	1 x 7900kW - MAN B&W 5S50MC-C7 MCR 7900kW **or** MAN B&W 6S42MC7 (economy MCR 6480kW version)
	Five Holds for the carriage of grain and other BC-A, ESP
Cargo hold capacity abt	43,770m^3
Generator Sets	3 x 600kW
Length, oa (approx)	182.30m
Length, bp	175.00m
Speed	14.5knots at 80%
Endurance	25,000m
Integrated alarm and monitoring system	
Depth to main deck	14.90m
Draught (max)	10.50m
Gross tonnage	21,180gt
Cargo cranes	4 x 30tonnes SWL/28m



'Nautilus' vessel profile through centre line.

hull of the longstanding B35 bulk carrier originally built in the late 1980s, but it has been substantially optimised using CFD modelling, with tank tests due to follow once the build negotiations are complete.'

Longitudinal framing throughout gives enhanced longitudinal strength and resistance to bending moment and shear forces, while all transverse bulkheads will be strengthened to withstand water flooding on one side only.

'We are already looking at a tanker version based on the same hull lines, and at jumboising the initial design by a length of 50m and raising the beam to Panamax width,' said Mr Knott. He added that other build opportunities existed for the new design, with discussions due to open concerning their construction in Turkey.

According to Mr French, meanwhile, the double hull bulk carrier is just the start of BMT's push into the Chinese market.

While the joint venture was currently based in Hong Kong, BMT would look to 'move up' into China, with a new head office planned for Shanghai and a regional office near to the shipyard partner. Furthermore, he said that the wider group would open a representative office in 2008, to pursue consultancy opportunities, having recruited ex-Atkins Brian Ashcroft to run the business. He envisaged an overall 50-60 man BMT team based in Shanghai.

Mr French said that, as far as the separate ship design joint venture was concerned, BMT was also willing to pursue a similar strategy in transferring know-how from fast ferry specialist BMT Nigel Gee to China at a later date, while the group would also explore opportunities to utilise the knowledge of BMT Fleet in Canada, with a view to passing on its expertise in ice-breakers to knowledge-hungry Chinese builders, and opportunities identified for such tonnage among Caspian Sea customers. *NA*

New ideas from Cosnav

Two new vessel types are emerging from the innovative Trieste-based designer. Both flow from the designer's close relationship with owner Naftotrade.

In order to consolidate its relationship with the Greek shipowner Naftotrade, Trieste-based designer Cosnav Engineering has developed a new 15,500dwt self unloading 'green' cement carrier.

The successful results obtained during the two years of service from two smaller sister vessels *Naftocement XI*, and *Naftocement XV*, which 'reached the top of the Australian market' due to their strict adherence to the environmental regulations, encouraged Cosnav Engineering to improve the security and the versatility of the new vessel.

The new construction provides six cargo holds, including a pneumatic discharging system with improved performance. The hydrodynamic design has also been optimised thanks to the tank tests done by the Model Basin of Vienna. The ship is now under construction at the Selah Makine ve Gemicilik Endustri Ticaret Shipyard in Tuzla under the supervision of classification society RINa.

Cosnav Engineering said it was also designing a new project for a 25,000dwt bulk carrier Ice Class 1A on behalf of Naftotrade, whose intention is to build the new vessel in the new shipyard Therme of Samsun (Turkey).

In this project the company is exploiting its 30 years of experience in Ice Class building and investigating new ways to build an environmentally-friendly ship.

The hullform features a bulbous bow, above which is an efficient stem line. The design includes a forecastle with an incorporated bulwark for protection against the heavy seas.

At the aft end a high efficiency rudder, including an ice knife, is attached to the open-water stern frame and improves manoeuvrability and direction stability on the vessel.

The vessel is a geared bulk carrier with five wide hatch openings, all closed by end-folding pair covers of the end–stowing type, and hydraulically operated.

The vessel is divided into five cargo holds by double skin transversal bulkheads built on stools and the space between these is used for ballast or HFO tanks.

Naftocement vessels 'reached the top of the Australian market'.

The double hull configuration, which is structure-free, in conjunction with the large holds, is said to guarantee easy discharge and cleaning.

The tank top is strengthened for heavy cargoes with a uniform load of 25tonnes/m^2 and the hatch covers for a load of 2.5tonnes/m^2. The strengthening of the vessel allows for alternated hold loading, therefore leaving holds 2 and 4 empty.

All the cargo holds can carry dangerous goods and are mechanically ventilated.

Ballast piping and valves are run in a duct in a duct keel, and the wing and double bottom tanks are separated to facilitate the sequential water ballast exchange.

The cargo is handled by four sets of hydraulically-operated level-luffing deck cranes of 30tonnes x 28m-outreach radius and mounted on a pedestal to stowage of deck cargoes.

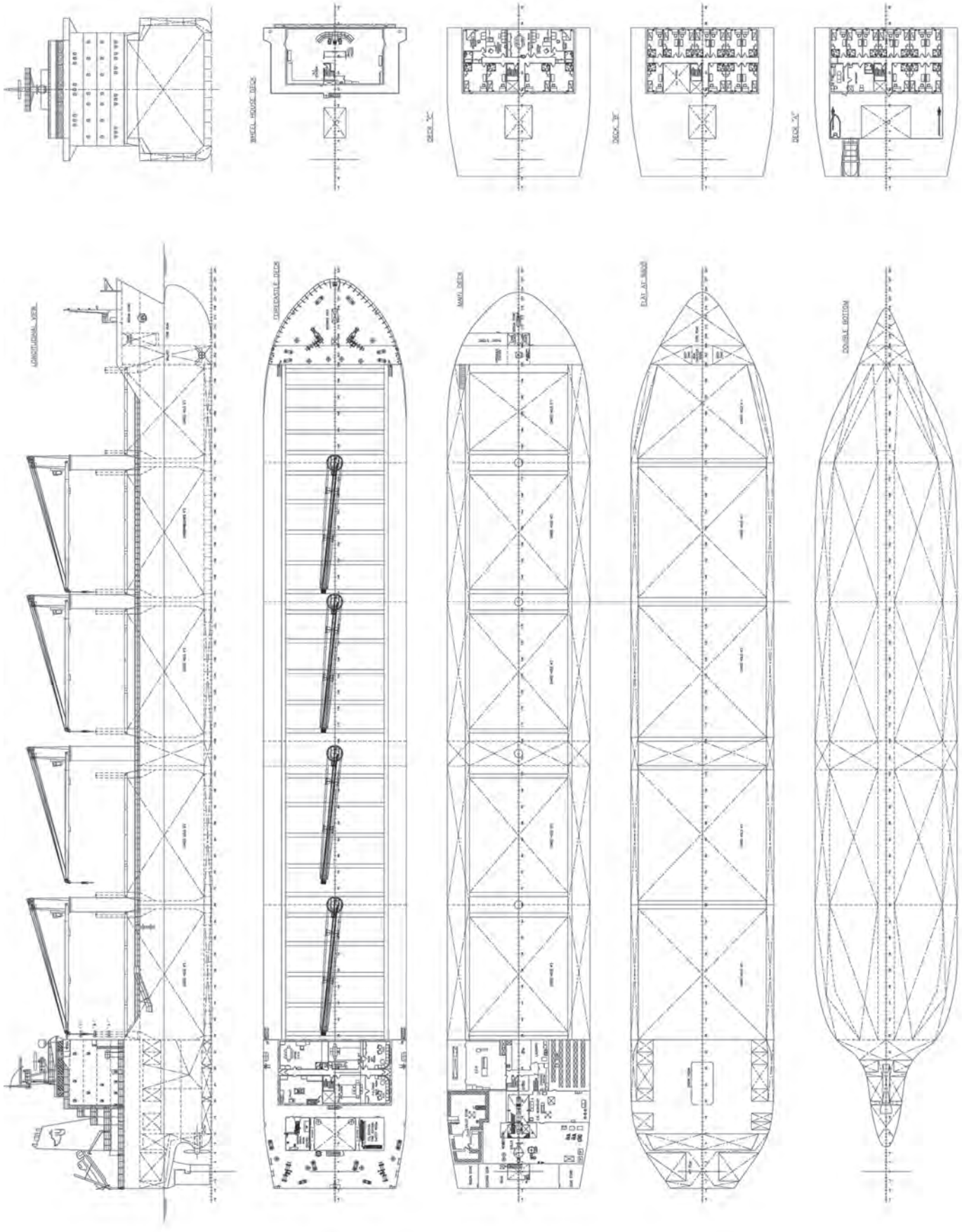
According to the requirements set out in the RINa classification, this project fully complies with all of the environmental regulations and will be classified as a 'Green Star 3 Design' vessel, which implies that all of the bunker tanks are protected from the sea. The high ballast tanks capacity avoids having to carry ballast in the holds and all of the installed machinery is arranged for low-sulphur fuel operation and is NOx compliant.

The two-stroke type main engine will create about 7400kW at 136rev/min and will provide a service speed of 14knots at 85% MCR using a 5900mm diameter propeller operating in an open water stern frame. The stern bulb is designed to optimise the propulsion efficiency.

The electrical requirements are served by three diesel alternators sets, each with an output of 680kW, while the boiler and economiser satisfy the steam requirements.

A remote automatic control system will serve the propulsion system with an integrated alarm and monitoring system, which includes power management and an integrated navigation system. *NA*

GA of the 25,000dwt bulk carrier Ice Class 1A, developed by Cosnav on behalf of Naftotrade.



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Self-standing inspection stands alone

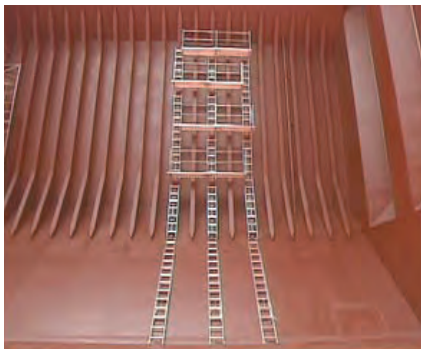
The maintenance and inspection of bulk carrier cargo holds sees a new methodology from Japanese specialists.

Mitsui OSK Techno-Trade and Chuo Build Industry have developed two new types of assembly scaffolding for the maintenance and inspection of bulk carrier cargo holds, with technical cooperation from Mitsui OSK Lines as an operator and also as an owner.

The companies have developed the maintenance staging tower (self-standing type) for maintenance of ship cargo holds. The tower makes it possible to blast, clean, and paint works in high places, which were previously inaccessible. The partners say the new approach to maintenance will reduce repair costs, decrease repair time during drydocking, and extend a ship's life.

The self-standing type maintenance staging tower has three models - a five-stage type (height 9.8m), a six-stage type (height 11.7m), and a seven-stage type (height 13.5m). Made from lightweight aluminium, the structure can be easily relocated. Enabling maintenance in high places to be accomplished easily and safely, its assembly and disassembly can be performed quickly (assembly by 3-4 people requires approximately one hour), while maintenance work of high places is made safe and easy.

The inspection scaffolding (hull supported type) has been developed for safety inspections for bulk carrier cargo holds. The scaffolding has been designed without any fixed equipment, for smooth cargo loading, and for discharging during ship operations. The staging tower, which has a safe load bearing capacity of 200kg, uses the screw-jack method for support and sits on casters for easy manoeuvrability, with a counter weight tank installed for stabilisation. After the first stage assembly is completed, the first assembly procedure is undertaken to reach the second stage, with outriggers installed on both sides for stabilisation purposes.



Hull-supported type inspection scaffolding.

Self-standing type maintenance staging tower.

Maintenance in high places in the cargo hold.

Maintenance work in the cargo hold.

The lashing clamp, set to the ship's hull, is re-attached once every two stages.

The assembly:

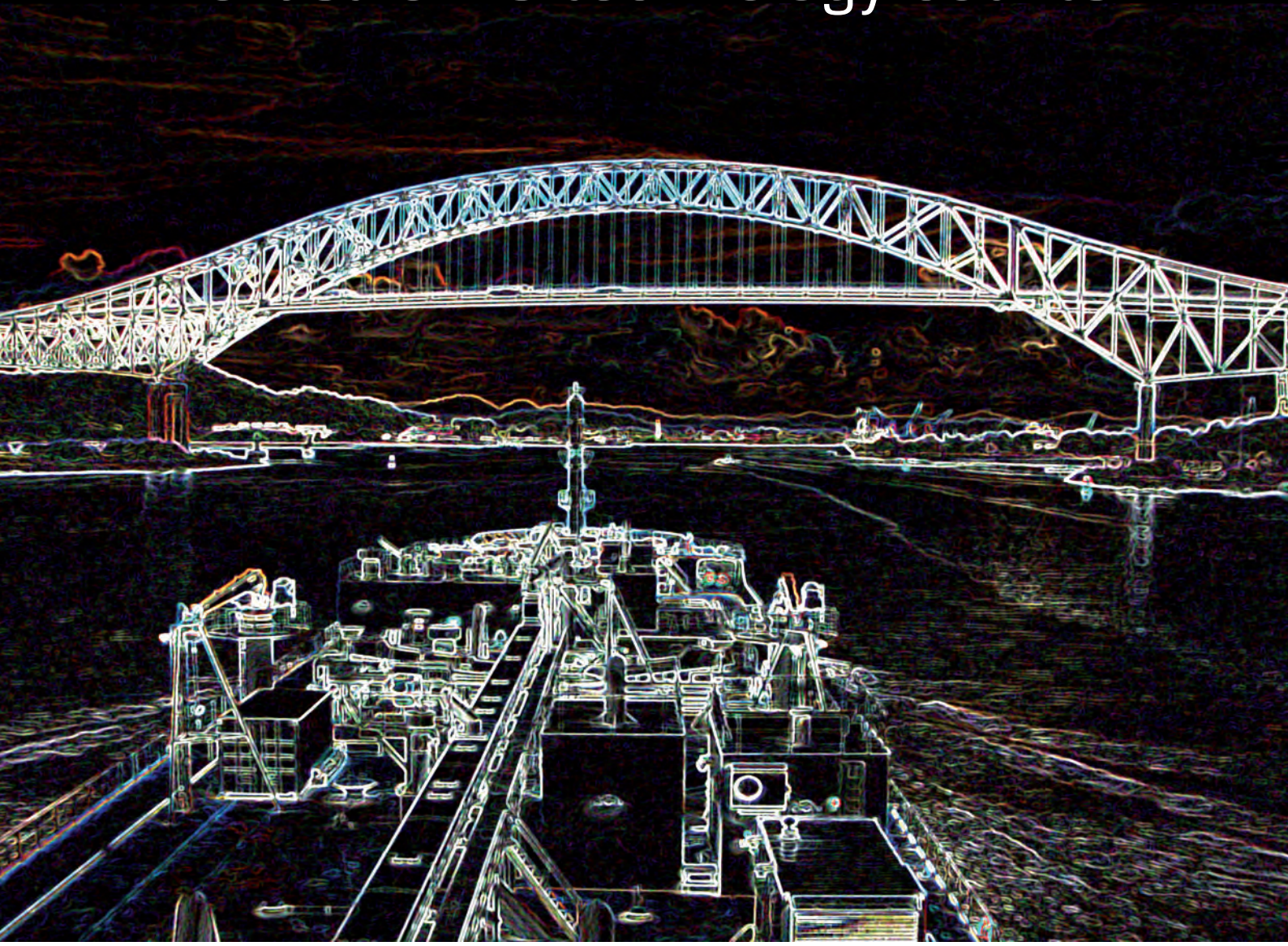
- Meets the PMA (Permanent Means of Access) requirements of SOLAS
- Means stabilisation can be achieved by securing to the hull structure
- Means that, by assembling the ladders and footing planks, hands can be kept free for inspection work
- Means that inspection of the areas between the topside tank (upper side-frame area) and side frame (lower part) is possible
- Can be used for Handy, Panamax, and Capesize bulk carriers
- Means that, by using common parts, assembly is simplified and costs are reduced

The method sees, first, extending the ladder with the hanging gangway on the hopper to the bottom of the side frame, then setting the hanging gangway (semi-automatically) on the ladder to the side frame so that it is secured, using the side frame as a rail, and securing the ladder frames upwards. Then, the ladder frame must be secured onto the side frame. *NA*

Hold cleaning operations during cargo hold change.

Nordströms Siwertell

100 cement self-unloaders sold: Nordström's technology counts



MacGREGOR Bulk recently won a contract for the 100th Nordströms cement carrier self-unloading system. The first was delivered in 1947, and most of them are still in service. This demonstrates the strength and reliability of our well proven Nordströms' technology: the most versatile, powerful and cost-effective solution. Whatever your needs - we design a self-unloader to meet your specific requirements!

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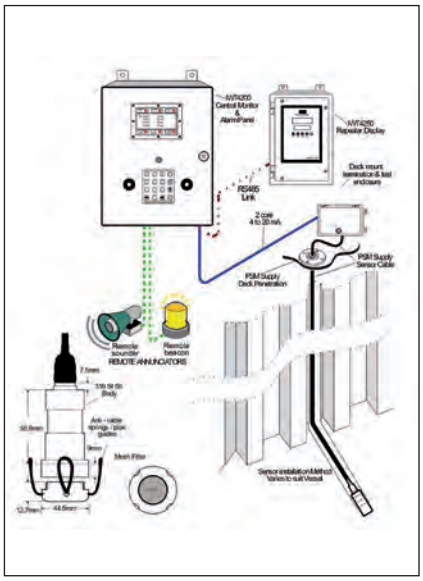
Intelligent response to water ingress

Geoff Taylor of PSM explains how new digital sensors aim to provide integrated reliability and reduce costs when it comes to water ingress alarms.

Water Ingress Detection Monitoring and Alarm Systems (WIAS) have been mandatory for all bulk carriers since 2006, and for all single hold cargo vessels since January 2007.

Since the SOLAS regulation Ch XII/12 effectively defined this new requirement for monitoring equipment it was left to equipment manufacturers to develop equipment to meet the new IACS specifications. To reach the larger refit market potential, manufacturers needed to do it quickly, since IMO had allowed very little time for existing fleets to come into compliance. The intention of acting swiftly was clearly necessary because of the unacceptably high loss of life in the bulk carrier sector of the industry.



PSM provides a sensor healthy feature with its 'live zero' operating system.

Not unreasonably, manufacturers, in selecting a technology for their systems, tended to opt for the 'simplest is best' approach. There was, after all, no similar duty on which to base experience. The IACS unified test (UR24) for this equipment appears thorough enough and, although it can be argued that it could have gone further, this is, perhaps, more in retrospect, in view of the complaints from operators of their rather poor reliability in experience of many of these systems.

True, simple passive devices such as float operated switches have been around for years, but none had been used in this exact application in these operating conditions. The point is that a passive device only triggers its response to a physical state change. In such a harsh environment there will be many influences that can prevent triggering, but the crux here is surely that there is no real method of ensuring that devices will work when they are supposed to.

A satisfactory test will not guarantee the subsequent operation of the device. If, during an incident, no trigger occurs ,there would be a reasonable assumption that everything is normal since there would be no alert. Probably worse is that, by virtue of the presence of a system onboard alone, a false sense of security could be engendered.

At this point one might draw the conclusion that, since WIAS regulation is intended as a primary safety device, what value does it have, if there is any doubt about the real-time health of the system.

A system that can positively monitor its own health and issue a warning of a failing component such as a sensor, is clearly what is called for before these systems can truly offer the intended lifesaving benefits.

The PSM system provides a sensor healthy feature with its 'live zero' operating system. Here, the sensor signal is permanently forced above its normal at-rest condition. Any increasing change in the elevated signal could signify water ingress and any decrease a sensor fault. In both cases the central monitor will initiate a warning.

In the case of a sensor warning, the procedure can be as simple as making a further remote full function sensor test, by manually operating the lever in the appropriate test box supplied for each hold. This is usually located on the deck for convenience. This test procedure can be simply carried out at any time, even if the holds are full.

PSM claims this 'live zero' system is now taken a stage further with the introduction of their latest intelligent sensors. This new digital sensor has the functionality to undertake a number of self-check routines continuously, and to initiate status alarms on a common bus. Such routines are run under a real-time clock, and data is stored for comparisons to eliminate spurious alarms. It will even provide a speed of change of water level giving a real instantaneous 'view' of what was actually happening in a hold. PSM claims that this comes at a very competitive price with the added bonus that for new installations the MODBUS data bus, the cost of cable, materials, and installed time is reduced. *NA*

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FKAB signs for a bitumen carrier design

FKAB has been awarded a Basic Design assignment for two 4700dwt bitumen carriers by the China's Jiangbei Yuanhan Ship Manufactory Co.

Two carriers were ordered from the Jiangbei Yuanhan Ship Manufacturing Co in late 2007 by Swedish shipowner Frederiet AB, on behalf of Nynas AB, and will be delivered in 2010. They will be able to carry 4300m^3 of bitumen at a temperature of up to 250°C.

Jiangbei shipyard has contracted FKAB to provide the basic design for the vessels, in a first agreement between the pairing, but FKAB said that there were hopes that a long-term cooperation could be developed.

At 99.9m long, the ships will be 16m wide and have a design draught of 6m. The contract speed is 14knots. They will be designed to meet BV-class requirements.

They will feature medium-speed engines, controlled pitch propellers, four cargo pumps, and two cargo stripping pumps apiece, and their own thermal oil heating systems.

They will be distinguished by a 'very blunt' bow section, designed to generate acceptable water flow to the propeller. Their deckhouses will be located aft. Independent tanks will be divided into two blocks. The design assignment will be managed from FKAB's main office in Uddevalla, with main basic design deliveries due in June and August. *NA*

E-Roll on a roll

'E-Roll' rolling hatch covers developed by MacGregor, in cooperation with Universal Shipbuilding, have been delivered for 12 x 207,000dwt bulk carriers on order at the Japanese yard, while an order from Kawasaki Shipbuilding has also followed, for three shipsets to be installed aboard 180,000dwt Capesize bulkers to be built at Sakaide.

'The first covers have been delivered to Universal Shipbuilding's Tsu works in Japan, and the shipyard, and shipowner NYK, are both more than happy with our products,' said Yoshida Yoichi, MacGregor area sales director in Japan.

Each side rolling hatch cover comprises two panels, one on each side, which are opened by a geared electric motor after being raised by electrically-powered cylinders. One complete roll up/down and open/close operation is carried out automatically when the operator pushes a single button, and smooth operation is said to be ensured by inverter and PLC control.

MacGregor started development work on electric-drive side-rolling hatch covers in 2001. 'Generally, piston movement is not so easy to achieve electrically,' said MacGregor's senior naval architect. 'For a long time, wheels have been lifted hydraulically, even if the drive is electric. We have solved the piston problem by electrically-powered cylinders.'

Turkish builder celebrates largest carrier

Cicek Shipyard cuts first steel for three Supramax bulk carriers, the largest vessels to be built in Turkey.

Turkey's Cicek Shipyard has begun construction of the first of three 58,000dwt Supramax bulk carriers, the largest vessels ever to be built by the country's shipbuilders. Ordered by the Bayraktar Shipping Group, they will be constructed in the shipbuilder's Panamax-sized building dock, which is currently being extended to 215m and when completed will be 250m long.

Cicek Shipyard's vice president, Berke Cicek, said: 'It was impossible for a private Turkish shipyard to build a 15,000dwt vessel when we started our expansion plan but the outlook for building Supramaxes and Capesizes in Turkey now looks very promising.'

Necip Nalbantoglu, president of the labour union Dokgem, Mehmet Berke Cicek, vice president, and Celal Cicek, president of Cicek Shipyard, (third, fourth, and fifth from the left respectively) and Sadan Bayraktar, president, and Erhan Bayraktar, chief executive of Bayraktar Shipping (sixth and seventh from the left).

In addition to the 58,000dwt Supramax bulk carriers, Cicek has contracts for two 1300TEU containerships, also for Bayraktar, that are due to be launched in April and August this year, two 24,000dwt bulk carriers for a foreign shipping company, one for delivery next year and the other in the first half of 2010, and four 3150dwt IMO II chemical tankers for delivery in 2008. *NA*

ICE breaks through in India

International Contract Engineering Ltd (ICE) and India's ABG Shipyard have signed a contract covering the design of a series of double hull bulk carriers, for undisclosed owners.

The breakthrough will see the Isle of Man/Romanian operation provide conceptual design, tank testing, and basic (classification) design for a series of geared, 32,000dwt, double-hulled carriers. The ships will be designed in accordance with ClassNK requirements.

This will be one of the world's first bulk carriers of this size to be designed in accordance with the new International Association of Class Societies Common Structural Rules (CSRs). ICE said the design was scheduled for delivery by mid-year 2008.

The 14knot-capable ships, powered by MAN B&W 6S46 MC-C Mk7 main engines, will feature 5.5m diameter, four-blade, fixed pitch propellers. They will be laid out with five cargo holds, with a total capacity of 43,000m^3 and equipped with four 30tonnes SWL deck cranes (working on holds 2, 3, and 4, functioning at 26m radius). Holds 2, 3, and 4 will be fully box shaped, while holds 1 and 5 are semi-box type with lower hopper slopes, to provide their double skin.

New 32,000dwt bulk carrier design from ICE – one of the first in this class to be built to CSRs.

The 182.5m long vessels will be 29m wide and exhibit a design draught of 9.85m. They will feature a bulbous bow, transom stern, raised forecastle and poop deck, and open water type stern frame.

Once built, the ship type will be suitable for coal, grain, ore, cement, alumina, bauxite, bagged cargoes, steel coils, industry log, lumber, and plywood.

Bulk boom feeds equipment orders

MacGregor wins series orders for bulk carrier hatch covers and shipboard cement cargo handling equipment.

In April, MacGregor secured orders covering 79 shipsets for hatch covers for bulk carriers, worth over €40 million.

The hatch covers are destined for bulk carriers ranging from 56,000dwt to 181,000dwt on order in South Korean shipyards for various shipowners.

Among the contracts is a complete hatch cover delivery for 10x56,000dwt bulk carriers on order at Hyundai Mipo Dockyard Co Ltd for a German owner. MacGregor is also delivering cargo cranes to four of these ships.

Sungdong Shipbuilding & Marine Engineering Co Ltd has on order 22 bulk carriers, where MacGregor's contract includes design, fabrication, and key components.

MacGregor is also delivering hatch cover design and key components for 47 bulkers on order at South Korea's STX shipyards for various owners.

All of these hatch covers will be manufactured at MacGregor's partner plants and will be delivered from 2009 to 2010.

In the meantime, Indonesian shipping company PT Rimba Segara Lines ordered a Nordströms cement-handling system from MacGregor. The system will be installed on a 7500dwt converted bulk carrier belonging to the Jakarta-based company, and this ship will eventually trade in Indonesia and abroad, handling bulk cement.

The new system will maintain mechanical loading of 750tonnes/hr and pneumatic loading direct from eight tank trucks. It will be able to mechanically discharge at a rate of 500tonnes/hr and has a pneumatic unloading capacity of 2 x 300tonnes/hr.

The job follows the conversion of Tokyo Cement's 17,500dwt bulker *Tabernacle Prince*, after which Rimba Segara Lines decided that it wanted the same type of system on its own vessel.

The system will be built by MacGregor's bulk handling division in Enköping, Sweden, and installed on the vessel at a shipyard in Indonesia. Delivery of the system to the shipyard is planned during the autumn of 2008 and the vessel will be in operation early in 2009. *NA*

In April alone, MacGregor secured orders for 79 hatch cover shipsets.

Nordströms self-unloading system for cement, similar to the one ordered by PT Rimba Segara Lines, was installed on 19,500dwt *Tabernacle Prince* in 2004. Capacities: mechanical loading 1000tonnes/hr, pneumatic loading 400tonnes/hr, and pneumatic unloading 450tonnes/hr.

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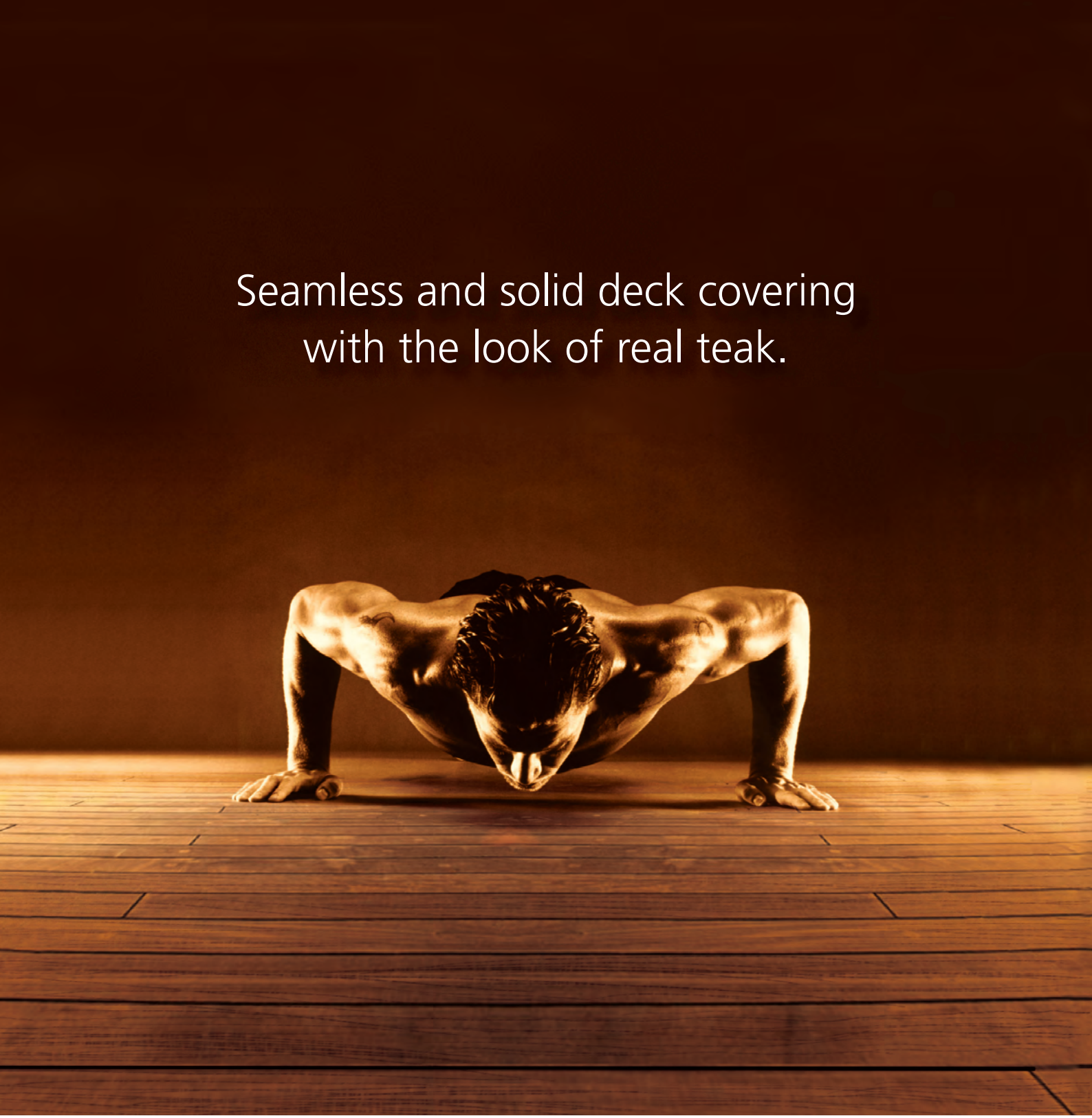

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Adventure in bulk transportation

Mitsui Engineering and Shipbuilding Co completed and delivered a 56,000dwt type bulk carrier, *Windsor Adventure*, from its Tamano Works on 26 March 2008 to Keymax Maritime Co Ltd/Fairmont Shipping (Hong Kong) Ltd.

Windsor Adventure is a Handymax type bulk carrier of 56,000dwt and is the 72nd ship in its series to be delivered, but she is nonetheless a notable workhorse in her field.

Generally called 'the Mitsui's 56', more than 130 units of this series have been ordered.

The vessel has larger cargo hold capacity (of 70,700m^3) compared to conventional Handymax type bulk carriers.

She has five cargo holds and four cranes for handling cargo. In order to load various kinds of cargo, the vessel is designed with high tank top cargo hold strength. Thus, the size of hatch cover is the largest for this type of vessel in terms of both length and width, with each cargo hold having a sufficient clear length in order to load long pipes, and strengthened to load heavy cargo such as hot coil.

The main engine is the latest Mitsui-MAN Diesel 6S50MCC, which is termed a light, compact, and high output engine, satisfying the environmental standards for exhaust gas emissions under IMO guidelines. The engine has marginal output to keep enough speed (at normal service output = 75% maximum continuous output), achieving the optimum matching at normal service output, according to the builder. *NA*

TECHNICAL PARTICULARS

Windsor Adventure

Length, oa	189.99m
Length, bp	182.00m
Breadth (moulded)	32.26m
Depth (moulded)	17.90m
Draft (moulded)	12.55m
Gross tonnage	31,247tonnes
Deadweight	55,975tonnes
Main engine	Mitsui-MAN B&W Diesel Engine 6S50MCC x 1 set
Maximum continuous output	9480kW x 127.0rev/min
Service speed	14.5knots
Complement	24 persons
Classification Society	NK
Port of Registry	Panama
Date of Delivery	26 March 2008

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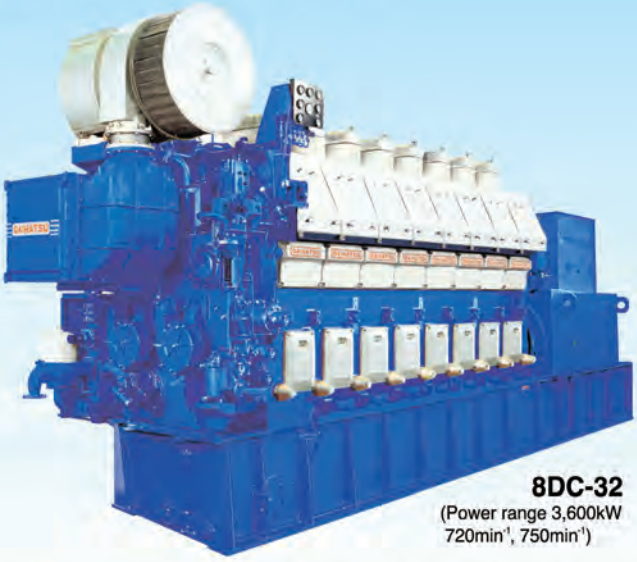

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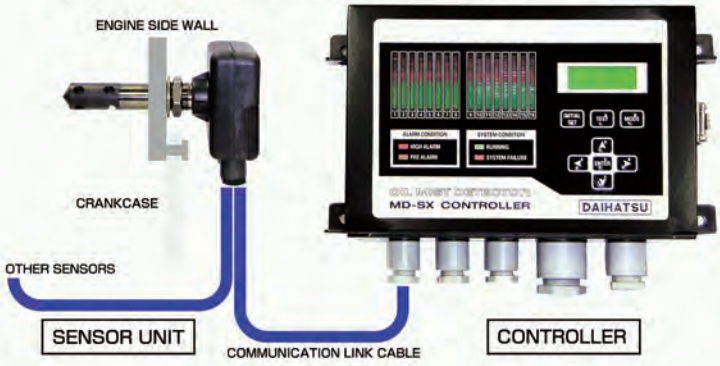

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ClassNK's new voice at the top table

A new wind of internationalism is blowing through ClassNK, following the appointment of Noboru Ueda as the Class Society's new president. Hugh O'Mahony reports.

A naval architect, and a 39-year veteran of ClassNK, Noboru Ueda is a University of Tokyo graduate, achieving a Bachelor's degree in 1967 and a Master's degree in 1969, both in naval architecture.

With ClassNK, he initially served in a number of assignments in Japan, starting with the Hull Department followed by the ClassNK Okayama and Imabari branch offices. He later returned to the head office where he worked in the development department, which is responsible for the development of the technical rules of the Society.

In 1980 Mr Ueda was given the responsibility of establishing the Seattle Office in the USA, where he served as the general manager until 1985. After a five-year stint in this senior position, and still young, Mr Ueda returned to the Hull Department, where he served as a manager before being promoted to general manager of the department in 1997.

He subsequently became a managing director in 2002 and executive vice president in 2006. He was then elected as chairman and president of the Society on 1 March 2008.

New man at the top, Noboru Ueda, president of ClassNK.

An insider speaks

Where the top job in Japanese classification has sometimes gone to career bureaucrats, Mr Ueda is convinced that his rise through the ranks gives him a distinct advantage.

'A person from the inside knows better about the situation of the organisation at a detailed level, about the people and what promotions should be made, and how to handle the workload.'

He said that top of his agenda in taking up the role was international expansion. 'Historically, ClassNK activities have been mainly focused on Japan and Japan's shipbuilding industry. But I plan to develop and expand ClassNK and bring a new internationalism to the organisation.

'We must make efforts to expand overseas, especially in Asian countries, particularly in Korea, China, the Philippines, Indonesia, India, Vietnam, as well as in Turkey, to reflect the changing nature of the work we are required to do. We are building our offices in each of these countries, sending Japanese staff, but also hiring local people and bringing on local surveyors.'

New offices

On 1 May, ClassNK established a new NK Zhoushan Office in China, the 103rd exclusive survey site in its global network and the 10th office in China.

The move swiftly followed on from the establishment of a 102nd representative office in Kochi, India, in April, ClassNK's fourth office in India.

'Now we have a new plan to establish a plan approval office in Turkey,' says Mr Ueda. In Korea, we have started with four people, and in India and Turkey we have started with two to three, but we plan to increase on these numbers.'

Mr Ueda said that ClassNK had been developing new and closer relations with the Indian Register of Shipping. 'Every year we make two or three visits to Mumbai to have core meetings for joint projects, such as computer program developments and ship recycling.'

Indeed, Mr Ueda revealed that ClassNK was fully supportive of the bid

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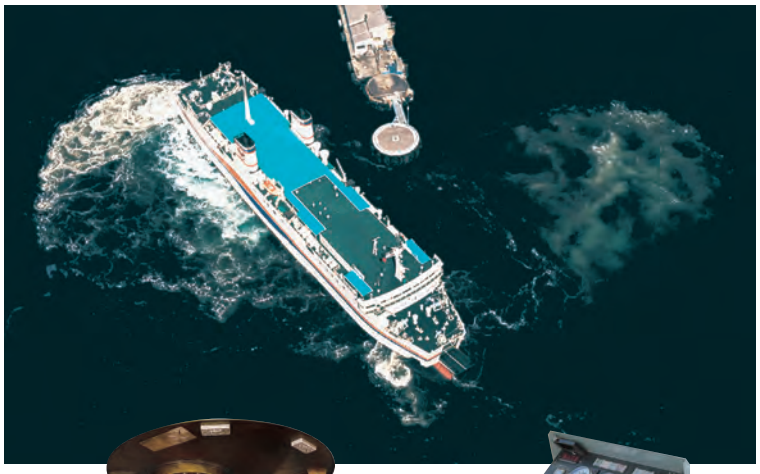

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by IRS to achieve full member status of IACS, because of 'their potential and their capacity'. However, he conceded: 'But IACS has 10 members and is a democratic organisation.'

ClassNK had also reached agreements with BKI in Indonesia, and Vietnam Classification, 'and very often we accept requests to train their surveyors and to offer IT training.' ClassNK also has an agreement with the Russian Maritime Register of Shipping, whereby the Russian Classification Society will undertake surveys on behalf of ClassNK in remote areas of Russia.

More significantly, perhaps, Mr Ueda says there are moves afoot for Asia's three biggest Class bodies to find common ground.

'In addition, we have the "Asian Three" project, involving NK, the Korean Register, and CCS in China. All three of us face a very similar situation, with lots of shipowners in the region, and also lots of shipbuilders. It is a different situation faced than by our non-Asian counterparts. That is why we are now having regular meetings: in March we met in Beijing; in May it was Japan. We have decided to make this close relationship in response to the LAN (Lloyd's Register, ABS, and Det Norske Veritas) Group. For example, we feel we have the right to show our collective opposition to irregular arrangements in the traditional IACS rotation of the chair. If the accepted rotation was to happen, KR is next in line to take the chair, but issues from the EU have led the LAN Group to suggest that the chair remains with one of their members.'

Important work

Like any IACS member, ClassNK is closely involved in a supporting role in developing work at the International Maritime Organization, and one of the most important areas of current discussion as far as ship structures is concerned is the Performance Standard on Protective Coatings, whose implementation in its current form has been exercising Asian shipbuilders because of the productivity cuts its adoption will imply, if all cargo tanks need to be protected by coatings.

In November 2007, the IMO's Sub-Committee on Ship Design and Equipment heard Japan's formal submission on an alternative to tank coatings in the case of corrosion suppression, with a new formalised description of the corrosion-resistant steel which has been developed by Japanese steel makers.

In cargo oil tanks of tankers, two types of accelerated corrosion have been found to be present:

- Pitting corrosion to the inner bottom plating within cargo tanks can lead to cargo leakage into the double bottom spaces, giving increased risk of explosion and pollution during ballasting operations
- Corrosion of the under deck structure within the cargo tank area can lead to a reduction in longitudinal strength which gives rise to a possibility of a more serious structural failure occurring

Two main approaches are identified to challenge such problems. One is to intercept the corrosive substances from steel by protective coating, and the other is to reduce the corrosion progress by self characteristics of the steel material.

If steel without coating is applied to a cargo oil tank, Japan argues, it would substantially reduce the work load during construction and possibly maintenance in service. It would also improve efficiency and credibility from the administrative point of view, since it needs no detailed inspections for coatings.

Goal-based standards

Goal-based standards demand that the thickness diminution of the steel by corrosion should be kept within the diminution allowance. In addition, GBS require that ships should have adequate watertight and weather-tight integrity for the intended service of the ship.

Japan argues that, should IMO develop mandatory performance standards to overcome the problem in cargo oil tanks, it should consider all possible technologies and should encourage development of future new effective technologies for the benefit of all concerned. Precluding new technologies to emerge would be the worst scenario.

'From ClassNK's point of view, for tankers, one option can be anti-corrosive steel,' says Mr Ueda.

Japan's formal submission to the IMO recognises that some concern has been that it is premature to introduce new technologies such as corrosion-resistant steel in the IMO regulation because there is not enough experience.

However, according to Japan's submission, what the IMO, as a rule-making body, should consider, is the target level of the performance expected to be achieved to overcome such concerns, rather than discussing the experience of using a specific product. 'It is the role of the manufacturers to develop, prove, and convince shipowners and Administrations that their product meets the required performance criteria developed and agreed by the IMO', Japan says.

Brittle cracking

For Mr Ueda, while critical, this is one of many issues demanding close attention from ClassNK. The Class Society has also been intimately involved in verifying work on the use of slimmer steel plate on the decks of very large containerships, with the emergence of YP47 grade steel (see '*Design and Construction of Containerships*' supplement, with this issue, p25). As containership sizes have increased, so has the thickness of their steel plate, and thicker plate, plate of over 100mm thickness, has a propensity to brittle cracking due to its lack of flexibility.

'This steel has been developed with the steel mills, with whom we have been working, and it exhibits crack-arresting properties,' says Mr Ueda. *MOL Creation* and two other MOL ships are already in service and, so far, so good.' These ships feature YP47 on their hatch coaming tops. 'This is a learning process, but this steel could be applied more widely. Once it has proven itself to be successful, Hyundai Heavy Industries, for example, is very interested in applying this steel to ships of 10,000TEU capacity and above.' ***NA***

Towards a reality-based CO_2 index

Japan's IMO delegation is at the heart of ongoing plans to develop a practical index of CO_2 emissions per unit shipping capacity to be used in the evaluation of energy efficiency.

In one of its latest submissions to the Marine Environment Protection Committee, Japan's proposal for an index of CO_2 ship emissions from ships looked to take actual ship conditions at sea into consideration.

This subject is due full debate at an inter-sessional meeting of an MEPC working group, to be staged in June and hosted by Norway.

CO_2 emissions from ships are reckoned to account for 3% of the total CO_2 emissions worldwide. This is projected to increase, based on growth in world trade and increase in international shipping activity (growing by 5.1% in the year 2005 alone on a tonne-mile basis).

Improving the energy efficiency of ships to be built in the future and replacing ships one by one with those emitting lower levels of CO_2 would have practical results in restraining total greenhouse gas emissions from international shipping. Given these beneficial results, a framework must be established as soon as possible to promote these initiatives, Japan says.

There is an urgent need to formulate a practical international index for improving the energy efficiency of individual ships at sea.

The energy efficiency of ships being built today is contractually guaranteed upon delivery of each ship, based on main engine power output and speed in calm water. However, such calculations do not take into account reduced speed due to waves and wind experienced under actual sea conditions.

All ships are subject to reduced speeds resulting from increasing wave height and changes in wave direction. The design of the ship affects this reduction in speed (and the corresponding increase in energy used) considerably.

This means the difference in CO_2 emissions between ships becomes significant as the wave height becomes higher. For example, among four Pure Car Carriers assessed in Figure 1, whose basic specification and operational condition are almost identical, the difference in CO_2 emissions between the ships with the highest and lowest levels of performance is estimated to reach 6000tonnes per year even at significant wave height 2m (Beaufort scale BF5).

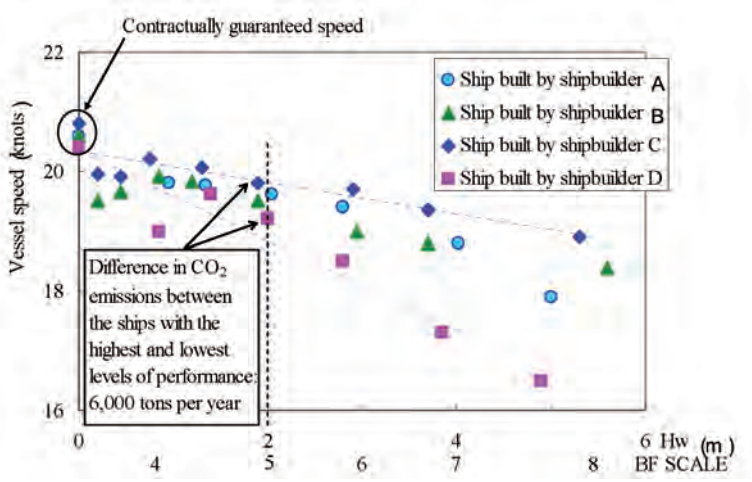

Fig 1: Comparison of fuel consumption of pure car carriers.

Japan Ship Technology Research Association president, Naoteru Tsuda, said that research in Japan had indicated that fuel consumption efficiency given for a ship operating in 'calm' (or hypothetical) waters could diverge by 10% from its indexed performance in experimentally-recreated actual seas. 'Shipbuilders deliver under trial on the basis of calm waters, but when ships sail in rough seas, their performance can be up to 10% worse in terms of fuel consumption – this is the data we have gathered from Japanese owners. We need to evaluate each vessel via such an index, to reflect on the price of running the vessel, for example, does it consume 10,000tonnes per year, or 9000tonnes per year, in the real world?'

In Japan, development of a practical CO_2 emissions index per unit shipping capacity is now underway, as a means of indicating energy efficiency per ship based on actual operational conditions.

Naoteru Tsuda, president of JSTRA.

The index must allow assessment of ship performance at the design stage, to enable confirmation by the shipping company of the CO_2 emissions index per unit shipping capacity for each ship prior to concluding a contract for a given new ship.

Mr Tsuda said that, this year, after tank tests conducted in the run up to MEPC, real data would be gathered from a pure car carrier or a bulk carrier at sea, to assess constant horsepower versus variations in velocity, after which, data from real conditions and towing tanks would be merged to develop a more sophisticated CO_2 index. *NA*

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Japanese builders on new merger trail

A preliminary agreement has been reached that sets the stage for the merger of Japanese shipyards IHI Marine United Inc and Universal Shipbuilding Corp.

An initial agreement has been reached at corporate level by IHI Corp and JFE Steel Corp which prepares the ground for the formation of a steering group to explore the merger of IHI Marine United and Universal Shipbuilding Corp.

Expectations are high that the exercise will lead to a merger within 12 months, although the precise shareholdings of each group in any unified operation have yet to be ascertained. IHI, Japan's third-largest maker of heavy machinery, had to announce smaller-than-predicted full-year profits in April, attributed to delays in delivering nuclear equipment and the erosion of overseas earnings, due to a stronger yen. The results came four months after IHI admitted to a larger than expected loss for the year ended March 2007, due to unforeseen costs at its boiler-building unit, and of nuclear equipment.

From the shipbuilding point of view, however, the idea is to enhance operations amid intensifying competition from Chinese and South Korean rivals.

Hiroshi (Dave) Iwamoto, IHI Marine United senior manager, corporate planning, said: 'The market has recovered, and we are in good shape, but the idea is to create something that can be considered a world class shipyard in light of developments at Korean and Chinese yards, something that can enjoy the benefits of scale.'

He said that rationalising the workforce of the two organisations was not the objective of the prospective merger. 'The idea is to get the best out of a larger company, with larger inputs and larger outputs,' he said. 'Both companies have problems, but also have a number of good things about them. Both companies could survive on their own, but it would be much better to get together.'

He said that joining forces would mean that extra staff could be made available in the combined operation to go after more niche shipbuilding projects. 'There could be duplicated activities, but the idea is not to find those duplications and get rid of people, but to exploit the wider scope of activities that a larger company can provide, with the future holding the prospect of developing different types of business, because shipbuilding is a cyclical business.

'Over the last few years, we have seen no sign of the market turning downwards, but now we have become a little more sceptical of prospects, and we have to ask ourselves how are we going to survive? A wider pool of people would serve us better.'

While the companies have VLCC construction in common, Universal specialises in Suezmax and Aframax tankers, as well as smaller offshore vessels, where IHI Marine United has focused on containership production, on bulk carriers from Handymax upwards, and on naval work. IHI also has its own liquefied natural gas carrier storage solution, where Universal has concentrated on its 'Mediterranean Max' LNG carrier type. *NA*

Hiroshi (Dave) Iwamoto, senior manager, corporate planning, IHI Marine United Inc.

The progress of contra-rotation

Already applied to VLCCs and large bulk carriers, IHI Marine United's contra-rotating propeller (CRP) has found a new audience among coaster operators, following its application to the 492gt general cargoship *Shinei Maru* and the 499gt chemical tanker *Dai-go Nikkou Maru*.

The inclusion of the CRP concept, where two propellers are arranged one behind the other to maximise push from the rotation disc, is part of a wider, government-backed programme to replace Japan's ageing fleet of coasters with new generation, environmentally-friendly ships, where operators of such ships have struggled even to cover operating costs, and bankers have remained reluctant to back new investments. As well as the CRP, the ships feature diesel-electric propulsion and smooth hull lines developed by IHI to minimise fuel consumption. In this configuration, the CRP uses two sets of electric motors driving two separate shafts, for redundancy.

Electric propulsion systems are less economical than their conventional counterparts, due to energy loss. To solve this problem, IHIMU's adoption of the CRP and high efficiency hullform, saved about 5% of fuel.

IHI has licensed the build of these new generation coasters to smaller, domestic yards, such as Sanuki.

IHI presented the benefits of its CRP solution to the International Maritime Organization's Bulk Liquids and Gases Subcommittee in February 2008.

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MES rolls out the big ships

It has been a year when the big ships have been rolling out of Mitsui Engineering & Shipbuilding Co's Chiba Works.

The most notable delivery from Mitsui Engineering & Shipbuilding in the last 12 months came in December 2007, when *Brasil Maru*, the first of six third-generation 327,180dwt, very large ore carriers left the yard, for delivery to owner Tamou Line. At 340m long, 60m across, and 28.15m deep, these 160,774gt ships are the largest ore carriers the world has ever seen.

Among the special features claimed for *Brasil Maru* and her sisters is low fuel consumption due to the combination of a hullform of higher propulsive performance, a propeller of higher propulsive efficiency, and the MIPB (Mitsui Integrated Propeller Boss), combined with reaction rudder. Greater operational flexibility is also claimed through the introduction of mooring equipment to meet loading ports condition in Brazil, securing of air draught to meet the entry into Australian ports, and capability of loading/unloading at multiple ports. Higher reliability of the hull structure is claimed by the introduction UIT processing (enhancement of fatigue strength by ultra-sonic processing) on major parts of ship structure, requiring high strength, in a first for the shipbuilding industry, with the collaboration of Nippon Steel Corp.

Brasil Maru's main engine is of the Mitsui-MAN B&W7S80MC-C type, which satisfies IMO exhaust gas standards and achieves fuel savings by introducing de-rating to enable an optimum operation at the most appropriate output. An electronically-controlled oil supply system is introduced as a main engine cylinder oil supplier.

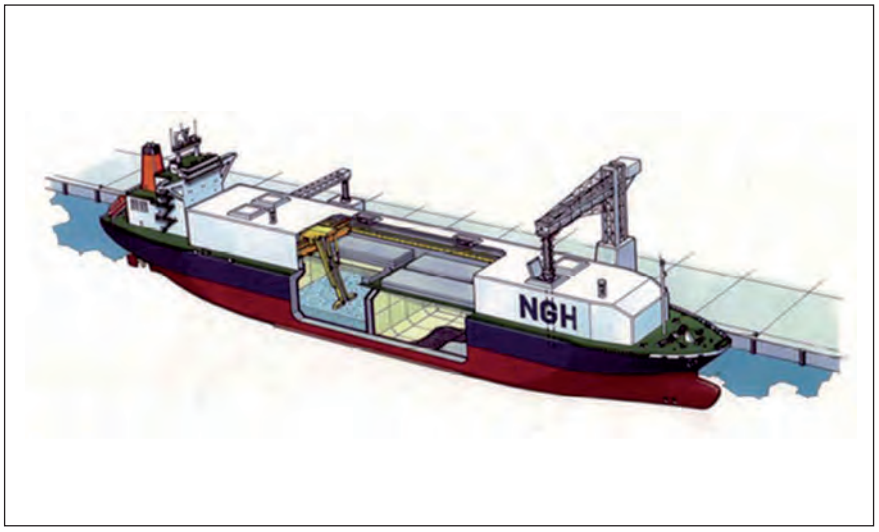
In May, meanwhile, MES will deliver the largest liquefied natural gas carrier it has ever built, in the shape of the 145,000m^3 capacity *Grand Mereya*, the 13th Moss type vessel delivered from Chiba, which yard has also delivered three membrane-type LNG carriers.

However, as the LNG market has cooled, MES has no LNG carrier backlog of orders. Rather, the company is adopting a wait and see policy, with the expectation that orders will pick up again for 2013-2014 delivery, when it should become clear whether the new workhorse of the industry will be of 170,000m^3, 180,000m^3, or 200,000m^3 capacity plus.

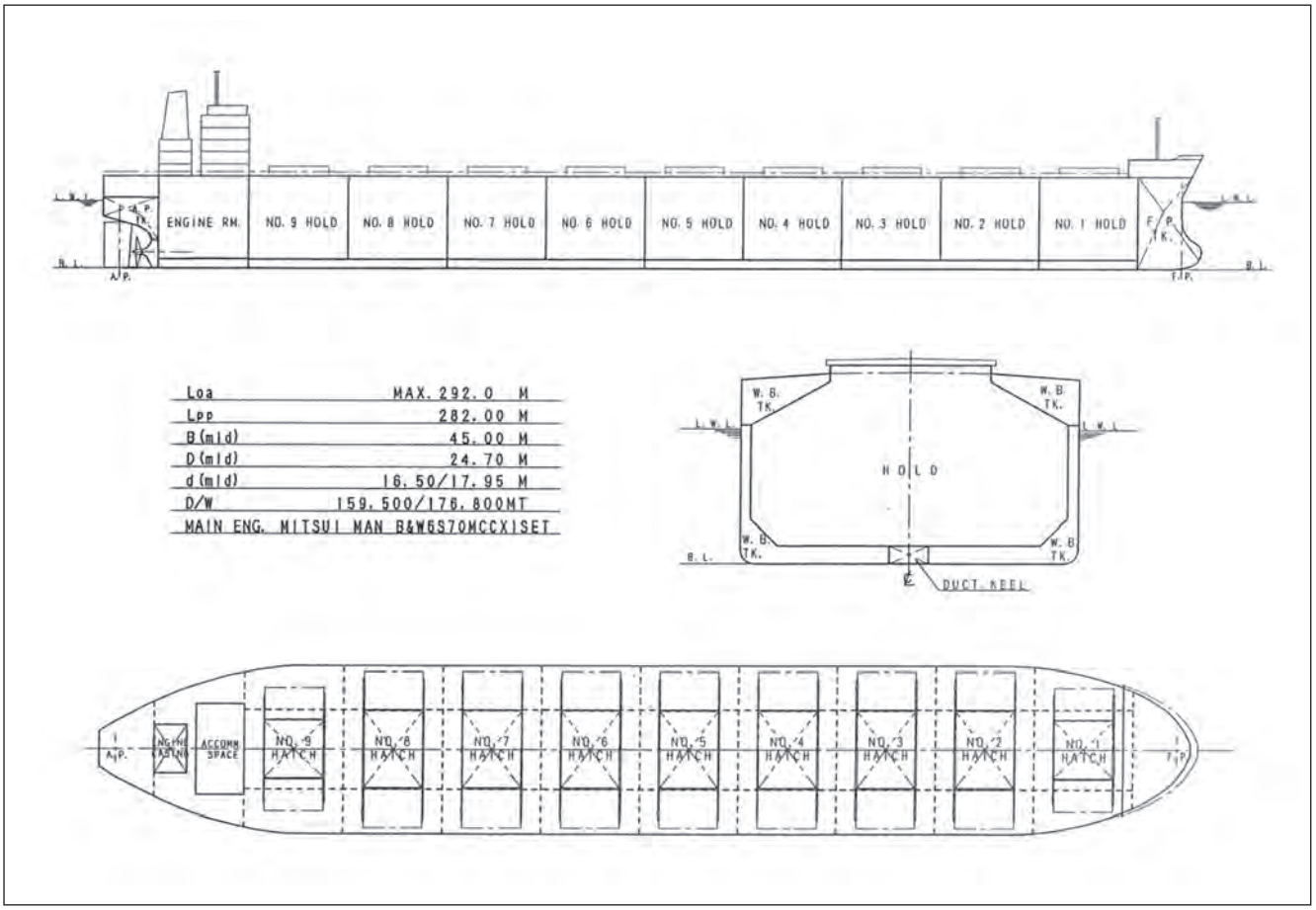
In the last fiscal year, ending 31 March 2008, MES delivered 26 ships. Apart from *Brasil Maru*, these consisted of one Panamax bulk carrier, 18 Handymax 56,000dwt bulk carriers, one 230,000dwt ore carrier for Nippon Steel, one VLCC for Mitsui OSK Line, three 110,000dwt Aframax tankers, and one patrol boat. This was deemed a 'normal year' by Masafumi Okada, MES director, ship and ocean project headquarters, and general manager of the Chiba works, although he said that production would rise to 28 ships in fiscal year 2009, 29 ships the year after, and 30 ships in the year after that.

Back to products

The key to sustaining and growing output remains in flexibility of vessel availability and Mr Okada said that, for the first time since the 1980s, MES was in the process of completing an LR2 product carrier. The Aframax-sized tanker would be delivered to MOL in the first quarter of 2009. Indicating how the IMO's Performance Standard for Protective Coatings was testing shipbuilder productivity, however, Mr Okada said that the first of these ships would actually be finished within 2008, but that the coating of tanks would take



Concept for a natural gas hydrates carrier.



Arrangement of the new nine-hold, 177,000dwt bulk carrier from MES.

as long as four months.

Japanese owners were also favouring a new, 177,000dwt double hull Capesize bulk carrier developed by MES, with the first such vessel due to be delivered by early 2009 to K-Line. With 197,000m^3 of carrying capacity for heavy bulk cargoes, MES reckons the nine-hold ship type will have the largest capacity of any operational bulk carrier of its size. The yard said Japanese owners had placed orders for two ships to be delivered in 2009, two more in 2010, and four more in 2011. While no orders have been placed for a 2012 delivery, Mr Okada said he expected that a trawl of owners would likely land between 10 and 20 ships of this type, although ships ordered after April 2006 will have to comply with IACS Common Structural Rules, implying an extra 2000tonnes of steel, and a reduction in deadweight to 175,000tonnes.

New rules are bringing the need to invest in existing facilities, with MES pumping in ¥5 billion (US$48.4 million) this year alone into new block handling facilities to meet CSRs and extra painting facilities to meet PSPC demands.

MES has also secured first contracts for its new 'mini-Cape' design of bulk carriers which, at 110,000dwt, will still be able to sail through the enlarged Panama Canal. With expectations that this ship size will simply replace the existing fleet of Panamax bulk carriers, there are hopes that owners will come in with orders by the half dozen, or dozen, rather than by the twos and threes.

Also on the 'to do' list were plans to develop a liquefied natural gas floating production storage and offloading vessel.

Gas ships of the future

More far reaching still are ongoing Japanese Government-supported plans to develop a Natural Gas Hydrate carrier, a ship to be dedicated to the carriage of pelletised hydrates (see *The Naval Architect*, June 2005, p42). Mr Okada said that a basic design for this potentially revolutionary vessel would be completed within 2008, although its dimensions remained to be determined by the expected point of consumption of the gas hydrates themselves. However, the initial conception is for a vessel 275m in length, 46m across, 25.5m deep, with a design draught of 14m, and a cargo capacity for about 160,000m^3. Heating plant to liquefy the pellets from its in-transit temperature of -20°C would be ashore, rather than onboard.

Japan informed the IMO's Sub-Committee on Bulk Liquds and Gases of progress on Natural Gas Hydrate carriers, to carry gas in pelletised form at -20°C.

It is expected NGHP carrier will be able to carry 1/5 to 1/6 of natural gas compared with an LNG carrier having

same volumetric capacity of cargo spaces. NGHP carriers are, therefore, less efficient for transporting natural gas than LNG carriers, gas transportation by means of NGHPs requires lower initial cost and higher running cost compared with gas transportation by means of LNG. It is considered that NGHP can be an economical medium for transporting natural gas from comparatively small gas fields located not far from terminals of users of natural gas.

Solid gas

NGHP carriers will be ships solely intended for the carriage of NGHPs with gas-tight and insulated cargo tanks. To prevent explosions, cargo tanks for NGHPs should be filled with almost the same gas contained in the NGHPs, similarly as the void spaces in tanks for LNG are filled with the natural gas.

The structure of the cargo tanks can be designed taking into account principles underlying the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code) and will be 'internal insulation tanks'.

NGHP can be regarded as a solid bulk cargo in view of cargo handling. One of the most challenging subjects in the research and development for NGHP carriers is development of unloading systems under gas-tight conditions.

The NGHP carrier has a gas-tight superstructure covering all the cargo tanks. After careful consideration on cargo handling operation, including inerting operations for inspection and maintenance, it was found that the volume of superstructure should drastically be reduced, with the NGHP carrier fitted with a movable gas-tight deckhouse. A new mechanism for keeping gas-tightness is being developed to make possible a movable gas-tight deckhouse.

From the viewpoint of safety, the integrity of a gas-tight deckhouse should be examined and it should be confirmed that the ingress of air (oxygen), due to small crack, into the atmosphere in cargo tanks and a deckhouse is appropriately prevented.

NGHPs may be handled by conveyor systems in trunks and other mechanical equipment.

Bucket chain un-loaders will be used for unloading of NGHPs.

For mechanical cargo handling systems, hydraulic units are necessary. A gas-tight room would contain hydraulic and electrical equipment located on a traversing unit. This room should be filled with inert gas such as nitrogen.

On an NGHP carrier, it may be possible to locate all electrical equipment outside the cargo areas. However, in such a case, the electrical wiring and piping arrangement of the ship will be very complex and unreliable.

Draft guidelines for the construction and equipment of ships carrying natural gas hydrate pellets in bulk will be developed. Japan will further investigate the safety measures for NGHP Carriers through detailed identification of hazards. *NA*

MHI adds to the mix

Adapting designs to market requirements and to new regulations is currently focusing minds at Mitsubishi Heavy Industries' shipbuilding and ocean development division.

Mitsubishi Heavy Industries turned out 24 ships in fiscal year ending 31 March 2008, from its yards in Kobe and Nagasaki, and expects to deliver the same number of ships in 2009 and 2010.

However, the mix of ships on order is changing. Where 10 pure car and truck carriers have been delivered this year, and 11 more are due in 2009, the number falls back to four units in 2010. Again, while five liquefied natural gas carriers are or have been delivered in 2008, this falls back to four units in 2009, and to zero in 2010.

Taking the place of this business will be an upsurge in containership deliveries, with three box ships delivered in 2008 and three due in 2009, but the number rises to nine units in 2010. Again, 2010 will see the first deliveries of both VLCC and ro-ro tonnage for some years for the yard (one unit in each case).

The VLCC in question will be MHI's first to be built to new Common Structural Rules from IACS, as well as Performance Standards for Protective Coatings and Permanent Means of Access rules laid down by the International Maritime Organization. The customer is believed to be Mitsui OSK Line.

As noted, MHI is also working its way through a series of LNG carriers, four of which are 145,000m^3 capacity units of the Moss type for NYK - which will charter the ships to domestic owners - with two being the remaining pair of a five ship order for MISC. The latter are GTT 96 membrane type vessels and offering 157,000m^3 of capacity.

As well as being the largest LNG carriers ever built by MHI, construction of the MISC ships has called for a degree of flexibility from the builder. The three earlier ships in the series were smaller, at 152,000m^3 but, more significantly, MHI was required to switch from a steam turbine-based propulsion solution to a dual fuel diesel-electric solution midstream. With the order already placed, the earliest ship in the run it was possible to switch was number four, due delivery in January 2009 and which, like number five in the series, is being fitted with two 12-cylinder 46V engines from Wärtsilä.

Also under construction are a latest series of 10 x 6400 car capacity PCTCs for Wilhelmsen Wallenius Logistics, notable for their economic fuel consumption, which the builder claims is 5%-10% lower than comparable vessels from other yards. As well as smooth hull lines, it says that these ships feature a flow control stator fin, arranged just after the propeller, which enhances hydrodynamic performance.

WWL has also specified that the holds of these 12-deck ships are flush, in order to maximise cargo carrying capacity, meaning that the shipbuilder has had to dispense with extruded brackets at high stress points within the hold. Partial transverse bulkheads have also been downsized, with the side structure of the ships strengthened to compensate.

Forward-looking design is also a feature of WWL's order for four ro-ro vessels, the first of which is due delivery in 2011. These 260m long ships are slated for heavy cargo loads and have been dubbed WWL's 'Mark V' ro-ro design. The design is distinguished by a slender hullform, again to minimise fuel consumption (see p7).

Minimising fuel consumption is also a claimed as a central attraction for the containerships MHI is building, although perhaps its most tangible innovation has been the inclusion of more flexible YP47 grade steel (see *Design and Construction of Containerships* supplement, with this issue, p25). The largest containership constructed by MHI to date has been 8100TEU capacity. However, MHI says it has developed a 10,000TEU plus capacity ship design.

Meanwhile, MHI said that the changing market situation had led it to consider making a re-entry into the cruiseship market. The builder has previous experience here, having built two 116,000gt, 290m long ships for P&O Princess Cruises – *Diamond Princess* and *Sapphire Princess* (although notoriously, *Diamond Princess* was badly damaged by fire during construction).

MHI said it was pitching a refined version of its cruiseship design to the same owner, which would see the addition of two decks to the original 18-deck *Diamond Princess* configuration. Discussions with P&O Princess were continuing, with price being the key issue according to the builder, while MHI said that it was also concentrating on how to control the logistics and manage sub-suppliers for a cruiseship newbuilding project. ***NA***

8100TEU capacity containership from Mitsubishi Heavy Industries.

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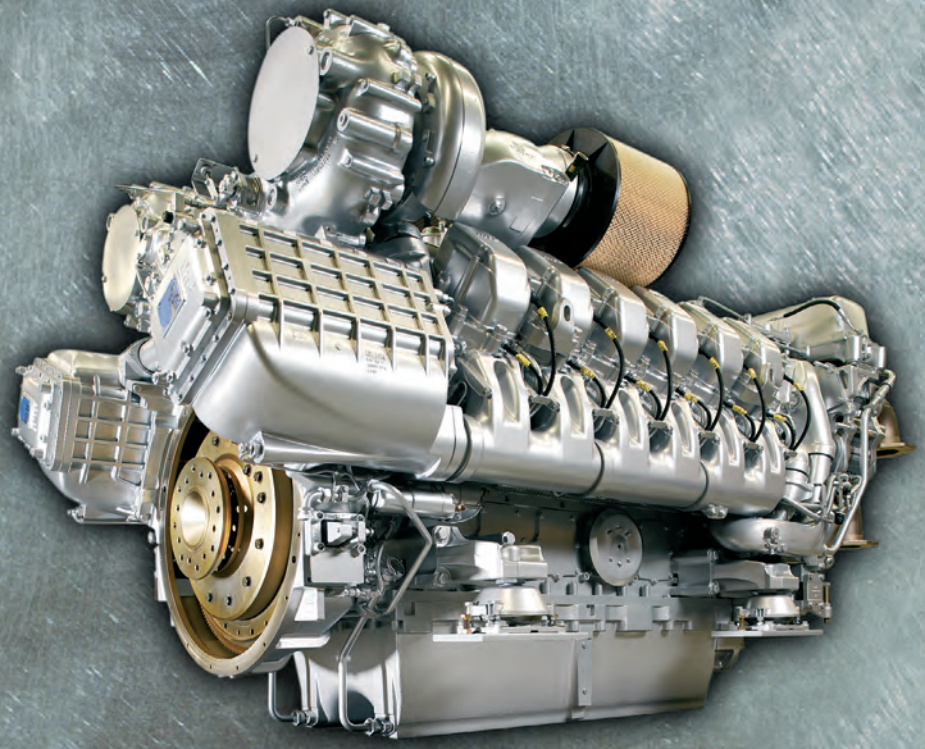

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MHI marine goes for growth

Mitsubishi Heavy Industries' diverse marine diesel and machinery businesses generated revenues of US$700m in fiscal year 2008. With growth assured for the coming years, it continues to invest in expanding its engine and turbocharger activities in particular.

Mitsubishi Heavy Industries has been investing heavily in turbocharger production for two-stroke engines at its Nagasaki plant, a market in which it claims a world-leading market share of 38%-39%. It has developed annual capacity to deliver 1500 units for attachment to low-speed engines, twice the size of its operation five years ago. The company said it was now on the way to developing its largest ever turbocharger model for the marine market, for compatibility with larger containerships using MAN Diesel's K98 and Wärtsilä's RT-flex 96 generation of engines, for 2010 delivery engines. Its company spokesman said its new generation turbochargers worked with engines operating at 20bar, but that units compatible with 23bar engines would soon follow.

The company also planned to raise its profile at the high-speed end of the turbocharger market, and was developing a new generation of units for auxiliary engines, for use on engines delivered by Yanmar and Daihatsu.

Main engine push

In the meantime, MHI has also been pushing forward with its 'UE' main marine engine programme, with engines available in the 33cm-85cm bore range. It currently produces around 120 units to its own UE design per year, either directly or through Japanese licensees.

Expansion will flow from its new alliance with Diesel United, which is due to deliver its first four 50cm bore UE engines in December 2008 for a 30,000dwt multi-purpose ship.

Separate is the joint venture with CSIC, Qingdao Qiyao Linshan Power Development Co Ltd (QQLPDC) and Wärtsilä-MHI vehicle Panda Shinco Holding BV (PSH). QQLPDC is jointly owned by Yichang Marine Diesel Plant (YMD) and Shanghai Marine Diesel Engine Research Institute (SMDERI), both being underlying units of CSIC.

Growth in China

The joint venture has established Qingdao Qiyao Wärtsilä MHI Linshan Marine Diesel Co Ltd (QMD) in China, with a view to starting production of large low-speed two-stroke engines from April 2009. QMD will be capable of building large marine engines of 50cm bore and above, extending up to 96cm bore. Initially the factory will have a capacity to build engines of about 1.2 million bhp per year, with planned development to increase capacity to about 3.5 million bhp/year.

> "MHI has also been pushing forward with its 'UE' main marine engine programme, with engines available in the 33cm-85cm bore range. It currently produces around 120 units to its own UE design per year."

MHI's spokesman said that the QMD venture already had over 120 marine diesel engine orders on the books, although the first run of orders had 'intentionally' been given over to Wärtsilä 'because they do not have a factory of their own'. There were, however, 20 UE engines on order, with production slated to start in 2010.

Other efforts are also being developed to expand production of MHI-designed marine engines overseas. The first engine to an older design, a 7UEC45LA unit, is expected to be delivered under licence from Vietnam this year, through Vinashin yard Bach Dang Shipbuilding Corp, for installation onboard a bulk carrier constructed for Vinalines. Facilities at Bach Dang could produce between 10 and 20 marine engines per year.

Again, the Japanese giant's spokesman said MHI was keen to cultivate engine-building capacity at Vinashin's Dung Quat facility, where it sees a role for its largest 85LSII engines for installation in VLCCs.

Development programme

The latest engine to be launched by MHI is the UEC45LSE, as the engine maker gradually upgrades its programme for higher pressure operation. Its existing LSII engine range, operating at 18bar, is available in 33cm, 37cm, 43cm, 50cm, 60cm, 75cm, and 85cm bore versions, but these are being augmented with the 50LSE, the 60LSE, and the 68LSE (the last equivalent to the 75LSII), operating at 19cm-20cm bore. The mechanically-controlled 50LSE has been developed in collaboration with Wärtsilä.

MHI has also been developing its own electronically-controlled engines, where it delivered a first 60LSII-'Eco' engine for use on the NYK pure car and truck carrier *Lyra Leader* in 2005. However, despite three years of trouble-free running, the engine-builder reports that Japanese owners have proved 'conservative' in their approach to the new technology. *NA*

Big and green MES machines

The acceleration in output by marine engine makers to meet continuing high demand for ships is witnessed by the rise in production expected by Mitsui Engineering & Shipbuilding's machines and systems division over the next two to three years.

Under licence to MAN B&W (now MAN Diesel) since 1926, it took until 2005 for MES to reach the landmark production figure of 50 million bhp. In March 2008, it reached 60 million bhp and the expectation is that total output will have reached 68 million bhp in 2010. While Hyundai Heavy Industries remains the largest marine engine producer in the world, MES reckons to be the largest producer of a single brand. MAN Diesel licensed engines account for 69.1% of the marine engines emanating from Japan, with MES construction accounting for two thirds of that production.

Recent investments in production at its Tamano Works have included a new machining shop that will see the total MES output of marine engines rise from the 200 units in 2007, to 215 in 2008, and 256 in 2009. With a capacity target of 6 million bhp per year, the expectation is that production will rise to 270 units in both 2010 and 2011 (See Table 1 for full breakdown).

Masaki Ohtsu, MES machines and systems technical associate director, said that, as well as steady business for its largest K98 engine from customers wanting larger containerships, MES was looking to boost output of the 65cm and 70cm bore engines ideal for Capesize bulk carriers. Furthermore, investments had been and would be made to meet the high demand for the type of 60cm bore engine installed in Panamax and Aframax bulk carriers, as well as pure car and truck carriers, and smaller containerships. Mr Ohtsu said that a new assembly hall, due completion in 2009, would allow the manufacturer to expand its output of smaller bore engines.

MES is also partner to China State Shipbuilding Corp in CCSC Mitsui Diesel (CMD), which opened for business in Shanghai in 2007 to build MAN Diesel engines of 70cm bore and above, with plans to ramp up production to over 2 million bhp by 2010.

Masaki Ohtsu, MES machines and systems technical associate director.

Year / Eng. Type	2007	2008	2009	2010	2011	2012
98	18	14	15	11	14	9
90	0	0	0	0	0	0
80	3	8	4	7	5	5
70	19	22	38	36	41	18
65	0	0	3	8	12	14
60	69	68	89	93	97	89
50	85	98	105	110	97	61
Below 50	6	5	2	5	4	0
Total	200	215	256	270	270	196

Table 1: Engine production forecast from Mitsui Engineering and Shipbuilding for MAN Diesel units built under licence.

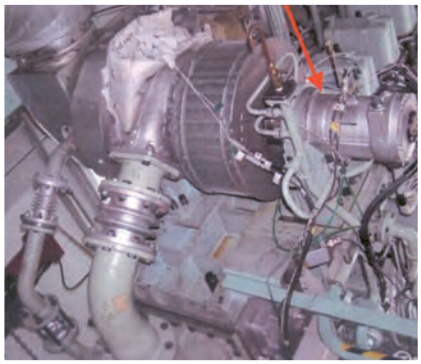
Environmental challenges

Booming production and revenues are no distraction from the fact that engine builders face stiff environmental challenges, in order to meet Tier III air emissions standards arrived at by the International Maritime Organization in April 2008. Where Tier II requirements, due into force in 2012, envisage NOx emissions limited to 14.36g/kWh at low speeds, 2017's Tier III requirements will demand a cut in NOx emissions in restricted sea areas to 3.4g/kWh.

Mr Ohtsu said that, for Tier II compliance, he felt that Japanese owners would come to accept the benefits of electronically-controlled fuel injection, particularly after 2010. Looking further ahead, he said that MAN Diesel was addressing environmental challenges by developing technologies that looked to humidify air to suppress NOx emissions. 'If the licensor leads, we may follow,' he said, 'but this solution has side effects – the introduction of humidity leads to an increase in the flow of fuel, increasing the amount of exhaust gas, so the developer needs to think about the recovery of energy from the exhaust gas.' MES was pursuing its own solution involving direct water injection into the cylinder.

The US and Japanese proposal to IMO to reduce NOx emissions by 80% had been 'on the presumption' of the development of selective catalytic reduction technology, Mr Ohtsu said. Ships already including such solutions featured the SCR unit fitted between the engine and the turbocharger, he noted, because they needed gas temperatures of above 300°C to work effectively. However, such installations were inherently complex, and also had a negative effect on sulphur emissions. Therefore, MES was investigating installation of an SCR unit after the turbocharger, using urea to react with NOx. He said that tests so far had shown that, given an acceptable 6% rise in fuel consumption, 70% lower NOx emissions were achievable. 'We still have a little way to go to reach the 80% cut using this method, although we are also assessing adding other technologies.'

With sulphur emissions cuts also agreed at IMO, Mr Ohtsu said low sulphur content fuel to suppress sulphur emissions provided an environmentally-friendly solution, and MES had experience in coating fuel pump plungers in such a way that it might address concerns over the low viscosity of the fuel type. However, he added that there were concerns over the quality of available low sulphur fuel. He expressed interest in the alternative technology being developed



The turbo hydraulic system and the turbo generator unit from MES – new methods to recover energy.

by Krystallon, looking to treat HFO by after-burning to meet coming low sulphur emission strictures.

The IMO has also recently agreed that progress needs to be made on CO_2 reduction, and Mr Ohtsu said MES was also keenly following progress made by MAN Diesel on its thermal efficiency system (steam turbines recovering waste heat have been installed on Maersk ships), and particularly on its variable ring turbocharger as the means of utilising exhaust energy, or improving thermal efficiency, where better specific fuel oil consumption is discernable at part load. This solution, which is under service test, can be installed at lower expense than is the case for steam turbine waste heat recovery, and takes up no extra space on the ship.

Here too, though, MES has research studies of its own to explore other techniques. These revolve around the 'turbo hydraulic system', and the 'turbo generator unit'.

The THS and the TGU are variations on a theme, attaching either a hydraulic pump and motor, or a high-speed electric generator, to the turbocharger.

In the case of the TGU, the load is taken from the turbocharger shaft, with its 'excess efficiency' used to generate power for auxiliary use.

The THS uses the same principle, but excess power is used to drive the hydraulic pump, whose output could be harnessed to contribute to the drive shaft at high loads.

While in need of confirmation, MES suggests that the TGU would retain the equivalent of 4% of total engine power for auxiliary purposes, while the THS could contribute up to 3% to engine power at high loads. *NA*

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Hitachi Zosen to double production

In 2009, two-stroke marine engine builder Hitachi Zosen Diesel & Engineering Co is due to open an additional production facility, developed at a cost of ¥7 billion (US$68 million).

Hitachi Zosen Diesel & Engineering, which currently turns out around 50 main engines under licence per year from its Ariake works, is currently building at full capacity but, when its new production facility opens in March 2009, it will double production capacity overnight.

This year, HZ D&E expects to turn out engines equivalent to just under 1.7 million bhp, but this is expected to rise to 2 million bhp by 2010, and to edge upwards to around 2.1million bhp by 2012.

Since becoming the first Japanese engine builder to complete a MAN Diesel electronically-controlled diesel engine in December 2003 (an ME50-C), Hitachi has continued to broaden the range of engines it builds, with the manufacture and completion of the first 65ME-C and 70ME-C engines. Current orders for ME-C engines include two sets of 50ME-C units for two 46,000dwt product carriers, three sets of the 7S65ME-C, for Suezmax tankers, and one 7S70ME-C for a 310,000dwt ice class bulk carrier. The company has also secured its first order for an S80ME engine for installation aboard an ore carrier for a Japanese client.

Small bore speciality

However, around 50% of current production is in the 50cm-60cm bore range, and the new facility will be completely given over to this popular range of engines. Facilities will include a new machine shop, a new assembly shop with two testbeds, a sub-assembly area for 50cm-60cm bore engines, and an enlarged precision shop. The existing facility will then be given over to producing 70cm bore engines and above.

Output of MAN Diesel engines dominates Hitachi Zosen production and, indeed, for an 11 year period lasting until 2008, the Japanese supplier did not offer engines licensed by rival Wärtsilä. Haruo Tanaka, HZ D&E general manager, design department, said that the licensee's assessment had been that production was too costly. However, an evaluation of Wärtsilä's new RT-flex electronically-controlled engines demonstrated that this was no longer the case and, this year, HZ D&E is turning out its first five RT-flex 50B engines, with expectations that this will grow to 12-15 units in 2009. Furthermore, Mr Tanaka said: 'Our next target will be the RT-flex 82 engine.'

SCR on track

Looking towards coming restrictions on emissions from ships, Mr Tanaka said that HZ D&E would follow its licensors when it came to meeting Tier II restrictions, due in 2012, but that it had its own separate plans to explore selective catalytic reduction. Future plans included construction of a new plant aiming to develop a compact SCR, using urea as its De-NOx element. *NA*

'Less Is More' Puzzle - Solar Solved

By pre***SSM***an, reporting on exceptional achievment by British Marine enterprises

Well known British marine equipment manufacturer Solar Solve Marine has set itself a mission to show that ***LESS*** is ***MORE***.

I was puzzled. How can Less be More?

I checked out their very impressive new look website **www.solasolv.com** that is full of interesting and useful information. This pillar of British marine equipment manufacturing excellence must be a huge organisation? Actually there are only 20 employees supported by a network of 48 independent distributors in 19 countries.

Solar Solve Marine manufactures the world's Brand Leading anti glare roller screen SOLASAFE®, which rejects glare, heat and ultra violet light and is used as a navigation safety aid.

ROLASOLV® is a marine roller blind they produce for passenger and crew accommodation.

Upwards of 75,000 roller screens and roller blinds have been supplied to something like 7,500 vessels. 80% of turnover is currently exported. So far 56 countries on all 7 continents have been supplied.

Lots of interesting numbers! Are they the clue to Less is More?

Or is it the company philosophy of 'customers should expend Minimum effort and get Maximum satisfaction'?

The contact details on the website helped solve my puzzle. I spoke with Paul Hopkins, Sales and Marketing Executive at the South Shields based company.

"Hi Paul, pre***SSM***an here.

"What's all this Less is More stuff I'm hearing about your company? I'm puzzled."

"Ah, well pre***SSM***an", says Paul.

"Be puzzled no longer."

"I have a brilliant new advertising strategy based on Less is More, printing only the company logo, leaving the rest white. Less space but more effective."

"Now I have Solar Solved your puzzle I hope everyone will look out for these ads and let me know what they think."

"E-mail **paul@solasolv.com** or ring me on **+44 191 454 8595**."

Supergreen dimethyl fuel

Daihatsu Diesel lays out its plans to develop marine engines running on a completely new fuel source.

Japan's 'Supergreen Marine Diesel Engine' project has state support and ranges across high-, medium- and low-speed marine engines.

Initiated in 2007, the project supports work being done by Mitsubishi Heavy Industries to develop a low NOx and SOx main slow-speed engine, with Yanmar chosen to develop an equivalently green high-speed engine. In the medium-speed range, however, research is being carried forward by three companies: Daihatsu Diesel Mfg Co, Niigata Power Systems, and Hitachi Zosen Diesel and Engineering Co.

Toshio Matsuka, Daihatsu Diesel general manager, marine diesel engine sales department, said that there would be no difficulty in Daihatsu meeting the International Maritime Organization's recently arrived at formula for 'Tier II' marine engines under the revised Annex VI of Marpol. This envisages a 20% cut in NOx emissions by 2012. 'We can do that already by developing our existing engines,' said Mr Matsuko. 'We will need to develop the Miller cycle and increase turbocharger power to meet the requirements.' Daihatsu offers engines ranging from 17cm to 32cm bore in its diesel range, with a larger 36cm bore gas engine also available.

'However,' Mr Matsuka went on, 'IMO's third tier will cut allowed NOx emissions by 80% by 2017 and that is why we are now working, with a Japanese government subsidy, on a new external catalyst.'

Mr Matsuko said Daihatsu was working with De-NOx catalyst developer Nippon Shokubai, which had wide experience in developing systems for stationary boiler and power station applications.

While others in the marine context have chosen urea as the De-NOx substance, Mr Matsuka said the Nippon Shokubai solution deployed ammonia.

'The problems are how to save on the cost of the equipment and its installation, and how to keep ammonia safe onboard ship,' said Mr Matsuka.

However, NOx is not the only emission in the sights of the IMO, with new rules governing SOx emissions already laid down for the future, and more work expected on CO_2.

'Another factor is that in the environmental picture now is medium-speed engines burn heavy fuel oils with a viscosity of 380cST,' said Mr Matsuka. While running engines on low sulphur fuel has been widely touted as the solution, Mr Matsuka said Daihatsu's research was focusing on a completely new fuel type, in the shape of dimethyl ether (DME), a steel mill byproduct produced from coal, gas, and other materials. Daihatsu was part of a joint project involving steelmaker JFE Steel Corp and gas supplier Iwatani.

Daihatsu presented the first findings of its investigations into DME to Cimac's 2007 meeting in Vienna, where it said a DME diesel engine would not emit SOx at all because the fuel type contains no sulphur, nor particulate matter/soot or other 'inconvenient' substances, involving no direct carbon bonds in the molecular structure.

To use DME as a fuel will require some adjustment to the marine engine, however, because it turns into gas at -25°C, while its calorific value per unit of mass is about 70% of gas oil, and its density about 80% of gas oil. As the fuel is also low in viscosity, and demonstrates no properties of lubrication, designers will have to modify the fuel supply and injection system, the air intake, and the exhaust system before using DME in a commercial engine, Mr Matsuka said.

However, he said that availability of DME would not be an issue, where China had already produced 'vast quantities' and there were 'huge' plans for commercial production in India, Australia, and Russia. Nor would distribution necessarily be a problem in

Daihatsu ramps up

In the fiscal year ending 31 March 2007, Daihatsu produced and delivered 829 (1.28m bhp) diesel engines from its Osaka works, with 776 (1.195m bhp) of them destined for marine customers. Financial year 2008 saw this leap forward, with around 1000 units produced, while fiscal year 2009 is expected to see 1100 units delivered, and 2010 a further 1200 units.

To produce such large numbers from Japan, Daihatsu will invest US$80 million by 2010 in new production facilities at its existing plant. The investment will focus on new machine tools, especially for crankshaft production, but also CNC cutting tools.

Much of the growth in Japanese-based production is attributable to growing Chinese shipbuilding customers, but this is by no means the end of the story, with Daihatsu's two Chinese licensees also ramping up production, with main engine outputs ranging between 1616kW and 4413kW, and auxiliaries ranging between 600kW and 4180kW.

Anqing Diesel produced 300 Daihatsu units in 2007, but went on to deliver 450 units in fiscal year 2008 and, in fiscal year 2009, it is expected to deliver 600 units, with the addition of a new factory with its own casting plant, completed at the turn of the year. Meanwhile, Shanxi Diesel Heavy Industries Co has been delivering 70 main engines per year for inland ships, but it is soon to go into the production of auxiliary engines built under the Daihatsu brand and plans to produce up to 300 units per year by 2009.

JFE Engineering Corp's Tsurumi works provides the test-bed for a demonstration engine running on DME which has successfully clocked up over 1000 hours in service.

Japan, as DME could be distributed around the same network currently moving liquefied petroleum gas.

Daihatsu Diesel and JFE Engineering have jointly developed a 1.25MW diesel demonstration engine at the Tsurumi works of JFE Engineering Corp, in Yokohama, which had achieved over 1000 hours of running time successfully, Mr Matsuka said. DME was already being used in trials to run a commercial truck engine.

Summing up, Mr Matsuka concluded: 'We think that DME is highly advantageous when compared to bio-fuels. Growing food to run cars is a crazy idea in the first place. We can make a good use of this material by creating energy and reducing carbon monoxide levels.' *NA*

Faster and further with Ecospeed

Ecospeed is an extremely durable hull coating that will save on fuel costs and give increased speed. It is expected to last for up to 25 years and is guaranteed for 10.

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The Belgian Navy have been using Ecospeed on a number of their vessels since 2004 and have committed to applying it on the remainder of their fleet.

The growing appeal of Ecospeed comes down to a number of key factors.

Average hull roughness remains the same throughout the vessel's lifetime as there is no build-up of paint layers. This, together with a smooth surface gives major fuel savings.

The strength and impermeability of the coating provides a very high degree of protection against mechanical impact and corrosion. The endless cycle of hull repainting every two to five years can therefore be dispensed with. Even after being tested under extreme Baltic winter ice conditions it has proven to be effective protection against mechanical impact.

In addition, the coating has no adverse environmental effect as it is entirely 100% toxic-free.

Ecospeed can be used on most ships, offshore vessels and structures. It has proven to be ideally suited for fast moving container and cargo ships, cruise vessels and ice-going ships. Its use can remove major headaches for ship superintendents. With no repainting necessary yet protecting the hull surface against corrosion, there will also be many additional advantages such as significant savings on repair and maintenance costs.

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The future of ballast tank coatings

Extracted from a paper first given at NACE International Marine Coatings Summit, Shanghai, in October 2007, by Rodney Towers C.Eng, MRINA, and Johnny Eliasson, Stolt-Nielsen Transportation Group.

All parties in the industry are aware of the need to rise to challenges posed by the IMO Performance Standard for Protective Coatings (PSPC) regulations, and there is common concern about how best these can be met.

Current practice amongst shipbuilders is broadly to either apply modified epoxy systems, or tar free epoxy systems for ballast tank coating. The terminology of tar free epoxy can mean any one of three main product types: solvent borne modified epoxies, solvent borne pure epoxies, and solvent free epoxies.

In the general case, modified epoxies are most commonly specified by Chinese and Japanese builders, whereas yard standard offers from Korean builders usually specify pure epoxy systems.

In summary, it appears that some 90%–95% of WB tank spaces are now coated with either modified epoxy or pure epoxy systems, and probably less than 5% of these with solvent free epoxy systems.

The intensely competitive nature of the shipbuilding industry led to earlier shipyard specifications of two-coat tar epoxy systems being reduced to one-coat systems. Equally, pressure by shipyards on manufacturers to further reduce costs resulted in the manufacture of some lower cost tar epoxy products, this being achieved by raising the tar content and lowering the proportion of higher cost epoxy resin. The objective of these actions was essentially to find a minimum specification and cost for painting WB tanks to a standard sufficient enough to avoid claims by owners arising within the shipbuilders' 12 month standard warranty.

Following concerns in the 1990s about certain raw materials being used in the manufacture of tar epoxies, and in response to the International Association of Classification Societies, IACS, recommendations to use two-coat, light colour, hard coating systems in WB tanks, the industry moved on to use replacement products such as non-tar, bleached tar, epoxymastic, and pure epoxy systems.

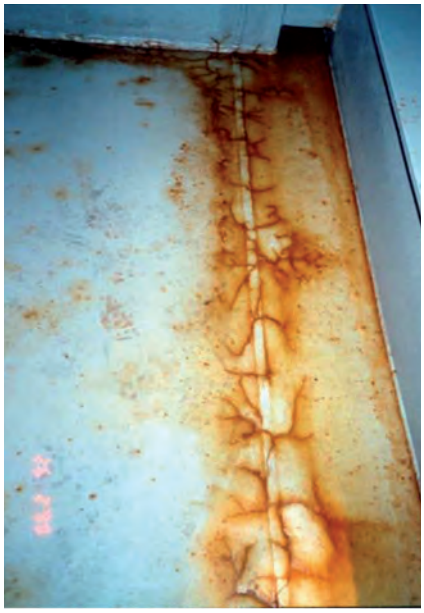

Photo 1. Typical example of cracking at weld.

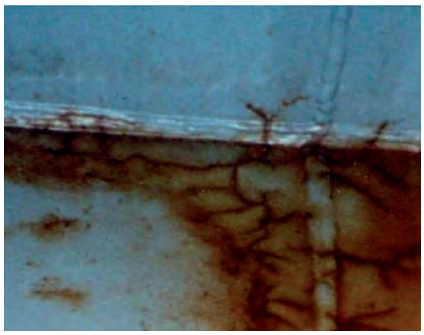

Photo 2. Some cracking in the coating near the angular corner of the vertical stiffening.

Different shipbuilders favoured each of the different product types, and there is evidence of good performance for each type. Recent product developments in both pure epoxy and modified epoxies have been directed towards improving performance.

However, during recent years, it appears that owner preference is moving in favour of pure epoxy products and away from modified epoxies.

It should come as no real surprise to the industry to find that the new IMO PSPC regulation seeks to impose some common standards across the global shipbuilding industry by adopting standards of good coating practice, which have proven beneficial when coating other locations in ships.

Application practice of recent years appears to have approached the common standard of a two coat epoxy system with nominal dry film thickness 250microns–300microns. Common standards for stripe coating practice remain less than clear.

Current shipyard practice is to apply either one or two stripe coats.

And so despite many advances in industry practice in recent years, there are still some yards which are going to have to seriously upgrade their WB tank coating practice when IMO PSPC comes into full force mid 2008. It is already in force for tankers and bulk ships of specific sizes, under IACS Common Structure Rules (CSRs).

Problems in service

The principal failure characteristic of the high solid type epoxies is one of cracking. Coating cracks are caused by internal stress released by shrinkage. The other observation is that the most common locations to exhibit this problem in WB tank spaces are block joint areas, and on butt, seam, and fillet welds.

In the authors' general experience, 70%–80% of cracking failures will occur within the shipbuilder's normal 12 month warranty and so will give rise to a claim against the builder by the shipowner. The shipbuilder will then pass the problem forward to the paint supplier to examine and resolve. Sometimes such failures take longer to develop and can then become an unanticipated cost problem to be resolved within the owners' maintenance budget.

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There can be several causes to the internal strain (stress) causing such cracking to occur. Excessive film thickness, poor surface preparation, poor product formulation, incorrect over-coating intervals, internal stresses, movement of lower scantling high tensile plating, retarded solvent evaporation (poor ventilation or too cold steel), and thermal cycling of structure adjacent to heated cargoes. There may be a combination of these factors.

Block joint areas are the most susceptible to such failure. Cracking around butt, seam, and fillet welds, as in photo 1, are other locations for early coating failure. This usually arises from excessive power tool cleaning, which may have polished the metal and left no surface profile.

In a written response[3] to IMO.215(82) on the draft regulations, the following comments summarise the problem: 'The cost and difficulty of abrasive blasting at post-erection has meant that power tooling methods have become accepted practice in many major newbuilding locations,' and experience led this party to conclude 'that general coating performance is inferior on "join-up" areas compared to that found on the main body of the tank coated at block stage'. The IMO 215.(82) PSPC2 does allow power tool cleaning of erection join areas since this is the common practice today in most yards around the world. The text does state Sa 2 ½ where practical, indicating that it acknowledges the inferiority of power tool cleaning as compared to abrasive blasting in terms of predictable performance.

An important point to note is that most of the cracks run laterally across the weld. This shows that the coating first detached, or became delaminated, from the steel, which is an adhesion failure. In this case the cracking, or cohesive failure of the coating, has been a secondary action, and occurred after the adhesion failure.

Cracking is also often found in corners and other local areas where the sprayer has had physical difficulty in laying down an even coat and has overcompensated from some awkward position.

PSPC states that WB coatings need to achieve a 15 year target life performance, after which time the overall condition of the coating system can be surveyed and described as being 'Good', where 'Good' condition is defined in resolution A.744(18) and is 'minor rust spotting affecting < 3% of flat plate surfaces, and < 20% of welds and edges'.

The best of past practice in the industry suggests that IMO's 15 year performance target objective is entirely realistic but that, to raise the general level of coating performance still requires good specification, good work, and good maintenance to achieve the 'Good' standard required by the IMO 215(82)[2] PSPC.

Consequences of PSPC

For shipbuilders, the consequences of PSPC can be summarised as follows:

- Many yards will have increased QC work to do during both block stage and in situ applications of WB tank coatings. Whether this work is done by their painting subcontractor or by their own team manpower, there will be an increase in inspection man hours
- Lead QC personnel are required to have qualifications to Frosio level 3, NACE level 2, or equivalent. A surge in demand for the training of such personnel can therefore be expected, entailing extra costs
- Yards are responsible for compiling the coatings technical file – itself a cost
- Some yards may have to consider the investment cost in new or additional coating facilities

For Marine Paint Manufacturers[1] there will be additional costs arising from the need to outsource independent testing of new coating products and systems to obtain mandatory approvals, the need for these independent test laboratories to meet requirements set out in IACS UR Z17[4], at all of their overseas factory locations manufacturing ballast tank coatings. Again, identical products manufactured at different locations must be shown by infra red and specific gravity measurements that they are identical to that tested. Paint companies will also have to prepare new data sheets, and train some Field Technical inspection personnel to the same Frosio, NACE, or equivalent levels as for shipbuilders.

The cost of a full ship supply of all WB tank coatings for a VLCC newbuilding is in the region of US$1.5 million. If the WB tank coating should fail and the WB tanks were to be recoated, the total cost for supply of coating material and application would be in the region of US$20,000,000. The cost of testing would then be in a range of 0.03%-0.6% of the total recoating work.

Shipowners and operators of large tankers and bulkers, especially for ships in which the WB tank areas are large, must also be prepared for consequences of PSPC: more expensive ships; higher maintenance requirements; and maintaining a coatings technical file onboard.

Initially the new regulations seem certain to result in some additional costs for both shipbuilders and paint manufacturers, which builders and paint manufacturers can be expected to try and recover through price increases.

The regulations mandate a new requirement for higher standards of steelwork preparation than some yards are used to, more product testing and laboratory approvals, training of personnel to higher levels of inspection competence, as well as additional documentation and record keeping.

Indeed, this is a time for a lot of new thinking on how to manage the new requirements arising from the IMO PSPC regulations. However, shipbuilders should not feel locked into a box of current products and standards, because PSPC regulations allow alternative products and innovation is encouraged.

If current estimates of consequent loss in productivity and additional costs are even remotely found to be correct, the major shipbuilders are likely to react and disallow such productivity losses to become permanent. This will stimulate more intensive research by shipbuilders into alternative and faster methods of application of WB tank coating systems. The objectives of such research will be about how to gain productivity and reduce costs as a consequence of the new IMO regulations. The directions of shipyard research might therefore focus upon:

- Find products and methodology which could speed up the processes of paint curing and QC procedures
- Find new coating materials with tolerance to higher relative humidity than the current norm of 85%, and lower temperature curing than the +5°C limit of many epoxies. Such wider application limits might enable shipyards to make

some cost savings in block coating cells during application

- Consider using alternative coating materials in these areas - a different type of coating might be better suited to the conditions of application in these areas
- With productivity being their primary issue, yards could decide to treat the application process as a shipyard engineering issue. They may conclude that it would be in their best interests to exercise more control over the process, even to the extent whereby yards will specify the WB system(s) they will provide
- Shop primer has long been a shipyard supply item because of its impact on construction processes. Such decisions are part of the engineering process, fundamental for guaranteeing better performance, and selected by the manufacturer
- Develop better and faster systems for inspection and collection and collation of data to generate the required CTF documentation and speed up the inspection process

For marine paint manufacturers, the new PSPC regime could now become a time of great opportunity. It will be very surprising if, in 15 – 20 years time, major shipbuilders are still applying two coat epoxy systems in WB tanks according to coating methodology generally in use today.

WB tank areas are just too big in terms of square metres for shipyard painting and too important in terms of the structural integrity of the hull for the industry to accept the status quo to continue with regard to both product and methodology.

In the coming one to five years, efforts will likely be concentrated upon the improvement of existing epoxy products already accepted by the market.

There are also some new products in the market which claim to have improved resistance to cracking. Information on one of these, described as fibre reinforced, was presented at PCE Marine[5] 2006. It is still too early to review in service feedback reports.

Interestingly in the USA the NSRP Technical Panel[6] SP-3 reported in 2005 that Navsea was researching technologies for single coat, multi-pass, rapid cure systems in tanks with the purpose of improving application productivity by eliminating two stripe coats and all the associated QC inspection work. If such an innovative approach can confirm good performance, then applications must be of serious interest to commercial shipyards, and solvent free system will undergo shipyard application trials shortly.

Taking a longer term (3 years - 8 years) view, it should be noted that big problems occurred in the auto industry some 15 years - 20 years ago when bodywork paint systems were found to be generally deteriorating after even two or three years, a situation which customers found unacceptable.

One manufacturer researched the situation and came up with a completely innovative methodology and product type for priming the steel bodywork. This resulted in far superior performance and has subsequently been wholly adopted by the auto industry. The consequence of adopting this technology enabled auto manufacturers to work out a new deal for customers where success of the process has led to bodywork perforation warranties currently of five to seven years. Against a shipbuilder's standard 12 month guarantee for a WB tank coating system, the marine industry offer is miserable by comparison.

The 'glue coat' primer

Two questions now remain.

1. Why should the first coat and second coat have to be of the same material?
2. Can some technical combination of different coating products produce a system suitable for 15 or even 25 years performance in the WB tank environment?

The authors' view on question 1 is that because there is virtually no historical precedent for the use of any mix of coating products in WB tanks, the issue has not really been fully addressed.

The authors are, however, aware of a small number of exceptions to this norm. During the 1980s a few progressive owners chose to meet the additional cost of applying a zinc silicate primer, and then over-coating this with two coats of tar epoxy. There are examples of very satisfactory performance of this type of mixed coating system still afloat today after more than 20 years in service, which therefore goes some way towards answering question 2.

This leads directly to the question of whether such a system could be successfully formulated to meet the needs of today's high steel throughput shipbuilding. What if, therefore, the first coat was designed primarily to maximise adhesion to the zinc silicate shop primers generally favoured in ship construction today. The function of such a first coat would then essentially be that of a 'glue coat'. The second coat would then be formulated to form the anticorrosive 'barrier'. It is envisaged that the following application cycle for such a system might then be possible. *NA*

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Photo 3. Typical condition of tar epoxy system in topside WB tank after 7 – 8 years, using present methods and coatings.

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Meeting ballast tank regulations

New IMO protective coatings regulations create new problems for inspectors.

From 1 July this year, new International Maritime Organisation (IMO) regulations, MSC.215(82) and MSC.215(84), focusing on performance standards for protective coatings (PSPC) for salt water ballast tanks, come into effect. This resolution, for newbuildings, poses a number of new issues for coatings inspectors, according to John Fletcher, technical support manager at Elcometer Instruments Ltd, a manufacturer and supplier of inspection equipment for the coatings industry.

To illustrate the problem, a 333m length overall, 20m draught, 58m beam VLCC, will have ballast tanks that need coating with a large area of approximately 300,000m^2. Each flat area needs five spot readings, according to the SSPC PA2 standard for coating thickness measurement, and each is the average of three readings per 10m^2.

Mr Fletcher goes on to calculate the outer surface area of a typical VLCC is approximately 41,000m^2. Thus, if two coating layers are applied, inspecting the vessel's outer surfaces alone, under SSPC PA2, would require 123,000 individual coating thickness readings to be taken and recorded. This huge number then increases to 132,000 when using Imperial units within SSPC PA2, and additionally, this does not take into account any complex areas or the superstructure itself.

The new regulations also include requirements for longitudinal and transverse stiffener members, primary support members, and complex areas (mainly large brackets of primary support members). In addition, a dry film thickness verification regime needs to be adopted under these new rules. This includes:

- One reading per 5m^2 on flat surface areas
- One gauge reading at 2m or 3m intervals and as close as possible to tank boundaries, but not further than 15mm from edges of tank boundaries
- Around openings, one gauge reading from each side of the opening
- Additional spot checks are to be taken to verify coating thickness in any area considered necessary by the coating inspector

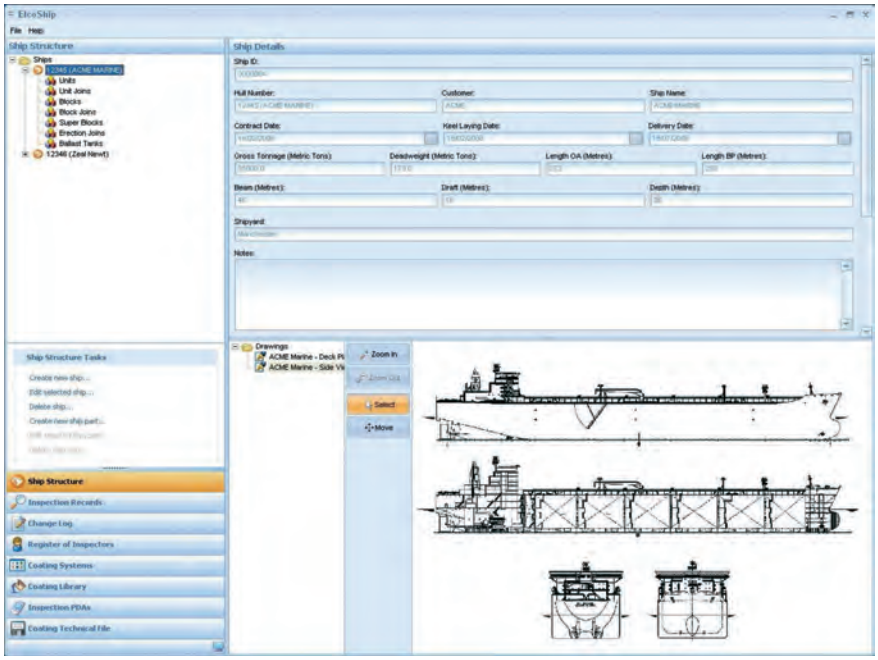
Using the lowest possible estimate, this indicates that a minimum of 300,000 readings must be taken and recorded to meet the obligation of the MSC.215(82) and MSC.215(84), reckons Mr Fletcher. This is also a SOLAS regulation, making it a legal requirement.

Mr Fletcher concludes that the number of coating thickness measurements required to be recorded by IMO for the coating technical file is significantly greater than the number of readings required for the inspection of the outside surfaces of the vessel, when using SSPC PA2. This also does not take into account any internal surfaces, cargo holds, fixtures and fittings, or any complex areas.

Additionally, the IMO regulation also requires the inspection of the surface profile and cleanliness, together with the recording of temperature, relative humidity, and dewpoint at each appropriate stage of the building process.

Paperless solutions

So how can an inspector schedule the appropriate inspection, record the results, and generate the coating technical file to meet the PSPC regulation, as well as



ElcoShip marine coating inspection software provides coating inspectors with a paperless QA solution and generates PSPC documentation instantly.

gathering data for various coating systems, and numerous other jobs, during ship construction?

'Paperless QA', 'digital data management', and 'digital job files' are buzz words that have been in the protective coating industry for the past two or three years. Mr Fletcher believes that the maximum number of readings that users can realistically report on a sheet of paper is 650. This means that a minimum of 225 pages, printed on both sides, will be required for the IMO coating technical file to report the coating thickness values for ballast tanks.

Elcometer has a number of digital gauges in the marketplace that measure, record, and transmit - via Bluetooth or other transfer methods - surface profile, coating thickness, relative humidity, dewpoint, and temperature measurements.

How can paperless QA be achieved for surface cleanliness and other visual or manual inspections which do not have an electronic method of measurement without the need for scanning? In addition, with discussions regarding IMO regulations for void spaces and cargo holds already underway, how can all this data be recorded in a structured manner and reported?

Elcometer has been working for some time on paperless QA, and already provides the software ElcoMaster free with all its gauges. However, for the particular issues surrounding the new IMO resolutions, Elcometer has been closely working with experts from the marine coatings industry to provide the answer.

ElcoShip has now been developed to provide a single point solution to marine coating inspection data management. Integrating coating inspection planning with data collation and reporting for both IMO legal documentation and non-IMO inspections, ElcoShip is an inspection solution which provides:

- Coating system management using manufacturer's technical data sheets and MSDS' in a coatings library, complete with change control
- Inspection personnel management – recording inspectors that are approved, together with associated certification records
- Coating inspection process planning, including reworks and pass/fail criteria
- A data management system, which records both digital and manual inspection tasks, digital data transferred directly, manual inspections recorded electronically using ElcoShip Mobile on a PDA. Inspection tasks are identified by ship location, complete with a change log
- The inspection status for the build of the ship at a glance, using the vessel's block plan diagram with zone by zone identification
- The coating technical file at a click of a button – electronically or in printed form

Due for release in May 2008 for extensive field trials, ElcoShip will be available for commercial use in July 2008. *NA*

Shipbuilding growth ensures coating boom

The continued expansion of the shipbuilding industry has proved fruitful for coatings manufacturers.

The move to International Maritime Organization (IMO) ballast tank coatings regulation MSC.215(82) and MSC.215(84) - performance standard for protective coatings (PSPC) - draws ever nearer, and the rush is on to gain certification and approval.

Earlier this year, International Paint Ltd announced that the first Lloyd's Register IMO PSPC type approval certificate was awarded to its Intershield 300 – the abrasion-resistant, aluminium-pure epoxy coating.

The PSPC and Lloyd's Register type approval certification process places new responsibilities on coatings manufacturers to ensure that all coatings designed for use in dedicated seawater ballast tanks in all types of ships and double side skin spaces of bulk carriers, meet strict performance requirements. To comply, coatings must either pass stringent laboratory testing, or be subjected to inspection and confirmation that the coating has provided a minimum of five years 'good' in service performance, or that the coating has existing B1 Marintek approval.

In addition to this, the coatings manufacturer must meet the approved supplier criteria for each supply location as set out in IACS UR Z17 and PR34. This includes the provision that if the manufacturer makes coatings in different locations under the same product name then infrared identification shall be used to demonstrate that the coating is of the same high quality and specification. Only if these requirements are met will Lloyd's Register issue type approval certification.

Mike Hindmarsh, worldwide marine business development manager, International Paint said: 'We have always supported the introduction of a standard that would help increase the service life of coatings for seawater ballast tanks and directly contribute to improved safety of life at sea. We're particularly pleased that the first Lloyd's Register certificate has been awarded to our anticorrosive, Intershield 300.'

Michael Hindmarsh (right), business development manager, International Paint, receives the Intershield 300 type approval certificate from David Howarth, global technology leader, Lloyd's Register.

The International Paint technical service training programme has also gained recognition from Lloyd's Register. Under the rules of the PSPC, all coating inspectors must either be qualified to NACE coating inspector level 2, FROSIO inspector level III, or an equivalent qualification.

Equivalence means the successful completion, as determined by a qualified tutor, of an approved course based on the requirements of the PSPC that also has an acceptable measurement of performance, for example, an examination. After a thorough review, Lloyd's Register has accredited International Paint's technical service training programme with equivalent status to the NACE and FROSIO programmes.

The qualification is valid for all current International Paint technical service representatives who have completed training to the required level and who have a minimum of five years experience. Representatives remain qualified provided they continue to be employed by International Paint.

First vessel meets new regs

Meanwhile, PPG Industries' protective and marine coatings (PMC) business announced in April that SigmaPrime 700 and SigmaPrime 700 LT coatings will be applied to a newbuild vessel being constructed in South Korea, for Chandris Hellas. This ship, it is claimed, will be the first built in full compliance with PSPC.

SigmaPrime 700 and SigmaPrime 700 LT coatings have also received Lloyd's Register type approval certificates in accordance with the IMO PSPC. 'We were delighted to receive this recognition of the quality and performance of our products,' noted Steve Dickey, PPG director of global marketing, PMC. 'We know how important it is to maintain good condition in key parts of a vessel, such as the sea water ballast tank, and we fully support this initiative to improve industry-wide safety standards.'

PPG's protective and marine coatings products include Amercoat coatings, Sigma coatings, and other brands. PPG acquired Ameron in 2007, and at the start of this year took over the SigmaKalon Group, of The Netherlands, taking the company to 'number two' in the marine coating market, behind International.

Advances in Asia

Also benefiting from the boom in shipbuilding is Jotun, and its many subsidiaries. At the start of this year, Jotun COSCO Marine Coatings (JCMC) signed a contract for 80 vessels, which are set to be constructed at the Dayang Shipyard, China. This was not only the first newbuilding contract that Jotun China secured in 2008, but also the largest contract ever in the history of Jotun. The contract was won with assistance from Jotun Greece, Jotun USA, and Jotun France.

The total deal value is around US$50 million, and includes a total volume of 10 million litres of paint to be supplied for 75 x 58,000dwt bulk carriers and five 16,500m^3 LPG tankers.

Dayang Shipyard is a medium-sized yard located along the Yangtze River, and Jotun now has a market share of almost

90% from this fledgling shipyard.

Meanwhile, Jotun Brasil has also won a maintenance contract with Petrobras, the Brazilian national oil company, for 51 vessels (2,516,036dwt), comprising a minimum of 250,000litres of coatings annually for onboard maintenance and cargo/ballast tanks.

Jotun has for some years been the leading supplier of drydock coatings, supplying approximately 200,000litres annually to Petrobras' tanker fleet. It is claimed that this contract now makes Jotun Brasil the market leader in this region.

In the same area, Hempel - along with co-venturer China Merchants Holdings (International) Co Ltd - reports that with new contracts signed on 1 January 2008, it will have supplied a total of 800 ships in China alone.

Hempel Hai-Hong already supplies the full coating system, including antifouling coating, to AP Moller-Maersk for its VLCCs and product carriers at both the GSI and Dalian shipyards.

The continued boom in the shipbuilding industry has meant that paints and coatings companies are extremely busy worldwide.

Another significant paint contract has also recently been signed between Hempel and Domestic Trade Ministry KouAn Shipbuilding Industry Co for 12 x 57,000dwt bulk carriers building for Vega Reederei Shipping (three ships); Anrenkiel Management (seven ships); and Fushun Shipping (two ships). Supply of paint for this contract began in May 2008 at both the new and old KouAn shipyards. Estimated paint consumption per ship is more than 150,000litres, amounting to around 2.2 million litres in total. *NA*

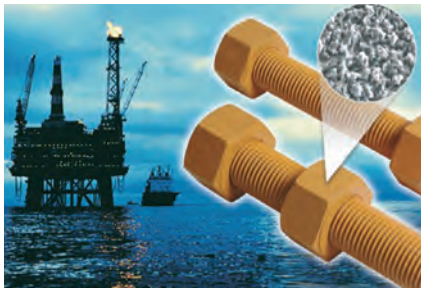
The potential of aluminium

Innovation stemming from the industrial galvanic deposition of aluminium is comparable to the replacement of standard coating procedures by the deposition of zinc-nickel, according to German coatings supplier to the marine industry, Aluminal.

New marine coatings product Aluminal works with a galvanic coating process doing without aqueous solvents. Its surface is a coating made of pure aluminium on metallic parts, which the supplier says offers additional safety for higher demands when other coatings have reached their limits, in particular for fasteners.

Aluminal says the new product shows its mettle in particular in extreme conditions. 'Some of the advantages for the maritime industry are: resistance against sea water, maximum corrosion protection, as well as cost reduction for maintenance by longer intervals and the possibility of re-coating the used parts,' the supplier says.

Aluminal coatings work exclusive of water or air. An electric charge is added to dissolve the aluminium out of an anode into the solvent and onto the parts to be coated. Aluminal coated parts meet the requirements of high corrosion protection, the supplier says, with a layer of galvanically deposited aluminium and a minimum layer thickness of 6µm. Salt spray tests carried out according DIN EN ISO 9227:2006 demonstrated the advantages of Aluminal, according to the supplier: 'The surface is approximately 30%-50% more resistant than established systems to the formation of red rust. Due to the cathodic protection of coatings in cloridic aqueous solvents the part is also protected against corrosion, also in sea water. Consequently, maintenance clearance is reduced, leading to lower costs for attendance.'



Optimum corrosion protection in the maritime sector: Aluminal surface finishing with pure aluminium.

Generally a strength of 1.000MPA is the limit for galvanically coated parts. Aluminal has already coated spring steel of 2.000MPA without the need of heat treatment afterwards, according to the supplier. *NA*

Coatings increase durability

Two innovative new coatings have been introduced into the coatings market by Denmark-based Hempel.

While the Polar Ice Caps melt, the shipping industry has poised itself to take full advantage of the situation. In northern routes, it is believed that transit routes between Asia, the USA, and Europe, can be reduced by up to 6000km, and bulk transport time from Europe to East Asia can be reduced by one third, several months a year. Both of these factors will reduce fuel consumption and harmful emissions.

In short, the Arctic seems set to become a major East-West transit lane. As a consequence of this, it is anticipated that there will be increasing demand for ice class tankers.

By the end of this year it is expected that 10% - or 18 million deadweight tonnes - of the world tanker fleet will be ice classed. New orders for ships that can cope with Arctic conditions now total 11.6 million deadweight tonnes, which is nearly three times the weight of the entire current ice class fleet.

Trans-Arctic routes present the shipping industry with huge challenges. Temperatures can drop below -50°C, which means that even in fair weather conditions, atmospheric icing from sea-spray will play havoc with a ship's superstructure. The water can be covered with packed ice – often 3m thick and even thicker where ice floes have collided. Shipping is also under constant threat from drifting ice and icebergs. Even in ice-free stretches of open water, storms are extreme, unpredictable, and common. Larger ships often experience problems navigating the relatively shallow waters of the Arctic Ocean and masters have to remain constantly vigilant to avoid grounding.

It is thought that double-acting vessels may replace the more traditional icebreaker, allowing ships to also work in warmer climates, increasing a vessel's usefulness. Thus, winterisation solutions are under development to ensure the reliability of superstructures exposed to ice. It is in this field that paints and coating manufacturer Hempel says it has a significant role to play.

The company has developed advanced coating systems to cope with the severe ice abrasion and ice adhesion common in Arctic conditions. Hempadur Multi-Strength GF 35870 provides ice-going vessels with a hull coating that has been proven in the Baltic Sea.

The high-performance pure epoxy coating is reinforced with lamellar glass flakes, which give it barrier properties against corrosion and make it extremely resistant to impact and abrasion. As the coating has curing characteristics, it is ideal for application in cold climates. The coating can be applied – and cured – at temperatures as low as 5°C.

It can also be applied quickly with an airless spray, and so does not require complex heated dual feed equipment. Due to the coating's high volume of solids – 87% – it can be applied in one coat without the need for a primer. A single application has a dry film thickness of up to 500microns compared to conventional epoxy coatings, which require two or three applications at 150microns-200microns. The volume of solids in the formulation is so high that less money and time is wasted on evaporating solvents, the company says.

This also produces excellent adhesion to the substrate – and Hempadur GF 35870 scored a top rating in adhesion immersion trials. It is also said to be fast-drying, and achieves water-resistance very quickly.

Crucially, the coating can be immersed in water only six hours after application at 20°C. Curing continues underwater, substantially reducing drydocking time. In icy waters, where low temperatures prohibit marine growth, antifouling is unnecessary, so using Hempadur GF 35870 as the underwater hull coating instead of an antifouling coating saves time and money, and reduces the environmental impact.

The end of mud-cracking

Another new product from Hempel is Galvosil Fibre 15750, which is thought to be the market's first mud-crack resistant zinc silicate solution.

The fibres in modern coatings improve flexibility and durability, making paint more resistant to abrasion, cracking, and knocks. This technology has been utilised in the newest generation of Hempel's antifouling and ballast tank coatings, and now, it has also been applied to Galvosil Fibre 15750.

This coating is a general purpose, heavy-duty, rust-preventing primer that can function as a single, complete coating for long-term protection of steel in a moderately-to-severely corrosive environment. It is also suitable for the decks and cargo holds of containerships where there is plenty of risk of

As the Polar ice melts, new shipping routes mean vessels need ice-resistant coatings.

The World Superyacht Awards

Young Designer of the Year 2009

A prestigious award for talented young superyacht designers is to be awarded at the Boat International Group 2009 World Superyacht Awards

The Royal Institution of Naval Architects, the Boat International Group and Camper & Nicholsons International invite entries for the 2009 World Superyacht Young Designer Award competition.

Introduced with great success in 2008, the World Superyacht Young Designer Award competition provides a showcase for young designers to demonstrate their ability and talents, and encourages the development of the next generation of superyacht designers.

The World Superyacht Young Designer Award will be presented to the winner of the competition at the World Superyacht Awards ceremony in April 2009, at which the remarkable ingenuity and innovation demanded in the design, engineering and construction of the world's finest luxury yachts is demonstrated, and is the most obvious place for new designer talent to be recognised and celebrated.

The Competition

The competition is open to anyone who is studying for a degree or vocational qualification in a subject relating to yacht or small craft design,or anyone who has already graduated within three years of the closing date for entries, which is 31 January 2009.

The 2008 competition saw many entries from all over the world, as far afield as NZ and China, as well as from all over Europe. RINA's CEO Trevor Blakeley is proud that RINA is continuing to support this award for young designers: 'The superyacht industry is one of the most successful sectors of the maritime industry, and owes much of that success to the work of its designers who provide that unique combination of form and function, which is the modern superyacht.'

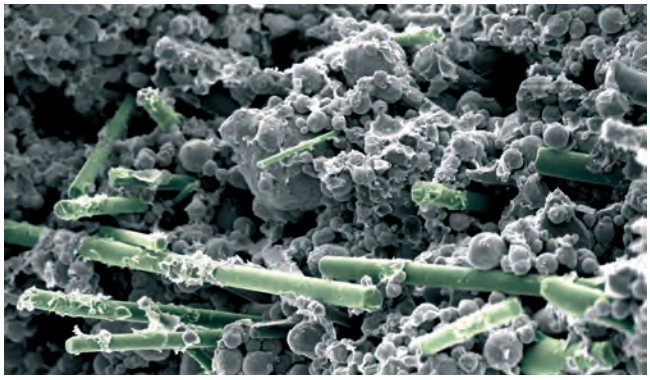
The Award

The World Superyacht Young Designer Award will be presented to the young designer who produces the best concept design for a superyacht. The entries will be judged by a group of leading world-class designers selected by the Royal Institution of Naval Architects and Boat International Group. The winner of the Award will receive a prize of €5,000 and will be invited to receive the award at the renowned World Superyacht Awards ceremony.

The sponsor

The Award is organised by the Royal Institution of Naval Architects and Boat International Group, and is sponsored by Camper and Nicholsons International: 'Following the joint Camper & Nicholsons International – Boat International initiative three years ago to reward the work of yacht designers and naval architects, we thought it was only natural to continue to collaborate with the Boat International Group and RINA in order to identify the young designers of the future, 'says Camper & Nicholsons International's CEO Jillian Montgomery. 'Taking an active part in this competition prepares the grounds for the future in many ways. Firstly, by giving up and coming designers exposure and the opportunity to get in touch with potential clients, and secondly by offering our existing and future clients a glimpse of designs that could soon be on the drawing boards, 'explains Laurent Perignon, director of marketing for CNI.

The closing date for entries is 31 Jan 2009. If you are interested in submitting an entry or would like more information, contact Giuseppe Gigantesco, E-mail: ggigantesco@rina.org.uk, Tel: +44 (0)20 7235 4622
The Royal Institution of Naval Architects, 10 Upper Belgrave Street, London, SW1X 8BQ The rules for the competition can be viewed at www.rina.org.uk/wsyaward



Galvosil Fibre 15750 can reduce the risk of mud cracking.

abrasion and corrosion.

Galvosil Fibre 15750, it is claimed, offers other significant benefits compared to other zinc silicates. The fibre content makes it mud-crack resistant at much higher film thicknesses, and drying time is significantly improved. It has good anticorrosive properties due to a zinc content of 80%.

With a curing time of just 10 hours, Galvosil Fibre 15750 is application friendly, and because it is possible to apply a higher dry film thickness without cracking, outlays on both time and cost are saved on application and finishing.

Chemicals on the web

In other news, Hempel's new web-based cargo protection guide (CPG) is claimed to make it easy to track down information on chemical-resistant coatings. Launched in February 2008, the CPG provides up-to-the-minute cargo lists and data on Hempel's HEMPADUR 15400, HEMPADUR 15500, and GALVOSIL 15700 tank coatings.

The new CPG database, which replaces the CD-ROM-based CPG version MD 05, contains information on chemical resistance for more than 3200 chemicals/cargoes. Utilising the software, users can search for the complete resistance for all chemicals/cargoes; resistance for a specific list of chemicals/cargoes (IMO ship type, MARPOL pollution category, or cargo/chemical groups); resistance for one specific cargo/chemical; and chemical resistance data for chemical synonyms. The CPG's list of chemicals and products contains the latest list of cargoes in the IBC Code, Chapter 17 and 18, as well as the latest list of synonyms in IBC code, chapter 19.

Apparently straightforward to use, Michael Aamodt, marine product manager, said: 'The CPG is designed to make it easier and quicker to obtain information on chemical resistance. Simply select your search criteria and you'll see a list containing formula, cargo name, UN Number, MARPOL category, ship type, and resistance with notes. And because it's online, you can use it anywhere in the world.' *NA*

New technology for LNG carrier construction

A new type of mastic developed for LNG carriers can reduce the weight of a ship substantially.

As readers will probably be aware, liquefied natural gas carriers using the membrane-type storage solution have proved far more popular in recent times than their Moss-type counterparts. South Korean shipyards, which now construct around 75% of the world's LNG tankers, only accept orders for membrane-type ships. As a result, much effort is being put into research, in order to enhance these vessels.

There are various organic materials used in the construction of LNG carriers, such as mastic, glue, polyurethane foam, triplex, insulating panel (plywood and urethane foam), etc but, to be applied, these materials must acquire certification from GTT (Gaztransport & Technigaz), of France, which owns the original membrane technology copyright.

Mastic, developed by South Korean coatings company KCC, is a new solution designed to help maintain the balance and fixed position of LNG storage tanks, which are covered with insulating panels. It also serves as an adhesive agent between the hull/tank and the insulating panels, which holds the load of the cargo tanks. Mastic is used to bond insulation panels to the double hull in the following case:

- In order to compensate the inner hull irregularities and to transmit the mechanical loads to it
- As a load bearing filler of corner panels and retainers

After product development, Mastic went through 16 months of tests and evaluations under GTT supervision in South Korea, France, and Germany, and finally, it acquired MARK-III certification from GTT in October 2007, with KCC the first Korean company to receive this document.

Glues

Glue is used between the LNG tank and a number of different types of insulating panels, and is applied closer to the storage tank. It should maintain adherence at a very low temperature (-170°C). Triplex, polyurethane, and insulating panels, the materials covering the storage tank, must also be certified by GTT.

Depending on its applied area, glue is classified either as epoxy type or urethane type. The former is directly used in shipyards, and the latter by the insulating panel producer for the adherence between polyurethane foams. Currently, most shipyards seem to be using the epoxy type, but cross-usage of urethane type is also being reviewed.

Mastic is a two-component epoxy product that vulcanises at normal temperatures. It is applied by using an automatic mixer called a dispenser, and mixed mastic is applied rope-shaped on plywood. It is then stuck to a hull.

Applied mastic, with a 20mm-30mm diameter, should overcome sagging when there is no pressure outside, and it should crush well, maintaining at least 4mm thickness, with only 5.5kg of force. It should also even crush well, three hours after mixing.

Since LNG tanks cool down from their normal temperature to as low as -162°C, contraction and expansion take place repeatedly. In order to settle the shock stably, mastic should possess good tensile strength and a compressive property in normal temperatures, as well as at -25°C. In addition, contraction rates should be insensitive to temperature change. Creep tests have been conducted to verify how much resistance a load can take.

Mastic should also possess high adherence intensity to steel, plywood, and aluminium at normal temperatures, as well as in a -25°C environment. It also has to stick well to wash primer, which prevents hull corrosion, and

LNG carrier: Korean company KCC has developed a new type of mastic for application in membrane type LNG carriers.

Crush test: KCC's mastic was crush tested to ensure it maintained at least 4mm of thickness.

Sagging test: it is important that the mastic does not sag when there is no outside pressure.

maintain the same adherence for up to six weeks after being settled in sea water.

Each LNG carrier consumes about 100,000litres of mastic, meaning that mastic itself weighs about 150tonnes. However, KCC has developed mastic with an average density of 1.0, which yields a weight of 95tonnes-105tonnes. This will bring down the weight burden of up to 50tonnes per vessel - a substantial load lightening.

KCC is currently applying for NO96 mastic certification, and is confident this will be achieved. Eventually the company aims to gain CS1 certification for both types of its mastic.

By winning the GTT certification for the mastic and wash primer developed by the Ulsan Research Institute, KCC says it is now able to apply its own products when painting LNG carriers, giving the company an advantageous position in the organic material market for LNG carriers. *NA*

Nippon Paint makes a mark

Global tanker owner-operator AET has entered into a partnership with Nippon Paint to trial the manufacturer's latest low-friction (LF) antifouling coating on AET vessels. The innovative LF-Sea AF Paint is expected to reduce fuel consumption by 4%, resulting in lower CO_2, SOx, and NOx emissions, thus helping AET fulfill its environmental responsibilities in line with ISO 14000.

Aframax vessel *Bunga Kenanga* is the first vessel to be painted with the new coating, while a further three vessels will be painted over the coming months.

Experiments conducted by Nippon Paint in collaboration with Osaka and Kobe universities demonstrate that LF-Sea AF Paint reduces hull resistance by 4% compared with current AF coatings. Tests carried out on vessels in Japan, which were then monitored over a 12-month period, have shown a saving of about 4% per year in fuel oil consumption.

MISC Berhad subsidiary AET's fleet comprises 12 VLCCs and 51 Aframax, 11 product, and two shuttle tankers. It also has a fleet of lightering support vessels in the US Gulf.

Hempel strips Denmark

Coatings supplier Hempel is to cease production at its factory in Lundtofte, Kgs Lyngby, Denmark, after 31 May 2010. Production will be replaced by a new factory in Poland. Hempel said its remaining departments in Lyngby would not be affected by the move.

The supplier said the decision was the result of developments in the global market. 'Growing competition in the paint industry means that it is no longer possible to produce paint in Denmark at competitive prices,' a Hempel statement said.

Around 123 factory workers were informed of the decision on 8 May.

Pierre-Yves Jullien, Hempel Group chief executive said: 'I'm sorry that stopping production at our Lyngby plant will affect so many of our valued colleagues, but unfortunately we have no choice if we are to compete on the global market. Fortunately, the timeline enables us to help those affected in the best possible manner.'

New ice loads call for propeller upgrade

Ensuring fatigue strength of propeller blades is a key part of new propulsion requirements for ships operating in harsh ice conditions from the Russian Maritime Register of Shipping (RS).

One of the greatest challenges facing the development of ships operating in ice is ensuring the reliability of propulsion systems that are subjected to heavy ice loads. Until recently, scantlings of ice ship and icebreaker propeller blades have had to be determined by their ability to ensure fatigue and static strength from ice loads. However, intensification of gas and oil fields development on the Arctic shelf has involved the growth in demand for ice ships and icebreakers to operate periodically in harsh ice conditions.

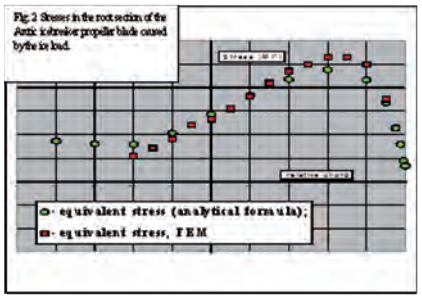
The need to increase the cost effectiveness of cargo transportation has led to the development of new types of double acting ice ships and icebreakers moving astern. In comparison with the ships previously operated, there is a basic need to increase the ability of modern ice ships' and icebreakers' propellers to handle intense ice exposure.

Therefore, propellers need to be significantly strengthened, while other elements of the propulsion system must also be strengthened to handle fatigue from ice loads. However, as noted, until recently, propeller scantlings were determined by their condition in static strength conditions only, with fatigue considered as an empirical factor obtained based upon experience.

Therefore, it has been necessary to develop new and modern methods to calculate fatigue strengths of ice ship and icebreaker propellers, and the Russian Maritime Register of Shipping (RS) has brought forward a research and development project with just such calculations in mind.

Developing a method of fatigue strength calculation of propeller blade includes the evaluation of ice load parameters (load level, distribution law, frequency), the evaluation of the blade stress condition, fatigue strength calculation (probable lifetime and its statistical parameters). All of these tasks are interrelated.

Fig 1. Ice milling test of the propeller model in the ice model basin of the Krylov Shipbuilding Research Institute.



Ice loads are the key factor while assigning propeller blades' scantlings of ice ships and icebreakers. The ice milling regime when an ice load is applied to the propeller blade edge is taken as a design regime for assigning ice loads. In this case both ice spindle torque and bending moment apply to the blade. Ice load parameters (load levels, distribution law, frequency) for the calculation of stress condition and blade fatigue strength are determined based on the complex approach including analysis of the full scale data, development of the model, and the design methods of ice load forecasting.

Considering research outputs recorded by RS, the methodology for evaluation of ice loads upon propeller blades was developed including their maximum values, distribution laws of operating parameters, and the time of a blade-to-ice interaction. Ice load parameters are calculated depending on the ice category of ice ships or icebreakers and the location of the propulsion complex.

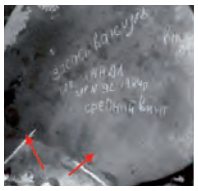


Fig 3. Fatigue cracks on the surface of icebreaker propeller blade.

Operating load parameters may be specified on the basis of test results of self-propelled model ships in the ice tank of the Krylov Shipbuilding Research Institute and special model tests of propellers at ice milling regimes (see Fig 1).

The method of contact pressure evaluation in the area of blade-to-ice interaction has been developed for the precise calculation of the stress condition. The finite element method (FEM) is used to calculate the blade stress condition for its strength evaluation. Analytical equations have been developed to evaluate stresses and assign scantlings in the most loaded points of the ice ships and icebreaker propeller blades - for example, the calculation formula for the maximum stress in the root section caused by combined action impact of the spindle torque and bending ice moment (see Fig 2).

Propeller blade scantlings are assigned depending on the condition of ensuring their 25 years' lifetime which is equal to the ship service life. Permissible stresses to meet this condition are determined by Meiner's rule, ie the first phase of fatigue damage (initiation of the fatigue macrocrack).

The main requirement for ensuring

fatigue strength is the limitation of the size of technological defect in a blade proceeding from the condition of its non-propagation as a macro-crack. It is not permitted to use a blade with a growing fatigue crack.

Analysis of the Arctic icebreaker propeller blades' lifetime has been performed to develop requirements for blade scantlings proceeding from the condition of ensuring fatigue strength. The blade lifetime is determined by the moment of initiation of the fatigue macro-crack in a blade. The moment of initiation of a macro-crack was controlled and revealed during underwater inspections and surveys at one month intervals. About 70 steel blades were surveyed.

The analysis shows that the fatigue macrocrack initiates usually on the suction (pressure) surface of the root section close to the leading (trailing) edge (see Fig 3).

The abovementioned point corresponds to the maximum tension stress due to the ice spindle torque and bending moment and it is taken as the main design point. The lifetime distribution of full-scale blades was studied depending on the propeller, corrosion, and fatigue characteristics of the propeller steel and surface hardening of the blade. Shot blasting of a blade increases its lifetime by almost twice as much. The data on lifetime distribution of full-scale blades were used for the development and verification of the fatigue strength calculation and relevant normative requirements.

On the basis of the RS comprehensive research the new requirements for propeller blades strength have been drafted based on the concept of simultaneously ensuring fatigue and static strength. New requirements mean that it is possible to assign propeller blade scantlings on the basis of scientific approaches, depending on the ship category considering operation time, propeller location, strength characteristics of propeller material, and blade surface treatment.

Steel blade scantlings are determined by fatigue strength, while scantlings of bronze blades made of NIAL alloy are determined by static strength. Surface hardening of steel blades means that it is possible to increase their fatigue strength. Use of blade steels with high fatigue characteristics make it possible to reduce scantlings of ice ship propeller blades, as opposed to NIAL type bronze.

New RS requirements will also apply to double acting ice ships and to icebreakers. The requirements drafted were thoroughly verified by the leading manufacturers of propulsion systems and they are now extensively used in modern ice ships and icebreaker construction. These requirements were used to ensure operating strength of the propulsion complex of the double acting ice ship *Norilsk-II*, classed by RS, Arc7 ice category. The requirements will be incorporated into the RS Rules. ***NA***

Voith at the cutting edge

German propulsion specialist Voith Turbo has been busily using CFD and FEM techniques for the last seven years, to take forward its propeller development programme, but its simulation-based researches are by no means at an end.

Developing propeller sizes of up to 3.6m diameter, with its largest installations being onboard ferries serving in The Netherlands and between Staten Island and Manhatten, Heidenheim-based propulsion specialist Voith Turbo has moved on from the five-bladed propellers it delivered in the 1990s, to the market's new requirement for six-bladed solutions. Modelling the performance of five-bladed propellers using simulation played a significant role in revealing the potential for improved performance, the company said. One of the main benefits of simulation lay in the fact that very small changes in flow over the structure could be logged without reverting to the inefficient 'trial and error' method, so that blade angles could be modified to change pressures acting on the blade and avoid vortex phenomena.

One of the key findings in its simulations regarding five-bladed propeller performance was the way low pressure in leading edges led to the 'collapse' of microscopic bubbles on the blade. There may be numerous causes of cavitation, such as incorrect matching of propeller style to application, incorrect pitch, physical damage to the blade edges, etc, but Voith's simulations, based on optimised algorithms, prompted a change its blade shapes and an increase in their thickness, with the introduction of a concave near trailing edge.

Simulation involved assessment of the comparative efficiency of 700 possible blade shapes.

After simulations of the modified six-blade propeller, Voith determined that an assymetrical propeller shape, in fact, developed an even spread on the leading edge, yielding better efficiency for bollard pull in the case of tugs.

But developments are not stopping here: Voith is now part of government-funded joint research project with the mathematics department of the University of Ulm, assessing the optimisation of hullforms when combined with optimised propeller blade shapes. With CD-Adapco providing the CFD input on hullforms, hullforms and propeller blade shapes may be optimised individually, but the object of the study is to optimise their interaction, using rather complex hexahedral modelling.

Voith Turbo said the results of this study would unfold over the coming two to three years. ***NA***

Sophisticated drives for new heavylifts

Innovation is a key attribute of today's heavylift vessel market, and nowhere is this more apparent than in the drive systems being selected for the current crop of newbuilds.

Jumbo Shipping's latest batch of vessels, built at Damen Shipyards in Romania, will feature mast cranes capable of lifting loads no less than 800tonnes, but they will also be significant for the Bakker Sliedrecht designed and supplied side thrusters drive system. This will consist of two 1500kW bow thrusters and a 1700kW azimuthing thruster. All three will be regulated and supplied by new generation direct water-cooled frequency drives, while the mast cranes will be fed through a Bakker Sliedrecht air-cooled multi-drive.

The Dutch company will also deliver and commission the ships' Kongsberg DP systems, where the energy supply will consist of two shaft alternators offering output of 3750kVA and two auxiliary engine-driven alternators offering 2280kVA.

Also two boardnet transformers of 1200kVA will be delivered.

New generation of drive systems demanded by a new generation of heavylift ships.

IHC Merwede's Krimpen yard is also at the cutting edge of heavylift ship design and, in this case, Bakker Sliedrecht is involved in the turn-key electrical installation of for the 'super' heavylift HLV5000 ships for Seaway Heavy Lifting. Here, the supplier has developed a diesel-electric propulsion concept featuring a redundant energy generation and propulsion system, involving two 5000kW azimuthing underwater propulsion thrusters (dis)mountable aft, two 3500kW azimuthing retractable DP thrusters at midship, two 1012kW (DP use) tunnel thrusters/1145kW (auxiliary use) tunnel thrusters mounted at the bow, six 4500kW main diesel generator sets, and one 1200kW skid-mounted emergency diesel generator set.

Here, the thruster motors are fed and controlled by direct water-cooled frequency converters. Together with the Kongsberg ship management/DP system (DP3 notation) this enables an optimisation of equipment availability, according to Bakker Sliedrecht. This turn-key project also includes switchboards, control desks, cabling, and training. *NA*

Retec prepared for Vietnam

Vietnam's shipbuilding industry may only now be coming to the fore, but the building blocks supporting its progress have been in place for some time. Electric systems specialist Alewijnse has been intensively involved in the emergent industry, from its head offices in The Netherlands and through its Romanian subsidiary Retec.

Alewijnse said it was involved in three projects on behalf of client Damen Gorinchem, commissioning two tugs, one apiece at the Da Nang Shipyard and the Hailong Shipyard, and the third involving electrical systems for four tugs under construction at Song Cam Shipyard.

Meanwhile, the company has played a key role in the commissioning of an initial three 2600dwt coasters for Rensen Seatrade under construction at Hongha Shipyard, with the first – Christiaan – launched last year, while the company is also supplying the complete electrical installation for three more 2600dwt ships for the same yard of build and the same end client.

Elsewhere, Alewijnse is providing complete electrical installation packages for three 3500dwt oil tankers under construction at the Hailong Shipyard for Seatrium Shipbuilding, as well as four 3500dwt dry cargo ships for the same customer that are under construction at Hongha.

King Steam's abiding subsea role

Peter Brotherhood has secured a further multi-million pound steam turbine-driven generator sets order from Single Buoy Moorings, for installation on a floating production, storage, and offloading (FPSO) vessel.

Peterborough, UK-based Peter Brotherhood has already supplied SBM with eight steam turbine-driven generator sets in the past five years. Its latest order is for two 14MW condensing steam turbine-driven generator sets for *Espirito Santo*, an SBM FPSO to be moored off the coast of Brazil.

The Espirito Santo (BC-10) development will be the first full field development based on subsea oil and gas separation and subsea pumping. For the *Espirito Santo* ship itself, technology requirements include artificial deepwater lift via high power electric pumps in seabed caissons and horizontal wells. The double-sided FPSO design includes significant power and heat delivery systems that are required to drive the system and process the heavy crudes that range from 16° to 24° API.

One of the two steam turbine-driven generator sets supplied to SBM by Peter Brotherhood Ltd.

The ship will be equipped with two steam turbine-driven generator sets, each consisting of a turbine, gearbox, and generator. All of this equipment will be mounted on a common bedplate incorporating the oil system, and a separate water-cooled condenser mounted directly below the turbine's exhaust. The equipment is currently being installed and commissioned onboard the vessel.

Peter Brotherhood sales and marketing director, Steve Wellburn, said: 'With the inclusion of this latest order we have supplied 10 turbines onboard six FPSO vessels which have a total power output of 130MW.'

Peter Brotherhood has been designing and manufacturing steam turbine-driven generator sets for FPSOs since 1981 and has installed turbines on vessels which are moored off the coast of West Africa, Indonesia, Thailand, Brazil, Australia, and in the North Sea. *NA*

Largest winch for FPSO

Single Buoy Moorings' *Frade* FPSO will be moored by an internal turret accommodating 33 risers, and the moorings and risers will be handled by the largest ever Plimsoll winch.

A 485tonne capacity Plimsoll chain-tensioning/riser pull-in winch for Single Buoy Moorings' *Frade* floating production, storage and offloading (FPSO) vessel off Brazil is the largest yet from MacGregor's Offshore division. The package of Plimsoll equipment supplied by MacGregor also includes a 45tonne auxiliary winch, electro-hydraulic power pack, local control station, and rotary platform.

The Frade Field is Chevron's first oilfield development project in Brazil. It is located in the Campos Basin in a water depth of 1000m, about 75miles off Rio de Janeiro, and is expected to begin production in late 2008 or early 2009.

Single Buoy Moorings Inc was awarded an engineering, procurement, construction, and installation (EPCI) contract covering the provision of the FPSO, based on the conversion of its 277,000dwt VLCC *Lu San*. In addition to the EPCI contract SBM is to operate the FPSO.

Moored by an internal turret accommodating 33 risers, the FPSO is fitted with topsides for the production of 100,000 barrels of oil, treatment and compression of 106 million ft^3 of gas, and treatment and injection of 150,000barrels of water per day.

The Plimsoll main winch is used for tensioning mooring chains and pulling in the pipeline risers that transfer well fluids from the seabed to the surface. It features a single main plain-cored drum with two storage compartments. Each of four variable-speed low-torque hydraulic piston motors drives through an epi-cyclic reduction gearbox and on to a final drive guarded spur reduction gearset. Totally enclosed plate type brakes mounted between the hydraulic motors and reduction gearboxes are hydraulically released and spring applied, so fail-safe to 'on'. Counterbalance valves are fitted into the hydraulic circuit to assist with controlled lowering on the winch.

For chain tensioning, the winch has a maximum (or 'stall') rating of 485tonnes pull, a duty pull of 440tonnes, and a brake holding load of 580tonnes (see table). The riser pull-in drum has a stall pull at top layer of 330tonnes, a duty pull of 300tonnes, and a brake holding load of 450tonnes at top layer. *NA*

New force from Greenwave

A new organisation that has attained charitable status reckons to have developed simple and practical shipboard energy-saving solutions that the shipping industry can readily adopt, if it really wants to demonstrate environmental credentials.

Shipping's claim to be the most environmentally-friendly of all transportation methods is well-rehearsed, but there is often the feeling that the industry is talking to itself when it trumpets the fact that this world would be a very different place if 95% of the trade that brings light, heat, food, and consumer durables could not be moved.

While true, shipping seldom registers on the radar of the public at large, unless there is an oilspill, cruiseship passengers are snatched from disaster after a grounding, or a ship shows up carrying arms for a dictatorial regime.

If this ignores the number of oil tankers and cruiseships that routinely make it home, or the fact that dictators find all sorts of ingenious ways to maintain their power, it is also fair to point out that, as an industry, it has become all to easy to wax on about the seeming ingratitude of the public and their political representatives, and to claim 'green' credentials as a birth right, rather than credentials that need to be earned.

After all, as well as the polluting low grade oil burned by ships, this is an industry that remained silent on being excluded from the Kyoto Protocol, one which still dumps its toxic ships on some far off developing world shore, and one that has struggled to sign up to a Convention on invasive aquatic species despite the fact that the problem has been identified as one of the four main sources of marine pollution in the world by the International Maritime Organization.

How refreshing, then, to meet Costas Apodiacos, managing director of shipbroker Victoria Steamship Co Ltd. Mr Apodiacos, who represents three Greek clients operating a total of 11 bulk carriers, is one of the driving forces behind Greenwave, a project specifically looking to develop commercially viable 'greener' ships, using advances in hydrodynamics, aerodynamics and, initially, wind power.

Formally established in 2007 by Greek interests, Greenwave's mission statement is to develop practical solutions to cut fuel consumption, emissions, and to 'change the industry's attitude from a single bottom line focus to a triple bottom line that delivers financial benefit plus environmental benefit plus safe and simple implementation by existing ships' crews'.

And, rather than showcasing some nice ideas that will never see fruition, or drawing on public funds in the hope of commercial viability later on, he is drawing on an initial injection of private capital from an anonymous benevolent Greek shipowner and, in April, established Greenwave as a charity in pursuit of further funding.

Mr Apodiacos says the 'holistic' Greenwave project was not formulated overnight.

'It began a couple of years ago, when I became interested in a sail technology for the recreation market. I asked its developer if it might be possible to fit this "wingsail" on ships, and whether there was a testbed available.'

Mr Apodiacos readily acknowledges that this initial idea drew its inspiration from John Walker's 'Walker Wingsail', which briefly featured as a possible solution in propelling leisure craft in the 1980s, before the crash in oil prices and the device's complexity led it to be shelved (although, see news p10).

In today's market, of course, there are over US$100 worth of reasons per barrel to look again at alternative propulsion methods.

While subsequently discarded as impractical, consideration of the wingsail concept proved the catalyst through which Mr Apodiacos began forming a team of like-minded individuals. Joined by technical director Spiros Contopoulos and project manager Nick Dearden, 'we started brainstorming about what other things we might be able to develop to conserve on the consumption of fossil fuels. We began to consider hydrodynamics, wind resistance, using another wind power solution, and other forms of energy, like the sun.'

At Mr Dearden's suggestion, the group approached Auckland's Massey University, because it had been so successful in designing New Zealand's Americas Cup yacht. Now, 18 months later, four firm projects have emerged.

L-R, Greenwave founding members, Costas Apodiacos, Nick Dearden, and Spiros Contopoulos.

Greenwave projects to cut fuel consumption and emissions.

- Drag reducing Aerodynamic Components (DRACS): an investigation into hull drag reduction above the waterline. This aerodynamics project is being led by Massey University. A project to assess what proportion of propulsion is lost to wind resistance and how this might be alleviated practically and at low cost, for example by grinding weld beads flat, adjusting crane designs, or adjusting airflow over the funnel, possibly through fitting a spoiler. Following wind tunnel tests, the 'easy to fit' aerodynamic improvements derived from this study will be unveiled at Posidonia 2008
- Wind Assisted Ship Propulsion (WASP) Alternative sources of power, initially wind. The project is also being undertaken by Massey University. Later study envisages the investigation of solar power for hotel requirements onboard ship
- Hydrodynamic Drag Reduction in Sail Assisted Shipping (HYDRIS): an investigation into drag reduction below the waterline. Principles are being developed at Southampton Solent University. One area of study explores the feasibility of injecting air bubbles under significant parts of the hull to reduce drag. Another aim of this project is to assess whether any modifications might be required to stabilise the ship under wind engine propulsion
- Performance Analysis Softweare System (PASS). Development of new software to predict and monitor systems on ships, so that shipowners can assess the impact of adopting Greenwave's solutions by entering data about their existing fleet. The software would also allow Masters at sea to assess whether any of the hydrodynamic, aerodynamic, or wind assisted solutions needed to be adjusted for optimised operations

In all cases, solutions should involve minimal crew involvement and be simple, cheap, and effective, and retrofittable.

'Last year, we came up with the name Greenwave and decided to turn this group of people into an organisation,' says Mr Apodiacos. 'The stage we are at now is that we've got a group of trustees and we are going for charitable status. Now that the project has a name, we are trying to attract more funding.'

The pursuit of finance is taking in classification societies, Greek shipowners, and even high street banks with shipping portfolios. 'We want to give the industry the opportunity to show that they are being proactive,' says Mr Apodiacos.

The push for charitable status confirms that the Greenwave project is not seeking to profit out of the progress it makes towards developing greener ship concepts. Rather: 'We are a technically-based organisation looking for technical solutions to reduce the consumption of fossil fuels. All we are seeking is to research and develop and make any findings available to the industry.

'It is a question of collecting a group of people together who think the same way. We can't just leave all these problems to our kids. This project is not about anyone getting a BMW in their garage. It is simply not a money exercise.'

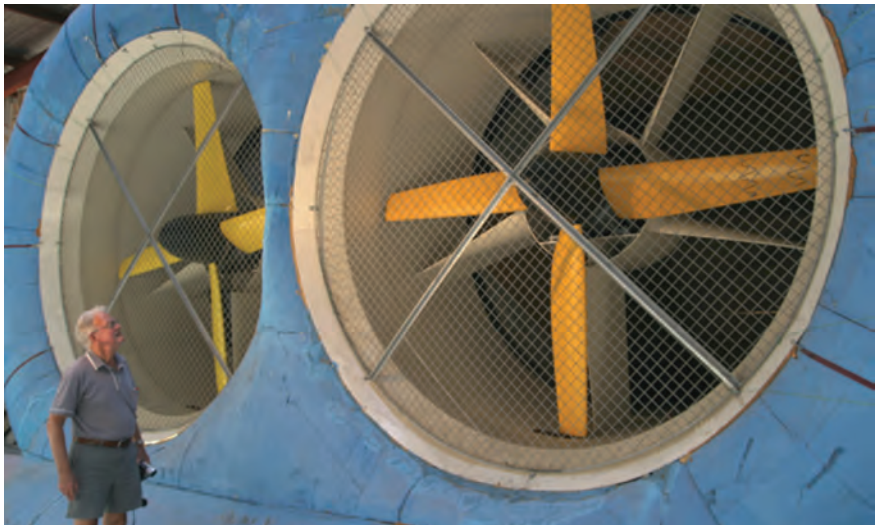
Progress has been tangible in developing the deck-mounted wingsail envisaged to offer auxiliary propulsion underway. Mr Apodiacos said that research had pointed towards a refined version of the Flettner Rotor, patented by Anton Flettner in 1922 – which uses the Magnus effect, where a spinning body in a moving airstream experiences a force perpendicular to the direction of the airstream. This 'wind engine' is said to generate 10 times more propulsion than the equivalent profile area of sail.

In its updated version, the 'tubular sail' could be assembled using lighter weight modern materials. He suggested that three such rotors would be appropriate for a Handymax bulk carrier. If such an installation were to cost US$1 million, initial calculations showed that it would achieve 12%-14% fuel savings in average conditions, even before the assembly was optimised. If the average fuel bill of a bulk carrier were US$3 million per year, annual fuel savings of around US$350,000 per year would mean a three year payback on the initial investment.

Stowage was still an issue, Mr Apodiacos conceded, but he said the idea was to develop a type of telescopic mechanism, so that the rotor could be retracted when not in use.

He said that, so far, rotors at one tenth scale had been tested in a wind tunnel, and that the next stage was to develop a one quarter or one third scale unit, for installation on a ship. *NA*

Wind tunnel tests have already been carried out on a number of models developed to Greenwave principles.



Local solution to local challenge

Newcastle's new Marine Design Centre is developing a strategy to support ship design prowess in a region once famed for its shipbuilding.

The 2006 winding up of the Swan Hunter yard brought closure to a story of shipbuilding decline in the UK's North East stretching back 50 years. But, while the rise of other shipbuilding nations may have put paid to the traditions of a region which can trace its construction records back to the completion of a first ship in 1293, and to have prompted the transfer of blue collar workers to the automotive, and oil and gas sectors, the design skills behind the metal bashing remain.

Newcastle University, for example, remains the largest producer of naval architects in the UK.

White collar workers native to the North East have had to ply their trade elsewhere – whether it be on the Future Aircraft Carrier design project, centred around Bristol, or further afield, in The Netherlands, Norway, The Middle East, or even Australia. But, what if the 'supply chain' that used to support regional shipbuilding could be brought together again, to retain the expertise nurtured over centuries of shipbuilding?

It is this ambition that saw the start-up of Newcastle's new Marine Design Centre at the end of 2007, with premises located just behind the city's main train station, and initially publicly funded through a £1.5 million contribution from One NorthEast. That funding came with clear instructions that no more would be forthcoming beyond 2009, and that the Centre had to demonstrate that it could stand on its own feet within three years, through membership fees and other revenue streams.

A survey of 30 companies conducted by the Centre in its first days established that 500 individuals could be identified regionally as being purely involved in marine design activities.

The Centre is fronted by director David Hewitt, who formerly set up North East design company Armstrong Technology (now part of Babcock International Group), which in turn had its roots in Swan Hunter. Under his guidance, the fledgling organisation looks to offer a service through which regional design companies can be represented nationally and, ultimately, internationally.

Alan Johnston of BVT Surface Fleet (left), with David Hewitt of the Marine Design Centre.

'We do not think there is an equivalent organisation anywhere in the world, and we would be interested to meet someone with the same problems,' said Mr Hewitt.

'We want to bring design companies onboard to harness their capabilities and market them worldwide. When the market was not so buoyant, designers from the region needed to go out and find work, but now we see a situation where there is far more work around than can be handled by designers based in the North East. We are trying to encourage people to come to the North East and work in the companies that are there. Five or six years ago, these companies were seeking orders; now, work is not the problem, but having the capacity to do the work is.

'It is critical that the sector brings graduates in, converting them from other disciplines into the marine sector. This is where the Marine Design Centre has a central role to play. We will have to engage with schools, universities, and colleges, and to look at innovative ways of turning people onto a career in this sector.

'We need to look again at our first survey in more detail, in order to know more about where the skills are and whether there are other sectors in the region from which skills may be transferable. As well as attracting young people, we need to bring people back into the fold.'

The Centre also offers training and refresher courses, so far extending to Aveva's 'Marine' integrated design and production applications package, but plans are afoot to extend this to FEM and CAD-based packages like Aveva PDMS and other Autocad applications. It also makes the tools avaliable to designers that they need to operate at the latest technological level, with hardware and CAD/CAM software for hire for on-site use.

Earlier this year, Aveva also hired the Centre's facilities to stage a seminar alongside ANSYS, covering FEM and CFD.

'We don't employ designers,' said Mr Hewitt. 'We facilitate design.'

The Centre has three full time staff, with Mr Hewitt working alongside business development managers John Lockey and Simon Ellis, but it is structured as a subsidiary of Northern Defence

Industries, meaning that it is possible to draw on the back office staff of its larger parent in pursuit of membership.

When *The Naval Architect* caught up with Mr Hewitt, at the end of March, he said that, four months in, the Marine Design Centre had attracted 14-15 members, with new members joining at the rate of around one per week. 'At the moment,' he said, 'it is very much about gathering the major players; for example BAE Systems or Babcock – these are global partners.'

In April, the Centre's start up brought an endorsement from the man set to run the UK's biggest remaining shipbuilder, for its innovative approach to the growing skills issue that threatens to subdue the growth of the industry in the North East.

Alan Johnston CBE, soon to be chief executive of BVT Surface Fleet, the joint venture between BAE Systems and VT Shipbuilding, said: 'There are great opportunities for manufacturers and marine design companies to win substantial orders in the coming years from the UK Defence sector – the new carriers being just one example. However, the issue of resource and skills must be addressed continually if these opportunities are to be realised.

He said the Marine Design Centre would be integral to such efforts. 'We need to build a sustainable industry and a strong supply chain that has an abundance of skilled people capable of utilising new technologies to innovate and create added value.'

According to Mr Hewitt: 'Defence is a key market and we have aspirations to be involved with the CVF [Future Aircraft Carrier] and MARS [Military Afloat Reach and Sustainability] projects, but there are also marine energy opportunities in the oil and gas sector and, increasingly, in renewables, as well as in commercial shipping.

'North East companies are in an exceptionally good position to take advantage. The region is once again becoming a real international force in the marine sector and we need to ensure we have the resource to take advantage of each and every opportunity that becomes available.

'To this end we are currently planning a major recruitment fair to be held in Newcastle during the summer aimed at highlighting the fantastic career opportunities that exist within the sector.'

Also in April, and demonstrating its ambitions on the international stage, the Centre welcomed a China State Shipbuilding Corp delegation, as part of a series of events hosted by the Society of Maritime Industries looking at shipyard logistics and design. *NA*

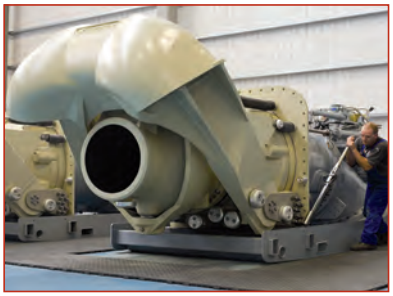
The Royal Institution of Naval Architects

WATERJET PROPULSION 5

HamiltonJet

17 – 18 September 2008, London, UK.

Second Announcement & Call for Papers



This international conference continues the very successful series of RINA events looking at developments in waterjet propulsion.

Waterjets are now accepted as a proven technology, particularly for high speed craft and they are increasing their penetration into small craft, leisure, workboat, patrol and military markets. Today, waterjets are becoming the preferred propulsion choice where high efficiency, enhanced manoeuvrability, shallow draft capability and low maintenance are key requirements. Continuing developments now include very large units of 30MW capacity and the use of waterjets for high speed boost propulsion.

As the technology matures, designers need better tools to help predict the performance and efficiency of these systems across a wide range of operating conditions. Computational fluid dynamics is an increasingly powerful tool which has become almost universal, but traditional model testing and trials measurements are still required to confirm critical results.

Designers and manufacturers also continue to seek to reduce noise, wake and wash as well as optimise the strength and weight of the various mechanical components and to improve reliability, reduce installation time and maintenance.

RINA invites papers on all aspects of waterjet design, production and operation, from designers, researchers, manufacturers and operators. Topics may include the following:

- Simulation for research and design
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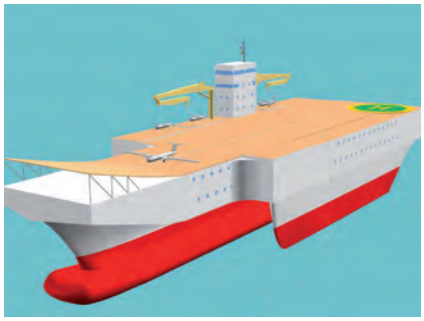
A carrier for unmanned aircraft

Unmanned aircraft (UMA) could gather diverse information on the Earth's surface for a relatively low outlay. A UMA carrier would provide the necessary support for work at sea, writes RINA Fellow, Victor A Dubrovsky.

Contemporary, and especially future, unmanned aircraft would offer a unique opportunity to gather information concerning the Earth's surface at relatively low cost. Unmanned aircraft (UMA) with special measuring equipment have been proposed in Russia as being particularly useful in the collection of:

- Geological data on shelf and near-coast land regions (searching mineral fields on land, and oil and gas fields on shelf; predicting and estimating pollution, and estimating ecological damage, etc)
- Ice monitoring data and the permanent monitoring of regions experiencing floating ice
- Data on under surface objects on land or on the sea bottom, including tube line safety, landslide generation, eternal frozen ground deformations, etc
- Data to monitor hydro-technical and soil improvement structures, including regions of filtration and initial stages of structure damage
- Data to monitor floods, swamp expansions, and the control of soils and forests
- Data that points to bio-productivity definition, including the discovery of shoals near the water surface
- Information regarding ship way and weather monitoring for higher safety of seagoing vessels
- Information on areas of sea identified and patrolled as special economic zones (including pollution and oil film thickness definition, ship-pollutant discovery, and exact definition of their placement, etc)

A new and original ship design has been developed to support such missions at sea, serving the need for deploying unmanned aircraft in remote locations. The ship would, in its full service mode, carry 10-12 unmanned aircraft (UMA) with overall wingspan of 6m, four to six unmanned aircraft (UMA) with wingspan of up to 15m, and some small unmanned submersibles.



Artist's impression of a ship designed to carry unmanned aircraft.

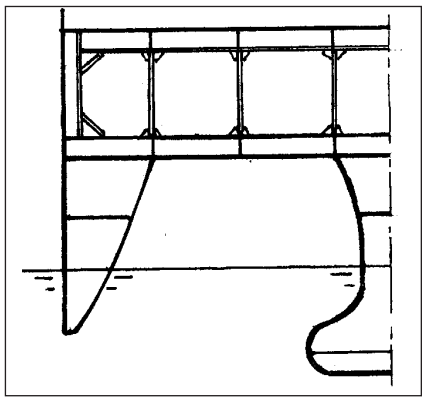
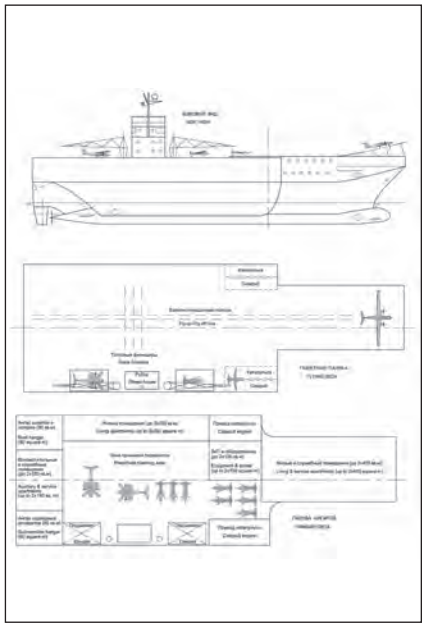


Fig. 1. Hull structure in the hangars.



General arrangement plan for the UMA ship.

The smaller UMA, with a payload 50kg, and cruising speed 300km per hour, can fly for 12 hours; the bigger UMA, with a payload of 200kg and the same speed, can fly for 10 hours.

Alternatively, such a ship could carry three to five strike helicopters (and two forking hangars) on its flying deck to combat pirates.

Initial demands

To take off, the 15m wingspan UMA would need a platform no less than 90m long by 15m wide at the bow. To land, the same UMA would need a platform no less than 60m by 25m across at ship's stern. The landing ground must also have rope finishers.

In the case of the 6m wingspan UMA, take off would be achieved via two catapults of about 12m long. For the same UMA to be lifted from the water, the ship would need two cranes able to load no less than 1tonne, at an outreach of no less than 15m.

To launch and lift the unmanned submersible, the ship would need a movable stern ramp, descending to water level. The ship would also need additional motor boats to service UMAs and unmanned submersibles, while landing and refuelling of additional helicopters of flying weight no more than 16tonnes would need to be ensured by special equipment.

As far as superstructure would be concerned, the ship would need special hangars and auxiliary apartments with cranes and rollers, covering no less than 600m^2, and no less than 4m high.

Such a ship would feature 100 cabins for crew and other personnel, with the total area of living, service, and auxiliary apartments covering no less than 1500m^2.

It would operate at a full speed of about 28knots-30knots, with 12knots-15knots given as its economy speed. These speeds correspond to battle ships of comparable dimensions, while the ship's range at this lower speed is given as 1500nm-2000nm, with an endurance of 30 days.

These initial demands suggest the payload of such a ship would not be so big, but that it would require large deck areas to achieve its operational goals.

Full-scale experiments and model tests have demonstrated that ships with a small waterplane area can ensure the highest seaworthiness while exhibiting a small displacement, while ships featuring outriggers have been built with a minimal hull structure mass. Therefore, an 'outrigger' small waterplane area ship has been selected as the best solution for carrying UMAs and underwater semisubmersibles. Its length overall must be no less than the necessary flying deck length - ie no less than 90m, while its beam at the stern must be no less than 25m for unmanned aircraft with wing span 15m, but it would also be necessary to add 5m for the wheelhouse, operator room, and elevators and cranes. Thus, the overall beam was selected as 30m at zero approximation.

If the ship is 90m long, its design draught would need to be about 5m for the hull bottom to avoid slamming in waves, while the vertical clearance of the outrigger ship with stern outriggers must be no less than 4m [1].

Allowing for an aircraft hangar height of 4m would mean that the distance between the flying deck and the hangar deck would need to be 6m. The distance between the hangar deck and the platform bottom, meanwhile, would need to be 1m for 'free-serving' of the inter-deck space. Therefore, the ship's depth must be about 15m. The proposed hull structure in the hangars is shown by Fig 1.

The ship's main engines and electric station will be arranged in the main hull gondola, while various stores and workshops can be placed in the main hull strut. The strut width above the enginerooms must be no less than 2.5m–3m for free extraction of engines, main gears, and generators.

The average thickness of the small waterplane area ship surfaces must be about 5mm-6mm, if the ship's displacement is about 1500tonnes-2000tonnes. Thus, the total mass of the plating would be about 600tonnes-700tonnes. Using a frame coefficient of 1.6,

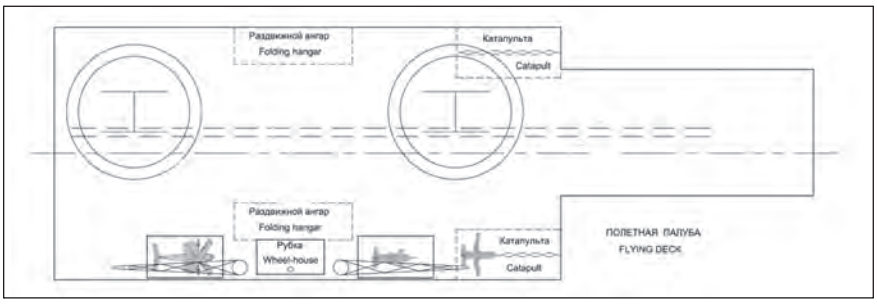


Fig 3: The flying deck with added places of helicopters and hangars.

Overall length, m	Overall beam, m	Hull depth, m	Design draught, m	Vertical clearance, m
90	30	15	5	4
Full displacement, tonnes	Full speed, knots	Range at speed 15knots, nm	Main engine power,	MWDeadweight, tonnes
2100	30	1500-2000	2 x 16	400

Table 1. Main dimensions of the UMA ship.

and an equipment coefficient of 1.25, [2], the total mass of the equipped hull structure would be about 1300tonnes-1400tonnes, while the full displacement of the outrigger ship would be about 1800tonnes-2000tonnes at zero approximation. The plating of the main surfaces was defined by the following external loads:

- Deck plating, general transverse bending: a half of the above-water platform weight with payload, the vertical load, and horizontal force would be equal to the outrigger displacement at the arm on half outrigger draught
- Strut plating at the most narrow section: the bending moment from the same horizontal load
- Platform plating for torsion moment: to be in accordance with the approximate formula from [2]
- Gondola bottom: by static pressure of water at the height from the basic line up to the upper deck

Referring to general comparable data on outrigger small waterplane area ship propulsion [2], [3], the engine power of the carrier would be estimated as 2 x 12MW for 28knots, or as 2 x 16.0MW for 30knots at zero approximation. The main engine and electric station mass can be estimated as 200tonnes (the combined main engine from two diesels for economy speed and two additional gas turbines for full speed). Power of about 2.5MW would be needed for economy speeds of about 15 knots; while fuel outlay would be about 0.7tonnes per hour, including the outlay of ship's electric station. Fuel supply of about 85tonnes would be needed for a range of 1500nm, or about 110tonnes for a range of 2000nm.

The outrigger waterplane area is defined by the following initial suppositions:

- The transverse initial stability must be ensured by both outriggers
- In a side wind of 100knots, at zero ship speed, the heel must be no more than 10degs

The usual standards of seaworthiness can be applied for motion limitation. For example, the usual standards for combat ships are the follows: - vertical acceleration in wheelhouse about 0.4g; - significant amplitudes of roll 6, of pitch - 3degs.

In short, such a ship could operate in Sea State 5 or slightly more, but in Sea State 6, speed and heading of the ship would be restricted without motion stabilisers – something to be considered at the next stage of design. *NA*

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Acoustic emissions and hull integrity

Ship hull condition monitoring using acoustic emission technology, as explored by J S Carlton and L Rogers, of Lloyd's Register of Shipping.

The condition monitoring of ship's machinery or hull structures has always been a prime concern of Lloyd's Register and methods by which this can be accomplished have featured in continuing research programmes.

In the case of hull condition monitoring, one such method is that based on acoustic emissions. Valuable experience was gained during the 1990s in applying acoustic emission techniques to both the structural integrity assessment of offshore structures and corrosion studies in marine water ballasting arrangements. This experience was subsequently enhanced in other marine situations such as the rolling element bearing failures of podded propulsors in the early years of this century and, more recently, with the prediction of rudder cavitation erosion and LNG tank integrity. In the context of hull condition monitoring, research has been ongoing since 2004 and is, in part, based on the foundation of accumulated knowledge gained in these other related fields.

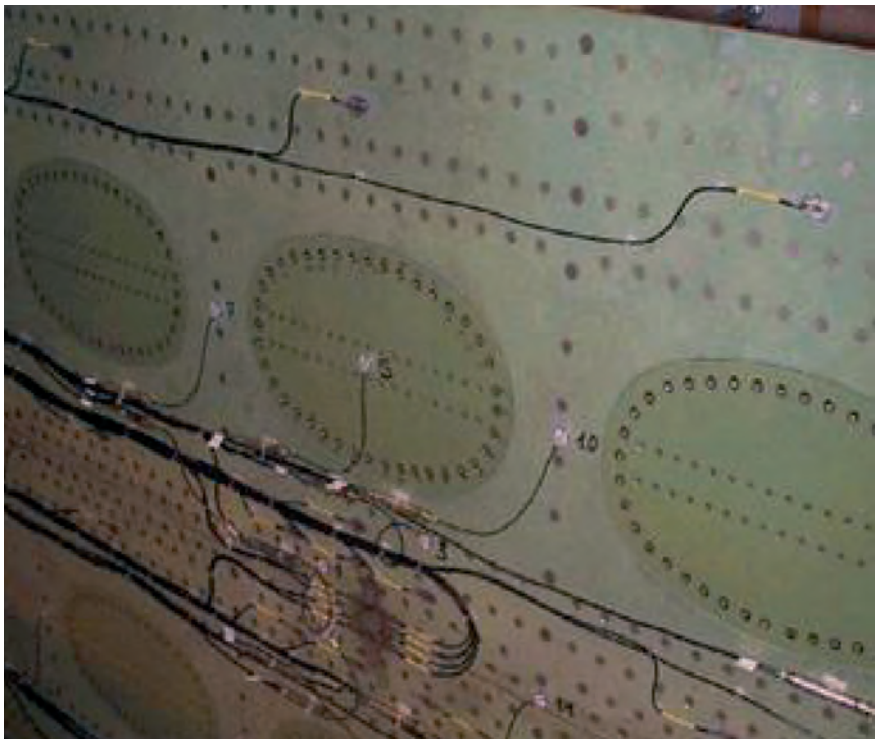

Figure 1: Acoustic emission source location on an aircraft wing panel from Delta T measurements using an array of sensors.

To explore the integrity of a structure with confidence it is necessary to be able both to detect and locate active cracks in structures. In the 1990s it became apparent that a new generation of acoustic emission techniques would be necessary to fulfil this objective. Consequently, Lloyd's Register collaborated with British Aerospace, which was also interested in this technology, to develop an advanced capability to detect crack propagation in structures. Subsequently, Ultra Electronics joined the consortium and the result was the multi-sensor BALRUE system, which fulfilled the basic requirements of the three organisations.

Before considering the progress achieved in the field of hull structural condition monitoring, it is helpful to compare the different approaches of the aerospace and marine transportation industries. Civil Aviation Authority airworthiness certification requires full scale fatigue endurance testing of all of the primary structural elements. Then, only when the structure has been subjected to accelerated fatigue testing, without developing cracks which could compromise operational safety, is the aircraft allowed into service for a period up to 20% of the demonstrated fatigue endurance. Stress fields and fatigue damage in critical structural components are initially investigated numerically and experimentally, Figure 1, but once in service, condition assessment of the airframe structure is still heavily dependant on rigorous planned inspection and maintenance programmes. Continuous monitoring of parameters such as vibration, strain, and acoustic emission, together with aircraft usage, is gaining acceptance as a preventative maintenance tool for reducing inspection and maintenance costs and for extending the safe working life of an aging aircraft fleet.

Ship structures, like those of aircraft, are highly compliant and damage tolerant. The general nature of the construction is common to both structures with the important difference in ship construction that welding replaced fasteners a long time ago. The fatigue design assessment of ship 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. However, 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 while in a member, only to arrest itself some time later when the general stress distribution in the structure rearranges itself to compensate for the change in structural continuity. In such a situation the crack tip stresses may no longer be sufficient to drive the crack further and the crack 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 is the current basis for evaluating critical crack size.

Fatigue life usually implies the crack propagation life based on the premise that defects of a threshold size for crack propagation will be present in the structure. As such, the critical factors determining the fatigue life of a structure are:

i. The existence of potential weld anomalies, particularly when these coincide with regions of high local stresses
ii. The environmental loading through the working life for the ship
iii. The stresses induced in a structure during a welding procedure

As a means of assessing the feasibility of an acoustic emission approach to hull condition monitoring, a pilot study was undertaken in 2004 by Lloyd's Register using a small product tanker. Embedded within this feasibility study was the question of whether the whole or just a critical portion of the ship's structure could be monitored. A fatigue design assessment had identified the fatigue sensitive areas as the vertical connections between the No. 1 and No. 2 transverse bulkheads and the hull. Since the wing tanks were used solely for ballast, Figure 2, it was considered

Figure 2: Top corner of the ballast tank used in the pilot study.

Figure 3: View inside the starboard cargo 6 tank looking towards the aft bulkhead and the adjoining ballast tank.

that acoustic emission hydrophones suspended in the ballast water might offer a potentially cost effective solution for crack detection in the hull.

The investigation involved the propagation of simulated wide band acoustic emissions through the hull from the seawater side to a 125kHz centre frequency acoustic emission hydrophone suspended in the adjacent ballast tank 2m from the cargo tank bulkhead. The acoustic emission generated on the seaward side paintwork of the hull by a Hsu-Nielsen source was readily detected by the hydrophone, including the reflection from the cargo tank bulkheads. The dominant acoustic emission wave propagation modes in the hull are pressure (compression), shear, and surface (Rayleigh) waves. Rayleigh waves are least attenuated at a metal-air interface but are severely attenuated at a metal-liquid interface depending on the viscosity and density of the fluid and the frequency of the sound. Water, which has a low viscosity, can only support compression waves and the attenuation of sound in water results mainly from the geometrical spreading of the wave front. These features favour the use of hydrophones in ballast tanks for detecting acoustic emissions from crack growth in the hull.

These preliminary results suggested continuous monitoring using an array of five hydrophones in the ballast tank, four attached to the vertical ribs of the cargo tank bulkhead forming a rectangular array facing towards the outer hull, and the fifth hydrophone, suspended near the centre of the tank, could detect and approximately locate fatigue cracks throughout that segment of the outer hull. In this way, continuous acoustic emission monitoring using intrinsically safe instruments has the potential to provide global surveillance of the hull for fatigue crack detection and location, thereby indicating when and where internal inspection by other non-destructive testing methods was necessary.

Following the successful conclusion of the pilot study, the applicability of the acoustic emission method to a double hull Aframax taker was investigated while the ship was undergoing refit. This involved measuring the attenuation of wide band sound pulses from a Hsu-Nielsen source horizontally and vertically through the structure in two sensing frequency bands, 50kHz-100kHz and 100kHz-200kHz, and determining acoustic emission source location uncertainty for key structural welds. The work was undertaken inside the starboard No. 6 cargo tank and the adjoining ballast tank; see Figure 3.

Triangular arrays of each of the sensor

types were attached to the aft transverse bulkhead, the tank bottom, and the side shell adjacent to the No. 6 ballast tank; each triangle being made as near equilateral as possible. Since the tank bottom and first 1000mm of the side walls were painted (hard epoxy) the sensors on this surface were bonded to the paint after first removing any asperities with fine grade emery paper.

Sound attenuation and source location measurements were made vertically near the centre of the bulkhead from the tank bottom to deck level and horizontally at +800mm and +5250mm. The measurements were repeated on the cargo/ballast skin and the tank bottom over the complete segment. Additional measurements were made with the Hsu-Nielsen source at selected primary welds in the cargo and ballast tanks. Actual source positions were compared with the positions determined from the measured difference in the arrival times of the sound at selected sensors.

Results of the sound attenuation measurements on the transverse bulkhead were summarised. Since the measurements were made in the absence of cargo and ballast, their effect must be considered when determining the sensor requirement for in-service monitoring.

The segmented bulkhead construction and restricted space within the double hull of large modern tankers is disadvantageous to hydrophones and surface mounted sensors are more practical. In this case the primary factor determining the viability of in-service acoustic emission monitoring is the required number of sensors, which depends on such factors as:

(i) Minimum acceptable defect size, for example 25% of the critical depth corresponding to the fracture toughness of the steel would be very acceptable under operational service conditions: which is within the capability of modern acoustic emission equipment
(ii) The presence of cargo or ballast
(iii) Background noise levels during severe weather when crack growth is most likely to occur

Figure 4: US Coast Guard deepwater cutter.

Fatigue sensitive areas can include the connections between the inner hull and the transverse bulkheads. Detection of cracks in the inner hull up to 5m each side of a connection with a transverse bulkhead over a 15m long band around the hull could be achieved in the absence of ballast and cargo with between five and eight sensors located inside the ballast tank.

If detection of larger cracks, approaching through wall thickness, is acceptable then their detection in the presence of cargo or ballast should be possible using the same number of sensors. The crack location uncertainty would be around + _5% of the sensor spacing if adequate preliminary tests are performed during installation using a Hsu-Nielsen source. In the above example, coverage of all transverse bulkhead connections with the inner skin would require between 70 and 112 sensors.

These trials have shown that acoustic emission detection of active propagating fatigue cracks together with their location is a viable technical tool. Moreover, in answer to the question posed as to whether a general or local surveillance of a hull is the most feasible, while given that general hull monitoring is possible using a sufficiently large array of sensors, it is likely to be more efficient to use small arrays concentrated in locations which are either known to be prone to cracking or are indicated from a fatigue design assessment exercise.

The final stage of the method evaluation is now currently beginning and is being done in association with the US Coast Guard's VALID Joint Industry Project, which is being coordinated by MARIN in The Netherlands. Arrays of sensors will be deployed on the hull structure of the US Coastguard's Deepwater cutter *USCGC Bertholf*, Figure 4, which is due for delivery in the not too distant future. These trials will be undertaken over an extended period using the data storage and transmission capabilities of the BALRUE instrumentation developed by Lloyd's Register in collaboration with its other partners. *NA*

The Royal Institution of Naval Architects

DESIGN AND OPERATION OF CONTAINER SHIPS

Lloyd's Register

3 – 4 July 2008, London, UK.

Second notice

The trend towards increased size of Container Ships presents unique challenges for Owners, Designers, Operators and Classification Societies. The high speeds and unconventional structural arrangement of Container Ships can increase the risks associated with innovation. The expansion plans for the Panama Canal are also set to create a new breed of Panamax vessels.

Questions of structural strength, severe weather loads and stability must be addressed. Thought is also being given to deck cargo arrangements; problems with securing the containers to resist green water and potential problems with the safety and speed of loading and unloading are beginning to be addressed.

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Unsettled waters ahead for shipping

Prominent members within shipping recently met to discuss the future of the industry at Det Norske Veritas' (DNV) third Maritime Forum, and mixed messages emerged, reports Clare Nicholls.

DNV's 2008 Maritime Forum, in April, took as its theme 'Preparing for an Uncertain Future', with many concerns being raised as to how shipping will fare in the medium term ahead.

At first glance, the outlook seems very positive, with forecasts of growth in the world fleet for the next two years estimated at 8.8% per annum. Total shipbuilding capacity is expected to increase by 15% each year until 2015, with China leading the capacity growth, possibly rising by sixfold in six years.

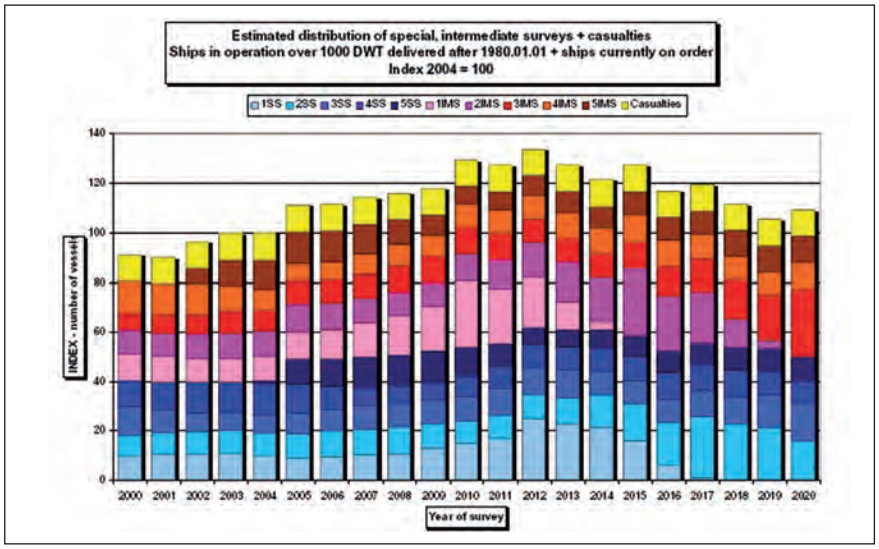
In 2008 twice as many ships are being built in shipyards than was the case last year. In 2011 yards globally are already almost half full.

In January this year the world fleet passed 500 million dwt for the first time, with a contract value of US$490 billion. In 2010 the Capesize bulk carrier orderbook alone will surpass 50 million dwt.

2006 smashed investment records, at US$161 billion, and in 2007 there was a US$230 billion investment in newbuildings.

Set against the continuing high levels of activity, the first quarter of 2008 has been slow in investment terms, with only US$20 billion being raised against new ship orders. In the wake of the 'credit crunch', it seems that the downturn may be a portent of events to come, with ships financed against what now look to be optimistic returns. With the present rate of demand unsustainable, there is growing concern that there will be an overcapacity of ships after 2010.

Of immediate concern is the fact that there is a limited supply of key components such as main engines, generators, and propeller shafts. With suppliers already working to capacity, in the future this may further delay construction projects and create a backlog of sizeable proportions at shipyards.



The world orderbook is expected to peak in 2012.

In 2007 deliveries grew by 5%, but as there is an upcoming world orderbook peak, it raises the question as to whether all of these ships will actually be delivered. There are many reports of refund guarantees not in place and only a third to a half of newbuildings are financed.

One third of the orderbook is at non-established yards – ie yards which have been established for less than two years. 28 yards are planned in China, plus eight expansions of existing yards, but so far only five projects have been completed. This means that 50% of yards in China are new.

Staff shortages

Shipping cannot attract enough personnel at the moment, let alone in the future. The human element is vital in order to keep the industry running over the next 10 years.

Therefore crew shortage is a prevalent issue, with DNV estimating that there will be a need for approximately 180,000 crew members in the next three years. In 2005 there was a moderate officer shortage of around 2.1%, but by 2015 this might rise to a severe shortage of 5.9%. The severe shortage figure is based on fleet growth of 1%.

The lack of adequate staffing numbers can be partially attributed to an expanding bulk carrier fleet, unattractive career prospects such as pay, leave, and terms and conditions, regulatory pressures on seafarers, and the gradual criminalisation of seafarers. There is also a shortage of qualified shore staff with seagoing experience, such as class surveyors and inspectors.

In order to address this problem, the IMO has introduced the International Convention on Standards of Training, Certification, and Watchkeeping for Seafarers (STCW), part of which looks to create an environment attractive to new recruits, and one that ensures that training equips them with the skills they need to perform the tasks that will be required of them.

An STCW qualification is valid onboard any ship worldwide and IMO has developed a series of courses to help implement the Convention. It is important that the industry puts career structures in place and incentives that will encourage

The Royal Institution of Naval Architects

INTERNATIONAL CONFERENCE ON SHIP & OFFSHORE TECHNOLOGY 2008 - VESSELS FOR DEEP & ULTRA DEEPWATER OPERATIONS

ABS

16 - 17 October 2008, Busan, Korea.

Second Notice & Call for Papers

Shallow water oil and gas production is in long term decline. Much of the undiscovered, economically recoverable oil and gas reserves are believed to lie in the deepwater ocean basins of the Gulf of Mexico, offshore West Africa, Brazil, Northern Europe, Western Australia and Southeast. There has been a significant boom in the entire deepwater exploration and drilling industry over the last few years. Studies indicate that deepwater fields now account for more than 25% of Operator investment in offshore facilities and this may increase to over 40% by the end of the decade.

The development of deepwater fields presents significant technical and commercial challenges. They are often in remote locations far from existing infrastructures and in inhospitable environments. The exploration and development of these field needs a whole range of vessels (survey, drilling units, supply ships, anchor handling vessels, floating production units, etc) with greater durability, reliability, large storage and greater handling and lifting capabilities.

RINA invites papers on all aspects of the design and operation of vessels associated with deep and ultra deepwater oil and gas exploration and field development, including the following topics:

- Experience on specific design & construction projects
- Project management and integration
- Environmental design criteria and loading
- Structural integrity and reliability
- Deepwater construction, installation and maintenance
- Mooring systems and dynamic positioning
- Safety & risk evaluation

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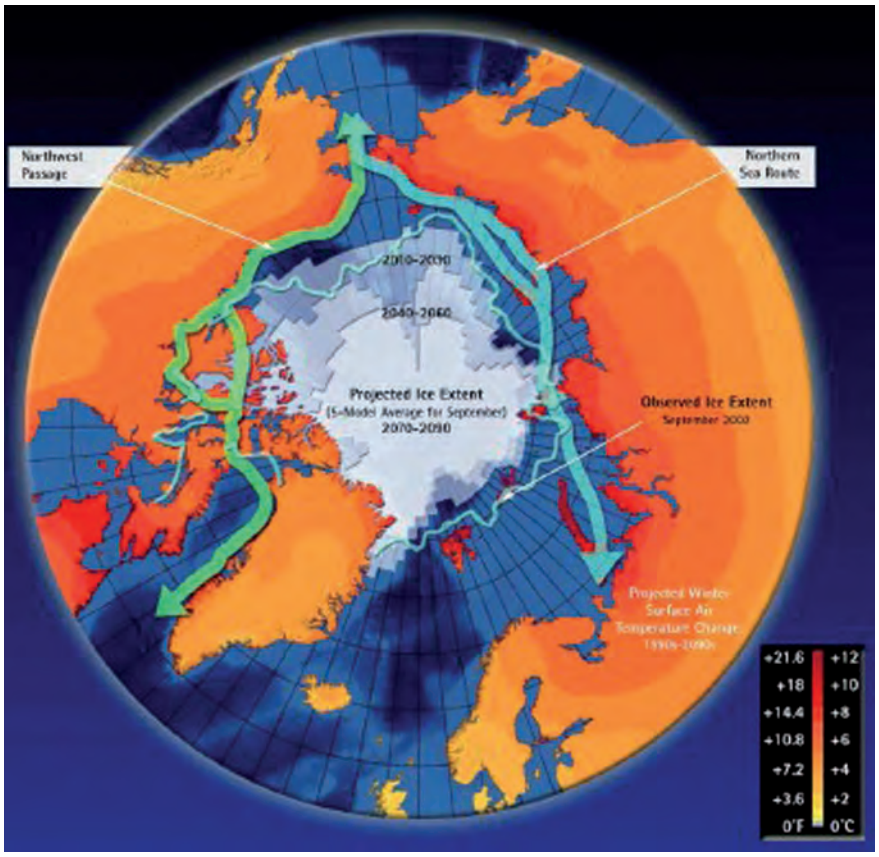
personnel to stay within shipping. Ship managers should also be trained to adequate standards and kept abreast of any technological developments.

Additionally, IMO's sub-committee on Standards of Training and Watchkeeping is considering a proposal for simplifying and harmonising the requirements for personnel serving on passenger ships, involving training methodologies including distance learning and e-learning. Training is particularly important in developing countries with limited infrastructure, as they are becoming a major supply pool for ships' crews.

For this reason IMO has also set up the Integrated Technical Cooperation Programme (ITCP) to ensure the uniform implementation of global standards. This scheme is intended to assist developing countries especially to comply with international rules and standards related to maritime safety and security and the prevention and control of marine pollution.

The ITCP's maritime training activities will be financed by around 70% of IMO's Technical Cooperation Fund allocation for 2008 and 2009.



Due to ice melting, shipping routes may open up over the Arctic.

Safety and costs

This staff shortfall has been one of the causes of the growing amount of accidents in the past four to five years. DNV recorded a high of 0.014 serious accidents per ship between 2004 and 2005, and for large tankers, containerships, and bulk carriers worldwide, there is currently an average of around 0.02 serious accidents per ship.

With the current evolution of the industry, maintaining current safety performance is challenging. One implication here is that the shipbuilding boom is encouraging speed of build over vessel quality, which could also be contributing to the high accident numbers.

At the DNV Forum there were also warnings of ever increasing fuel prices further influencing the way ship operators will have to manage their fleets. Fuel oil price is now five times more expensive than five years ago. Estimates of fuel costs for containerships predict up to US$50,960,000 per year in the near future, including any possible carbon taxes, compared to an average of US$29,120,000 a year currently.

According to Moore Stephens, in 2006, operating costs for bulk carriers increased by an average of 10.7%, whereas in a 'normal' year there would be an increase of between 3% and 5%. It may therefore be crucial for shipowners to reduce fuel oil consumption so as to keep competitiveness in operation.

Another way these costs could be combated would be to limit vessels' speed. If a vessel slowed by only 2knots – 3knots, then it could save around 40% on bunker expenses and emission volumes. For containerships, a 20% speed reduction could also result in a 40% decrease of CO_2. Additionally, there can be a 10% CO_2 decrease with just a 3% speed reduction.

Due to bunker prices doubling within a year, towards the end of 2007 CMA CGM implemented just such a 'slow steaming' scheme on its Europe-Asia line and found it could add an extra ship to the route. Force Technology DK reports that shippers agree that reliability of services is more important than the speed of services. Minimising time in port could partially offset the time taken for slow steaming, as well as optimising routing, and using larger vessels.

Arctic passageways

As shipping attempts to minimise its contribution to global warming, it could simultaneously take advantage of some of its effects in the future. The melting of sea ice may open up new possibilities with respect to new shipping routes and extended use of existing routes. The Arctic Climate Impact Assessment predicts that by 2040, the shipping season of northern shipping routes may be extended to 150 days, compared with 20-30 days at the turn of the century.

However, Arctic shipping brings increased risks, as the consequences of an accident may be more serious due to ice and low temperatures, and the remoteness of the location. The marine and coastal environment will also be more vulnerable.

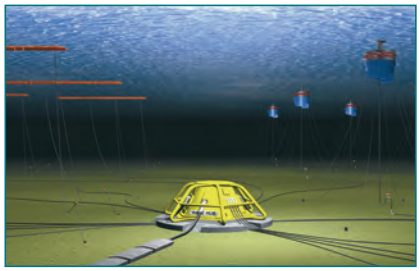
Furthermore, winterisation of vessels

The Royal Institution of Naval Architects

MARINE RENEWABLE ENERGY

19 - 20 November 2008, RINA HQ, London.

First Announcement & Call for Papers



In November 2008 the Royal Institution of Naval Architects will be holding its first conference on Marine Renewable Energy. During these times of increasing environmental awareness and diminishing oil and gas reserves, many countries are now seeking to utilise their renewable marine resources; wind, wave and tidal will be significant energy sources of the future. At the spring European Council the EU agreed a target of 20% of all energy should be sort from renewable sources by 2020. Renewable energy is a key element of sustainable development, is vital in reducing greenhouse gas emissions and creates diversity of energy supply and security.

From initial research and development through to site planning, construction, installation and operation; the marine renewable energy industry covers a wide range of disciplines, expertise and industrial sectors. This conference will bring together the industry stakeholders to provide a forum for discussion and a means of professional development for those involved with marine renewable energy.

RINA invites papers on the following topics:

- Research and development; new Wind, Wave and Tidal technology.
- Design and construction of renewable energy systems.
- Materials technology and production.
- Marine spatial planning, environmental protection, sustainable development.
- Project management and integration.
- Economics and viability.
- Installation, maintenance and subsea operations.
- Transport / lift vessels and associated support infrastructure.
- Regulations, licensing and future directions for development.

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would have to be taken into consideration at the design stage. For Arctic operation, an ice class 1A tanker would require a fully enclosed bridge with heated windows; winterised cranes, winches, windlasses, and lifeboats; additional heating in the engineroom and accommodation areas; an ice radar; and an ice impact mooring system.

Rules and regulations

Complying with future rules and regulations will have to be taken into account in the near future. By 2012, CO_2 emissions from shipping may be included within the EU's Emissions Trading Scheme. A possible price of €20 per CO_2 tonne has been suggested.

MARPOL Annex VI is now in the final stages of revision, but the provisional agreement represents a considerable success in itself. IMO has achieved international accord which seems to feature an acceptable timescale. However, the Annex has not yet been formally ratified or adopted.

The recent amendments state that the sulphur limit in emission control areas will go down to 1% as of 1 March 2010 from 1.5% currently, with the global sulphur cap reduced to 3.5% as of 1 January 2012, from a current maximum of 4.5%. Further ahead, the SECA limit will be reduced to 0.1% from 1 January 2015.

The global sulphur cap will be reduced to 0.5% from 1 January 2020, subject to a review in 2018. If the review is negative then the ultimate default date is 1 January 2025. Action will be taken if there is not enough fuel available to comply with the regulations, but abatement technology will be permitted.

NOx Tier II emission requirements could be achieved with an electronically-controlled camshaft-less main engine, and NOx Tier II standards could be met using selective catalytic reduction.

There is still much work to be done to reduce CO_2 emissions if IMO is to deliver a global solution during 2009, and this solution will lie in behavioural change. The International Chamber of Shipping called for interim measures before the new IMO Convention comes into force, and that these should not be too complex. It also posed the question of how to identify recycling yards which meet acceptable standards.

A selection of innovative bow shapes may be employed in the future.

A selection of innovative bow shapes may be employed in the future.

IMO, ILO, and the Basel Convention are currently jointly working on ship recycling. The IMO's Guidelines on Ship Recycling state that new ship and equipment design should minimise the use of hazardous substances and waste generation and facilitate recycling and the removal of hazardous materials. A Green Passport may be required for new and existing ships, and shipowners would have to consider the selection of a recycling facility and preparing a ship for recycling, including a ship recycling plan.

Opportunities

In the future, shipping might not experience such revolutions as have previously been the case, but there may be opportunities to utilise different types of materials, including composites and ultra high tensile steel. Future vessel designs may take account of hullform improvements, energy saving devices, waste heat recovery systems, and bow shape developments. Some ideas under consideration are the AX-Bow, the LEADGE-Bow, or the resistance shape.

So, as far as the DNV Forum for 2008 was concerned, there are mixed messages on the future of shipping. The boom phase may give way to a downturn in the fortunes of the shipping industry in the not too distant future, but this may not be a disaster if preparations are put in place to take advantage of possible openings it may represent. *NA*

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Call for Papers

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15 – 16 September 2008
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Proposed Session Themes
- Dismantling process and facilities
- Innovative recycling methods
- Identification, removal and disposal of hazardous materials
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- Case studies

Key Dates
10th June 2008: Deadline for Abstracts (max. 300 words)
30th June 2008: Notification of authors
15th August 2008: Manuscript submission

Fees
Registration fee is £450 including Conference Proceedings CD-ROM, printed paper summaries and conference dinner.

Contact
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Universities of Glasgow & Strathclyde,
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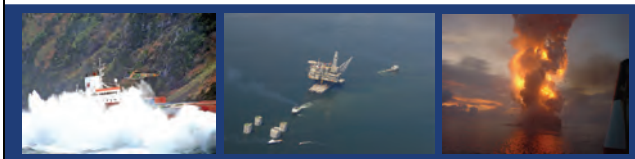

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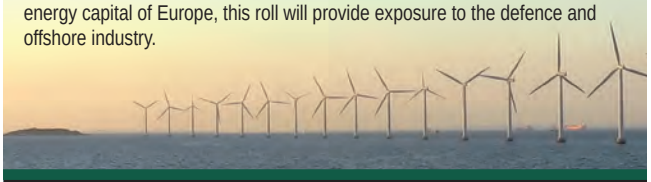

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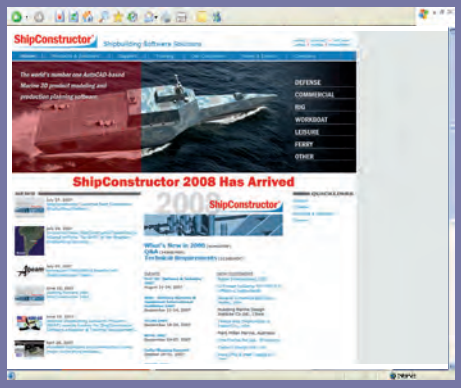

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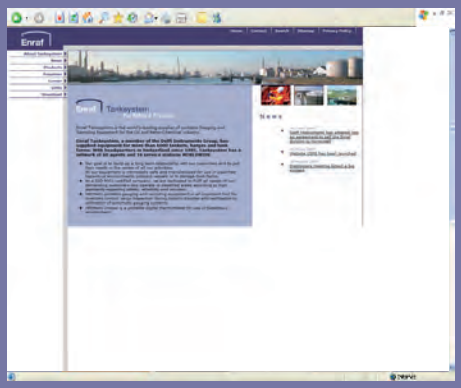

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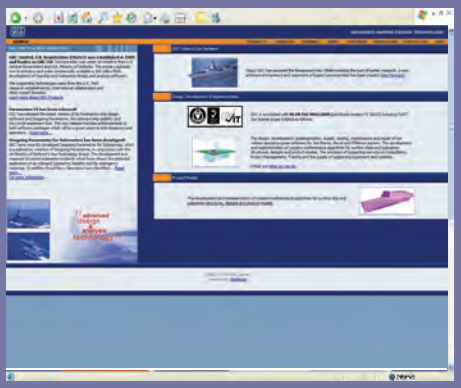

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