THE NAVAL ARCHITECT

A publication of The Royal Institution of Naval Architects | www.rina.org.uk/tna

Shipbuilding in China / Passenger and freight ferries / German marine industries / Deck equipment and machinery / **September 2010**

International®

Intersleek®900

Environmental care
Commercial sense

Intersleek®900 can enhance your environmental profile as well your profits, through a reduction of up to 9% on your annual fuel bill and a corresponding reduction in greenhouse gas emissions*.

It's biocide-free and has high volume solids, which means less paint, less waste disposal and lower VOC emissions at subsequent drydockings. With over 300 vessels now coated, **Intersleek®900** is the latest generation foul release coating for vessels over 10 knots.

Better for the environment, better for your business.

To find out more visit
www.international-marine.com/intersleek900

* Depending on application and in-service conditions

AkzoNobel

Editor Nick Savvides
Editorial Assistant Samantha Fisk
Design/Production Manager Sandy Defraine
Group Sales Director John Payten
Assistant Advertisement Manager Daniel Payne
Advertisement Production Manager Stephen Bell
Marketing Manager Adelaide Proctor
Publisher Mark J Staunton-Lambert

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

Printed in Wales by Stephens & George Magazines.

A 2011 subscription to *The Naval Architect* costs:

	12 Months	24 Months	36 Months
Inland	£150	£260	£375
Europe	£156	£272	£390
Overseas	£168	£292	£420

Average Net Circulation 11,650
1 January to December 2009
ISSN 0306 0209

Your Dependable Class Partner Anytime, Anywhere

As a member of International Association of Classification Societies (IACS), KOREAN REGISTER (KR) has been providing top quality classification services for ships and offshore installations. With exclusive survey offices at major ports around the world, KR endeavors to safeguard life, property and the environment.



SMM

● 7 – 10 Sept. 2010 SMM
Please visit us at HALL B2
GROUND FL. STAND NO 322

KR
KOREAN REGISTER

60 Sinseongno, 23-7 Jang-dong Yuseong-gu
Daejoen, Republic of Korea TEL: 82-42)869-9114 FAX: 82-42)862-6011

46-128 Features

40

Daria Cabaj discuss' the impact of SOLAS 2009.

124

The latest amendment for the CSS code go through.

On-line Edition

The Royal Institution of Naval Architects is proud to announce that as of January 2008, *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.

DISCOVER A NEW VIEW ON WEIGHT, SAFETY, ENERGY AND COMFORT

Wherever specialists work together, new perspectives are bound to emerge. For this reason, Saint-Gobain Marine Applications has brought together no less than eleven renowned specialists in the field of glazing, insulation, flooring, interior finishing, climate control and more.

This new approach will enable lighter and more efficient ships to be constructed, reduce energy consumption, increase security and fire safety and improve the comfort of passengers and crew - with integrated solutions that will be a sound investment for the future.

Want to know more about how easy it is to work with one innovative advisor and experience real benefits? Then discover new perspectives at www.saint-gobain-marine.com

SAINT-GOBAIN

MARINE APPLICATIONS

ISOVER SAINT-GOBAIN · weber SAINT-GOBAIN · DUBRIT · Saint-Gobain Glass Solutions · Saint-Gobain Deutsche Glas · Gyproc SAINT-GOBAIN · SAINT-GOBAIN SULLY · raab karcher Fliesenwelt · SAINT-GOBAIN TECHNICAL FABRICS · SAINT-GOBAIN GLASS Interior Glass Solutions · vetrotech SAINT-GOBAIN · Halton MARINE

Speaking volumes

Estonia sank with the loss of 852 lives in September 1994 and the Joint Accident Investigating Committee concluded that the failure of the visor and the bow ramp were to blame for the casualty. To this day these findings have been hotly contested.

Key elements of the Final Report of the Joint Accident Investigation Committee (JAIC) into the sinking of *Estonia* have been called into question by Margus Kurm, the Estonian chief state prosecutor, who believes that the Final Report is "not convincing".

He is critical that essential evidence failed to be gathered and that theses were proffered, but not tested scientifically. In short Mr Kurm says: "The Final Report cannot be defended in all respects, because it contains contradictions and unanswered questions".

The major questions for Mr Kurm are clear; he needs to know if it is a fact that a ro-ro ship that is listing at 40degs will capsize? If this same vessel's hull is intact with no water below the waterline would the ship turn upright in seconds? Lastly if this ship did capsize is it a fact that it could not sink within 10 minutes?

"If these are really scientific facts, based on today's best knowledge, *Estonia* could not have sunk in the way the JAIC describes it in the Final Report. And if we want to know how the ship sank, we should start from determining whether the bottom of the ship is intact or not," said Mr Kurm.

In such circumstances the families of the victims must be considered and if they still wish to find closure through knowing why this ship was lost then there should be no question that further free and open discussions with all the available evidence should be a matter of course. There is no question about it.

However, there are other considerations namely that future vessel designers must make ships safer in order that further loss of life can be prevented and to do this lessons from past catastrophes must be learned. If through obfuscation certain authorities seek to muddle the issues and obscure the facts for their own, unknown, purposes pressure must be brought to bear on these authorities to make them alter course.

Essentially the initial question must be, is there enough evidence to create uncertainty in the JAIC's version of events. Certainly there appears to be ample uncertainty as is so ably demonstrated by the lawyer Margus Kurm as well as the naval architects Anders Fisher and Anders Björkman.

If, however, the JAIC's version of events prove to be the correct scenario and the vessel did capsize and sink following the flooding of its car deck and the free surface effect of the water that had flowed onto the ship. One then has to question whether the SOLAS 2009 regulation that can allow long low holds to be built into new designs should be reappraised?

Certainly the authorities within the European Union are sufficiently concerned about long low holds that they have maintained the regulations developed following the loss of *Estonia*, the so-called Stockholm Agreement, that was designed to improve the safety of ro-ro vessels and was to be replaced by SOLAS 2009, rather than the two regulations operating concurrently.

So the question remains are the probabilistic rules enshrined in SOLAS 2009 safe? Unfortunately the answer appears to be yes until there is an accident that proves otherwise. Yet this is not the way that most designers and naval architects want to operate. Ships must be seen to be the safest that they can be when they set sail and if that means analysing the past disasters then so be it?

The time to act is now not after the next disaster, there have already been too many accidents, with too many lives lost with the loss of *Herald of Free Enterprise, Express Samina* and *Estonia* in a 13-year period. The total loss of life was 1127 people and the significant contributing factor for these losses was the lack of stability following the accident.

In the case of the *Express Samina* it was found that the vessel would not have sunk if nine of the 11 watertight doors had been closed as was required by regulation. *Herald of Free Enterprise* capsized after taking on water, through its open ramp as the master attempted to speed operations.

Given that operational errors are likely to happen it is important that the design of the vessel is sufficiently robust to allow passengers and crew enough time to escape a stricken ship. Do the new rules allow that? Like the sinking of *Estonia* it remains uncertain, but it is an unknown to which a solution can and should be found, before the next disaster. *NA*

LNG

DSME launches GTT competitor

GTT chairman and CEO Phillipe Bertorottiere said that his company welcomes the competition that will come from the development of the ACT-IB (Aluminium Cargo Tank – Independent type B) LNG cargo containment system by Daewoo Shipbuilding and Marine Engineering (DSME).

However, Mr Bertorottiere questioned whether the new technology would pose an immediate threat to the established systems produced by GTT. "It has a long way to go before it is established as proven technology, there is a big difference between the concept and the working and adapted investment," explained Mr Bertorottiere.

DSME announced that it had developed the world's largest independent-type LNG cargo containment system, which it says is essential for LNG carriers and LNG-FPSO (Floating, Production, Storage and Offloading) vessels.

According to DSME the new containment system has the largest storage capacity among the independent type containment systems. DSME will apply this technology to its LNG-FPSOs, which produce over two million tonnes of LNG annually.

This new system can contain a maximum of 210,000m^3 of LNG, three times more than a conventional containment system of about 80,000m^3 or 50% higher than 150,000m^3, which is an equivalent amount to that consumed daily in Korea.

DSME also said that the development of the its new system meant that "DSME no longer has to pay a technology royalty to French or Japanese LNG containment system patent holders." The company had complained that high royalty payments made the acquisition of LNG containment technology very costly. DSME said last year that it "no longer recommended" GTT's MKIII containment system as the secondary barrier was very weak and "owners were very worried" about the bonding on the system.

Dismissing these concerns Mr Bertorottiere said that this was "negative marketing". He said that DSME uses the No96 system and therefore it was being negative about the MKIII, however, Samsung heavy Industries uses the MKIII and they are happy with it, "there are no bonding problems". "I wish they would use positive marketing instead," said Mr Bertorottiere.

A cross section of DSME's LNG cargo containment system for use in floating storage and LNG tankers.

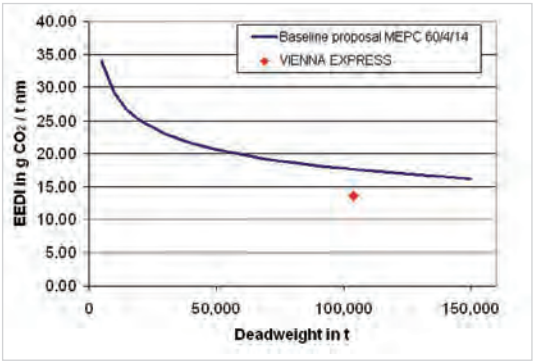
Environment

GL issues the first EEDI certificate

Germanischer Lloyd said it issued the first Energy Efficiency Design Index (EEDI) certification in June. The certificate was awarded to the Hapag Lloyd container ship, the 8749TEU *Vienna Express*.

The EEDI certificate was issued in accordance with the voluntary EEDI guidelines, MEPC.1/Circ.681 and 682 of the International Maritime Organization (IMO), said GL.

The EEDI value attained *Vienna Express* is significantly better than the present average score for vessels of a similar size (based on Lloyds database), underlining the high energy efficiency of the vessel's design, said GL.



Comparison of attained EEDI value of 8749TEU *Vienna Express* with proposed baseline of MEPC.

The IMO is looking to reduce emissions from shipping through EEDI which was conceived as a future mandatory newbuilding standard. The EEDI compares theoretical CO_2 emissions and transport work of a vessel (gCO_2/(t*nm)) and will eventually be benchmarked against an IMO-set requirement.

Verification of the EEDI value was conducted through the compilation of a technical file which summarised all the relevant technical data, and documents and the calculation procedure towards the final EEDI score. However, GL said: "Some issues in this context require more attention from the IMO and, therefore, identified items have been forwarded to the German flag state administration for possible consideration at future IMO meetings." GL did not elaborate on what these items might be.

A hard hat, a flashlight and
sound, professional judgement
will always form the bedrock of
effective classification services.

Setting the Standard for Service.

www.eagle.org

FOUNDED 1862
ABS
Setting Standards of Excellence

R&D

EC and BESST sign contract

The European Commission (EC) and the shipyard coordinator for the BESST (Breakthrough in European Ship and Shipbuilding Technologies) consortium signed the Grant Agreement in Brussels at the end of June.

EC funding for the BESST project will amount to €17.5million with the research programme having a total budget of €29million. According to the EC, "BESST aims to achieve a breakthrough in competitiveness, environmental friendliness and safety in European Union (EU) built ships with a focus on passenger ships, ferries and megayachts."

The primary goal of BESST is to increase the competitiveness of European built ships through decreased life cycle cost, drastically reduced environmental impact and continually improved safety. The estimated overall impact of BESST will result in a reduction of life cycle cost of roughly €120million/Panamax ship and a reduction of CO_2 emissions by approximately 12 % per ship each year.

The key areas of technical developments include Space Optimisation and Easy Maintenance, Improving Payload to Gross Tonnage Ratio, Cost Efficient Building and Refurbishment Processes, Improved Energy Efficiency and Reduced Emissions, Noise and Vibration, Improved Reliability through Model-Based Design and Condition Monitoring, Optimization of Logistic Chains and Improving Safety and Security.

Fincantieri will coordinate the yards, which include Meyer Werft, Thyssen Krupp, Damen Group, STX Finland and STX France. A further 56 groups will take part in the research programme, including five classification societies, 10 universities, 10 research centres and 17 technological partners composed of small to medium sized enterprises.

Classification

IACS sets up CSR advisory group

An external advisory group composed of selected industry representatives will be established by the International Association of Classification Societies (IACS) to aid in the harmonisation process of the common structural rules (CSR) for bulk carriers and tankers.

At 61st council meeting, which took place in late June at Germanischer Lloyd's head office in Hamburg, IACS members a review of the harmonisation process took place and a revision of the schedule for the project was agreed. Submission of the new rules for verification by the International Maritime Organization's (IMO) will now take place on 31 December 2013, which is the same date as the implementation of the IMO's Goal Based Standards.

June's council meeting was also the first for the latest full member of IACS, the Indian Register of Shipping (IRS). The IRS gained full membership on 22 June 2010 under the new membership criteria which established a single class of membership. This qualitative approach applies uniformly to applications for and continued membership of IACS. IRS fulfils the new requirements of a Quality System Certification Scheme (QSCS), which ensures safety and quality standards.

Newbuildings

GNMTC, STX France sign a new deal

Libya's state owned GNMTC has taken the first step to entering the cruise market when it signed a contract with STX France for the construction of a new cruise ship. This signature follows the letter of intent signed on 4 June 2010.

The 139,400dwt vessel will be 333m long, 38m wide and include 1739 passenger cabins with 732 crew cabins. Delivery is scheduled for December 2012.

GNMTC operates a fleet of 24 vessels specialised in the transport of crude oil, oil products and LPG, all over the world.

"We are proud to welcome this new client to our Saint-Nazaire shipyard and therefore contribute to the expansion of GNMTC activities," Jacques Hardelay, General Manager of STX France, said.

Meanwhile, and STX France delivered the cruise ship

Norwegian Epic leaving the STX France yard in Saint-Nazaire on 17 June 2010.

Norwegian Epic to its owner, Norwegian Cruise Line (NCL), in June.

The vessel was ordered in September 2006, and the construction of the vessel started at the end of 2007. *Norwegian Epic* is the largest ship built in Saint-Nazaire shipyard.

Key figures for *Norwegian Epic*

- Length : 330m
- Breadth : 41m
- Decks : 19
- Number of passenger cabins / passengers : 2114 / 5186 pax
- Number of crew cabins / crew members : 1404 / 1730 crew
- People onboard max. : 6430
- Propulsion : Diesel / Electric
- Total propulsive power: 2 x 24MW - 137 revs/ min. about on 2 shaftlines
- Classification : DET NORSKE VERITAS
- Flag : Bahamas

Newbuildings

AET orders SHI Suezmaxes

AET has signed a contract with Korea's Samsung Heavy Industries for the construction of four 158,500dwt Suezmax tankers. The vessels will be delivered between April and October 2012.

These ships will be the first Suezmax vessels in the company's fleet to be owned AET.

Construction work will be carried out at Samsung's Geoje shipyard, but the signing ceremony took place at AET's headquarters in Kuala Lumpur.

AET President & CEO Hor Weng Yew said: "AET will continue to invest in its fleet of large tankers – including Suezmax and VLCCs – as well as continued rejuvenation and expansion of its Aframax tanker and clean product tanker fleet over the coming years."

According to the Malaysian company this latest order means the company has a total 17 ships in its orderbook, which also includes 10 Aframax tankers and three product tankers.

The ships will be used on the trades from the Middle East and West Africa to Asia said AET.

From Left: HY Lee, Chief Marketing Officer, SHI; IS Roh, CEO, SHI; Datuk Nasarudin bin Mohd Idris, President & CEO of MISC and Deputy Chairman of AET; Hor Weng yew, President & CEO of AET; John Baptist, VP Global Commercial Projects and S&P, AET, signing the suezmax contract in June.

TECHNICAL PARTICULARS

hull nos 1965 to 1969

Capacity:	158,500 dwt
LOA:	approx 274 m
Breadth (moulded):	48 m
Depth (moulded):	23.2 m
Main engine:	MAN B&W 6S70MC-C8

Engines

Wärtsilä in 80-unit overdrive

An order in excess of €23million to supply 80 main engines for bunkering tankers is cited by Wärtsilä as one of its largest ever orders. Some 40 new tankers for Hong Kong listed Brightoil Petroleum Group (BPG) will be built, with a contract signed for the first 10 at Zhejiang, China for delivery by June 2012.

The tankers will come in two sizes, 4100dwt and 7000dwt and both designs have the same power configuration with a twin-screw propulsion set up driven by Wärtsilä 20 engines. Some of the vessels will operate in Chinese waters and will be classified by the China Classification Society and the remainder will trade internationally Bureau Veritas classification.

The 40 tankers will each be powered by two 6-cylinder in-line Wärtsilä 20 medium-speed engines. Delivery of the first 10 engines is scheduled to take place between December 2010 and June 2011. Wärtsilä has also signed an eight-year spare parts and technical services agreement with BPG for all 80 engines.

Key to the choice of engine was the Wärtsilä 20's maintenance-friendly design with overhaul intervals of up to 24,000 hours which has made the engine type a popular choice with some 2000 units installed worldwide.

"Wärtsilä has a fine reputation for both quality and reliability, and is able to support its customers and ship power solutions with a truly global service network. We are, therefore, very pleased to co-operate with Wärtsilä

MACGREGOR

Committed to clean seas

Cargotec aims to be a market leader in energy-efficient products within its field. We are present in all stages of global cargo handling and develop environmentally-advanced cargo handling solutions that meet customer needs – such as our electric drive technology and totally-enclosed conveyor systems.

We are committed to operating in a responsible manner and taking environmental considerations into account.

Cargotec *improves the efficiency of cargo flows on land and at sea – wherever cargo is on the move. Cargotec's daughter brands, Hiab, Kalmar and MacGregor are recognised leaders in cargo and load handling solutions around the world.*

www.cargotec.com ▪ www.macgregor-group.com

in this major project," said Mr. Tan Bo, Vice President of BPG.

Engines

Wärtsilä's cell mates go green

Wallenius Lines has installed a Wärtsilä WFC20 fuel cell unit aboard the *Undine*, a car carrier, that will provide 20kW of auxiliary power.

The solid oxide fuel cell technology (SOFC) is powered by methanol which can be produced from natural gas, or from renewable raw materials such as biomass that has been broken down through a gasification process. Methanol is a commonly used liquid in the oil and process industries, and is available in all major harbours.

This SOFC power unit is the first of its kind in the world, and will during the test period provide auxiliary power to the vessel while producing close to zero emissions. "This project is an important step towards more environmentally sound shipping," said a company statement.

Installation SOFC aboard the *Undine* is the result of a joint project by the international METHAPU consortium which counts among its members Wärtsilä, Wallenius Marine, Lloyd's Register, Det Norske Veritas, and the University of Genoa, each of whom is globally active in the field of fuel cell system integration, sustainable shipping, classification work or environmental assessment. The project has been funded by the European Union to the tune of €1million and is part of the European Community Framework Programme (FP6).

The principal aim of the METHAPU project has been to validate and demonstrate new technologies for global shipping that can reduce the environmental impact of vessels. In addition, a further major aim is to establish the necessary international regulations for the use of methanol onboard commercial vessels, and to allow the use of methanol as a marine fuel.

The Undine, with the Wärtsilä FC20 unit installed, sailed from Bremerhaven in May and from there it headed for the USA, via Sweden and the UK. The validation process carried out at sea will provide valuable information for the future development of this technology for marine applications.

Environment

Collaborate to innovate

In their efforts to reduce the impact of shipping on the environment, NYK and AP Moller-Maersk have agreed to share ideas on emission-reduction technologies and initiatives. In exchanging knowledge in these areas the companies aim to enable more cost-effective solutions and more efficient implementation of measures required to reduce CO_2, NOx and SOx emissions and other technologies and substances that impact the environment. To provide a classification society perspective and competence on technology solutions and risk management, Det Norske Veritas (DNV) will be part of the knowledge-sharing process.

The companies will exchange ideas mainly in the following areas:

1. Energy-efficient technologies, including waste-heat recovery and air lubrication
2. Emission-abatement technologies including emission-cleaning systems, systems for operations using low-sulphur fuel, and systems for ballast-water treatment.
3. Alternative fuel, including LNG and fuel cells, as a replacement for heavy fuel oil.
4. Vessel-operation measures, including super-slow-steaming operations, to reduce air emissions and increase fuel efficiency.

In addition to the above, technological exchanges among the companies will be promoted in a number of other fields.

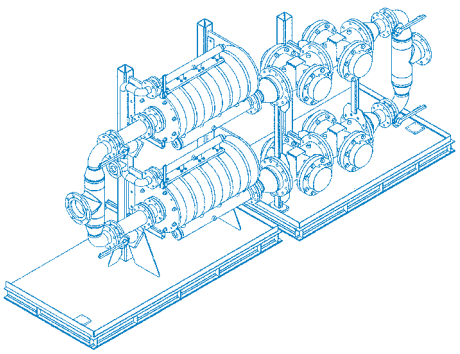
Wärtsilä's fuel cell unit WFC20 started its journey in Espoo, Finland and it was installed onboard Wallenius Lines' car carrier *Undine* in May.

SEDINOX®

Did you know... separating sediment using no moving parts technology, means minimal crew intervention, spare parts and consumables?

40
30
20
10
0
MOVING PARTS

SEPARATION LEVEL	POTENTIAL FUEL COST SAVINGS	TREATMENT OCCURS	DISINFECTION RATE
60 MICRON 50 MICRON 40 MICRON 30 MICRON 20 MICRON	3%	1	99.9%



Hamworthy's SEDINOX® ballast water management system.
The more we reduce, the more it adds up.

With our new SEDINOX® ballast water management system, less is definitely more. With no moving parts, there's less need for maintenance, reducing costs and man hours. And because all particles down to 20 micron are removed, power requirements for treatment is at a minimum – meaning lower fuel bills.

Who would have thought reducing could give you more? But that's Hamworthy know-how for you.

ballastwater@hamworthy.com
www.hamworthy.com/ballast_water_management

Hamworthy

Ancillary equipment

Quattrojet

UK-based ESAB has introduced its latest in cutting systems' the Quattrojet oxy-fuel flame cutting system that ESAB has said will give the welder enhanced levels of productivity and performance.

The Quattrojet is available for use with propane and natural gas and is capable of cutting metals from 3 - 300mm thick, Quattrojet incorporates a number of features including integrated height sensor and flame monitor, integrated ignition system and a quick change cutting nozzle. Together these features are a further step towards full cutting automation as well as ensuring a safer cutting environment.

Quattrojet requires no separate height sensor to ensure the correct distance between the cutting nozzle and the surface of the metal and the design means that there are no unnecessary components around the cutting torch and nozzle. The result is much lower maintenance and spare parts are needed.

The flame monitoring feature ensures that the Quattrojet torch recognises every break in the cutting operation, including possible malfunctions on the cutting tool or faults in the material. This prevents cutting errors as well as uncontrolled leakages and losses of cutting gas which could otherwise result in a fire.

The fully integrated automatic internal ignition system means that a conventional external ignition device is unnecessary and results in a compact design for the torch unit.

The quick change of nozzles can be carried out without tools, resulting in far shorter set up times and no accidental change in the position of the torch.

Quattrojet, with its slim and compact design is consistently geared towards smooth operation and high performance oxy-fuel cutting. For multi - torch operation, it also allows smaller spaces between the individual torches than conventional models.

Contact ESAB, Hanover House, Queensgate, Britannia Road,Waltham Cross, Hertfordshire, EN8 7TF, UK.
Tel +44 (0) 1992 768515
www.esab.com

ESAB's latest welding solution Quattrojet.

Bridge systems

Transas' simulation experience

Transas Marine has been awarded the contract for two simulation systems that will be delivered and installed onboard two ships operated and owned by shipping company Intership Navigation Co. Ltd. (ISN).

The "K Class" Capesize Bulk Carriers *Lancelot* and *Percival* with a capacity of 178.000dwt each are currently being built at New Times Shipyard in Jing Jiang, China. The Transas scope of supply comprises the software for an Engine Room Simulator (ERS 4000) and the software plus dedicated hardware for a Navi-Trainer Professional 5000 ship handling simulator.

The training systems onboard real ships will enable underway training connected with nautical / marine engineering work in the mariners' professional environment.

Lancelot will be used as a platform for nautical training onboard the vessel. Besides the real wheelhouse there will be a dedicated room one deck below the bridge which, will be equipped with a Transas NTPro 5000 ship handling simulator and is intended for training officer cadets. This 'secondary' bridge comprises the instructor station and one own ship bridge in a dedicated manoeuvring console.

Percival will be used as a platform for marine engineering training and is equipped with a Transas Engine Room Simulator (ERS 4000) with one instructor station and six interconnected trainee workplaces. Two different vessels from the ERS 4000 ship model library are licensed in the training facility. The classroom will also be integrated into the ship's deck house, the standard PC hardware will be supplied by the contractor.

Contact Transas Marine, Luruper Chaussee 125, Hamburg 22761, Germany.
Tel +49 40 890 66 60
Fax +49 40 881 13 79
E-mail info@transas.de
www.transas.com

Engines

Trelleborg mounts for Seasall diesels

The latest Seasall marine engines developed from Hyundai's automotive engines will use Cushyfloat elastomeric engine mounts from Trelleborg Industrial AVS as standard throughout its range.

The two basic engine types in the range: the 125kW D170 series, which is developed from Hyundai's 2.2 litre in-line four-cylinder, common rail diesel and the 176kW S240 series, developed from Hyundai's V6 with piezo-controlled common rail injection. Both the D170 series and the larger engines are available in sterndriver, inboard and waterjet versions, all with a Cushyfloat four point mounting system.

The Cushyfloat design is a robust, low-profile rubber/metal assembly, specially developed for reliable, long-life operation in harsh marine environments.

In addition to suppressing vibration, they also reduce structure-borne noise, so improving comfort on board. Minimising combustion noise and vibration is one of the main features of the Seasall range and has been a priority for the company's engineers. The Trelleborg engine mounts are equipped with a compact height adjuster allowing the installation to be adjusted at both front and rear.

Contact Trelleborg AB, P.O. Box 153, 231 22 Trelleborg, Sweden.
Tel +46 410 670 00
Fax +46 410 427 63
www.trelleborg.com

The Cushyfloat from Trelleborg dampen vibrations from engines.

Propulsion

Wärtsilä Energopac cuts costs

Wärtsilä Energopac has recently shown in testing its ability to cut cost in fuel saving for the ship owner. Energopac is an integrated propeller and rudder design that effectively reduces flow separation behind the propeller hub, and thereby reducing frictional drag while preserving course-keeping capabilities.

Recent trials carried out in cooperation with the Spliethoff Group has shown that the Wärtsilä Energopac solution delivers significant reductions in fuel costs. The trials involved eight 17,700dwt vessels, six of which were fitted with standard rudders and two with Energopac. The trials have shown that the Energopac solution saves close to 4% power in design condition. This represents annual fuel cost savings of more than US$ 120,000 (at fuel prices in July 2010).

"After six months of operation, it has been shown that the reality confirms the theory," said Frank Louwers, director at Spliethoff. "This facilitated our decision to install the Energopac propulsion solution on the next series of another five vessels."

In addition to the Energopac systems already delivered, another 20 Energopac systems have been ordered and will be delivered in 2010 and 2011. Reductions in fuel consumption depend on the

Wärtsilä's Energopac is an integrated propeller and rudder design. Energopac solution delivers significant reductions in fuel costs.

inmarsat

The mobile satellite company™

That's over 10,000 vessels and growing - all benefiting from real-time chart and weather updates, more fuel-efficient routes, improved crew communications and increased productivity. Delivered by FleetBroadband. Contact your Inmarsat service provider or visit us online to find out more.

See us at SMM, Hamburg, stand 111, hall B6

FleetBroadband
With a portfolio of terminals for every size and type of vessel, FleetBroadband delivers cost-effective, always-available voice, email and high-speed data connectivity on all the world's oceans. It's our fastest growing maritime service ever.

inmarsat.com/merchant

vessel type, its operational profile and also on the reference propeller and rudder. The performance improvements determined through computational fluid dynamics (CFD) calculations and/or model tests indicate power reduction values ranging from a minimum of 2% to a maximum of 9%.

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

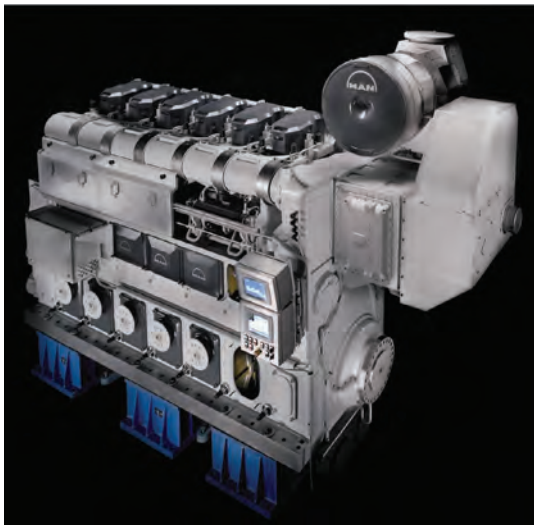
Engines

Bergen goes with MAN power

MAN Diesel & Turbo has recently signed a supply contract with Norwegian shipbuilder, Bergen Group Fosen, in Rissa, Norway. Under the terms of the deal, MAN Diesel & Turbo will supply eight state-of-the-art, common-rail-based 10L32/44CR main engines, along with six L21/31 auxiliary generating-sets and four RENK gearboxes for two ferries to be operated by Fjord Line Danmark A/S, the Danish subsidiary of the Norwegian ferry company. The main engines could optionally be retrofitted to a dual-fuel (DF) version, once the development of the DF type has been completed.

Fjord Line reached an agreement earlier this year with Bergen Group Fosen for the construction of two modern cruise-ferries. Both ferries will have the capacity to carry up to 1500 passengers and 600 vehicles, and will offer daily sailings on services between Norway and Denmark. The vessels will sail under Danish flag.

The MAN 6L32/44CR engine.



Bergen Group Fosen chose the well-proven MAN 32/44 common-rail engines on account of their fuel-efficiency and minimal emissions. The two vessels are due for delivery to Fjord Line in 2012. Hulls will be constructed by Bergen Group's Polish partner, Stocznia Gdansk, while final completion, assembly and interior work will be carried out by Bergen Group Fosen.

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

Lifesaving

Design-your-own lifejackets

Viking Life-Saving Equipment has launched a new product appealing to the offshore and commercial shipping industries: design-your-own inflatable SOLAS lifejackets.

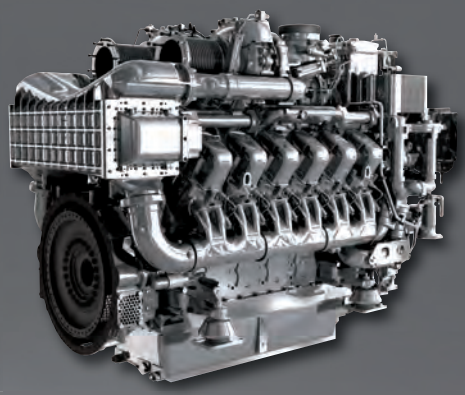
Customers will now be able to tailor their own solutions for specific working conditions such as those encountered in maritime environments as well as offshore wind power, offshore welding and industrial conditions.

The company offers a variety options including a choice of 180 Newton or 275 Newton buoyancy for those carrying extra weight, e.g. as with tool belts. There's a choice of three different closure (buckle) types, including an optional integrated harness for offshore wind industry workers. As well as cover materials ranging from durable Cordura, wipe clean covers and even aluminium covers for welders or fire situations. A host of accessories and colours are also possible. All combinations are SOLAS approved, so no matter how the lifejacket is designed, it will fulfill the existing and future SOLAS requirements described in MSC-200(81).

Viking, CEO, Henrik Uhd Christensen says the new lifejackets are just part of the company's drive to provide flexible and fast solutions to a changing market. "We've always offered a choice of models and styles, but if our customers wanted to change any detail of the standard specification it would take a while to get the approvals through. Now, an offshore welder can quickly and easily specify a spark-resistant aluminium covering with a host of personal features, while someone else working in an oily or greasy production area of a platform may prefer some of the same features with a wipe clean cover."

I'M ONE OF THE IRONMEN.

"When we choose our engines, we don't just take performance into account. It's just as important to have a clean engine. In our role we are also required to operate in an environmentally friendly way, and the MTU engine allows us to do this. It even already satisfies the future, stringent requirements for exhaust emissions."



Werner Kallweit,
Deputy manager of the technical department, B. Dettmer Reederei, Bremen

IRONMEN: BUILT TOUGH TO TAKE IT.

MTU SERIES 4000 WORKBOAT EDITION

www.mtu-ironmen.com

Power. Passion. Partnership.

Contact Viking Life-Saving Equipment A/S, Saedding Ringvej 13, 6710 Esbjerg V, Denmark.
Tel +45 76 11 81 00
Fax +45 76 11 81 01
E-mail VIKING@VIKING-life.com
www.viking-life.com

Ship safety

WSS announces test stations

Wilhelmsen Ships Service (WSS) is launching a new initiative to assist its tanker operator customers in adapting to new regulations regarding the testing and supplying of fire-fighting foam. The initiative, in which WSS has set up a network of testing stations, follows the International Maritime Organization's (IMO) revised requirements for testing protein-based, alcohol-resistant (PB AR) foam concentrates.

"It is important that ship operators do not compromise the safety of their ships in case of a fire on deck," explains Katja Eriksen, marketing manager at Wilhelmsen Ships Service. "We are offering free advice on foam concentrates to ensure that our customers' fire protection continues to be fully effective." She adds: "Customers can land their foam samples in a port of their choice to be tested by Wilhelmsen Ships Service in accordance with the new MSC 1./Circ.1312."

Martin van der End, product marketing manager for Fire & Safety Products explained further. "It was found that older types of PB AR foam concentrates may not be compatible with a number of chemicals (polar solvents) and may fail to extinguish a fire in an emergency. The new test standard combines the traditional test standards MSC/Circ.582 and MSC/Circ.799 in one standard, amends the requirements for the stability test on acetone and adds a small scale fire test for PB AR foam concentrates, which actually makes the difference in comparison to the traditional test standards that are being superseded by the MSC 1./Circ.1312."

It is anticipated that many, if not all, of the PB AR foam concentrates presently in use onboard ships could fail to pass if tested in accordance with the new test standard and will therefore have to be replaced.

Contact Wilhelmsen Ships Service, PO Box 33, N-1324 Lysaker, Norway.
Tel +47 67584550
Fax +47 67584570
www.wilhelmsen.com

Ancillary equipment

Flensburger to fit Hyde Guardian

German Shipyard, Flensburger Schiffbau Gesellschaft, is building two 195m ro-ro ships to Lloyds Register Ice Class and "Green Passport" notation for Rettig Group Ltd. Bore of Finland. The two ships, to be delivered in May and August of 2011 will be fitted with Hyde Guardian Ballast Water Treatment Systems as specified by the owner. Each Guardian system will have a capacity of 700m^3/hr.

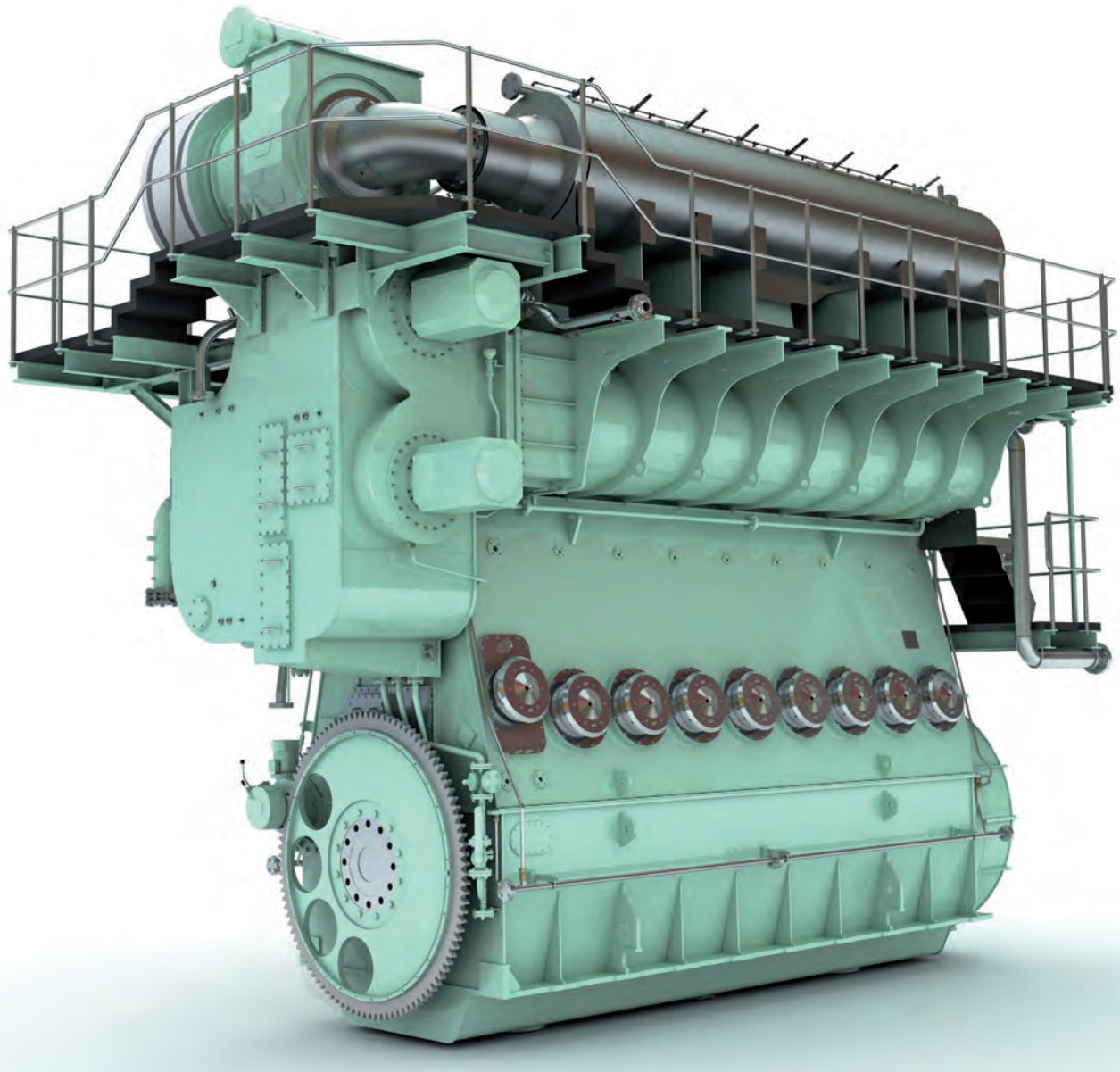
Bore's early adoption of the Ballast Water Management Convention's (BWMC) requirements, vice president marine operations, Mr. Jorgen Mansnerus, stated: "Rettig Group Ltd Bore is committed to operate its vessels in an environmentally friendly, sustainable and economical way. We are constantly looking to improve our ship operations and minimise our environmental footprint - keeping in mind the requirements of ISO 14001. We have been following the ratification process of the IMO BWM Convention – which is expected to enter into force in early 2012."

Mr. Mansnerus continued "As a company currently involved in a fleet renewal program, we had already identified in 2008 the need to start adopting the requirements of the BWMC. We screened the market for available and type approved technologies and finally decided to fit the Hyde BWMS – as the system had proven reliability and uses no chemicals, which Rettig Group Ltd Bore is trying to minimise in its ship operations. The Hyde Guardian also offered us a safe technology and low power demand, which are important features for us. Today's ships are full of complex equipment and systems that we all know require the attention of the operating crew including regular maintenance. We

Flensburger signs up to hyde systems onboard two ro-ro's.

MAN B&W MC-C9 Engines

optimised for short sea and coastal operation



MAN B&W MC/MC-C Engines MAN B&W ME/ME-C/ME-B Engines MAN B&W ME-GI/ME-C-GI/ME-B-GI Engines

The world's most versatile two-stroke engine programme has been further extended with new small bore MC-C9 designs. Our new low speed 35- and 40-cm bore engines are targeted to vessels designed for short sea and coastal operation. Great manoeuvrability, flexibility and unsurpassed operating economy – delivered by compact and reliable MAN B&W engine technology. Consider a C9! Find out more at www.mandieselturbo.com

Engineering the Future – since 1758.

MAN Diesel & Turbo

wanted to have a simple and fully automatic BWM system that requires minimum maintenance and little training of the operator."

Contact Hyde Marine Inc. 2000 McLaren Woods Drive, Pittsburgh, Pennsylvania 15108, USA.
Tel +1 800/422-7266
Fax +1 440/871-8104
E-mail sales@hydemarine.com
www.hydemarine.com

CAD/CAM

NAPA gets onboard with BAS

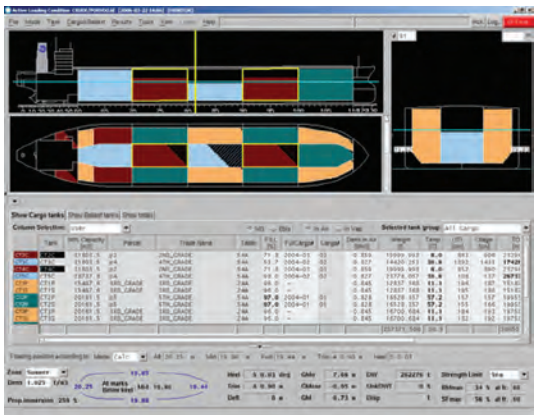
Onboard-Napa Ltd has signed an agreement on cooperation with BAS Engineering AS earlier this year. This agreement will enable Onboard-Napa to increase the company's support to ship designers in Norway, and answers the growing development demands of the offshore industry.

"Onboard-Napa's software businesses with their focus on efficiency and safety have tremendous scope for growth," says Sebastian Sjöberg, Area Sales Manager at Onboard-Napa. "We have strengthened our market approach by cooperating with BAS. This provides flexibility and allows us to implement Onboard-NAPA solutions and processes to increase our market share. And, importantly, we have an excellent opportunity to provide even better service for our customers, locally."

"BAS has extensive experience in developing tailor-made applications for NAPA - macros, widgets and managers. We also do programming with the NAPA API. BAS has developed applications for the majority of NAPA users in Norway, and we have also carried out software development related to the NAPA Manager for Napa Ltd in Finland," says Runar Aasen, Head of Customer Relations at BAS. "Our experience and knowledge of engineering give excellent support for Onboard-Napa's business expansion".

Onboard-Napa will further expand its presence on the market and will respond better to demands for software solutions increasing the safety of ship operations. BAS will be able to provide Onboard-NAPA software engineering as well as education and services for users of the NAPA and Onboard-NAPA solutions.

Contact Onboard Napa, PO Box 470, FI-00181 Helsinki, Finland.
Tel +358 9 22 813 1
Fax +358 9 22 813 600



BAS Engineering has signed agreement to get onboard Napa.

E-mail obnapa.service @ napa.fi
www.napa.fi

Communications

Siemens equips heavy-lift carrier

Siemens Industry Solutions has received an order from Zhejiang Shara-Ever Business Co. Ltd. to supply the electrical propulsion equipment for a semi-submersible heavy-lift carrier with a loading capacity of 38,000dwt. This includes the diesel-electric propulsion package for medium voltage and low voltage drives as well as the power management and automation systems. The order is worth several million Euros. The vessel will be built at the Chinese shipyard Zhejiang Bandao Shipbuilding Co., Ltd., Zhoushan, and is due to enter service at the end of 2011.

Siemens is supplying three 5400kVA generators for the onboard power supply, the switchgear and power management system for the vessel's MV distribution. The scope of supply includes the MV main thruster transformers, the frequency converters and the motors, as well as the LV tunnel thruster transformers along with the associated frequency converters and motors. Siship IMAC, the ship's automation system, will perform monitoring, alarm and control functions for the electrical equipment onboard.

Siemens is also responsible for project management, engineering and commissioning of the entire electrical equipment. All systems and components used are part of the "Siship" solution platform from Siemens.

Contact Siemens AG, Marine Solutions, Lindenplatz 2, 20099 Hamburg, Germany.

At Rolls-Royce we are working closely with our customers to develop innovative, value adding solutions that will fully meet their future requirements. To perfect our leading-edge technologies we are using the most advanced facilities and making substantial investments in research and development. By doing this, we are providing our customers with new products, integrated systems and services that will enable them to realise the immense benefits of improved performance and optimised through-life costs. Rolls-Royce, delivering total satisfaction today and thinking ahead to deliver intelligent marine solutions for tomorrow.

Trusted to deliver excellence

www.rolls-royce.com

Rolls-Royce

Tel +49 (40) 2889 2700
Fax +49 (40) 2889 3680
www.industrysolutions.siemen.com

Ancillary equipment

Odfjell Group adds AWT

Applied Weather Technology, Inc. (AWT) has announced that the Odfjell Group recently selected AWT's routing services and onboard voyage optimisation system to help Odfjell enhance safety and efficiency, as well as reduce fuel consumption, costs and carbon emissions.

During the first 90 days of implementing AWT's optimum ship routing services onboard approximately 65 tankers, Odfjell has had said that it has seen a benefit with a number of vessels steering clear of severe storms, potentially preventing significant ship damage and/or crew injury. AWT was able to show time savings of 30 sailing days and a reduction of approximately 1000tonnes of fuel oil in this 90-day period. This equates to fuel savings of US$475,000 and a reduction in carbon emissions of 3000tonnes. As the period in question did not involve the entire fleet, savings are expected to increase in the future.

Contact AWT Worldwide, 140 Kifer Court, Sunnyvale, CA 94086, USA.
Tel +1 408 731 8600
Fax +1 408 731 8601
www.awtworldwide.com

Ancillary equipment

Navis launches AP4000 autopilot

Finnish-based Navis Engineering has announced the launch of its AP4000 autopilot (AP3000 in the previous generation), the JP4000 Joystick Control System/Autopilot (previously JP3000) and the NavDP4000 Series Dynamic Positioning System.

The AP4000 autopilot has undergone a substantial redesign. The front panel has been given a more modern outlook, materials and technology and a 6.5' high contrast and resolution colour display with the 150degs viewing angle. Besides, the level of front panel protection has been increased from IP44 up to IP67 which makes the AP4000 suitable for outdoor installations (at fly-bridge or port/starboard wings). The user-friendly GUI complies with all the industry ergonomic standards and is very easy to read and operate. Day and night colour palettes are available.

The software part of the autopilot has also been upgraded to include the functionality of network control transfer between up to five network connected control panels. To facilitate the fine-tuning of the autopilot performance, only one parameter, Sensitivity, is used, which allows for covering all the known yawing, steering and counter rudder settings of the autopilots of other brands.

Adding to the AP4000 it has a built-in Heading Monitor System (HMS) functionality which makes it possible to constantly receive and monitor the data coming from two heading data sources (Gyro+Gyro, Gyro+Magn.Compass, Gyro+Fluxgate etc.). Also a further three more control modes have been added.

The AP3000 autopilot, the predecessor of the AP4000 has had the DNV MED-B and MED-D "Wheelmark" type-approval examination. It has also been certified as a Track Control System of the "C" category. Full certification of the AP4000 is expected to be finished by the end of the year.

Contact Navis Engineering Oy, Tuupakantie 3 A, 01740 Vantaa, Finland.
Tel +358 (0)9 2509011
Fax +358 (0)9 2509012
E-mail headoffice@navisincontrol.com
www.navisincontrol.com

Navis Engineering lauches AP4000.

IT'S YOUR CHOICE


DISPOSAL


FINES


JAIL


BANNED

Continue to leak stern tube oil and risk heavy pollution fines and bad publicity,

OR

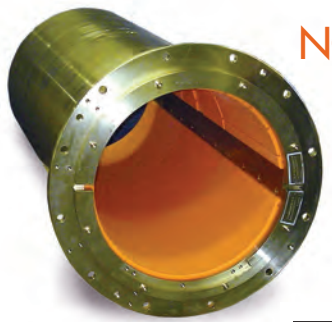
get top performance and reduced operating costs by eliminating stern tube oil leaks forever.

Environmental legislation is getting tougher. And even well maintained ships leak stern tube oil – a serious environmental issue facing commercial ship owners today.

The simplest way to eliminate oil from the stern tube is to use seawater as the lubrication method and Thordon non-metallic bearings. This pollution-free, high performance, low maintenance bearing system is used on cruise ships, bulk carriers, tankers, ferries, AHTS's, dry cargo and tugs – operating around the world with excellent results.

Ship owners using Thordon´s COMPAC system enjoy significant savings and other benefits:

- Reduced operating costs (no AFT seal)
- Seawater-lubricated shaft lines are virtually maintenance-free
- Longer time intervals between required seal maintenance
- Proven performance and reliability
- Fitting and monitoring methods to meet Class Society approvals
- No pollution fines resulting from stern tube oil leakage



NOW IS THE TIME for Thordon´s COMPAC Seawater Lubricated Propeller Shaft Bearing System. It's the right choice and a smart investment.

15 YEAR BEARING GUARANTEE

*Certain conditions may apply. Please contact Thordon Bearings Inc. for further information.

THORDON

THORDON BEARINGS INC.

For more information or references, call us at +1.905.335.1440 or visit www.ThordonBearings.com

Key *Estonia* questions

Margus Kurm Estonia's Chief State Prosecutor and chairman of the committee of experts reporting on the *Estonia* investigation believes that the official report was "unsatisfactory". Has the time come to look again at the Europe's worst ferry accident, the *Estonia* disaster?

Speaking in Scotland, on 14 May 2007 Margus Kurm gave the strongest indication yet that the events of 27/28 September 1994 must be re-visited. His view carries significant weight as the man charged with producing the Estonian Government's report.

Mr Kurm stressed that his report was an investigation of the JAIC report and on the evidence gathered by that original enquiry. No further evidence was gathered.

However, the committee's view on the original JAIC report is far from encouraging. Discussing the question; "What was the basis for the statement by JAIC that the ramp had opened completely, the JAIC falls short."

According to JAIC the visor fell into the water and in so doing the ramp was pulled open allowing the ingress of water at a rate of about 300-600tonnes/minute. The ship then heeled in a matter of minutes. Later the ramp was forced closed by the wave motion and it remains closed position at the bottom of the sea.

Mr Kurm said: "This scenario is possible only if we consider the testimony of the three crew members (Margus Treu, hannes Kadak and Henrik Sillaste) to be wrong. I do not say that we cannot do that. We can – but in that case there should be other evidence, stronger evidence that outweighs their statements."

"My question is, do we have such evidence? The only explanation given for the immediate opening of the ramp is the fact that the upper part of the ramp extended into the visor. Consequently, when the visor fell right down, it had to pull the ramp open.It is not evidence, it is argumentation."

He went on to say: "In my profession, in a court trial, evidence cannot be refuted by argumentation, especially in a situation where additional evidence could have been gathered to establish the truth."

According to the Kurm Report there are three pieces of evidence that could, but have not been gathered that mayhave supported the JAIC's view. In the first instance a witness who saw the ramp fully open, but no such witness exists, or to test the behaviour of the visor and ramp through model tests, but no such tests have been made, says Mr Kurm to the best of his knowledge.

"Third, of course, it could have, and should have been established that the hull was intact. To show that there were simply no other possibilities for the water to come in. but, there is no film, log or other source of information that indicates that the bottom part of the hull has been investigated and filmed in the fullest possible extent. Neither has anybody confirmed to me that this has been done. Consequently, the hull is never thoroughly investigated, which is a problem, a great problem."

It is stated in the Final Report, section 12.6.1, that the flooding of the cardeck itself would not be sufficient to sink the vessel. "As long as the hull was intact and watertight below and above the cardeck, the residual stability with water on the cardeck would not have significantly changed at large heel angles. Capsize could only have been completed through water entering other areas of the vessel."

So the JAIC believes that the filling of the lower decks is of "decisive importance from the point of view of the sinking" said Mr Kurm. He added: We hoped to find in the final report or its annexes analyses and calculations on how water exactly flew, when the flooding of a certain compartment began, which amount of water was necessary to sink the ship etc. In the similar manner as there are calculations about the water inflow through the ramp opening as well as about other important circumstances like the stability of the ship, the strength of the visor locks etc."

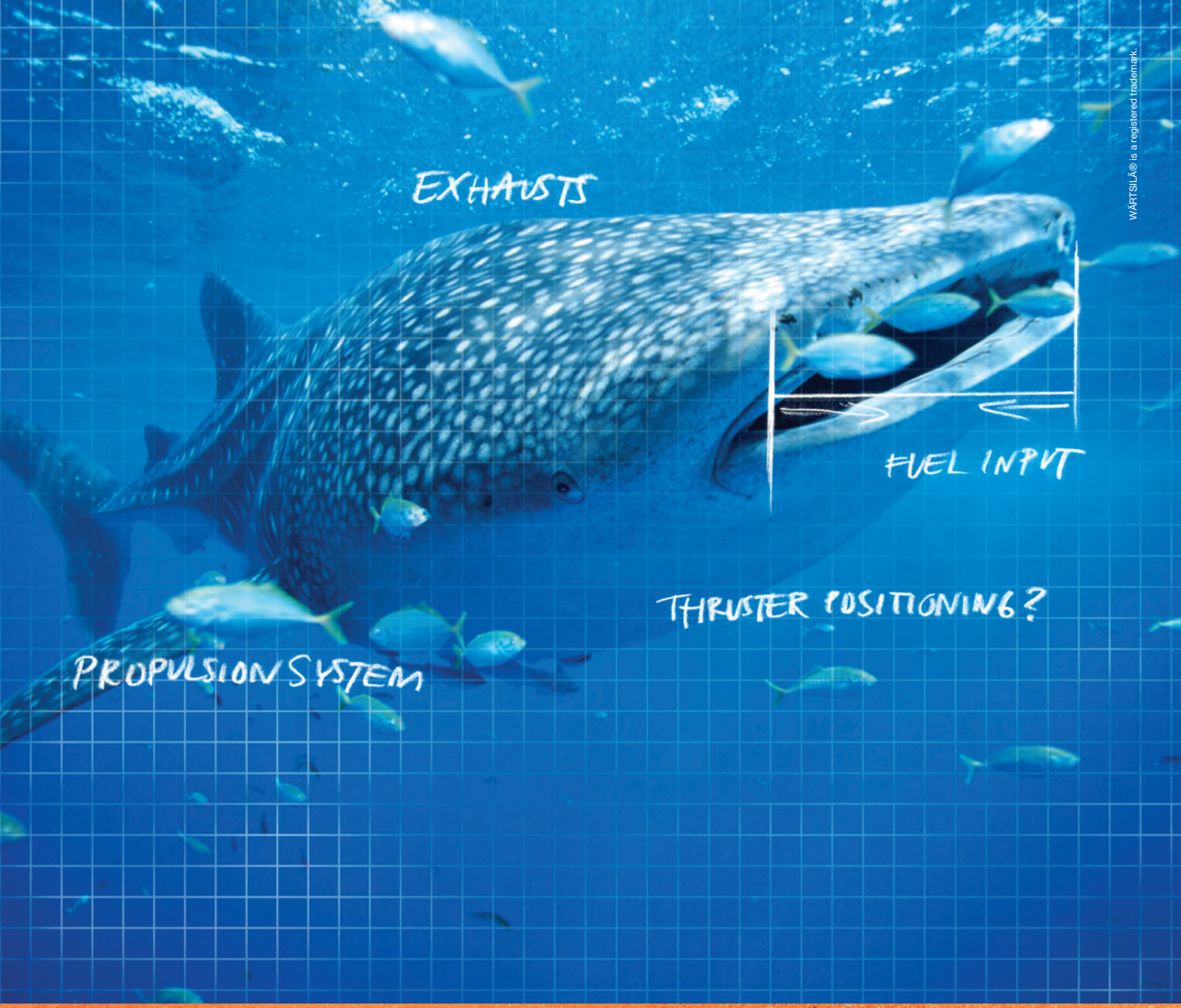
He continued: "Yet the Final Report does not contain any analysis of the flooding of the lower decks with water. In section 13.6, it is only stated that the watertight compartments below the cardeck were flooded from above, as there were connections between decks via staircases and other openings."

As a result Mr Kurm concludes: "I am not competent to argue what happens with a ship when water cannot get into compartments of the ship below the waterline. But when the investigators themselves write that in such a case a ship would not sink, I can only conclude that it is a very important issue. And if a very important issue has not been investigated, analysed or calculated, the report is not convincing."

Helpfully Margus Kurm summarises the three key questions and asks whether they are to be treated as facts, opinions or hypotheses.

1. A vessel cannot float on her side with a list of 40 degs without capsizing in a couple of minutes?
2. If the hull is intact and there is no water below the waterline, a capsized vessel would turn upright in seconds?
3. If a vessel capsizes, she cannot sink as quickly as in 10 minutes due to the air inside the bottom decks?

In the following stories we look at these questions in some depth and then look at the developments that have come about since *Estonia* was lost and debate whether this type of accident could still be a possibility on some newly designed ships. *NA*



SMALLER FUEL INTAKE, LESS EMISSIONS.

Wärtsilä now offers the marine industry total solutions that cover everything from design to lifecycle service. This makes our solutions uniquely efficient and environmentally sound. Read more about what we can do for you, wherever you are: wartsila.com.

ENERGY
ENVIRONMENT
ECONOMY

WARTSILA.COM

WÄRTSILÄ

Sinking of *Estonia*, an industry failure?

Have the lessons of the *Estonia* disaster, 16 years ago this month, been learnt? Controversial naval architect Anders Björkman believes that the industry has shirked its responsibility by failing to recognise some obvious clues, and therefore remedies, to the causes of the disaster.

Sixteen years after the capsize and sinking of *Estonia* in the Baltic in heavy weather, with the loss of 852 lives, the lessons that should be derived from this catastrophe are still contested by many in the industry who feel that the official version of events does not go far enough in explaining how the ship was lost.

Essentially the accident involving *Estonia* occurred at between midnight and 2am on the morning of the 28 September 1994 as the ship was making the crossing from Tallinn to Stockholm.

A storm was blowing, around 7-8 on the Beaufort scale with wave height at around 3-4m which was described in some reports as a normal autumn storm for the region. Official reports suggest that a failure of the bow visor caused the flooding of the car decks and the free surface effect capsized and sank the vessel within a very short period of time, less than one hour.

Many challenges to the official version have been made and some views are seen as unlikely while many others are open to interpretation. Anders Björkman's view as a naval architect gives an insight into what could be the causes of the continued and persistent speculation around the loss of *Estonia*.

In Mr Björkman's view the vessel was unseaworthy before it set sail because it contravened a number of regulations that should have seen the vessel prevented from operating.

However, the initial cause of the accident and the reason for the first sudden listing, more than 30deg at 01.02hrs according to a majority of the survivors, must have been a heavy leak below the waterline with a failure by the crew to take proper action, "except starting the bilge pumps". The leakage had apparently started at 00.50-00.55hrs, according to Mr Björkman's findings.

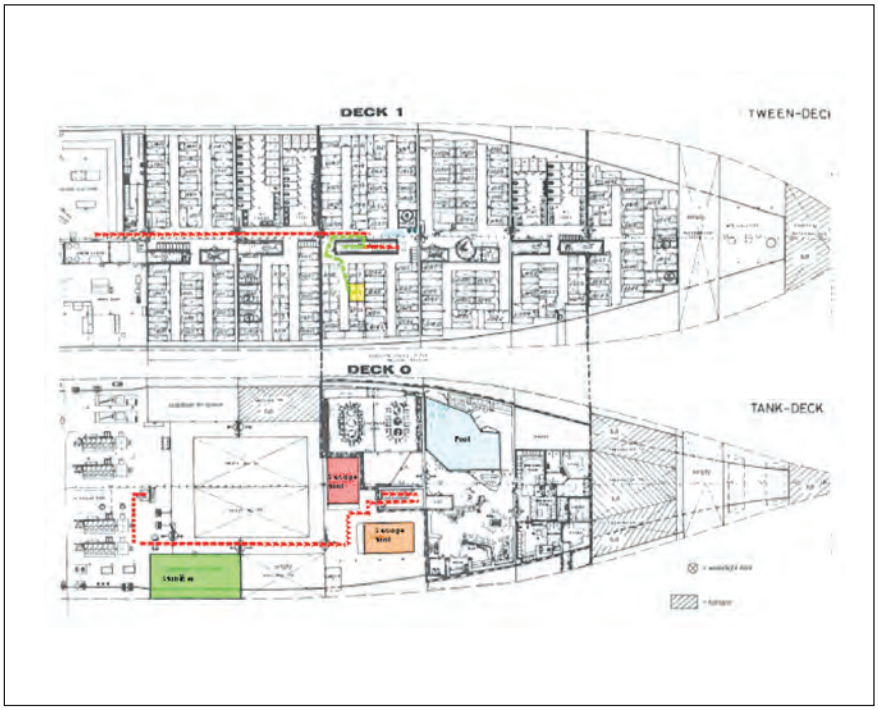


Figure. 1 Passenger Carl Övberg on deck 2 sees water flooding up from compartment on deck 1 below. The red paths show alternative escape routes of crew member Henrik Sillaste who did repairs in the sewage room below Carl Övberg's cabin at time of heeling/accident.

Leaking sea water through its hull the water was allowed to spread through open watertight doors on the tank top, so that the initial stability, GoM, was reduced to nil due to the free water surfaces inside the ship hull at 01.02 hrs (three or four compartments filled with about 600 tonnes of water).

Alternatively - if the leak was a fracture in the shell plate just above the bilge strake, the fracture could have developed forward and aft so that the leak and water inflow spread into several dry compartments, including the starboard heeling tank.

Then - at 01.02 hrs - the ship heeled suddenly, more than 30 degrees, but stabilised at 15 degrees heel as expected (the new equilibrium due to the water on the tank top) during many minutes, when several hundreds of crew and passengers were evacuated to open decks 7 and 8.

The ship, then rolling severely with a list of around 15 degrees due to reduced GoM, enabled passengers to get out as it was possible to walk on the decks when the ship rolled to port and the angle of list was close to 0 degrees. When it rolled to starboard the list was more than 30-40 degrees and you could not get out until the ship rolled back to port.

As the ship rolled more water came in below the waterline, the ship listed more, but it did not capsize (it was stable, but with a list) and then it sank on the stern hitting bottom at 01.33 hrs. The clock on the bridge stopped at 01.35 hrs, thus after that time the ship could not move further.

Estonia was plotted on radar and seen

by the watch officer of the ship *Mariella*, which went to the aid of survivors, between 01.30 and 01.36 hrs and proper records were kept.

Mr Björkman also cites the information given by passenger Carl Övberg who was in a cabin on deck 1, marked in yellow (see figure 1 below), it is evidence that water had penetrated the *Estonia's* hull. "When the sudden list occurred Carl Övberg escaped using the green path to the stairway, he stopped and turned in the stairwell and saw water flowing out onto deck 1 from an air pipe with a swan neck in the centre corridor."

A possible cause of the shell failure, according to Mr Björkman, was the shallow swimming pool forward of the sewage room. "The swimming pool room was insulated at the sides (the outside water was less than10°C six months per year). The whole space was a rust trap of unbelievable proportions. Pool water often flowed out and behind the insulation and corroded the shell plate and frames.

"There were also reports that the sauna space forward of the pool - very often heated to 100°C - was frequently flooded, which resulted in wetting the side insulation and corrosion. It is possible that the hull leak sinking the *Estonia* started in these rusty compartments," writes Mr Björkman.

SOLAS II-1.15.9.1

An added and very significant factor to the loss of the vessel was that the watertight doors within the hull, which should have been closed, were open. The Final report (5) does not describe the watertight bulkheads and doors in the hull of the ship; numbers, positions and how they close and open, and how the doors are remotely indicated/controlled," writes Mr Björkman.

"This", he says, "is a serious fault, as it is very important to know, if the watertight doors/bulkheads are closed and are preventing water to spread, when a ship is sinking".

He goes on to point out that: "If the watertight doors had been closed, and if *Estonia* were only leaking into one or two hull compartments, the ship may have listed, but should not have sunk as a result of the leakage (or water on the car deck in the superstructure above the hull)."

As any naval architect will accept a ro-ro ferry with the watertight doors in its hull closed should float even if it capsizes. According to Mr Björkman *Estonia* should have had an airtight space of around 18,000m^3 below the waterline which would have been sufficient for the vessel to float even with one or two damaged compartments in the hull.

"*Estonia* was correctly protected according to SOLAS rules by 13 watertight bulkheads, which divided the ferry into 12 watertight compartments between the aft peak and tanks forward and the forepeak tank. These are simple rules dating back up to 50 years that govern the design of ro-ro ferries," explained Mr Björkman.

According to the naval architect "the risk of collision is always there, but in most collisions, about 70%, you only rupture the hull between two bulkheads, i.e. no bulkhead is damaged and only one compartment is flooded. No problem - the ship floats. In more severe collisions, say 29%, you may damage one watertight bulkhead and two compartments are flooded. No problem again - all passenger ships above a certain size are designed to survive with two watertight compartments full of water. If two watertight bulkheads - a fair distance apart - are damaged in one collision - a very rare occurrence (<1% chance), three compartments are flooded and the ship may sink."

However Mr Björkman explains that "the watertight doors in all the bulkheads must be closed at any time at sea. You never know, when a collision will take place, so the watertight doors must be closed (SOLAS II-1.15.9.1)."

Furthermore, SOLAS rules state that: "the number of openings in watertight bulkheads shall be reduced to a minimum depending on the design of the ship ...; satisfactory means to close the openings shall be provided' (SOLAS II-1.15.1). In engine compartments you cannot have more than one door in each bulkhead except in special cases" (not applicable to *Estonia*).

"A normal interpretation of these regulations is that there are no watertight doors at all in the bulkheads except between engine rooms (for escape and emergency purposes).

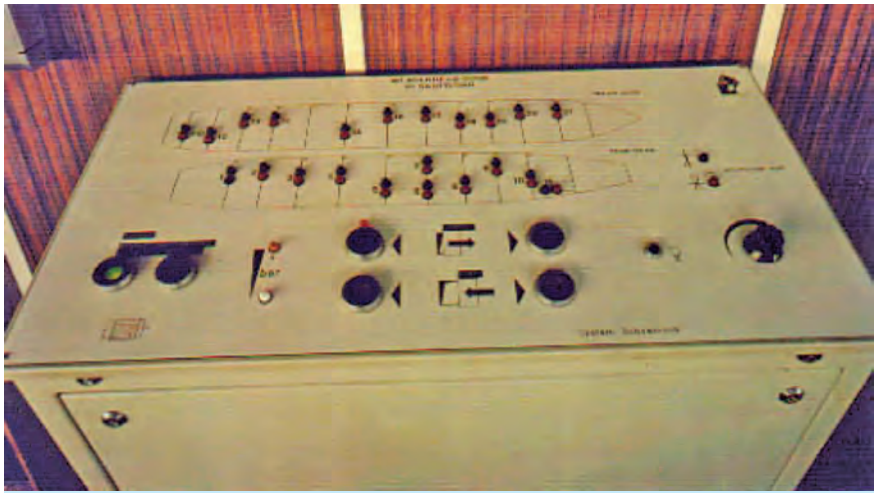
Watertight doors between passenger and/or crew spaces in the hull are not permitted.

Any passenger or crewmember must take the stairs up to the bulkhead deck and down again to reach an adjacent compartment," said Mr Björkman.

Estonia did not comply with these rules. The engine control room (ECR) on deck 1 was itself fitted with two watertight doors - one leading into the engine room itself, one leading into the passenger accommodation forward. On deck 0 below the ECR the same bulkheads were also fitted with watertight doors.

This arrangement contravened the regulations and should have caused sufficient concern for the authorities in any one of Sweden, Finland or Estonia to revoke the vessel's licence to operate. A

Figure 2: *Estonia's* control panel for watertight doors.



standard ferry normally has a maximum of five or six watertight doors between engine spaces - there are only two or three on smaller ferries, *Estonia* had a total of 22 watertight doors in the hull space.

"There were three between store rooms aft, eight in the engine spaces, two between engine and passenger spaces and seven in the public spaces forward. The bulkheads in the engine rooms - frames no. 66, A and L - had two doors each - not acceptable for SOLAS standards. The bulkhead at frame L had in fact three doors fitted, one extra door to the passenger spaces. Bulkheads at frames 80, 91 and 101 also had two watertight doors each, where none should have been fitted (*Estonia* was a lengthened version of the Swedish flag *Diana II* - an extra section had been fitted at frame 79 with frame marked by letters A, B, C, etc.)".

According to Mr Björkman one reason that *Estonia* had too many watertight doors appears to be that the company had moved the crew from watertight compartments without watertight doors on deck 1 in the hull to more comfortable cabins in the deck house on deck 8.

The hull compartments on decks 1 and 0, below the car deck were then allocated to passengers, and as they did not like to run up and down stairs to go to the toilets, watertight doors were installed.

A swimming pool compartment - with the pool piping recessed into the double bottom – was also fitted as was a sauna and a conference compartment for passengers on deck 0, which were also interconnected by watertight doors. And at the same time extra doors were fitted between the engine rooms themselves and to the passenger spaces, allowing passengers to walk into the engine rooms through the watertight doors.

This arrangement with the watertight doors in the passenger accommodation in the hull also resulted in that the escape arrangements from these compartments being defective. Normally you should have two escape routes (stairs) from any passenger compartment in the hull – so that if one is blocked by a fire you can use the other route - and it should not lead through a watertight door. The six passenger compartments in the hull of *Estonia* had only one correct escape route - the normal stairwell with a door located in the centre of the compartment.

On deck 0 two watertight compartments - for stabilisers and heeling tanks - could only be accessed via watertight doors from adjacent compartments. A correct arrangement would have been direct access from deck 1 or 2. Thus, if the stabiliser compartment was leaking and flooded you could not access it without opening a watertight door which would allow flood water to spread.

Watertight Door Control

All watertight doors should be able to be remotely closed from the bridge. Representatives from the German shipyard that built *Estonia*, Meyer Werft, have been in correspondence with the Commission,

and they suggested that the controls and indications that related to the watertight doors had been altered - green lights indicated an open door where normally it would indicate a closed door.

"We know that the doors were open at sea to facilitate passengers and crew movements. It is possible that the local and remote closure function was shut off so that a passenger would not close the door", writes Mr Björkman.

The Final Report states that the key witnesses in the ECR had informed the commission that the watertight doors were closed after the sudden listing had occurred. The statement is strange because - there is no indication panel in the ECR for watertight doors showing if the doors are open or closed, Mr Björkman claims.

German yard officials had interviewed seamen, who had served on the ship under the Finnish flag) – and they are quoted here: "The light indication for the watertight doors on the bridge must have been changed after the ship was renamed the *Estonia*, because as long as she sailed under Finnish flag the lights were 'green' when the doors were 'open' (which was the normal condition) and 'red' when the doors were 'closed'."

This information would indicate that when the ship operated under the Finnish flag it did not comply with the SOLAS-rules, which require closed watertight doors to be indicated by green lights.

It is probable that *Estonia* also did not comply with these rules, as it was impractical to close the watertight doors at sea, as 75% of the passengers on deck 1 could then not visit the public toilets without walking up one flight and down another flight of stairs.

It seems also to apply to the passenger compartments on deck 0. A passenger could take an elevator down to deck 0 and go through watertight doors to the swimming pool, sauna and conference room. Many passengers travelling with the *Estonia* have said that the watertight doors were always open at sea. Estline employees have given similar statements to the commission.

Incorrect Handling of watertight Doors

It is further probable that incorrect handling of the watertight doors contributed to the accident. The watertight doors had a remote indicator on the bridge. The remote closing of the watertight doors was thus positioned on the bridge. Did the remote closing work? At a questioning by the Commission on 2 November 1994 Åke Sjöblom, ship safety inspector of the Swedish NMA, stated that he did not test (sic) the remote closing of the doors from the bridge. The reason should have been that you do not do that with 500-600 persons aboard. Mr. Zahlér was supposed to do local testing below.

Åke Sjöblom, ship safety inspector of the Swedish NMA, stated that the "deficiency of the watertight door remote control panel was that the chief officer had no idea what was open or closed. The lights were green and the chief officer thought (sic) it meant that the doors were closed. And so says the latest SOLAS rules. But on this ship green light meant that the doors were open." At least two persons told the commission that the watertight door indication panel was incorrect or confusing.

Watertight Doors kept open from the Bridge

On 2 November 1994 Mr Gunnar Zahlér, ship safety inspector of the Swedish NMA, was also questioned by the Commission.

Carl Övberg Estonia passenger

Excerpt from the testimony of *Estonia* ferry disaster survivor Carl Övberg, residing in cabin 1049 deck 1 on the night of the accident. He said that he went to bed at around 22.30 and was awoken by load metallic banging noises along with sledgehammer bangs and sounds of hydraulics. At the sound of the final loudest metallic crash *Estonia* came to a juddering halt. From here Mr Övberg takes up the story.

"I jumped out of my bed and put on clothes very quickly when I realised that all engine noises had stopped and the ferry was now making much softer pitch movements, I rushed out of the cabin, turned right towards the stairway, around the aft part of it, through the open WT-door (watertight) towards aft, but turned around after some metres and headed forward, the vessel started to make sideways movements by now (rolling), the door at the port side of the stairway was either open or missing, and I rushed into it, turned right up the stairs when my coat got caught at the beginning of the handrail, I turned round to my right and looked over my right shoulder out through the door opening into the alleyway (corridor), thereby I saw two goose-necks next to the cabin wall… out of these goose-necks water was streaming under great pressure… I also saw water penetrating the door forward of these goose-necks in the next compartment… which according to the drawing belonged to a cleaning room. I saw the water running over the floors. Then I freed myself, whereby I lost my mobile phone which fell down the stairs to 0-deck. I rushed up the stairs. When I was about half way up to the car deck the vessel heeled suddenly and abruptly more than 45 degs, probably 50 degs or 60 degs, to starboard because I was standing on the wall holding the stair rail. The ferry quickly came back to almost upright position and thereafter slowly heeled more and more to starboard. I continued upwards, ie. I pulled myself up whilst the ferry was rolling, ie. Almost uprighted and thereafter heeled to starboard more and more. When I was holding onto the rail in a squatted position during the very wide heel there was an elderly man above me on the stair, whom I passed on my way up after the ferry had more or less uprighted…"

Mr Zahlér had inspected *Estonia* at Tallinn the 27 September 1994, the day before the accident together with Mr Sjöblom. Mr Zahlér said that in port (Tallinn) the watertight doors were open, that is to say "the doors got an input signal from the bridge to be kept open".

This was a strange arrangement, according to Mr Björkman, he says you should not be able to open, or to keep open, watertight doors from the bridge - only to remotely close a locally open door from the bridge.

Mr Zahlér thus explained that he tried locally to close the doors in port, but when any door was closed, "they automatically opened immediately ... we didn't close the doors from the bridge, as there were persons aboard" That is the control panel on the bridge was arranged to prevent local closure of the watertight doors

Figure 2 shows *Estonia's* control panel for watertight doors. Two deck plans with indication lights red/green - deck 1 with 14 watertight compartments and 11 doors, deck 0 with another 10 or 11 doors (one door is maybe a hatch in the deck?) most of which contravene SOLAS regulations.

The panel confirms that several watertight bulkheads had two or three watertight doors, in contravention of SOLAS regulations. Bottom left on the panel are two buttons/indication lights - the left is green. Maybe is it on/off for the system. Bottom middle are four buttons and/or indication lights probably used for remote opening (the two upper) and for remote closing (the two lower ones). Bottom right is a dimmer and a small button for light bulb control. It is unclear whether it were possible to remotely open and close individual doors.

Mr Björkman is convinced that the defective watertight door system contributed in large part to the *Estonia* accident, as the ship would never have sunk if the doors were closed. "Maybe some doors were closed at sea before the leakage, some watertight compartments filled up and then the doors were opened (!) from the bridge by mistake, when the crew attempted to close all doors, which resulted in two big bangs heard on the ship just prior to the sudden listing", he writes.

He goes on to say that he never made an attempt to verify this as it is difficult to do such a test, but the result would have been a shock wave of water flooding the adjacent dry compartment - probably being noticed by some noise or bangs - and then loss of stability, sudden listing due to the great free water surfaces on the inner bottom of several compartments.

In response to a letter from a marine expert (letter 960719) Mr Schager of the Commission answered: "The watertight doors were closed" at the time of the accident. Asked how this was known Mr Schager replied by letter 960801 that: "According testimonies the watertight doors were closed during the early events of the accident (at the beginning of the sequence of events)".

Mr Björkman asks: "What is "at the beginning of the sequence of events, the alleged noise at 00.55hrs or the alleged listing at 01.15 hrs? And who closed them and from where, was it the bridge or locally?"

No more clarifications were received from Mr Schager. Nobody from the bridge survived and it was on the bridge that the indicating panel was located. Nobody was in the aft compartments with many watertight doors. Nobody was on deck 0 forward with three watertight doors. The 21 survivors from deck 1 observed that the five watertight doors there were open. The three survivors from the ECR had to pass watertight doors to escape. Thus nobody could have confirmed that all watertight doors were closed.

Nevertheless, open watertight doors do not sink vessels. They contribute to a vessels' sinking when their hulls are damaged. So how did the water enter Estonia's hull, through hull damage below the waterline, as suggested by Mr Björkman, or via a lost visor at the forward end of the superstructure on top of the hull as the official report claims? A new investigation may clarify the matter. *NA*

Estonia failure was regulatory

Naval architect Anders Fischer says *Estonia* was in compliance for operations in restricted waters, and not for the open sea. This regulatory failure led to the catastrophe 16 years ago this month.

Estonia was designed as an "inland ferry" with vehicles expected to roll on at one end and roll off at the other end. It was unprepared and ill-equipped for the stormy Baltic waters that it encountered on the night of 27-28 September 1994.

Meeting waves head on in stormy weather was disastrous for *Estonia*, locks and hinges were turned into breaking pins. The opened ramp closing like a return valve made for slow water ingress, preventing an immediate capsize, floating upside down. Up-flooding into cabin cluster on upper decks prolonged the belated capsize-process from seconds to minutes.

Estonia. (From SSPA final report.)

Sixteen years have passed since *Estonia* sank. The two new investigations (from the HSVA, the Hamburg Ship Model Basin, Consortium and the SSPA Consortium), presented in May 2008, confirmed the earlier report from JAIC, the Joint Accident Investigation Commission, except for a difference in time of 15 minutes, three very competent commissions have arrived at the same conclusion.

They could then hardly have been anything but right! However, the objection from Margus Kurm, the state prosecutor of Estonia, came as a real dash of cold water. The ramp was continuously under surveillance on the monitor in the machinery control room and it was never seen down. Like JAIC, the new independent consortia had staked their investigations on its being down. Not up.

Now further investigation failures were imminent because Mr Kurm insisted on his witnesses being trustworthy. Was a new dive necessary? Instead of having to accept an indefinite stalemate certainly all could be resolved from existing knowledge.

At the time that *Estonia* was on the drawing board there were no computer codes in general use for calculating stress and strain as a function of both time and space as is experienced by a ship's hull in stormy weather, with the stern the first and worst. Formulas meant for static loads are in this case of little or no relevance.

Nevertheless experience and sound thinking has over the years led to sound constructions. The keyword is 'continuity'. Wave impacts (slamming) are transmitted into the material as stresswaves. They are sent further into the hull in a 'soft' way. The energy will then be consumed mainly in flexural propagating vibrations. A considerable part of this energy is in fact returned to the water by the vibrating hull. Thresholds, sharp corners and edges or anything that narrows the stressflow, i.e. constitutes a discontinuity are forbidden.

On *Estonia* (and her kind) hinges and locks (Gångjärn, Sidolås, Bottenlås in figure 1 below), the elements that joined the visor to the hull - were particularly evil in this sense. They were subject to stresswaves in their interior when the stem with its visor smashed into the waves.

They functioned like "breaking pins". Normally such an element is there in order to save the construction from overloading. In this case however, they brought disaster when *Estonia* for the first time encountered waves generated by a storm, having blown freely over an open stretch of water from the South Baltic to Ålands Sea. This should be compared to the maximum 20 nautical miles from nearest land, which was what she was certified for.

The new investigations did not pursue this problem, however. They were solely dedicated to the sinking process, which was strictly according to the instruction given by the Swedish government. And consequently they arrived at the same conclusion as the 10 year older investigation, with methods 10 years more modern. But, the government was driven by the general public, and many of its questions, for instance about sabotage, were left unanswered.

The uncertainties regarding the sinking process remain. With an abundance of in themselves admirable diagrams, animations, pictures and drawings stretching over hundreds of pages the said public may have become tired but

Meet us at SMM Stand No.: B1.EG.100

ADVANCED CONTROL

New valve series, DN 200 to DN 600

For the engineering officer at sea, the long proven performance of Clorius valves means added security.

Clorius Controls is your best choice and ensures your ship running all years.

Clorius Controls A/S
- ensures reliable control of heating, cooling and ventilation systems

Clorius Controls A/S
Tempovej 27
DK-2750 Ballerup
Denmark
Tel.: +45 77 32 31 30
Fax: +45 77 32 31 31
www.cloriuscontrols.com
mail@cloriuscontrols.com

Meet us at SMM Stand No.: B1.EG.100

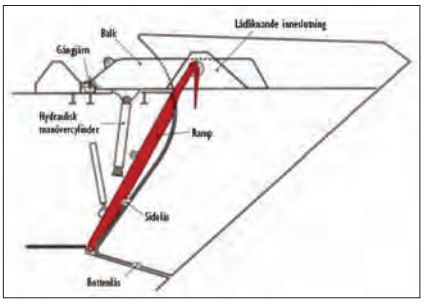


Figure 1. The visor is connected to the hull at Gångjärn, Sidolås and Bottenlås (Hinge, Sidelock and Bottomlock). From JAIC final report, Swedish version.

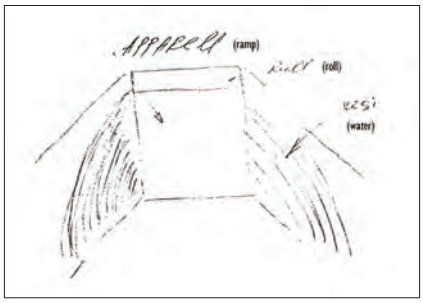


Figure 3.13 (from JAIC-report): Crewman Henrik Sillastes drawing showing water flooding through the sides of the bow ramp.

hardly reassured. Notwithstanding, declarations that immediate capsizing follows an open cardeck, if anything confirmed by the runs in the HSVA model basin, they, nevertheless, deal with an open cardeck, because with the ramp only slightly open there will not be enough water for the given scenario to occur. And again computation of leak stability shows that for those large heel angles, leakage in the underwater body as cause of the accident is out of the question. All of which is in accordance with what the JAIC arrived at 12 years ago and for which it was so criticised. Yet the Estonian state prosecutor insists on the ramp being up, not down.

Crewman Henrik Sillaste's drawing shows that the visor is gone, because if it had been in place the water should have seeped in at the top. But, as you can see for yourselves below, it spurts! Measured directly on the drawing, with scales from figure 3.13 in the JAIC-report (also reproduced below) it spurts into the cardeck with about 10m/s, which, incidentally corresponds to *Estonia* meeting the waves with full power (simply apply Bernoulli's equation).

However, before the visor has separated completely it hangs on the starboard actuator arm. The lifting device (consisting of a piston in a cylinder, filled with hydraulic oil, a medium which, when treated analytically, for extreme impulsive loads is not to be regarded as incompressible) is now loaded from the weight of the falling visor. When the last connection, the attachment to the deck, bursts, it recoils and the free end of the actuator arm smashes into the starboard front bulkhead, resulting in an oblong hole of at least one square metre, which in the absence of other plausible explanations was believed to have been caused by an explosion.

Before this however the ramp, loosened by the visor, has temporarily come to rest on the upper cross-bar inside the visor. It now falls forward with the visor, but is immediately flushed back into an almost closed position by the encountering seas when the visor leaves, thus acting much like a return valve.

According to Margus Treu, the third engineer, the water influx was enormous, the camera was partly obscured….the ramp was not mentioned. (Did Mr Treu see the first big flush that could possibly have caused the sudden heel? Both he and HSVA are contradictory on this point, HSVA-report p12 and 14; and on p16 and 123 HSVA assumes that the ramp opens again.) The following influx in the gap at the ramp, now closed, was observed by motorman Henrik Sillaste and motorman Hannes Kadak and the camera was not obscured. (Compare with HSVA figure. 27 and comments on ingress through full opening.)

The influx through the front bulkhead has been seen by nobody, but could very well be of the same order as through the gap. The heel when the visor collides with the bulbous bow and falls to port is close to zero (a fact to be contained in any hypothesis) according to photos of the rescued visor.

Not so, however, in the Seaman-simulation in the SSPA final report. Note that Mr Sillaste looked into the monitor after the first heel (because he was worried), that is when the visor already had slipped over the ramp and fallen off. Thus the visor photos verifies Mr Sillaste's drawing, ie. he drew what he saw.

When the ship turns away from the waves the ramp falls forward and smashes onto the forepeak deck. Not until then is the ramp deformed into its final shape, with the ramp-railings bent outwards. Successively and intermittent, water is accumulated on cardeck, which leads to the course of events described by the witnesses. The ramp slowly falls back to its closed position when *Estonia* is lying on its side at a heel exceeding 90deg and trimming astern.

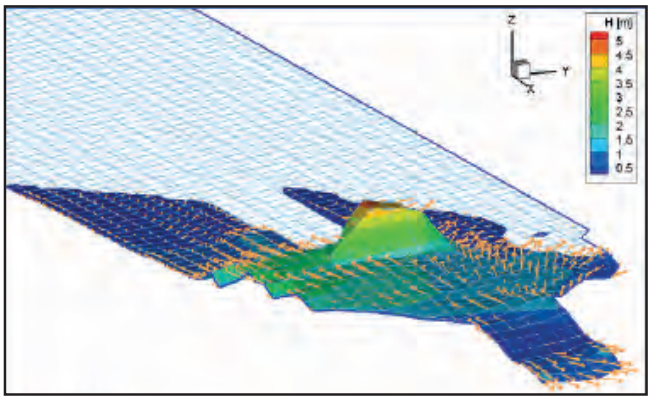
Because of its heavy weight it then easily snaps the much lighter railing, pieces of which were later found on the sea bottom lying some 250m aft of the ship's stern, which indeed fits well to the drift of the hull due to the current of one or two knots. Some prefer more interesting explanations eg. it was cut off in a clandestine operation (in the aftermath of the cold war...).

Now however, after the Kurm Report, the pieces constitute ample evidence that the ramp never even passed its ordinary open position when the visor fell off. Instead, as suggested, it was flushed back into its nearly closed position together with an amount of water that was enough to dynamically tip the ship over to some 20–25deg, whereupon it rebounded to a temporary list of around 15degs (as stated by witnesses).

According to the JAIC final report, this amount of water is about 600tonnes. With an opening of 25 to 30m^2 and a relative speed of the water of some 6-12m/s it could very well enter the cardeck within a few seconds. The next stage, inflow of an additional 1400tonnes of water is a much slower process due to a much smaller opening, reduced speed and a change of direction.

Before sinking the ship did turn upside down, ie. capsized, which is documented by an extraordinary photo reproduced below (Öun, Scanpix).

Contrary of the official investigations



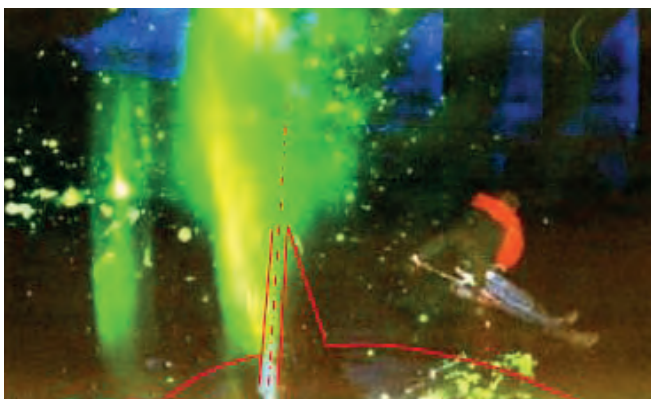
HSVA final report figure 27: Waves on the vehicle deck coming in through the open bow (fully open ramp slosh against the front face of the central casing and splash water up. The colours show the water height and the vectors the flow direction and speed.

this version *contains the Estonian argument* ie. the ramp in the almost closed position. Scratchmarks on the front of the salvaged visor shows that the list was zero when the visor fell off, same on the inside shows that the ramp was ripped open. These facts effectively exclude any other scenario. With the first gush of water, "enormous" as observed by the third engineer, the following leakage at the slammed back ramp and through the front bulkhead took the Estonia into a position where further openings became submerged.

Sources

JAIC final report (Edita Ltd, Helsinki), downloads from HSVA, SSPA, HEIWA, The Independent Fact Group and The German Group of Experts, the report by Rosenius/ Sjöling, books by Anders Jörle/Anders Hellberg and by Knut Carlqvist, articles in The Naval Architect and some drawings from Meyer (like general arrangement and deckplans), Kurm's presentation in Glasgow May, 2007 ("Looking back to move forward"). Carlsson's presentation in Stockolm May 2008 ("Bow arrangement collapse – sequence of events"). An English version of the official "Kurmreport" (februari 2009) is now available on the web. *NA*

Figure 5 HSVA final report. (Mikael Öun, scanpix) showing *Estonia* upside down on the seabed.



SOLAS 2009 takes ro-ro's to new limits

The Stockholm Agreement added more stringent stability requirements to SOLAS 90 for ro-pax vessels following the loss of Estonia in 1994. Daria Cabaj, a naval architect with Burness Corlett Three Quays (BCTQ), asks will the generation of new SOLAS 2009-compliant ro-pax ships be safer?

SOLAS 2009 is considered to be a major step forward in the rationalisation and harmonisation of the damage stability rules. In general, SOLAS 2009 is perceived to achieve a higher overall level of safety and passenger ships must also comply with requirements to cover local vulnerabilities to flooding. However, there are certain designs such as ro-pax ships with long lower holds (LLH) that can be susceptible to critical damage.

Although a ship can be shown to comply with SOLAS 2009 there may be certain moderate damage scenarios that are not covered by the present regulatory framework. Recent research shows that some commercially attractive ro-ro ships with wider LLH configurations meet the current standards but are particularly vulnerable to the consequences of lower hold flooding. Although the number of such damage scenarios may be small (otherwise the required survivability index would not be met), it introduces some controversy as to whether SOLAS 2009 brought about an improvement.

In fact, some recent research leads us to the conclusion that SOLAS 2009 is a slightly higher standard than SOLAS90 but not quite as high as SOLAS90 plus the Stockholm Agreement. Maritime authorities are further examining the adequacy of requirements currently set out in SOLAS 2009 for ro-pax ships.

The question as to whether or not SOLAS 2009 offers a higher standard is difficult to answer because level of safety can be interpreted in different ways. This has led to a general lack of confidence in SOLAS 2009 for ro-pax ships and, as a result, the European Union (EU) has decided not to rescind the Stockholm Agreement (directive 2003/25/EC) for new ro-pax ships but to retain it in addition to the SOLAS 2009 requirements. The EU is awaiting clarification and further direction from the International Maritime Organization (IMO) before concluding this matter.

Naval architect Daria Cabaj receives RINA-Lloyds Trust safety award in 2009 from the former RINA president Stephen Payne.

How to define the level of safety?

With a probabilistic approach to damage stability, the overall level of safety is defined by the capability of a ship surviving all possible damage scenarios (attained index, A). This capability must be greater, than the stipulated level of survivability (required index, R). For passenger ships additional factors, such as protection against local vulnerabilities to flooding, must also be considered when defining the level of safety.

What makes ro-ro ships so particular?

The main characteristic of ro-pax ships is wide open decks to facilitate efficient loading and unloading. In the event of

When modelling coast and sea

MIKE 21 and MIKE 3

MIKE BY DHI

Only one product family covers all your coastal and marine modelling needs. For more than 20 years MIKE 21 and MIKE 3 have been the premium standard within modelling software for coastal engineers due to its reliability and high productivity.

MIKE 21 and MIKE 3 are applied for:

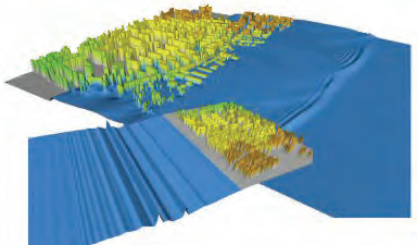
- Design data assessment (waves, currents, water levels) for coastal and offshore structures
- Optimisation of port layout and coastal protection measures
- Cooling water, desalination and recirculation analysis
- Optimisation of coastal outfalls
- Environmental impact assessment of marine infrastructures
- Ecological modelling including optimisation of aquaculture systems
- Optimisation of renewable energy systems
- Coastal flooding and storm surge warnings
- Coastal and oceanographic circulation studies, including fine sediment dynamics
- Coastal and marine restoration projects

For a free demo or software catalogue call:
+45 4516 9333 or email:
software@dhigroup.com

Only one product family offers a choice of three modelling technologies

MIKE 21 and MIKE 3 offer a unique selection of numerical engines:

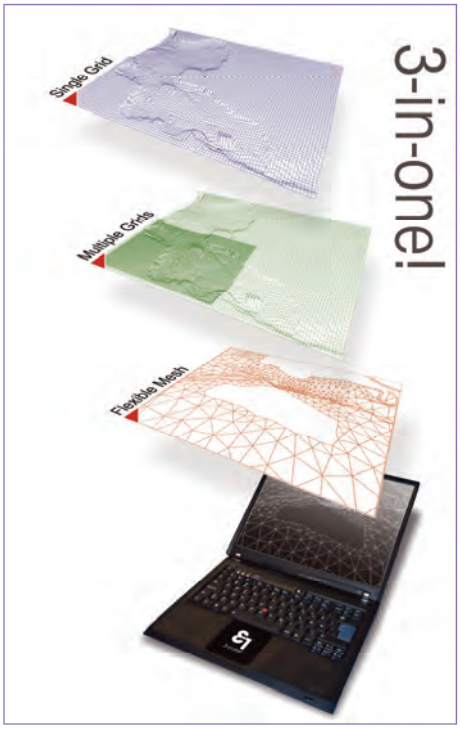
- Single Grid - the classic rectilinear model
- Multiple Grids - dynamically nested rectilinear model
- Flexible Mesh - maximum flexibility for tailoring grid resolution within the model



NEW The Flexible Mesh engines now support parallel processing - up to 8 times faster for 8 processors!

More than just software

The unique 3-in-one! package includes all three engines in one great package.



DHI is a global organisation dedicated to the development and practical application of knowledge and technology related to water, environment and health. Our leading MIKE by DHI products are used by professionals worldwide and supported by 950 DHI experts in more than 30 international offices.

www.dhigroup.com

damage the accumulation of flood water on the bulkhead deck has an adverse effect on stability which has resulted in previous catastrophic losses. This problem was addressed by the Stockholm Agreement.

For those ships designed with LLH to increase cargo capacity, the ingress of floodwater not only results in a significant free surface effect but can also create an adverse trim. The ability of a ship to survive is greatly influenced by reserve buoyancy and its distribution along the ship's length.

In the previous deterministic regulations LLH's were allowed, particularly when the transverse position of the longitudinal bulkheads was inboard of the B/5 boundary. In SOLAS 2009, this boundary has been moved outboard to B/10 and the 's' factor (which represents survivability) reduced to a minimum value of 0.9. Whilst this change to the transverse location of the longitudinal bulkhead is commercially attractive, there is a risk that future ro-pax ships built with a LLH configuration before sufficient experience has been gained.

Internal research by BCTQ in 2006 identified this problem. The concern we raised at this time was, that although it is possible to demonstrate compliance with both local and global safety standards, certain apparently insignificant damage scenarios can still result in ship loss. The underlying question is whether or not the level of risk arising from this situation is acceptable.

Which ships are safer the small or the big ones?

Ideally all ships should have the same level of safety. However, the standard of survivability required by the probabilistic regulations is a function of the number of passengers exposed to risk and ship's length. The research of Euroyards seems to confirm that for smaller ro-pax ships, sailing with a lesser number of passengers, the overall standard of survivability 'may be less demanding than the previous requirements'. This is a result of the decisions taken by MSC 78 with respect to Required Index.

According to the mathematical formulae used in SOLAS 2009, larger ships require a greater degree of subdivision and, therefore, from a stability perspective, it could be argued they are relatively safer.

Solving the 'ro-pax problem'

There have been various discussions at IMO as to whether there is a need to improve safety standards for ro-pax ships and, if so, how to address this potential deficiency in the regulation.

Following SLF51 (the IMO sub-committee discussing damage stability in ro-ro vessels) an investigation into the impact of damage stability using SOLAS 2009 on ro-pax ships in comparison with SOLAS90 Stockholm Agreement was undertaken. Three major projects were reviewed (Euroyard project, a joint NL/UK project and the EMSA project) but the results were inconclusive. Two of the studies indicated that the vessels examined, though commercially attractive, could be subjected to high risk of capsize or sinking in virtually calm water if the LLH is penetrated. There has been agreement that more research is needed to investigate this problem.

Future research on this subject includes continuation of the EMSA studies (evaluation of a further five SOLAS 2009 compliant ships). There are also two EU-funded research projects: GOALDS (focusing on probability of survival for large passenger vessels) and FLOODSTAND (relationship evacuation time and time of survival) but the results will not be available until 2011-2012.

It is a commonly held view that some amendments to SOLAS 2009 may be necessary and, to date, there have been various proposals to address this issue. Some projects suggested modifications to the survivability formula ('s' factor), others proposed an increase to the Required Index. There was also a proposal to leave the SOLAS 2009 as it is but develop additional, separate Water-On-Deck criterion for ro-pax ships. More research is needed to draw any final conclusions.

Deterministic or probabalistic regulations?

In SOLAS 90 only damages up to the B/5 line needed to be assessed. In SOLAS 2009 all potential damage cases are to be considered. In one damage zone there may be a number of scenarios depending on the extent of damage inboard and all these cases have a weighted contribution. This leads to increased benefits for longitudinal subdivision.

SOLAS 90 had a simplistic approach (s=1 pass, s=0 fail) and offered a relatively straightforward assessment. In contrast, the SOLAS 2009 regulations are more complex because all damage cases can contribute to the final result (index A). Various factors must now be considered, resulting in the probabilistic regulations being less transparent to designers.

With the previous regulations, no pipe-work, valves or openings that could lead to progressive flooding were allowed within an area 20% of the ship's breadth adjacent to the hull (B/5). This meant that no matter what standard of stability the ship met, there was always some protection against local, minor damage. With SOLAS 2009, the analysis of progressive flooding is handled differently through a more thorough and comprehensive process. In addition, the requirements regarding margin line immersion no longer exist, but there is zero contribution to the attained index when evacuation routes are immersed.

In theory, the designer now has more flexibility as an increase of risk in one area, to some extent, may be offset by an increase in safety elsewhere. However, the calculations for probabilistic damage stability are complex and require an iterative process to optimise a design. Specialist knowledge and a comprehensive understanding of the standards are required to undertake such an analysis. Extensive calculations are necessary and the adjustment of any one element will require all damage cases to be re-visited. This can only be undertaken by computer using appropriate software. Unsatisfactory results will require the redefinition of one or all of the following: principal subdivision, openings, initial loading conditions or even the hull geometry. To facilitate the approval process, close cooperation with Regulatory Authorities from early stages of the design, is recommended.

As a final observation, many factors will influence the design of future ro-pax ships. However, the conclusions from various research projects underline the importance of starting with a good arrangement of subdivision. *NA*

E-novation sets Maris apart

Norwegian company, Maris, has sought to initiate operational savings for the maritime industry through the introduction of technology. The latest tests on a 170,000dwt tanker show that annual savings of more than 5.5% on fuel outlay can be achieved

Fuel costs remain a ship operator's major costs, any significant cuts in these costs has largely been achieved through slow steaming. Other ways in cutting fuel consumption have been limited to trimming through hull form design and routeing decisions based on weather reports.

What sets Maris apart from other routeing applications is its development of an application that can route a vessel which will aid the vessels' voyage through the use of currents, rather than against currents which inevitably increases fuel consumption. In addition the company's systems can all be run from a standard marine PC, which means that training and installation costs can be reduced to a minimum.

Maris was able to achieve this through the development of its other products including the use of the Electronic Chart Display System (ECDIS) with a flat panel monitor, it was the first company to gain UK Hydrographic Office (UKHO) approval for the update of electronic charts via email and it was the first company in the world to offer a black box and chart system using a single PC.

The UKHO e-Navigator is being developed by the UKHO working with Maris providing the gateway to all Admiralty products as well as those of a wide range of partners, giving access to the best solutions available in the market. This innovation will see the UKHO move from paper charts into the digital age.

e-Navigator is based on Maris' Maritime Digital Services (MDS) platform on which it says it has more than 1000 existing users already. These users will be switched to e-Navigator when the UKHO decide to launch the system.

The e-Navigator system 'fuels' the Vessel Decision system (VDS) that includes a number of modules; voyage planning and optimisation; active seakeeping, that is vessel manoeuvring, trim and stability optimisation and heavy weather navigation; meeting required regulations under MARPOL and SOLAS agreements regarding the environmental impact of the vessel; and the post voyage reporting that will allow vessel and fleet performance analysis to and fleet management.

Steinar Gundersen is used to moving at speed, the Maris CEO sits astride one of his beloved Honda CBX 1000 straight six bikes, the fastest road bike in the world when it was launched in 1978.

According to Maris deputy chief executive Streinar Gundersen the VDS, has been tested on the 170,000dwt tanker *Pinnacle Spirit*, which is operated by Teekay Shipping, over a period of one and a half years in the first phase of testing for the new system.

"The ships saved some US$400,000," said Mr Gundersen, "And now we have a second [Teekay] test vessel, the 77,000dwt *Madrid Spirit*, which in addition to the current routing is testing the second module sea keeping and heavy weather. These tests will be completed this year with the objective to realize another 5% fuel savings; -- all on ECDIS," he added.

Maris will test the shore-based module in the first half of next year and fully expects a further 5% fuel savings

following those tests, with the objective of making a total of 15% fuel savings over the complete system.

Mr Gundersen said that the satellite-based system was "more accurate than any other system we know of." He went on to say that a further 10 ships from cooperating shipowners will test the system on different types of ship, "to gain further experience," said Mr Gundersen.

"…We are well placed in the strongest current, and for the time being making almost 14knots, on engine power for less than 12knots.

"It is a great feeling to be able to navigate a ship with such equipment on board, knowing we are at the right place at the right time.

"I do meet many ships eastbound in the middle of this strong current, and have been asking myself why are they here. The simple answer is that they do not know any better, as they have no means to know where the best current is for their planning and execution of the voyage.

"On the other hand, I have not seen even one vessel westbound, using this route to improve their performance. Westbound vessels seem to be well to the north, in much less favourable waters," said the master of the test vessel, *Pinnacle Spirit*, on a voyage across the Atlantic.

Although the master of the *Pinnacle Spirit* appears to endorse the system, he is also quoted as saying "yes this works" by Maris, Teekay was more measured in its official response, though the company did confirm that it was testing the system.

According to Maris the test ship saved 12 hours on a 900 mile voyage that took it across the Gulf stream at thee most optimum point and then "surfing a counter current parallel to the Gulf current". The ship arrived in the Florida Straits earlier than a "faster vessel sailing a direct course against the current", according to Maris.

"Teekay has been actively involved in looking at cost effective route optimisation models that takes into consideration effects of weather and currents. For this purpose we have been engaged with various parties of which our trial of the Voyage Decision System [along with e-Navigator] is one. The system has been developed by Maris with support from Teekay and Innovation Norway. Trials onboard a Teekay vessel have been productive and results are still being evaluated," a Teekay statement said.

Maris confirms and ECDIS, VDS and e-Navigator can all run on a single PC, though while e-Navigator would normally run on a laptop computer VDS would run on ECDIS and be available at the chart table at the planning station.

The costs for installing the system come comparatively cheaply according to Maris. Price will depend on ship's equipment but, with a MARIS dual ECDIS system already onboard, the price is a modest US$50,000 to buy and install. data and communication costs not included.

"Those costs will be insignificant compared to the savings," said Mr Gundersen and with the ECDIS system required for all SOLAS vessels by 2018 the potential market could be as many as 50,000 ships, he said. *NA*

Sailing in all winds

Starting in the north in Dalian and heading gradually south to Jiangsu before sauntering up the Yangtze River, Xiang Si takes readers through all the new developments in the northern half of the world's most populous nation.

Dalian

A strong design team and a willingness to take ship orders of all shapes and sizes is what helps fill the five drydocks at Dalian Shipbuilding Industry Co (DSIC), a flagship yard of state run China Shipbuilding Industry Co, the umbrella of northern state yards.

DSIC places great emphasis on coming up with its own designs via its 400 strong R&D department.

Owners like what they see. International Fareastern Leasing Co, for instance, has recently signed up for six 81,200dwt kamsarmax bulkers, a self-designed ship type. Likewise its 24,000dwt multipurpose ship design has come in for numerous orders.

On a larger scale DSIC, China's first yard to export very large crude carriers a decade ago, has recently enjoyed huge success with its super-sized VLCC design. Traditionally, DSIC has built VLCCs to 298,000dwt or 300,000dwt size. However, it decided to develop a 320,000dwt vessel which it claims is the largest deadweight among all Chinese yards.

This July SK Shipping of South Korea ordered a pair of these new ship types, the first time a Korean owner has ever bought such a large sized ship in the People's Republic. DSIC has spent much time improving productivity levels at its facility whereby it can now knock out a VLCC in just nine months. Only Nantong Kawasaki COSCO Ship Engineering Co (NACKS) is faster in China.

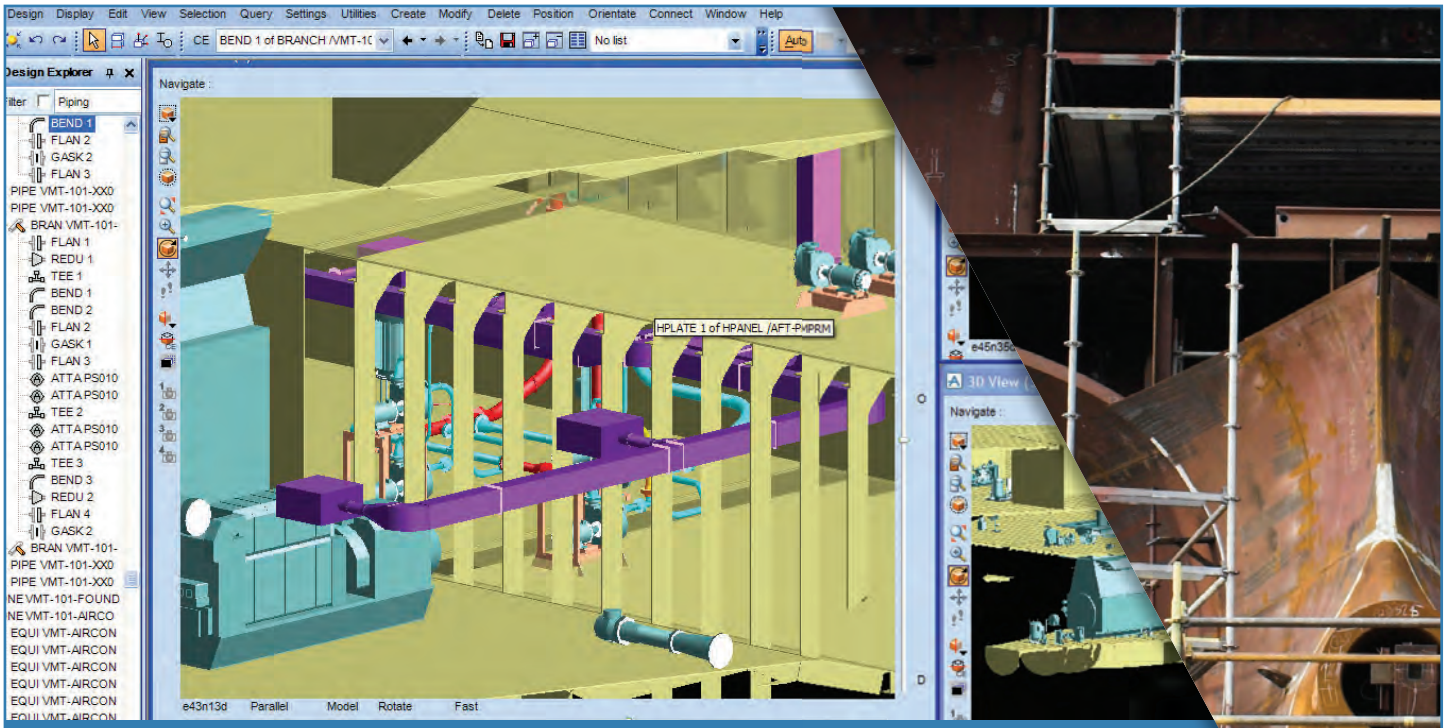
Looking ahead DSIC, one of the nation's top builders, is anxious to get in on the liquefied natural gas scene.

It has completed the design for a new 156,800m^3 LNG tanker with the technical cooperation of British classification society, Lloyd's Register (LR). The yard also claims that it is developing a 200,000m^3 LNG tanker jointly with the Marine Design & Research Institute of China (MARIC), a design company under the wing of China State Shipbuilding Corp. (CSSC). PetroChina is building an LNG terminal just to the north of Dalian; the energy giant could go local for the ships needed to fill the new terminal.

STX Dalian is quickly shedding central government shackles that had limited the size of vessel construction at the world's largest shipyard by area space.

Qingdao Beihai Shipbuilding Heavy Industry Co (BSIC) makes a statement with its new premises as orders larger ships increase.

Dalian keeps busy with different designs.



AVEVA Marine

Integrated engineering technology for shipbuilders

Shipbuilding is the most demanding of the manufacturing industries.

It brings together a multitude of technical disciplines, complex supply chains, huge quantities of materials and costly production facilities, all of which must be managed and coordinated into an efficient workflow.

And with no possibility of building a prototype, and ever-tighter delivery timescales, everything has to be 'right first time.'

AVEVA Marine is the most powerful and complete solution for the efficient delivery of these complex projects, maximising productivity at every stage from design concept to commissioning.

AVEVA Marine enables:

- Efficient naval architecture and design analysis of all types of vessel
- The most efficient, concurrent hull and outfitting design
- Globally distributed, flexible, collaborative working, enabling optimum use of all available resources
- Accurate, error-free construction and the most efficient use of production facilities
- Efficient workflow and information management throughout the shipyard and its network of suppliers and project partners

Whether you are a full-service shipyard, a design agent or a subcontractor, AVEVA Marine will provide you with maximum productivity and almost unlimited opportunities for collaborative working.

Unlock your potential

Find out how AVEVA Marine can make your business more competitive. Visit **www.aveva.com** to learn about the AVEVA Marine solutions, or **www.aveva.com/events** for opportunities to see them in action.

AVEVA
CONTINUAL PROGRESSION

Head office:
High Cross, Madingley Road
Cambridge CB3 0HB UK
marketing.contact@aveva.com
Tel +44 (0)1223 556655

Chongqing the small, but busy municipality is starting to make a name for itself in the Chinese shipbuilding industry.

Representatives from both BG Group and NITC have visited the yard recently to look at its plans for LNG ship construction, a source at the shipbuilder confirmed. Both shipping companies are committed to building in China, the former as part of a contract to use Mitsui O.S.K. Lines to ship gas from Papua New Guinea to China.

STX Dalian's parent, STX Offshore and Shipbuilding, located in Jinhae, South Korea has developed three LNG designs: 155,000, 173,000 and 210,000m^3. It is the middle option that will likely fit the needs of both BG and NITC.

To date, just Shanghai's Hudong-Zhonghua Shipbuilding has built technically demanding gas ships in China, completing five out of a six ship orders for a domestic joint venture.

STX Dalian was founded in 2006 on Changxing Island, a growing marine equipment hub in the northern Chinese city. Central government rulings at the time barred foreign yards in China from building above 100,000dwt. However, this year STX Dalian got the nod to build eight very large ore carriers for Brazilian miner, Vale, suggesting the ruling had been overturned.

In mid July STX Dalian delivered the largest PCTC ever built in China, a 6700 unit carrier for sister firm STX Pan Ocean with a length (LOA) of 199.1m. Recent statistics show the yard has a backlog of 77 orders.

Other new ship types the yard is offering include a 23,500m^2 livestock carrier, a 105,000dwt mini capesize, and an 82,000dwt kamsarmax. On the offshore front STX Dalian has three offerings at present: an 11,000dwt PLV, a lightweight 24,216dwt drillship and a huge 335m long, 335,000dwt FSU, the latter firmly putting to bed once and for all the 100,000dwt limitations that have plagued this four year old yard in the past.

Cutting through the daily Dalian traffic. China's workforce is one of its greatest assets.

Marine Diesel Engines Complying with January 2011 Tier 2 NOx Standards

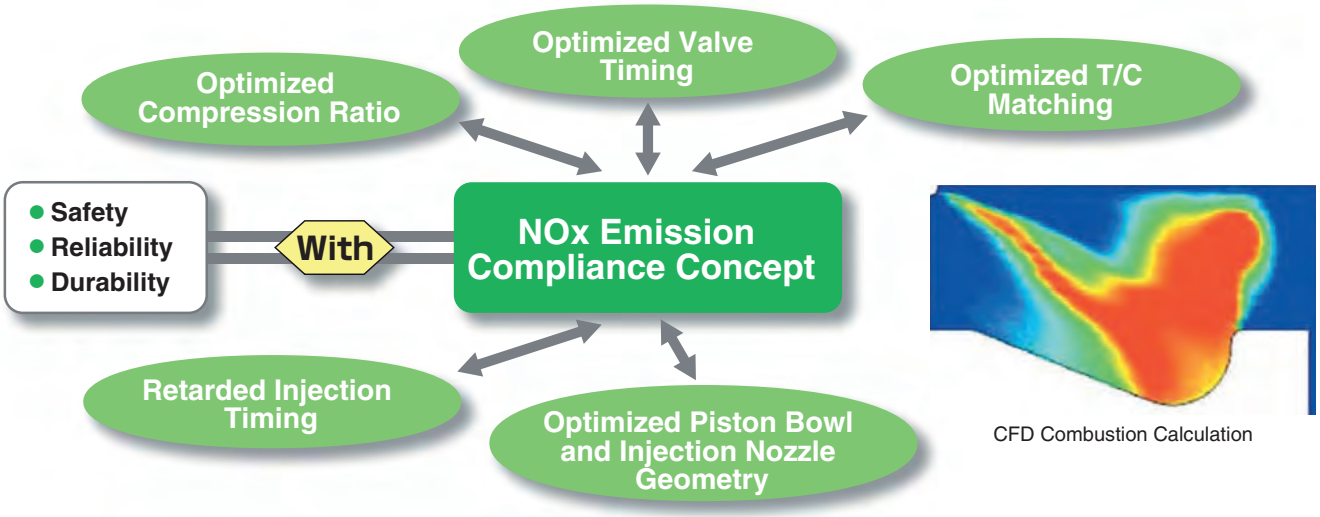
See us at SMM Hamburg Hall A1, Stand No.706

e-Diesel

Environmentally Friendly Engines Complying with IMO Secondary Regulations

DC series	DC-17Ae	450~560 kWe
	DC-32e	2760~3690 kWe
DK series	DK-20e	560~1270 kWe
	DK-26e	1200~1600 kWe
	DK-28e	1870~2500 kWe
	DK-32e	2300~3000 kWe
	DK-36e	3120~6000 kWe

NOx Emission Compliance Concept



CFD Combustion Calculation

DAIHATSU DAIHATSU DIESEL (EUROPE) LTD.

5th Floor, Devon House, 58-60 St. Katharine's Way, London E1W 1LB, U.K. TEL: 44-20-7977-0280 FAX: 44-20-7702-4325

DAIHATSU DAIHATSU DIESEL MFG.CO.,LTD.

Head Office 1-30, Oyodo Naka1-chome, Kita-ku, Osaka, 531-0076 Japan TEL: 81-6-6454-2393 FAX: 81-6-6454-2686

Tokyo Office 16-11, Nihonbashi 1-chome, Chuo-ku, Tokyo, 103-0027 Japan TEL: 81-3-3279-0827 FAX: 81-3-3245-0359

www.dhtd.co.jp

Qingdao shipyards increase capacity for a bid to increase orders.

Like DSIC is for China Shipbuilding Industry Corporation (CSIC), COSCO Dalian Shipyard is very much the flagship of the Cosco Shipyard Group. With two newbuild docks plus one of the world's largest floating docks (300,000dwt) to go alongside its raft of repair facilities the yard is by quite some distance the largest in the group and the city of Dalian acts as dual headquarters for the group. When the group entered newbuilding three years ago there was a strong focus on bulkers. While COSCO Dalian still has a range of bulker designs for sale – 57,000dwt, 80,000dwt, 92,500dwt and most recently 82,000dwt – it has branched out. Last November it delivered its first multipurpose ship, a 30,000dwt vessel for Chipolbrok as part of a six ship series. The 30,000dwt A*dam Asnyk* has dual heavy-lift cranes with a combined capacity of 640tonnes.

COSCO Dalian has strong offshore credentials too. This July it secured a turn-key EPC (Engineering, Procurement and Construction) contract worth more than US$500 million with Dalian Deepwater Development Ltd to build an advanced and versatile DP3 deepwater drillship.

This unique vessel, with a hull size of 291m by 50m, is designed to drill wells in international oilfields with high efficiency and safety in harsh environments and at ultra-deep water depths up to 10,000ft (3050m) and drilling depths exceeding 30,000ft (9150m).

The vessel will have a separate production moon-pool and its variable deck-load capacity, deck space and cargo storage capacity will be the highest of any drillship ever built. The drillship will be upgradeable for enhanced well intervention capabilities, extended well testing and early field production with one million barrels of crude oil storage capacity.

The hull of the vessel and certain equipment thereon were originally built and installed by COSCO Dalian as part of a floating, production, drilling, storage and off-loading (FPDSO) unit for MPF Corp. Ltd which had sought bankruptcy protection in 2008. Pursuant to the insolvency proceedings that followed, a sale of MPF Corp Ltd's assets was conducted and the said hull and equipment were acquired by COSCO Dalian pursuant to such sale.

The contract with Dalian Deepwater Development Ltd became effective on 20 July 2010 and the vessel is expected to be delivered to the buyer in the third quarter of 2012.

Huludao

At Bohai Shipbuilding Heavy Industry Co increasingly big is best. The Bohai shipyard is located in the city of Huludao some 450km north-east of Beijing. It has a 50,000dwt floating dock plus two huge drydocks, one at 300,000dwt (480m x 107m x 12.75m) and another opened in 2008 that is even bigger at 488m in length and can knock out two million dwt of ships a year.

On its menu of ship types are 49,000dwt product carriers, 180,000dwt capesizes, 6690 and 8024TEU container ships, 163,000dwt suezmaxes, 300,000dwt and 320,000dwt very large crude carriers (VLCCs) and 388,000dwt very large oil carriers (VLOCs).

On 4 January this year, Bohai launched the largest-ever very large crude carrier built in the country. The first of two 320,000dwt tankers for BW Maritime carries state-of-the-art green technologies.

The LOA of the tanker stands at 331.93m, with 60m in breadth, 21m in designed draft and 22.6m in structure draft. Regardless of wave factor, the speed can be kept at 16.1knots.

This huge ship impressed Chinese oil major PetroChina so much it ordered two plus two options there earlier this year, the first time any Chinese oil major has ordered a VLCC.

BW is also behind Bohai's move into giant VLOCs. The VLOCs from Bohai are scheduled for delivery at the beginning of spring 2011 and will become the world's largest bulk carriers – topping the current world record holder, BW Bulk's 364,000dwt *Berge Stahl*. Bohai has other VLOC designs, including 330,000dwt and 363,000dwt.

Bohai's 2008 finished indoor workshop for block fabrication is one kilometre long with three parallel production lines, so simple maths adds up to 3000m of extra workshop covering some 120,000m^2.

Tianjin

Tianjin Xingang Shipbuilding Heavy Industry has signed a bulker order for its new facility. Hong Kong-based Hong Da International this June ordered three supramax bulkers for delivery from September 2011.

The three supramaxes will be the biggest vessels the 70-year-old, state-owned yard has built.

Xingang's existing facility, some 10km (6.25 miles) from the new site, can only build ships of below 40,000dwt because of slipway restrictions. Nor can it construct vessels more than 28m wide.

Construction of the new facility started at the end of 2007. It is located in Liaoning Industrial Zone and is almost five times the size of the current site. It is equipped with two dry docks of 510m by 110m that can easily handle ships of up to 400,000dwt.

Full Fingertip Control

Fingertip control of vessel maneuverability —
Kawasaki Heavy Industries' century of expertise and R&D combine in perfect harmony,
culminating in the state-of-the-art propulsion systems that provide precise maneuverability.

C.P. Propeller

Side Thruster

Rexpeller

Integrated Control System

KAWASAKI HEAVY INDUSTRIES, LTD.

Kawasaki Heavy Industries (Europe) B.V. Amsterdam	TEL +31-20-644-6869	FAX +31-20-642-5725
Kawasaki Heavy Industries (UK) Ltd. London	TEL +44-20-7588-5222	FAX +44-20-7588-5333
Kawasaki Heavy Industries (U.S.A.), Inc. NY	TEL +1-212-759-4950	FAX +1-212-759-6421
Kawasaki Heavy Industries (Singapore) Pte. Ltd.	TEL +65-62255133～4	FAX +65-62249029
Kawasaki Heavy Industries Consulting & Service (Shanghai) Co., Ltd.	TEL +86-21-3366-3100	FAX +86-21-3366-3108
Kawasaki Do Brasil Industria E Comércio Ltda.	TEL +55-11-289-2388	FAX +55-11-289-2788

Tokyo Head Office
World Trade Center Bldg., 4-1, Hamamatsu-cho, 2-chome, Minato-ku, Tokyo 105-6116, Japan
Marine Machinery Sales Dept. Machinery Division: TEL +81-3-3435-2374 FAX +81-3-3435-2022

Kawasaki http://www.khi.co.jp

Meet us at SMM
Booth No.
Hall A1/714

The two docks will be available to use from March next year.

The new facility will be able to produce two million dwt of newbuildings and repair up to 220 vessels per year. Xingang's current site will continue to build and repair ships.

Other ship types offered by Xingang include 37,600 and 38,000dwt handysize bulkers as well as railway ferries of 6500dwt with 188m in LOA and 22.6m in breadth.

Weihai

While China has surpassed the world's expectations in its ability to tackle just about any ship type, even LNG, in such a short space of time, its one area that it is still behind the curve is passenger and cruise ship building. In the former British concession of Weihai on the southern tip of Bohai Bay progress on this last frontier for China's shipbuilders is moving on apace. On 11 May this year the *Bo Hai Fei Zhu*, China's largest ro-pax ship finished its trial voyage successfully. It is now operating in Bohai Bay.

The ship, valued at RMB350 million (US$51.5 million), was built for China's Bohai Ferry Co., Ltd. The gross tonnage of the ship is just over 20,000gt, with 163.95m in LOA and 25m in breadth. The lane length stands at 2000m while the capacity comes up to 280 cars and 1650 passengers.

Now the same shipowner, Bohai Ferry, is readying an order at the same yard to build four luxury ferries worth RMB1.6 billion (US$236.01 million).

The LOA of the new design is 178.8m while the breadth is 28m. The gross tonnage comes up to 27,000gt, with capacity for 2296 passengers and 300 cars.

The ship is to be fitted with hi-tech power, navigation, alarm, and emergency systems. With reliable stability and hull strength, the ferry can sail on the condition of eight-level wind.

The ferry will be operated not only in the domestic market but also in international lines, such as to Korea, Japan, Taiwan, and even Europe.

Moreover, Bohai Ferry is about to invest RMB1.5 billion (US$221.56 million) to launch a luxury cruise ship as well. On 15 January, the company signed a memorandum of cooperation with CCS, Shanghai Merchant Ship Design & Research Institute (SDARI), and Huanghai Shipbuilding. Beijing's stimulus package specifically called for the nation's shipbuilders to crack the cruise market. Huanghai might be first.

Shandong New Shipbuilding Heavy Industry, also known as Shandong Weihai Shipyard, tends to focus on multipurpose ships and bulkers. It recently bagged an order from a local firm for six 28,400dwt ships for delivery from 2012 at around US$25 million each. State-owned Shandong Weihai is located in Zaobei Bay in Gushan Town. It is equipped with two 100,000dwt dry docks and has plans to build another of 300,000dwt. The largest ship type built at the yard was of 92,500dwt for Greek owner Transmed.

South Korean emerging shipbuilder Samjin Shipbuilding Industries Korea Co, Ltd (SSI) located in Weihai, Shandong, offers a variety of handysize bulkers and PCTCs.

Handysizes tend to be 34,000dwt in size (180m by 34m), while PCTCs are up to 6700 units.

SSI with its 7000 workers including some 200 Koreans in the management team can build five vessels of up to 100,000dwt class simultaneously at its one million m^2 size yard that is equipped with one large dry dock and four skid berths. The yard delivered its first ship last year and is aiming to deliver on ship every month this year.

SSI has introduced the Conveyor Assembly System (CAS) at the yard as a new method for ship block assembly for the first time in the world, which maximizes ship construction efficiency while minimizing investment. Shipbuilding output has more than doubled after introduction of the CAS.

Yantai

Last year China's top container manufacturer, aware of the slide in box shipping fortunes, bought out one of the nation's offshore pioneers, Singapore-controlled Yantai Raffles. China International Marine Containers (CIMC) was able to acquire the debt laden yard for just US$300 million; it had been worth as much as US$1 billion just a year prior. Since then CIMC has invested heavily to boost expertise and production in this field.

CIMC Raffles, the newly re-branded name, is looking to raise up to US$100 million from a non-underwritten rights issue.

It plans to issue 136.7 million shares priced at 73.5 US cents each on the basis of one rights share for every two existing ordinary shares.

Proceeds from the rights issue will go towards improving facilities at its existing shipyards and to build new facilities.

Rongsheng looks to the LNG market.

The Singapore-headquartered company, which is listed on Oslo's over-the-counter (OTC) market, changed its name on 1 July.

CIMC Raffles' planned investments include the second phase of an 18m deepwater wharf at its main shipyard located in Yantai.

It also plans to build more workshops at its shipyard in Haiyang, Shandong to enable it to carry out more construction work under cover, thereby minimising the effects of adverse weather on production.

It added that a newly acquired shipyard in Longkou, Shandong, will also be developed into a "world-class construction yard" for building jack-up drilling rigs. The new yard cost RMB291 million (US$43 million), and is spread over 400,000m^2. "Our long term plan is to become the number one supplier of Jackup drilling rigs in the world within the next three-five years." said Deputy Chairman Brian Chang at the time of the acquisition.

A representative of CIMC said the group was negotiating several offshore contracts totalling US$3 billion at present.

In February CIMC paid US$75 million to buy a 75% stake in Friede & Goldman United (F&G), a USA-based naval architecture and marine engineering firm for the offshore drilling market. Sources at CIMC Raffles say that the company is now working on high tech LNG-FPSO designs, something no Chinese yard has won an order for yet.

China heads for the bigger vessel sizes.

Qingdao

Qingdao is an emerging shipbuilding base with a huge number of yards suddenly making international waves.

Qingdao Beihai Shipbuilding Heavy Industry Co (BSIC) is both the oldest and the largest yard. Established back in 1898, now a part of northern state run yard conglomerate China Shipbuilding Industry Corporation, it made way for the Olympic sailing regatta relocating six years ago to the development zone at Huangdao. Its new premises are enormous, stretching out across 330 hectares, with 9km of coastline, two huge shipbuilding drydocks (500,000 and 300,000dwt), two repair docks (300,000 and 150,000dwt), one floating repair dock (100,000dwt), four 600tonne gantry cranes plus a 350tonne crane and another crane at 200tonnes. Current annual building production is set at two million dwt, and the business plan mapped out for BSIC sees this former repair and conversion specialist able to churn out 4.7million dwt in the future. Hosco and Indian firms Reliance and Tata Steel are among the yard's major clients for capesize ships. New products include kamsarmaxes, this year's in vogue, must have among owners ordering in China. The 82,000dwt ship is 229m LOA, 32.6m wide with a scantling draft of 14.5m.

Oil giant CNOOC has an offshore fabricating facility just opposite BSIC and was keen to get BSIC involved in offshore construction but the shipbuilder is understood to have dragged its heels. BSIC is now in talks with McDermott to get into the offshore sector.

The next largest shipbuilder is Qingdao Shipyard which was recently taken over by the Yangfan Group, a major yard player in the Zhoushan area. Qingdao Shipyard specialises in military vessels and offshore workboats with a slight exposure to small bulkers. CNOOC, Sinopec, Sinochem and PetroChina are main clients outside the navy, though interest is growing in the Middle East with White Shipping from the United Arab Emirates (UAE) placing a series of tug orders here.

The cramped, old facilities in the centre of town are now accompanied by a new, larger site 90 minutes away. The old yard has a 5000dwt dock and three slipways while the new one, which started last December, is six times larger on 1200 acres with two decent sized docks and a 150,000dwt tanker design being marketed.

China's Wuchang Shipbuilding Industry's new shipyard Qingdao Wuchuan Heavy Industry has recently sealed a deal to build four bulkers of 45,000dwt, reportedly with Shanghai Time Shipping, a joint venture between China Shipping Development Co (CSDC) and electricity supplier Huanneng Group.

The newbuildings are said to be shallow-draft vessels suited to transporting coal along coastal routes and inland waters.

Located in Haixi Bay in Qingdao city, Qingdao Wuchuan is an offshoot of Wuchang Shipbuilding in Wuhan city, which has been building ships for more than 75 years.

Qingdao Wuchuan can build vessels up to 300,000dwt. The yard is targeting large commercial ships and offshore vessels such as floating production, storage and offloading (FPSO) units and

semi-submersibles. It started operating last summer and is currently constructing two 8000dwt bulkers for a domestic owner and a few offshore vessels.

Jiangsu

Five-year-old Jiangsu Rongsheng Heavy Industries has rapidly established itself as China's largest private shipyard. Each of its three current drydocks has a massive 900tonne crane, while a planned fourth will house a 1600tonne monster.

Already well known as the world's number one suezmax builder, Rongsheng's portfolio continues to expand. Since inception it has been construction ice class panamax bulk carriers. Capesizes then joined the menu before Vale came in with a substantial US$1.6 billion VLOC order for giant 400,000dwt ships, a type since reordered by Omani interests.

Newest ship types to be taken up by the market include the yard's self-designed 320,000dwt VLCCs.

The fourth drydock, due to start operations soon, is specifically focused on offshore and has the capability to build up to six FPSOs of up to 150,000dwt a year.

The construction of the US$44 million *Hai Yang Shi You 201*, Asia's first 3000m deepsea pipe laying lifter, has been completed by Rongsheng this year to China National Offshore Oil Corporation (CNOOC), a first of its kind for China. The client has been delighted with the ship and promises to bring more offshore work Rongsheng's way.

Rongsheng is pitching for LNG projects though remains tight lipped on the specifics of the ship design.

Rongsheng has been the busiest shipyard in China this year taking orders worth a combined US$3 billion. A spokesman for Rongsheng said the facility was now fully booked through to the middle of 2013.

Rongsheng is gearing up for a Hong Kong listing worth up to US$1 billion. Rongsheng, which boasts Goldman Sachs, DE Shaw and even the son of the Chinese premier among its investors, saw operating income soar more than 60% last year to RMB10 billion (US$1.4billion) as orders continued to flood in.

Down the road from Rongsheng back towards Shanghai lies Nantong Mingde Heavy Industry which this July supersized its building capabilities by entering the capesize market. Cabot Shipping ordered a pair of 180,000dwt ships which are 291.95m long, 45.0m wide, and a height of 24.75m, a design drought of 16.5m, and a coating area of 400,000m^3. Mingde upgraded the commonly used 176,000dwt Green cape design. The ships will have high-tensile steel to reduce lightweight and increase deadweight. Each ship costs US$56 million and delivery of the first one is expected in October 2012.

Up until this order Mingde's largest ship types were its popular mini-capes, which at 115,000dwt had proved a niche hit.

The mini-capes were developed by Shanghai Merchant Ship Design & Research Institute (SDARI).

Another popular item on Mingde's portfolio is its 25,000dwt product tanker designs.

New Century Shipbuilding, another much talked about Jiangsu yard, suffered the ignominy this year of scrapping a planned initial public offering in Singapore due to late emerging discrepancies in its prospectus. It dealt a severe blow to the fast evolving yard's future plans. As much as S$371.1 million (US$274.4million) from the IPO proceeds had been earmarked for New Century to move into the offshore sector. The plan had been to get in on the FPSO and drilling rig act. These offshore ambitions now are on hold following the embarrassing failure in June of its Singapore listing. That is not to say, however, that the yard is not

China may be focused on what is currently happening, but plans for the future are starting to emerge.

busy. New Century ranks as China's fifth largest shipbuilder and the world's 13th largest in terms of orderbook measured by deadweight tonnage.

While it built a reputation on its 92,500dwt bulkers, its 73,400dwt aframaxes and its 163,000dwt suezmaxes, latterly it has enjoyed some success marketing its new 320,000dwt VLCCs, Greece's Dynacom Tankers Management among those opting for this supertanker design. Also on the yard's portfolio are 176,000dwt capesizes.

One Chinese yard that is listed in Singapore is Jiangsu Yangzijiang Shipbuilding, which is expanding fast. Its 93,000dwt bulker design has proved popular, as have its multipurpose ships of all shapes and sizes.

Suggesting a very bright future for the shipbuilding group, a Qatar sovereign wealth fund has emerged as the mystery investor in Yangzijiang. In April an unnamed Middle East investor agreed to subscribe to 83.5 million new shares in the Singapore-listed Chinese shipbuilder at S$1.29 (US$0.94) a share. It was revealed this summer that the investor in was none other than the Qatari sovereign fund, one of the world's richest investment vehicles.

At the end of June Yangzijiang Shipbuilding grabbed a majority stake in Chinese rival Jiangsu Changbo Shipyard at a "compelling price".

Yangzijiang paid RMB51 million (US$7.5 million) for a 51% holding in the Yangtze River yard and also committed to plough fresh capital into the business.

Jiangsu Changbo has orders for 20 vessels in deals worth a collective US$338 million, Yangzijiang says. The orderbook stretches until the middle of 2012.

Ren Yuanlin, CEO of Yangzijiang Shipbuilding, said: "This recent acquisition will be a value-add for the Yangzijiang Group based on the compelling price of acquisition and on the yard's strategic location and proximity to the group's existing yards.

"Moreover, this new yard will serve as an alternative production area to our old yard in building small sized vessels."

Jiangsu Changbo is located only 5km downstream from Yangzijiang's Jiangsu New Yangzi Shipbuilding yard on the Yangtze.

Having started life as a repair yard in 1970, Jiangsu Changbo (which will be renamed Jiangsu Yangzijiang Changbo Shipbuilding) turned to shipbuilding in the 1990s.

Handymax and supramax specialist Jiangsu Hantong Ship Heavy Industry has diversified into constructing kamsarmax bulkers.

The Sino-Korean-owned yard announced this July it has bagged four 82,000dwt bulker order plus four options from a domestic owner. Jiangsu Hantong declined to reveal the identity of the buyer but says it is scheduled to deliver the first ship in May 2012.

Sources familiar with Jiangsu Hantong say the yard will be constructing the newbuildings at its new facility called Jiangsu New Hantong Ship Heavy Industry, which is also located in Zhenjiang city, Jiangsu province. It is in operation and rolled out its first vessel last year.

With the new yard, Jiangsu Hantong is aiming to deliver 18 vessels this year, as compared with 11 last year.

Hantong made a name for itself by becoming very adept at churning out supramaxes, the Dolphin-57 units, a design developed by Shanghai Merchant Ship Design & Research Institute (SDARI).

Hantong is a modern, mid-sized newbuilding and repair yard that was set up five years ago as a joint venture between a Korean investor and Nantong Ocean Water Construction Co Ltd. Facilities are being developed whereby the yard could be building ships of up to 300,000dwt soon.

Wuhan

Wuchang Shipbuilding, located on the Yangtze river in Wuhan in Hubei province, specializes in chemical and product tankers as well as anchor handling tugs and supply vessels and heavy engineering projects.

Chinese oil giant CNOOC is getting Wuchang to build two especially high tech two anchor handing, tug and supply vessels. The two UT788 CD deepwater vessels cost RMB1.4 billion (US$206.5 million) in total. The vessels measure 93.4m in length, 22m in width and 6.5m of water line with 29,000 HP of total propeller power.

Qingshan Shipyard, part of China Changjiang Shipbuilding Industry, also located in Wuhan is touting its 57,000dwt bulker design. These are the largest ships built in the central China area, made possible by extensive dredging of the Yangtze.

The ship designed by Shanghai Ship Research & Design Institute, is nearly 190 meters in length, 32.26m wide and 18m deep.

Ships of this size would have been impossible to build in Wuhan until very recently as the draft of the Yangtze could not accommodate such vessels. A huge dredging effort, done in stages, from Shanghai all the way up to Chongqing is changing the face of Yangtze River traffic. Wuhan lies some 1100km along the Yangtze from the river's estuary near Shanghai.

Chongqing

It might lie close to 3000km to the coast but the world's largest municipality, but Chongqing (population 32 million; size equivalent to Austria) is rapidly gaining a reputation for building decent ships.

During January to May the gross industrial output of Chongqing shipbuilding industry reached RMB6.5 billion (US$957 million), rising by 51.9%.

Sinotrans, the state owned transport giant, this April announced plans to spend RMB2 billion (US$295 million) in the city to build dozens of dry bulkers, small boxships, 800 unit ro-ros, chemical tankers and river cruise vessels, all in Chongqing.

Among the more high tech ships completed in the city of late was a small 8000dwt LPG carrier for a Shanghai owner built by Chongqing Jinlong Shipbuilding.

Chongqing Dongfeng Shipbuilding, owned by river shipping company China Changjiang National Shipping Corporation, is the city's number one builder, specializing in chemical and product carriers of 5500dwt to 10,000dwt. It has just finished expanding the yard, whereby a new 530m long dock makes it possible to build eight vessels simultaneously. *NA*

ECOSPEED®

SHIP HULL PERFORMANCE TECHNOLOGY

Ecospeed ship hull performance technology lasts the lifetime of the vessel. The need for full repaints during future drydockings is eliminated.

An impermeable and extremely tough coating is combined with an underwater cleaning system keeping the hull roughness at an optimum level and resulting in a major saving in fuel.

Ecospeed is a 100% non-toxic technology and is guaranteed for 10 years. Its surface texture will improve over time with regular inwater hull maintenance.

a HYDREX® UNDERWATER TECHNOLOGY

Phone: +32 3 213 5318 info@ecospeed.be
Fax: +32 3 213 5321 **www.ecospeed.be**

Filling the skills gap

Developing into a competitive and competent shipbuilding facility at the rate that has been achieved by many Chinese yards requires the rapid development of skills and technological excellence. Sandra Tsui discovers how DNV is helping China meet its need for high quality, trained personnel.

A shortage of skills and technology are issues that face all developing countries when they first enter an industry, China is no different. The country has already developed into one of the most prolific and important shipbuilding bases worldwide, but the nation needs to level its expertise in research and development (R&D) capability to match that of its peers in the developed world if it is to survive and keep growing.

When asked what the challenges are for the present shipbuilding industry in China, Zhao Jia Lin, pre-contract Manager of DNV China, pointed out that while labour and raw material costs are on the rise, ship prices are falling. Excess supply also poses problems as not only China, but other countries in the region such as South Korea continue to expand their building capacity. More importantly, China has to strengthen its R&D ability to gain an edge on skills and technology.

While the first two issues may not be handled one-sidedly by China; China's shipbuilding industry can certainly tackle and has already started to take on the third challenge.

"Not many Chinese shipyards have their own R&D departments. Many of them still rely on independent local or overseas design houses. While green design and energy saving are issues facing the whole shipbuilding industry, China does not have an advantage in terms of technology, research and development yet compared with its peers in the developed world," said Mr Zhao.

Some sizable shipyards in the country do have their own R&D departments, but when it comes to certain special ship types, even larger shipyards look for help from independent design consultants such as Shanghai Bestway Marine Engineering Design. Yards of medium size often rely on independent design houses and the research units under large state-owned shipbuilding enterprises, such as the Marine Design & Research Institute of China (MARIC) and the Shanghai Merchant Ship Design & Research Institute (SDARI) under China State Shipbuilding Corporation (CSSC), according to Mr Zhao.

Zhao Jia Lin, Pre-contract Manager for DNV in China.

A common cooperation model is that when a shipyard first receives an inquiry from a shipowner, it would ask a design consultant to prepare a preliminary design. After an order has been confirmed, the shipyard will formally assign the consultant to proceed on the detailed design. If no order is resulted, whether the preliminary design is paid would depend on the agreement between the parties and the complexity of the preliminary design. Some design house may require the yard to pay a small sum in advance.

In some rarer cases, shipyards may delegate a consultant to work out a design of a particular ship type before it has secured any order and then sell that design to shipowners. There are also situations where consultants initiate a project on its own and sell the end product to shipyards, explained Mr Zhao.

"Spending 6% to 7% of revenue on research, development and innovation every year, DNV is keen to play a role in the technological advancement of China's shipbuilding industry and bring its research results and know-how to the country," said Mr Zhao.

The classification society has recently provided professional advice to Hudong Zhonghua Shipbuilding (Group) Co Ltd and MARIC, both subsidiaries of CSSC, on a project of developing a new LNG carrier model, said Mr Zhao.

Hudong Zhonghua is the first Chinese shipyard having the capability to build LNG carriers. The present 147,210m^3 LNG carrier model of Hudong Zhonghua is of medium size, propelled by steam turbine and designed for long distance operations.

The new model, also targeting long distance routes, will be of a larger size. The key criterion of the new design is energy saving and the research team will consider whether to continue using steam turbine like the existing design of LNG carrier of Hudong Zhonghua, or to use duel fuel engine, according to Mr Zhao.

DNV has also been involved in the FPDSO (floating production, drilling, storage & offloading unit) project of Cosco (Nantong) Shipyard Company Limited and Norway's Sevan Marine.

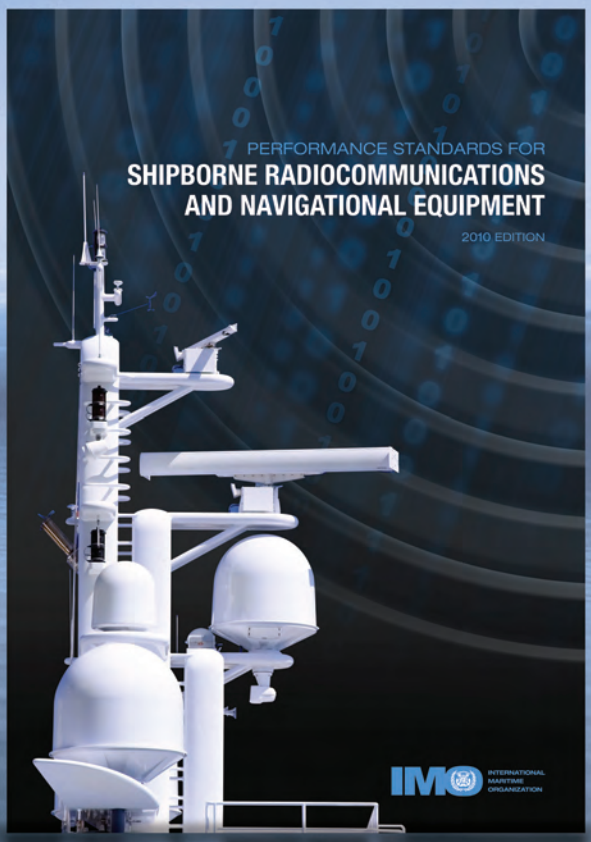
Meanwhile, DNV is introducing its new containership concept "Quantum", released this April, to the China market. DNV has integrated a long list of innovative solutions into the Quantum which the institute claims can transport more cargo with less fuel and a reduced environmental impact.

If Quantum is realised as designed, it would be a 272.3m long, 6210TEU vessel with a design speed of 21knots, but can operate efficiently at speeds between less than 10knots and more than 22knots. The design has a beam of 42.5m which gives it good stability and it has a width of 49.0m that will increases its cargo capacity. The need for ballast water is minimised and LNG is introduced as part of the ship's fuel. *NA*

PERFORMANCE STANDARDS FOR

SHIPBORNE RADIOCOMMUNICATIONS AND NAVIGATIONAL EQUIPMENT

2010 EDITION



IMO INTERNATIONAL MARITIME ORGANIZATION
PUBLISHING

visit www.imo.org for your local distributor

Wärtsilä moves to support China's shipbuilding

For more than 30 years, Wärtsilä has been producing marine engines in China and its next move is to establish an engineering centre in the country it regards as one of its most important and fastest growing markets. Sandra Tsui investigates.

The latest move from Wärsilä has seen an engineering centre set up in Shanghai and the facility will become operational in 2011, according to Martin Wernli, president, Wärtsilä Switzerland. Wärtsilä marine products currently being produced in China include low speed engines, propellers, generating sets and thrusters. The engineering centre will be run by experts from Europe as well as local engineers, according to Mr Wernli.

"This engineering centre will focus on supporting the firm's production and local engineering capacities for marine products," explained Mr Wernli.

Wärtsilä has no research and development (R&D) function in China at the moment. It has eight licensees in China, which include subsidiaries under the two largest state-owned shipbuilding groups, China State Shipbuilding Corporation and China Shipbuilding Industries Corporation, and newcomer Zhuhai Yuchai Marine Power Co Ltd (ZYMP), a subsidiary of Guangxi Yuchai Machinery Group.

ZYMP signed a licence agreement with Wärtsilä last October and it will focus on the manufacturing of engines of 35 to 50cm cylinder bore with the latest of Wärtsilä's common-rail technology incorporating full electronic control of engine processes.

The plant has received its first order from Ningbo Donghai Shipping Co which is also the first order for Wärtsilä's RT-flex35 engines. ZYMP will supply five 6-cylinder Wärtsilä RT-flex35 common rail diesel engines with a power output of 5220kW (7099 bhp) for a series of five 17,000dwt chemical tankers to be built by Ningbo Shipyard Group in Fujian. Delivery of the first engine is scheduled for August 2011.

"About one-third of Wärtsilä's low speed marine engines are being produced in China at the moment. However, manufacturing capacity in the country was not enough to satisfy the local demands for Wärtsilä marine engines and is currently being built up. Imports from Japan, South Korea and Europe will be needed to a much less extend," Mr Wernli explained.

Martin Wernli, president, Wärtsilä Switzerland.

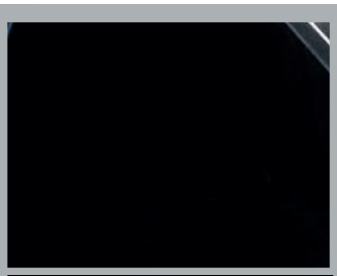
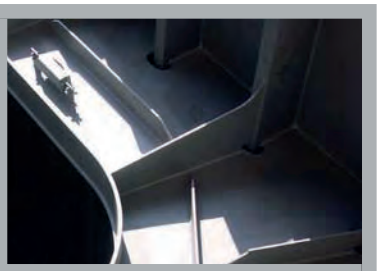
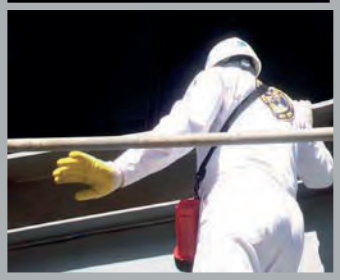
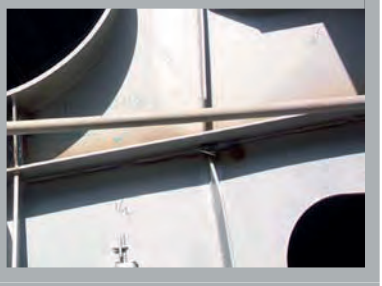
"In the long run, we expect to have all the marine engines needed locally to be made in China," said Mr Wernli. "It is our strategy to be closer to our customers."

Apart from setting up a new engineering centre in Shanghai, the company also intends to expand the scale of production, range of products being produced and market share in China.

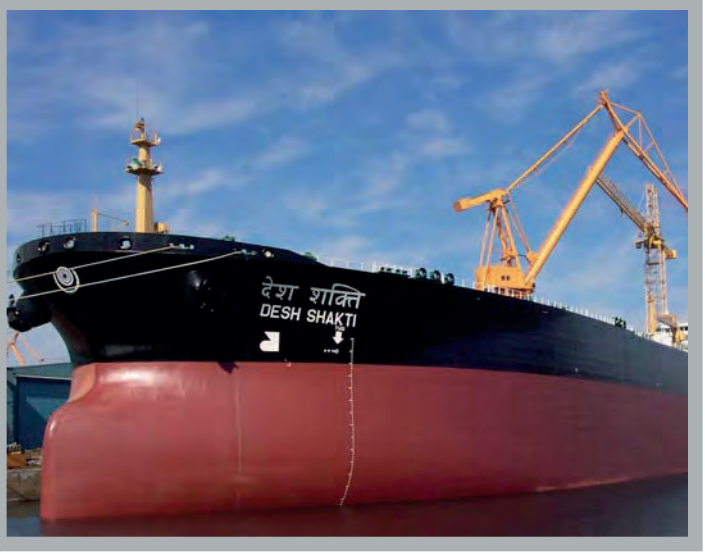
In the past, only engines of up to 72cm cylinder bore were produced in China. Larger engines such as RT-flex82T, RT-flex82C, RT-flex84T, RT-flex96C are mainly imported from South Korea. But today, licensees in China also have the capacity to produce larger engines. Dalian Marine Diesel, a joint venture between CSIC and Wärtsilä has started to manufacture RT-flex84T engines.

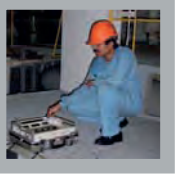
"China is one of the most important and fastest growing markets. We expect to see some big independent players coming up and the industry to move towards the production of higher value added products," said Mr Wernli.

He expects the country's shipbuilding industry will be expanding in the coming three years and that there will be a lot of potential in the LNG carrier and offshore sectors. Wärtsilä's duel fuel engines for LNG carriers are currently produced in Europe and South Korea and the engines for the offshore sectors imported from Europe. Mr Wernli said that these products can be manufactured in China in the future making the production process closer to its customers. *NA*



At IRCLASS,

classification is not just about

compliance with the rules.

It is our partnership with you to ensure

your ship's construction quality,

operational safety

and your business efficiency.

At IRCLASS we combine experience, expertise and understanding

with technology, worldwide operations and a professional team

to achieve just this.

Visit us at
SMM Hamburg
booth no B2.EG.111

Discover More With

IRCLASS
Indian Register of Shipping

52-A, A.S.Marg, Mumbai 400072, INDIA, +91-22-30519400, Fax: +91-22-25703611, Email: ho@irclass.org

Building a future

China's private shipbuilding sector is developing a skill base through partnership with foreign organisations. Sandra Tsui reports on the developing expertise at Sinopacific and the company's latest designs.

Ship owners look for three basic qualities in a ship: safety, eco-friendliness and cost-effectiveness regardless of the ship type according to Simon Liang, chairman and CEO of Sinopacific Shipbuilding Group, one of the few private shipbuilders that has its own research and development (R&D) department.

With two shipbuilding bases in east China's Zhejiang and Jiangsu provinces, Sinopacific delivered 53 vessels with output value amounting RMB12billion (US$1.77billion) last year. The group designs simpler products on its own and cooperates with partners on the development of more complex ship types such as the Norwegian Ulstein Group and Seattle-based Guido Perla & Associates (GPA), explained Mr Liang.

"But when it comes to offshore and LPG vessels, safety and eco-friendliness become the priorities," he said. "The recent Gulf of Mexico oil spill has sent a strong message to the industry that these incidents could threaten the stability of a company. Clients are willing to input more in these areas nowadays. When these two criteria are satisfied, shipowners will then look for lower fuel costs and greater deadweight cargo tonnage without compromising on speed," he added.

In meeting the twin requirements of safe and clean shipping Sinopacific's LPG tanker design, the Tiger FP5000, has a complete double skin in the cargo hold area, consisting of double side shell and double bottom. An integral upper deck is also in place to give the cargo tanks additional protection and make transportation more economical by reducing leakage of certain types of cargo due to environmental changes.

This design can also avoid the difficulties involved in the maintenance of a rubber skirt installed in fully pressurised vessels. Being fully automated with one-man bridge control, Tiger FP5000 needs fewer crew, according to Mr Liang.

The LPG ship model complies with all latest new rules and regulations, such as International Maritime Organization (IMO) PSPC (Performance Standard for Protective Coating), new convention on ballast water management, revised MARPOL 73/78 regarding NOx etc, European Union (EU) SOx control as well as those to be effective in the foreseeable future, said Mr Liang. Class notation of EP (Environmental Passport) and Green Passport of IMO will also be applied, he added.

"Ship owners have shown great interest in our new design of 5000m^2 LPG carrier Tiger FP5000, said Mr Liang. He said the company has received orders for six Tiger FP5000s so far. The production design of Tiger FP5000 will be completed by the end of this year.

The company has also received 16 orders for its Crown 63 design, a 63,000dwt eco-friendly bulk carrier which has been certified by Bureau Veritas.

Crown 63, the latest bulk carrier developed by Sinopacific is claimed to be 9% higher in deadweight cargo tonnage but 13% more energy efficient in terms of fuel consumption compared to the 58000dwt bulk carriers generally in the market.

"Currently, all our bulk ship models are self-designed. The parameters of the 58,000dwt bulk carrier and the latest 63,000dwt bulk vessel are of world class quality," claimed Mr Liang.

Lately, Sinopacific has started its own independent R&D projects on some of the more complex ship types. "Our first 1800dwt anchor handling tug supply (AHTS) vessel "SPA80", with its concept design completed in March this year, is being introduced to the market," said Mr Liang. "We expect the production design would be finished in October. We have already received orders for 20 vessels of this model."

The company has also led the joint development projects of LPG vessels of 16,500m^2, 12,000m^2 and 5000m^2 with Nantong United Heavy Industry Co Ltd. *NA*

TECHNICAL PARTICULARS

Tiger FP5000

L o,a	99.90m
L b,p	92.0m
Beam	17.40m
Depth	11.70m
Deadweight	4900dwt
Design/scantling draft	7.00m
Cargo tanks	5,000m^3
Heavy fuel oil tank	550m^3
Diesel oil tank	125m^3
Fresh water tank	125m^3
Water ballast tank	1200m^3
Speed at design draft	14knots
Main engine consumption at CSR	12.0t/d
For LNG service is abt 13.50knots with fuel oil consumption about 10.0t/d	
Classification	GL✠ 100A5 Liquified Gas Carrier Type 2PG, IW, EP, WBM-S NAV-O ✠ MC AUT
Main Engine	MAK 6 M32C Tier II x 1 set or equivalent MCR 3000kW at 600.0r/min CSR 2700kW at 600.0r/min
Main diesel generators	2 sets x 425kWe (450V, 60Hz, 1800r/min, 3 phase, 3 wire)
Shaft generator	1 set x 400kWe (450V, 60Hz, 1800r/min, 3 phase, 3 wire)
Ballast pump	2 sets x 100m^3/h @ 0.25MPa
Bow thruster	1 set x abt.250kW with fixed pitch propeller
Cargo containment	One bilobe and one cylinder independent type C cargo tanks with the material of high tensile carbon steel.
Cargo plant	One cargo compressor with one compressor motor; three sets deep-well cargo pumps x 200m^3
Accommodation	Cabins for 16 persons

INTERFERRY
35th ANNUAL CONFERENCE

NEW YORK MARRIOTT at the BROOKLYN BRIDGE • OCT 3-6, 2010

NAVIGATING THROUGH A NEW WORLD ECONOMY

SESSIONS

- Emergency Preparedness
- Access to Finance
- Environmental Innovations
- Developments in Emerging Markets
- Developments in North America
- Interior Design: What Does It Mean to the Bottom Line?
- Debate on Cabotage
- Special Guest Speakers

ACTIVITIES

- Pre-Tours
- First-Timers Reception
- Welcome Reception
- Evening Reception
- Networking Opportunities
- Happy Hours
- Gala Dinner
- Spouses/Partners Program
- **Professional Tour**
- Post Tour

SPONSORS

Partners: HARBOR EXPERIENCE COMPANIES (WATER TAXI, CIRCLE LINE DOWNTOWN, WATER TAXI Beach), RTA

Platinum: DNV, RODRIQUEZ CANTIERI NAVALI SPA

Gold: AUSTAL, carus, CURRENT corporation, Lloyd's Register 250 YEARS OF SERVICE

Silver: FLIR, FORTH CAT, HamiltonJet, Hogia, L3 Ocean Systems, mtu, AFC, SIEMENS, Stena RoRo, stx Finland, stx Canada/US Marine, WÄRTSILÄ

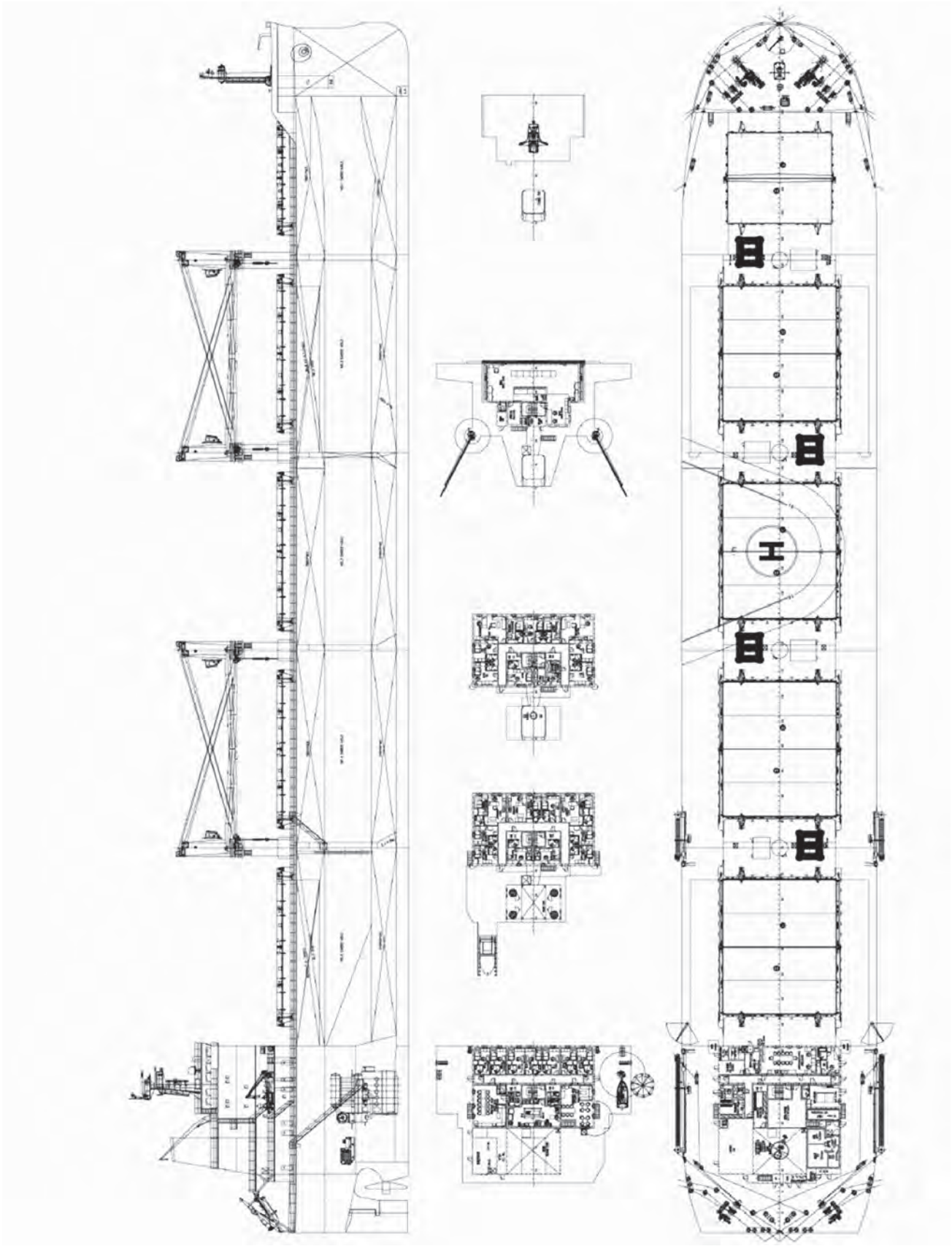
Bronze: ABS, Bloemsma Boats, BEURTEAUX, DAMEN, HMS GLOBAL MARITIME, IBS, MOFFATT & NICHOL, NAIAD DYNAMICS, Shipowners, solarsailor, TURBOJET, VOITH, ZF

Other: RTS, GLADDING-HEARN SHIPBUILDING, REDERI AB GOTLAND, OSK-ShipTech

Media: THE NAVAL ARCHITECT

CHECK OUT THE WEBSITE FOR COMPLETE INFORMATION: WWW.INTERFERRY.COM

GA plan of Tiger FP5000 LPG carrier.



We are exhibiting

SMM 2010

See you at Hamburg Messe, Hall A1

JSMEA Japan Marine Equipment Association

http://www.jsmea.or.jp

Quick learner COSCO in successful shift to shipbuilding

Started as shiprepairer in 2001, COSCO Shipyard Group has horizontally expanded into shipbuilding since 2007 and has handled some of the highest profile shipbuilding projects in the country, writes Sandra Tsui.

Last November, COSCO Shipyard delivered the world's first cylindrical ultra-deep water semi submersible drilling rig to Norway's Sevan Marine ASA. A second is scheduled for delivery early next year. Meanwhile, the company is also building the first octagonal drilling unit in the world for ATP Oil & Gas (UK) Ltd.

COSCO's shipbuilding success also includes some of the company's most popular products: its 92,500dwt, 57,000dwt, 79,500dwt bulk carriers and the multipurpose heavy-lift vessel of 30,000dwt, according to Xu Xiulong, Deputy General Manager of Technical Center, COSCO Shipyard Group Co Ltd.

"The industry standard of environmentally friendliness of ship designs is getting higher and higher. New ship models must meet the latest MARPOL requirements and the standard of nitrogen oxides (NOx) emission. They also need to be able to burn marine gas oil (MGO) and equipped with oil-water separator and marine sewage treatment system etc," said Mr Xu.

On top of major conventions and standard environmental protection requirements, shipowners assess new ship models by their deadweight capacity, cubic capacity, speed, energy consumption and eco-friendliness, said Mr Xu. The shipyard has, therefore, required design consultants to pay more attention to the maximisation of cargo capacity, control of light ship weight, engine selection and the processing of ballast water among other things.

"Cubic capacity of cargo holds is vital for bulk vessels, especially when carrying lighter cargoes such as grains. The importance of cubic capacity is even higher than that of deadweight capacity in some cases," said Zhang Bo,

TECHNICAL PARTICULARS

30,000dwt multipurpose heavy lift vessel

Length o,a	199.80m
Length b,p	189.00m
Breadth	27.80m
Depth	15.50m
Design draught	10.30m
Scantling draught	11.00m
Deadweight capacity	30,300dwt
Main engine	16520kW x 114r/min
Service speed	19.20knots
Endurance	15,000nm
Number of crane	4 (2 x 320tonnes; 2 x 50tonnes)

The 30,000dwt multipurpose heavy lift vessel designed by SDARI and COSCO Shipyard Group.

TECHNICAL PARTICULARS	
92,500dwt bulk carrier	
Length o,a	229.20m
Length b,p	222.00m
Breadth	38.00m
Depth	20.70m
Cubic capacity of cargo holds	110,300m^3
Design draught	12.50m
Scantling draught	14.90m
Deadweight capacity	92,500dwt
Main engine	MAN B&W 6S60MC
Service speed	14.10knots
Endurance	22,000nm
Number of crane	4

manager of shipbuilding technology department, COSCO (Dalian) Shipyard. Ships built by COSCO with better cubic capacities include the 92,500dwt bulk carrier which was designed by Shanghai Merchant Ship Design & Research Institute (SDARI) and has a cubic capacity of 110,300m^3.

Another important consideration is the control of light ship weight. "If the main particulars, service speed and power of main engine remain unchanged, deadweight capacity can be raised by limiting the light ship weight," said Mr Zhang.

One of the most effective ways to control light ship weight is to use high-strength steel which, if used properly, can enhance cargo capacity and performance of the ship hull, save energy and lower production costs, said Mr Zhang. However, high-strength steel cannot be used extensively because components made of high-strength are smaller, thinner and with high yield stress, thus have poorer anti-fatigue performance, he added.

The selection of the main engine is also of great importance as the design of the whole power system onboard is based on the main engine, said Mr Zhang.

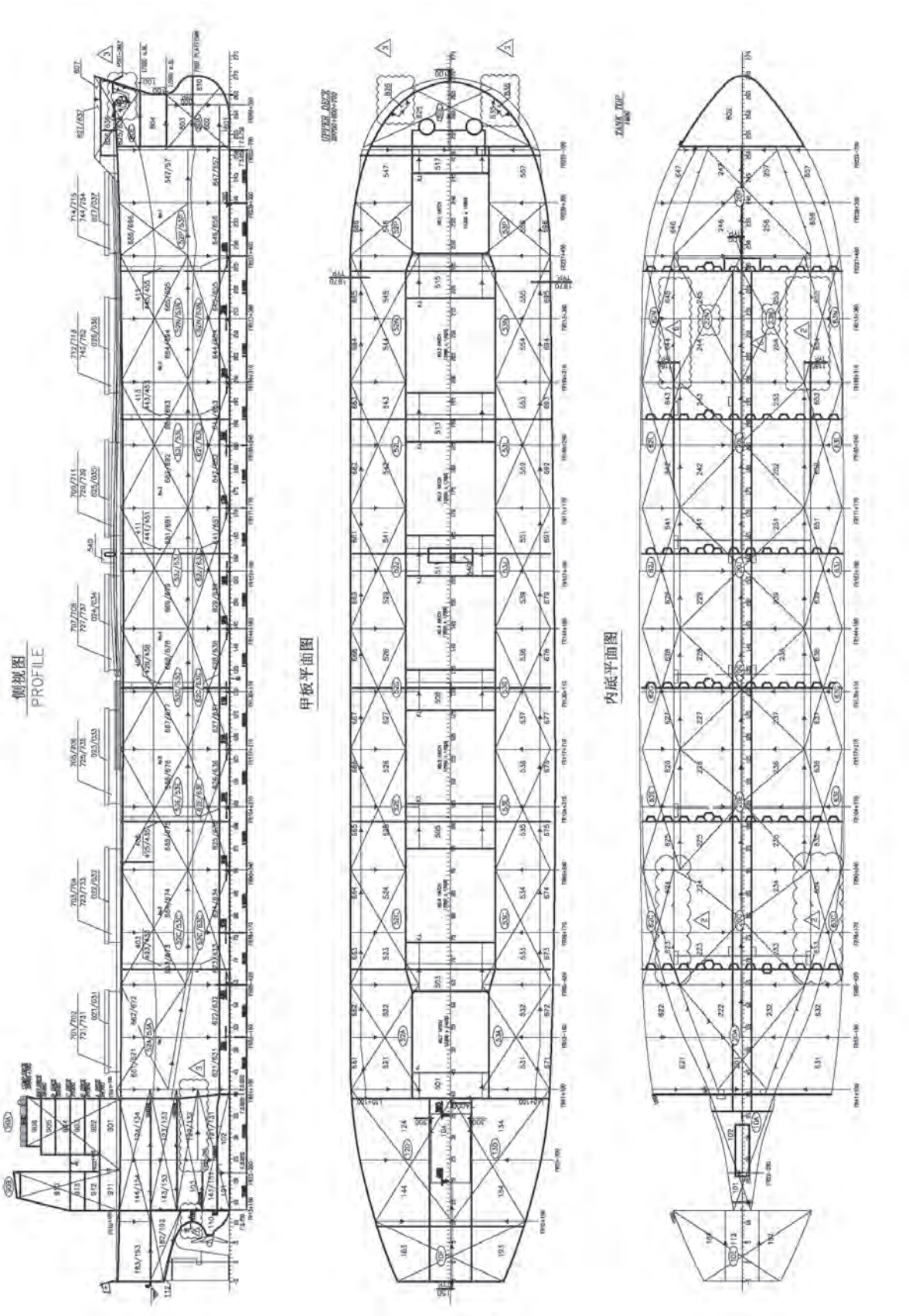
Besides bulk carriers and offshore units, another major product of COSCO is the 30,000dwt multipurpose heavy lift vessel, which can carry containers, bulk cargo and large machinery parts.

The bow flare of this multipurpose heavy lift vessel is large and its hull form design rather slim, with a V-shape instead of a U-shape, which allows the ship to sail faster. A powerful main engine plus the bow thrusters give the vessel speed and flexibility. It has a second deck-hatchcover and is equipped with an anti-heel system. With its own cranes onboard, operations of the ship will not be limited by facilities at ports, according to Mr Zhang.

The detailed design of the 30,000dwt vessel is done by SDARI and the production design by COSCO. The yard has delivered two vessels of this model and received orders for four more.

Meanwhile, COSCO's technical centre in northern China's Dalian is developing its first self-designed model of bulk carrier which will be of 82,000dwt. The yard hopes to complete the design by 2011, or late 2010 the earliest, said Mr Zhang. *NA*

GA Plan: 92,500dwt bulk carrier of COSCO Shipyard Group.



CSBC refines its designs

The Taiwnese shipbuilder is looking at making its designs for a number of new vessel types more environmentally friendly and to improve on the ships' cost efficiency. Sandra Tsui reports on the latest research from CSBC.

Energy efficiency, carbon emissions, green design ... these are all too familiar to shipyards nowadays as they are often asked about by shipowners.

TECHNICAL PARTICULARS

1700TEU container vessel

Length o,a	175.10m
Length b,p	164.90m
Breadth (moulded)	27.90m
Depth (moulded)	13.80m
Design draft (moulded)	8.50m
Deadweight at design draft	abt.18,370tonnes
Scantling draft (moulded)	9,50m
Deadweight at scantling draft	abt.22,300tonnes
Tonnage	abt.18,100gt
Service speed	abt. 20knots
Class	ABS,+A1E, "container carrier", +AMS, ACCU, SH, SHCM, UWILD
Complement	24 persons
Tank capacity	
Heavy fuel oil	abt. 2,150m3
Marine diesel oil	abt. 300m3
Fresh water	abt. 300m3
Ballast water	abt. 7200m3
Main engine	7S60MC-C7 or 7RTA58T 1 set
MCR	21,490PS x 105rpm
NOR	19,340PS x 101.4rpm
Power equipment	3 sets x 1500kW diesel generator 1 set emergency generator
Propulsion	1 set x 800kW Bow thrusters, controllable pitch propeller
Container capacity	10 rows across and four tiers of 8'-6" container plus one tier of 9'-6" container can be stowed in hold. Meet SOLAS's visibility requirement.
On deck (Max. 6 tiers)	1095TEU
In hold	618TEU
Total	1713TEU

"The emphasis on energy efficiency and carbon emission levels of ship designs are partly due to the cost saving effects and partly the trend towards international regulatory requirements," said Robert Kuo-cheng Tseng, deputy director of the design department at Taiwanese shipbuilder CSBC Corporation. "More attention has been paid to issues such as minimising water ballast etc," he added.

Based in the industrial city Kaohsiung in southern Taiwan, CSBC mostly handles the basic, detailed and production designs of all vessels on its own, according to Mr Tseng. In response to the demand for greener and more fuel efficient designs, CSBC has cooperated with universities, classification societies and international professional institutes, such as Hamburg Ship Model Basin (HSVA), to carry out research on particular technical issues in order to improve its existing ship designs.

ES10 and ES20 energy saving research projects

One of CSBC's latest initiatives is ES10, a three-year joint project started in 2006 with three local universities, National Taiwan University, National Taiwan Ocean University and Chung Yuan Christian University. The ES10 scheme has set targets to achieve 10% of fuel saving on an existing design of 1700TEU container vessel, of which 5% was planned to be attained by reducing air resistance of the ship and 5% optimising the propulsion system.

The four partners have carried out studies on methods to reduce ship resistance and raise the efficiency of the propulsion system. These include optimising the hull shape, twisted rudder, rudder fin and pre-swirl stator, etc.

A series of ship model tests were implemented at HSVA in early 2009 and National Taiwan University.

The results of these tests for the project ES10 project will be applied in the next batch of 1700TEU boxships built at CSBC, according to Mr Tseng. One cylinder can be left out from the main engine in the future design which will lead to a 10% fuel saving. With this arrangement, the speed will be maintained while the power and fuel oil consumption will be cut by 10%.

Following the success of ES10, the company has started the ES20 scheme which has set targets to achieve at least 10% more savings in fuel consumption on the already improved 1700TEU ship model by the end of 2011.

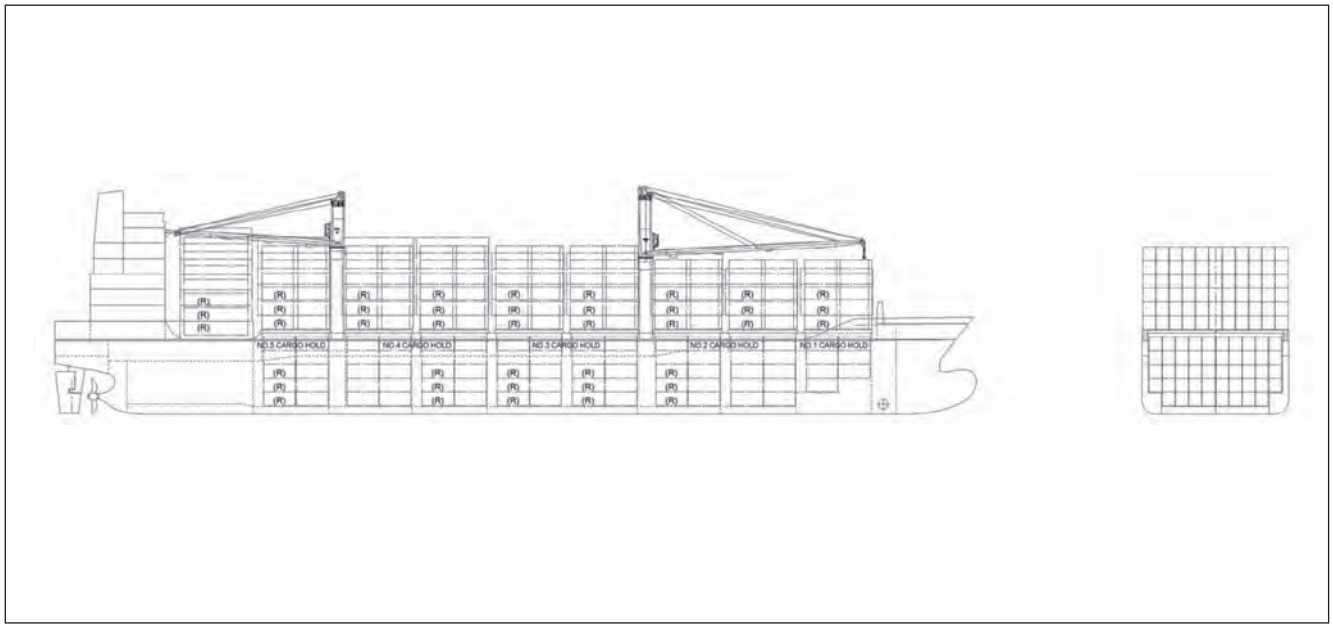
The initial plan is to reduce 8% of the energy consumption through the reduction of frictional drag by micro bubble technology, 2% through further optimisation of the propulsion system and 2% through the new design of the ship's bow shape, what CSBC has termed the 'Sea Sword Bow'. Research on designs of tip fin propeller and rudder fin will also be carried out.

For the ES20 project, CSBC has formed several joint development projects with ABS, DNV and Texas A&M University.

Up to June 2010, CSBC and its partners have improved the energy efficiency of

Results of the ES10 project.

	Hull form optimisation	Energy saving device, trim optimisation, etc	Total energy saving
Target	5%	5%	10%
Result	7%	≥3%	≥10%



GA of 1700TEU container vessel.

the ship model by 2% through further optimisation of the propulsion system in the laboratory. The experiment on micro bubble drag reduction has also been completed. Both the shipyard and its partners are currently working on the application of the two results in real world construction. Regarding the optimisation of the 'Sea Sword Bow' design, a new design has been ready and model experiments are being carried out in towing tank.

Also based on the 1700TEU containership model, CSBC has carried out a study on the impact load of the bow flare to find out how the ship hull shape and structure design can be improved.

The current ship design trend of enlarging the bow flare together with the higher speed of modern vessels has increased the impact force of waves to the bow, which can cause damage to the bow structure. As the rule set by classification societies does not provide sufficient information for shipyards to optimise the design of the ship bow to meet ship's safety and performance requirements in extreme sea-states, additional research is required, according to Mr Tseng.

CSBC has implemented a three-phase study using finite element analysis (FEA) where the team added loading onto a bow flare in an experiment, and then compared the experimental result with damage caused to a ship's structure during actual operations.

The research team has analysed the equivalent static pressure of the impact load according to the classification society rule in the first phase of the test. Then, a wave impact load analysis has been carried out in order to simulate the real world situation. In the last stage, the team will apply the dynamic failure theory to analyse reasons for the ship structure failure. The first two stages have been completed and the yard is running the last phase of the research at the moment.

Ship-size optimisation and tank position

New arrangements of ship dimension and the position of tanks have played important roles in the optimisation of ship designs by CSBC.

In its latest ship model of 4500TEU container vessel, CSBC has tried to improve the energy efficiency of an existing design by adjusting the breadth of the vessel.

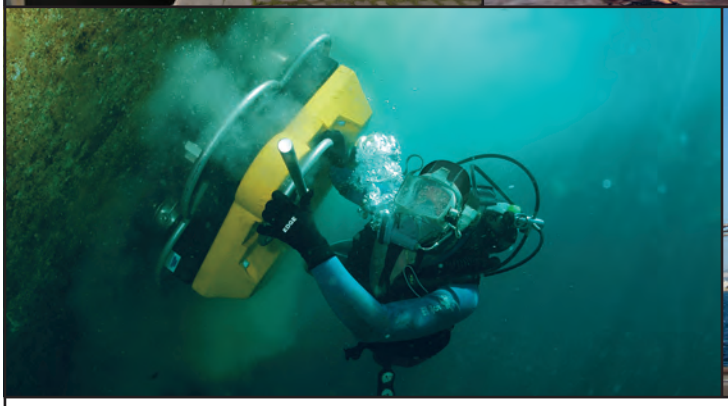
The yard has tested the effect of broadening the ship breadth from 34.8m to 37.3m without changing the deadweight tonnage and engine horsepower.

The actual loads of vessels in general are around homogeneous 9-10tonnes/TEU. Under the extreme draught condition, if the load is 10tonnes/TEU, the broadening of the ship breadth to 37.3m can reduce the amount of ballast water required by 7550tonnes. This helps save energy used in the processing

Breadth	34.8m	37.3m	Result
The corresponding draught for 10tonnes/TEU x 3770TEU	12.8m	11.8m	Reduce draught by 1.0m
Ballast water	11,9000tonnes	4,350tonnes	Reduce ballast water by 755tonnes
Service speed	23.4knots	23.7knots	Achieve approximately 6% of energy saving

The effects of widening a 4500TEU containership from 34.8m to 37.3m




HYDREX WORLDWIDE UNDERWATER REPAIR AND MAINTENANCE SERVICES

Hydrex provides a comprehensive range of underwater maintenance and repair services to the ship owner and offshore industry.

Saving significant amounts of time, trouble and expense thanks to *in-situ* work, the offered services range from an inspection of an external condition and any required maintenance or cleaning work all the way through to highly technical major repairs or replacements of a ship's external underwater equipment and machinery. Repairs to thrusters, propellers, rudders, stern tube seals, damaged or corroded hulls and all other underwater services are carried out by professional teams trained and qualified to perform complex technical tasks underwater while the vessel is *in-situ*. Working closely together with owners, managers and supervisors, all used methods are fully approved by all major classification societies.

Hydrex is renowned for bringing drydock like conditions to the vessel and offshore unit. This helps owners to extend their vessel's drydock interval and gets rid of the loss of time and production docking brings about.

HYDREX®
UNDERWATER TECHNOLOGY

Headquarters Hydrex N.V. - Antwerp
Phone: + 32 3 213 5300 (24/7)
E-mail: hydrex@hydrex.be

Hydrex Spain - Algeciras
Phone: + 34 (956) 675 049 (24/7)
E-mail: info@hydrex.es

Hydrex LLC - Tampa, U.S.A.
Phone: + 1 727 443 3900 (24/7)
E-mail: info@hydrex.us

Hydrex West Africa – Port Gentil, Gabon
Phone: + 241 04 16 49 48 (24/7)
E-mail: westafrica@hydrex.be

Hydrex India - Mumbai
Phone: + 91 222 2046 988 (24/7)
E-mail: mumbai@hydrex.be

Hydrex India -Vishakhaptnam
Phone: + 91 891 2711 863 (24/7)
E-mail: vishakhapatnam@hydrex.be

www.hydrex.be

The 1700TEU *Maersk Warsaw* part of a new breed of feeder vessel.

of ballast water. Under the same sailing speed and with the load maintained at 10tonnes/TEU, the design with a wider beam is 6% more energy efficient than the original one.

The ES10 technology, including the hull form optimisation, advanced propeller design and energy saving propeller cap have been applied to the enhanced 4500TEU containership for which CSBC has received five orders.

In the latest design of 6600TEU containership completed last year, CSBC has rearranged the positions of the fuel oil tank and the ballast water tank to reduce the amount of ballast water required and to raise the cargo carrying capacity of the vessel. Three vessels of this model have been delivered so far and the yard will deliver two more by the end of this year. Of the 10 orders for the 6600TEU container vessel, six are from Germany's Peter Doehle and four from Taiwan's Yang Ming Marine Transport.

Seaway Optimum Design & Operation (SODO)

Apart from its energy saving research initiative, CSBC has also applied the SODO (Seaway Optimum Design & Operation) concept of ship design, which allows the yard to consider the actual seaway environment while conceiving or enhancing existing vessel models.

"Cargo vessels are often required to sail in windy or stormy weather. A well-designed vessel not only needs to be stable and efficient in calm seas, it also has to be able to operate smoothly in bad weather, providing a steady and comfortable environment for the crew as well as keeping the loss of speed in windy and wavy situation to the minimum," said Mr Tseng.

The designed speed and energy consumption of a vessel used to be set in a calm sea situation in the past. But in reality, the speed and energy efficiency of a vessel depends very much on external factors, such as the weight and distribution of cargo and ballast water onboard, wind direction, ocean currents, waves and style of ship operation, Mr Tseng explained.

Following the release of the proposed Energy Efficiency Design Index (EEDI) and Energy Efficiency Operational Indicator (EEOI) by the International Maritime Organization (IMO), it is foreseeable that the pressure on shipowners to improve the energy efficiency of their vessels will mount. Shipowners are therefore encouraged to cooperate with the shipyard to provide information of the actual routes of operation, so that the shipbuilder can design vessels and optimise energy efficiency based on the real world situation, according to Mr Tseng.

Under the SODO scheme, CSBC assesses the impact force of wave borne by the bow flare by examining the actual damages of ships that have sailed for a period of time to ensure the reliability and safety of the ship structure in real world operations. The yard also carries out sea-keeping analysis and finite element analysis to see how the ship bow shape and structure can be optimised. Factors such as the vibration force of the new energy saving propeller and how convenient it is for the crew to repair the reefer container compressor are also taken into account when designing new ship types.

In addition, the company has applied the experimental stress analysis (ESA) to assess the buckling of the ship hulls of large container vessels to establish its capability to test the reliability of vessel structure.

Looking ahead, CSBC plans to commence the development of greener ship designs, such as duel fuel engine vessels. Research on more energy efficient electricity system onboard will also be carried out. On top of the application of the results of the ES10 and SODO schemes on other ship models, the shipbuilder will also start the ES30 project following the completion of ES20.

"The major challenges facing the shipbuilding industry include the fierce completion in ship price and the rising shipbuilding costs due to new regulations coming into force and higher costs of equipment and raw materials. The continuing expansion of production capacity in some of the emerging shipbuilding countries has also intensified the competition. The only way to stay competitive is to strengthen our own skills and capability," Mr Tseng concluded. *NA*


Compact and reliable solutions
for your marine applications.
MarelliMotori®
MarelliGenerators®
essential.
www.marellimotori.com. Innovation and technology since 1891.

Lloyd's Register spreads the word

Lloyd's Register partners Chinese design houses in an effort to improve existing ship designs and develop new models from scratch.

Lloyd's Register is looking to develop its new ideas through joint development projects helping local design houses and shipyards to create greener and more energy efficient ship models on the one hand, and forming cooperation that can later be translated into additional business opportunities for the class society, according to Nick Brown, country and marine manager, China of Lloyd's Register.

A recent example is the classification society's joint development project with Shenzhen-listed Shanghai Bestway Marine Engineering Design (Bestway) to optimise an existing design of 32,000 dwt bulk carrier. The improved design will be of 35,000dwt. The institute is to ensure that the new model will be more energy efficient, more environmentally friendly than the existing one and comply with international regulations.

Bestway 35,000dwt bulk carrier model at Wuxi Model Basin. Courtesy of Bestway Shanghai.

Started in 2009, the two-year project has two stages. In the first phase, the team has focused on studying the friction and shape of the hull and the position of the propeller in order to reduce emissions and increase fuel efficiency.

The research team has also worked on the shape of the accommodation block which catches a lot of wind while the ship is sailing. The institute is studying the possibility of making the accommodation block aerodynamic in order to reduce the level of air resistance of the ship and make it more energy efficient. But, such a design will potentially add to the production costs as there will be more welding involved. The research team has to take into account whether the extra cost can be offset by the fuel cost saved.

Regarding what coating to use, the team has been considering using a silicon-based paint, which is more expensive and more commonly used on larger and faster ships such as large tankers, LNG or box carriers. Again, whether the fuel costs, which will be saved in the long run can make up for the higher cost of the paint itself is a key question. Operational factors such as smaller vessels tend to be damaged more easily during operations are to be taken into account during the design process.

The first phase of the project is still in progress and the team is conducting ship model tests in a public facility in Wuxi, Jiangsu Province of China at the moment. It is estimated that the new design would be able to save up to 10% of fuel comparing with the present design, according to Dr. Fai Cheng, senior principal surveyor, head of strategic research group at Lloyd's Register. In the second phase, during 2011, the research team will incorporate the results from the first stage into the ship design.

Mr Brown explained that the majority of the existing handysize bulk vessels are more than 15 years old and their designs are more than 18 years old, and some of them even have designs of more than 20 or even 30 years old. Therefore, a new, greener, more energy efficient design should be welcomed by the market.

Meanwhile, Lloyd's Register has started a similar joint development project with the Shanghai Ship Design and Research Institute (SDARI), a design house under the China State Shipbuilding Corporation (CSSC), on the improvement of an existing design of bulk carrier of the size of up to capesize.

Having participated in joint development projects of bulkers and gas carriers, the institute also hopes to move into the R&D of other ship types, such as feeder containerships. Apart from new ship model research, the classification society has since last September launched services to help shipyards improve their efficiency in welding and non-destructive examination.

The institute offers to examine the whole welding process and facilities of its clients, including training, control of consumable, welding procedure and equipment. It also carries out results analysis of the non-destructive examinations for the yards to find out the trend of common problems and locate the root cause of such problems. This can help customers to shorten the overall shipbuilding period by reducing the number of repairs needed during the shipbuilding process.

Commenting on the current Chinese shipbuilding industry, Mr Brown said human capital is one of the biggest challenges in the country. There are many new shipyards and the existing yards are expanding quickly, but there are not enough experienced production managers, designers and technicians as it takes time for the managers and engineers to accumulate experience. *NA*

INDUCTIVE HEATING TUBE BENDING MACHINES ON RUSSIAN SHIPBUILDING ENTERPRISES

The advertorial is based on the article by V.A.Nikitin, V.I.Chervinsky

Maximum diameter of pipes applied in ship systems and in ship propulsion systems is 273 mm, in specific cases it runs up to 325 mm. In spite of development of cold bending machines, Russian shipbuilding enterprises traditionally use machines with inductive heating for bending of pipes, which diameter exceeds 159 mm. The reason is not only in major diameter of bended pipes and high efforts of bending accordingly, but also in other advantages of machines with inductive heating, such as:

• Capability of achieving of steep bends with radius up to 1.5 d_t (where d_t is external diameter of pipe) with permitted values of ellipse and thinning of outer wall.

• Capability of achieving 2 closely–spaced bends (straight section between 2 bends up to 1.0 d_t), because it is impossible to achieve the same space on cold bending machines.

First pipe–bending machines with inductive heating were installed on Russian enterprises in 1960s. Many of them are used to the present day, thus proving their high reliability. At the same time, their service life expired long time ago, and they are morally outdated. In recent decades, outdated machines are gradually replaced by their newer analogues, based on recent developments in power driven equipment and inductive heating equipment.

As known, the essence of bending with inductive heating is kept in continuous and sequent pipe bending with use of inductor for local heating of strained cut. At that they receive an elementary deflection in the

When pipe moves through inductor, heating zone moves along the pipe, and elementary deflections sum up consequently, forming shaped section of certain radius. As practice shows, the width of heating zone must be narrow and run up to (1.5–2.5)***s*** where ***s*** is the width of pipe wall. At that neighboring cold sections prevent the tube from elongation. Due to the fact, that the temperature of strained pipe cut varies from 800°C to 1200°C, bending efforts are in 5–8 times lower in comparison with cold bending. This allows producing equipment of lower weight and size, in comparison with cold bending.

They use two manufacturing schemes for pipe bending, distinct from each other by method of bending effort application: bending with use of pressure roller and bending with use of carriage.

When bending with use of pressure roller, pipe moves along its center–line over guiding rollers affected by effort ***P*** and heated with inductor. Line feed and cross feed drive of pressure roller switch on simultaneously.

Bending with use of pressure roller provides achievement of any value of bending radius (unlimitedly high) without applying of any special bending tools. Also, this machine can produce both left and right bending.

Pipe bending with use of carriage is also performed by longitudinal motion of pipe over driving rollers affected by effort ***P***. Bending is achieved because of easy rotation of carriage relatively to its axis. The adjustment of machine on defined bending radius is performed by setting required distance between axis of carriage and axis of pipe.

Shipbuilding enterprises perform both bending schemes, but scheme with use of carriage is more popular because it provides higher quality of bending. There are machines, capable to perform bending by both schemes. At that, bending with radius, which doesn't exceed (3–4)d_t is performed by carriage, and if the radius exceeds this value, then pressure roller is applied.

3D–model of pipe bending machine with use of carriage of UTG-IN–type (УТГ–ИН) machines is depicted on Fig. 1. This machine possesses electro carriages for main and secondary motions. Machines of this type possess the following design feature: presence of lengthener on short foundation slab which allows bending tubes of up to 6 and above meters length. The standard length of bended pipes is 9 meters. These machines possess three driving rollers to perform pipe motion. Universal type machine, capable of bending either by carriage or by pressure roller in range from 1,5d_t to ∞, has some insignificant functional differences. First of all, one of these differences is the capability to move carriage of driving rollers along the housing of machine in order to set up required distance between pressure roller and inductor ***l***. Machines are equipped with optical motion detectors by x–y–z coordinates, what allows to perform bending, based on analysis information.

Most enterprises use thyristor converters as frequency converters (generators). Also, insignificant amount of old–type electric machine converters is still in use. They plan to implement new type of electric machine transistor–based converters. The power of converters is 125–160 kW, frequency is 2.4 kHz (thickness of pipe walls usually does not exceed 12 mm).

Cooling systems design significantly af-

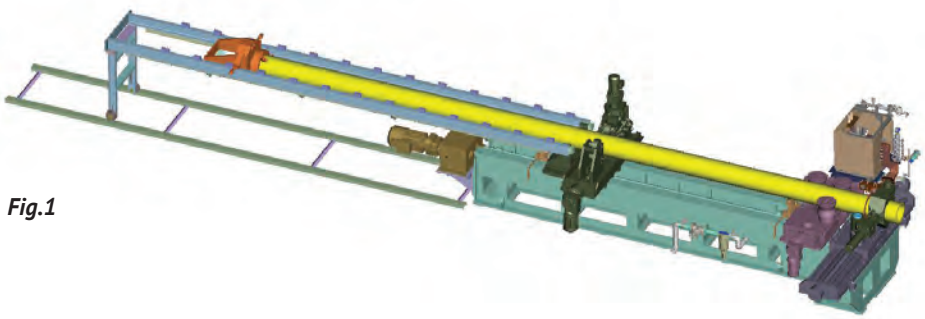


Fig.1

fects reliability of pipe bending machine performance and its safety for environment. New machines don't use single loop system for water drain in canalization, and old type machines are constantly reequipped with double loop systems of new type. Double loop cooling systems provide persistence of high quality of cooling water and minimize its consumption. The inner (first) loop is the system of parallel flow channels, and each of them cools any heating element of inductive heating machine. Most important flow channels, which define reliability of inductive heating machine performance, are equipped with detectors of water presence and its temperature. Pump is utilized for water circulation in the first loop. Water inside inner loop is cooled either in heat–exchange unit with service water, coming from outer loop from plant circulating water supply ("water–water" scheme), or by air radiator ("water–air scheme").

Accurate cooling of pipe significantly affects the quality of bending. Heating and cooling of pipe is processed by one and the same construction element – the inductor, combined with sprayer in order to cool the pipe. Air or water are used as cooling media.

Water is more efficient cooler and consequently it is more frequently applied in general purpose pipe–bending machines with inductive heating. However, water has various disadvantages and limits, concerned with metal structural changes during cooling process, what requires following thermal processing of bended pipe in some instances. In particular, when bending pipes from steels, containing 0.2 % of carbon or more, water cooling leads to necessity of following thermal processing to remove strains and to restore metal structure.

Water cooling of titanium alloys, used in particularly important areas of shipbuilding infrastructure leads to forming of gas–saturated layer, constituting upper metal layer, which was formed in conditions of heating in oxygenated environment, and described by high concentration of interstitial elements in comparison with parent metal. Gas–saturated layer increases danger of crack formations and decreases performance of heavily loaded pipelines. This layer in not permitted to appear in critical pipelines made from titanium alloys. That's why they use air cooling for pipes made from titanium alloys. For this purpose they use air from plants main tube with pressure 0.6 MPa.

Fig.2

At presence, Russian shipbuilding enterprises replace old type machines with machines of new type, possessing higher level of mechanization/automation. At first, this type of machines allows to move from traditional pipe–bending based on using the stamp as information carrier of pipe configuration and size to analytic method of bending, which is performed on cold bending machines. Automation of process control of pipe heating is particularly important here. The main element here is pyrometer. Heating temperature of pipe is estimated on outer bend. Pyrometer becomes critical device when bending tubes are made either from titanium alloys, where range of potential temperature change is about 820–840 °C or from corrosion–resistant steel: 1050–1100°C.

Fig.2 shows photo of machine UTG–IN–273 during its testing on manufacturers facility ("JSC "SSTC", Saint–Petersburg). Main technical parameters of this machine are shown below. Such types of machines are currently used for re-equipment of pipe–production lines of shipbuilding enterprises.

Outer diameter of bended pipe, mm	73
Maximum thickness of pipe wall, mm	12
Minimal bending radius	$1.5d_t$
Maximum radius of bending (carriage), mm	1180
Maximum bending angle, degr	190
Speed of pipe line feed, mm/s	0.1–3.0
Power of inductive device, kW	160
Generator frequency, Hz	2400
Machine weight, kg	9500

For more information please check site of Joint stock corporation Shipbuilding & Shiprepair Technology Center
www.sstc.spb.ru

SHIPBUILDING & SHIPREPAIR TECHNOLOGY CENTER

Modal shift drives Grimaldi investment

The Naples-based Grimaldi Group has maintained a considerable fleet development momentum in recent years, a key element of its strategy having been to act on opportunities presented by Europe's politically-endorsed Motorways of the Sea concept. By David Tinsley.

Although Brussels' willingness to encourage investments aimed at fostering a modal shift from road to sea transport now appears to be waning, in the new environment of financial austerity, Grimaldi has already brought key projects to realisation. The result has been to provide travellers with increased options and service levels in intra-European ferry traffic.

The latest testament to the Italian group's bold approach is encapsulated in the second of two pairs of exceptionally fast, high-grade ro-pax vessels commissioned into Mediterranean duties. The 54,310gt sisters *Cruise Europa* and *Cruise Olympia*, assigned to Grimaldi's Minoan Lines operation, each combine a high payload with the scope to offer schedules entailing laden speeds of up to 28knots.

***Cruise Europa* and *Cruise Olympia* the latast high-speed ro-pax vessels to join Grimaldi Minoan Lines.**

TECHNICAL PARTICULARS

Cruise Europa

Length overall	225.00m
Length b.p.	202.00m
Breadth, moulded	30.40m
Depth, to upper deck	15.95m
Depth, to main deck	10.00m
Draught, maximum	7.15m
Corresponding dwt	8550dwt
Draught, design	7.00m
Gross tonnage	54,310gt
Passenger capacity	3000
Passenger cabins	413
Freight capacity	3000 lane-m
Additional cars	215
Main engines	4 x Wartsila 12V46D
Main engine power	4 x 13,860kW
Service speed	around 25knots
Maximum cruising speed	around 28knots
Trial speed, design draught @76% MCR	27knots
Generator engines	3 x 2600kW
Bow thrusters	2 x 1850kW

The hull and technical specification is essentially the same as that of the first two ships, *Cruise Roma* and *Cruise Barcelona*, introduced in 2008 by Grimaldi to foster service developments in the western Mediterranean. However, the latest vessels differ in a number of respects, as regards a slightly higher load intake as well as changes in interior design and layout, more attuned to the needs of the Greek market.

Although high speed has lately become anathema in the container trades, signifying a wholesale turnround in philosophy from little more than two years ago, fast transits still have fundamentally important competitive implications for ferry operators, in the context of both passenger traffic and intra-regional exchange of time-sensitive goods and produce.

Cruise Europa and *Cruise Olympia* have effectively heralded a new era in ro-pax services between Italy and Greece, through a combination of speed, capacity, and productivity brought to bear on a mainstream operation run under the Grimaldi Group's Minoan Lines banner. While the design type is an exceptionally fast ro-pax vessel in form and function, it is a cruise ferry in concept and standard. The entire series of four newbuilds was produced at Fincantieri's Castellammare di Stabia yard in Naples Bay, confirming the group's capabilities in the design, construction, and project management of outfitting-intensive tonnage.

On main dimensions of 225m length overall and 30.4m breadth, the new generation offers a deadweight of 8550tonnes at maximum 7.15m draught, loading 3060 linear metres of freight vehicles, or about 187 trailers, plus 215 cars. As a result, the first two ships in the four-vessel series, *Cruise Roma* and *Cruise Barcelona*, increased ro-ro capacity

digital gauging

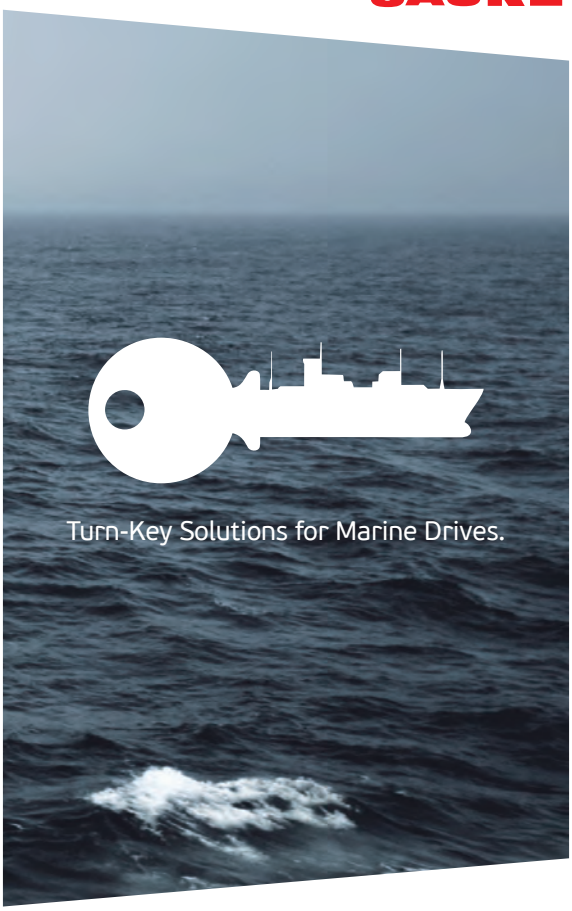
Learn about Honeywell Tanksystem's portable, digital, automatic, topping-off monitoring system at SMM 2010 Sept. 7-10 in Hamburg (Hall A1, Stand 165).

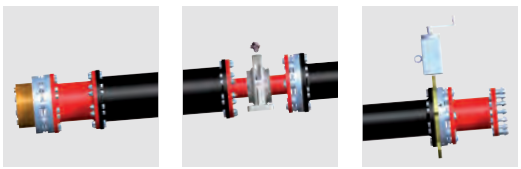
The HERMetic TOMSYS is a portable, digital, automatic, gas tight, level monitoring system, designed to continuously and automatically monitor the cargo tank liquid level during topping-off procedures. The unit accurately monitors the liquid level over the last upper three meters.
By increasing safety and efficiency, Honeywell Tanksystem helps customers improve business performance.

Honeywell

For more information: www.tanksystem.com
Tel. +41 26 919 15 00
E-mail: tanksystem@honeywell.com

JAURE





Jaure, S.A. is a leading supplier of class approved marine couplings and drive shafts. We provide tailored package solutions with no limitation in size.

We will be glad to welcome you at the SMM **(Hall A4, Stand 221)** for further information.

POWER TRANSMISSION SOLUTIONS

www.jaure.com

EMERSON Industrial Automation

The two sister vessels have higher payloads and faster speeds.

on the Civitavecchia/Barcelona route by 70% compared with the ships previously used, while reinforcing the cruise ferry standard available to 2140 passengers. The vessels were subsequently allocated to two of Grimaldi's new Mediterranean services, on routes linking Porto Torres(Sardinia) with Civitavecchia and Barcelona.

Cruise Europa entered service in the latter part of 2009 as the Mediterranean's largest cruise ferry, by virtue of the passenger capacity having been upped to 3000, in conjunction with the retained freight vehicle capacity of 3000 linear metres. Under the aegis of Minoan Lines, she and her recently delivered sister have been assigned to the cross-Adriatic traffic.

The capability to make 28knots allows the Ancona/Igoumenitsa/Patras connection to be accomplished in 22 hours. Notwithstanding the cost premium that an operator has to bear in ensuring high speed, the design's blend of freight and passenger volume provides a level of scale economy that can underpin competitive pricing policies.

The trial speed stipulation was 27knots at the 7.0m design draught, with 76% maximum continuous output from the main engines. It is understood that *Cruise Europa* attained around 30knots on trials. The diesel-mechanical installation is based on four 12-cylinder engines of Wartsila's 46D design, representing a power bank of 55,440kW, and complemented for effectiveness by a hydrodynamically-optimised hull form. Drive is to a pair of Wartsila Lips controllable pitch propellers through twin input, single output Renk gearboxes.

The loading capacity of 3000 linear metres for trucks, trailers, coaches and campers is provided on three ro-ro decks, and there is additional space for 215 cars in a dedicated car garage. All cargo and vehicles are handled across the stern threshold of the main deck (No3). The twin Navalimpianti stern ramps occupy almost the full width of the stern, leading directly into the 4.7m-high main deck, which can accommodate 1300 lane-m.

One fixed ramp, closed by a flush-fitting, watertight cover, leads down to the tank top hold, which can be used by unaccompanied trailers and other vehicles. Another fixed ramp in the aft part of the main deck gives access to the 1500 lane-m upper ro-ro freight deck(No5), also designated for campers, an important element in the Italy-Greece traffic. This ramp incorporates a vertical door to meet regulations governing the carriage of dangerous goods.

Access from the main deck level to the special car garage is accomplished through two hoistable ramps, the first leading from the main to the upper trailer deck, and the second from the upper deck. This arrangement offers minimum interference to freight handling on decks 3 and 5.

Grimaldi has sought to confer an onboard environment intended to convey standards more akin to a cruise ship rather than those generally associated with ferry travel. The public spaces provide a style, quality and variety intended to ensure high levels of passenger receptivity, and to foster enjoyment and expectations of the sea crossing, rather than viewing the ferry simply as a means of making a necessary journey. Genoa's well known, innovative interior design firm Studio de Jorio was retained for the project.

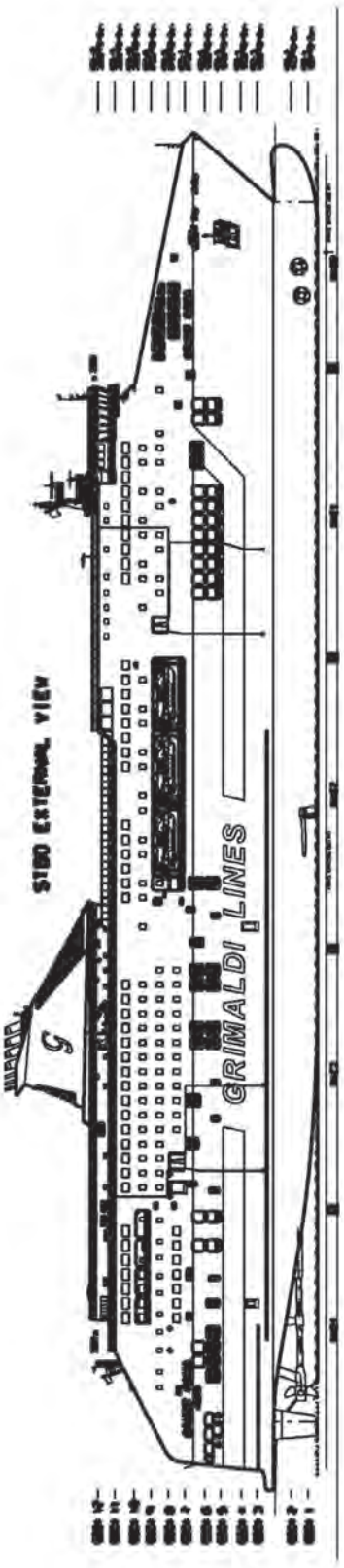
The public rooms are located on Decks 10 and 11, and the differing requirements of the trans-Adriatic market compared to the western Mediterranean business have fostered a number of changes in the composition and configuration of the public spaces and facilities relative to those on the *Cruise Roma* and *Cruise Barcelona*.

Also, one of the reasons for the higher passenger capacity in the *Cruise Europa* duo, compared with the first two vessels, is the requirement for a larger number of reclining seats for younger travellers. *Cruise Europa* and *Cruise Olympia* each provide cabin accommodation for up to 1252 of a total of some 3000 passengers.

Fin stabilisers have been fitted in the interests of passenger comfort and freight security, and these, along with each ship's two 1850kW bow thrusters, were manufactured by Fincantieri's own marine equipment division.

Cruise Europa's credentials have been acknowledged by RINa through the society's Green Star certification, which identifies ships designed, built and operated to the levels of environmental compliance required by the Clean Air and Clean Sea notations. ***NA***

GA of *Cruise Europa*.



Navantia designs reign in Spain

Latest Acciona Trasmediterranea ferries meet the Spanish market requirements for fast and reliable vessels with a significant controlled temperature freight capacity. David Tinsley reports.

Denoting the first stage in the realisation of a project involving the highest capacity and fastest ro-ro vessels in the Spanish market, the 31,000gt *Jose Maria Entrecanales* has brought a new level of capability and productivity to the trade between the mainland and the Canary Islands.

Commissioned during March 2010 by Acciona Trasmediterranea, it has been allocated to the route from Barcelona and Alicante to Las Palmas de Gran Canaria and Santa Cruz de Tenerife, returning northbound via the Moroccan port of Agadir.

The design's 26knot service speed is pertinent to the requirement for the new generation of ro-ros to be able to achieve a weekly rotation on the 1500 nautical mile route, or to perform two weekly round-trips on crossings of 700-800 nautical miles.

Jose Maria Entrecanales **has the largest capacity in the spanish market.**

With a multi-engine propulsion plant conferring the requisite 26knots at 90% maximum continuous power output, *Jose Maria Entrecanales* offers considerable scope as to both the extent and nature of the itineraries which she can serve, while also giving added flexibility in responding to changing and varied service demands.

In this respect, the importance of the northbound trade in fresh produce, and the design's substantial provision for carrying temperature-controlled goods, has a signal bearing on transit time performance, and the need to be able to adjust to market demands at any one time.

The hull form and dimensioning reflects not only the requirement for a fast service speed, but also for sea-keeping performance and year-round scheduling reliability on the route along the western fringe of the Atlantic.

Two sisterships were ordered by Acciona Trasmediterranea from Navantia Astillero San Fernando-Puerto Real, whose large-scale yard is located on the Bay of Cadiz. The second vessel of the class, Superfast Baleares, was handed over in mid-year.

The circa €200 million investment encapsulated by the two vessels, and the key characteristics relating to freight capacity and speed, have been shaped not simply by the Acciona group's role as a shipping service provider, being one of Europe's largest ferry companies, but also by its stake in through transport operations. Acciona Logistic controls a fleet of 900 reefer trailers plus 1500 dry cargo trailers, which load on to the Acciona Trasmediterranea ferries. The logistics network also includes over 100,000m^2 of warehousing, 150,000m^2 of temperature-controlled storage and 600,000m^2 of own dock area.

Reflecting the group's involvement in door-to-door movements of perishables, the *Jose Maria Entrecanales* generation offers a very high reefer component within a freight capacity of 210 trailers of 31tonnes plus 50 double-stacked containers. The ro-ro intake corresponds to some 3500 lane-metres overall, with the four freight decks complemented by a dedicated, fixed car deck for about 100 units located above the main deck forward.

The 15m-wide stern ramp/door, which has an overall length of 18.6m including the flaps, provides the sole ro-ro interface with the shore across the main deck threshold. The bow is accordingly finer than would be the case with a drive-through layout, and the steep rake culminates in a surface-piercing bulb.

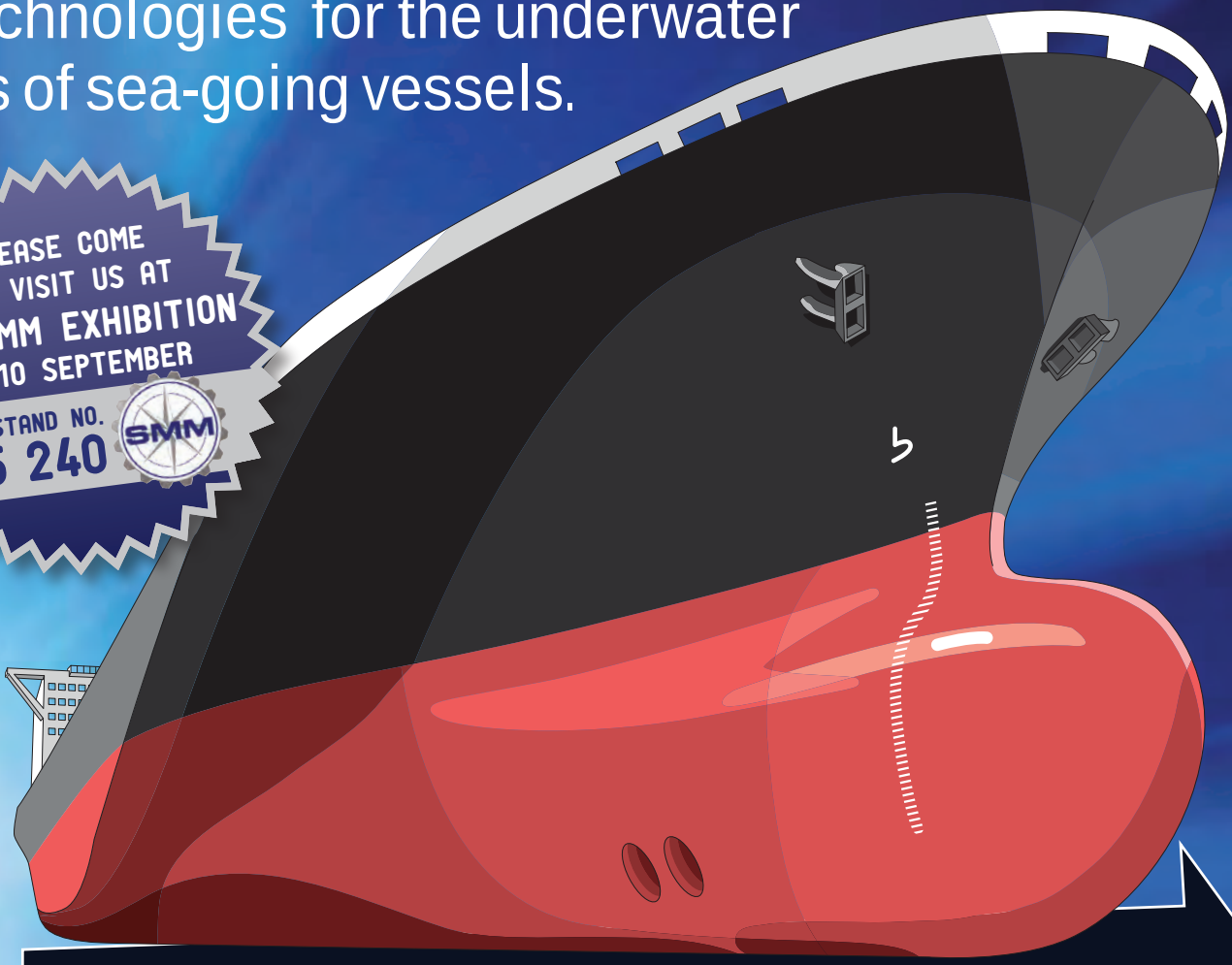
TECHNICAL PARTICULARS

Jose Maria Entrecanales

Length overall	209.43m
Length b.p.	190.00m
Breadth	26.50m
Depth, to upper deck	16.65m
Depth, to main deck	9.60m
Draught, scantling	7.10m
Draught, design	7.00m
Gross tonnage	30,998gt
Net tonnage	18,547nt
Displacement, maximum	22,140tonnes
Deadweight	10,140tonnes
Freight capacity	approx 3500 lane-m
Freight intake	210 x 31tonnes trailers plus 50 double-stacked containers
Additional car capacity	100
Passengers, in cabins	12
Crew complement	28
Main engines	4 x MAN 9L48/60B
Main engine power	4 x 10,800kW
Total main engine power	43,200kW
Bow thrusters	2 x 1350kW
Service speed @ 90% mcr, 10% sea margin	26kn
Class	Bureau Veritas

From Chugoku Marine Paints - The Evolution of A Balanced Portfolio of technologies for the underwater Hulls of sea-going vessels.

PLEASE COME AND VISIT US AT THE SMM EXHIBITION 07–10 SEPTEMBER STAND NO. B5 240 SMM



More than 20 years of continuous Environmentally focused Antifoulings & Foul release coating development

1989	1997/2008	2000	2004/2009
SEAGRANDPRIX 2000,1000 & 500	CMP BIOCLEAN CMP BIOCLEAN HB	SEAGRANDPRIX CF-10 & mk 2	SEAGRANDPRIX 220 HS, 330R & 660 HS
TBT Free SPC	**Biocide free Foul release**	**Copper & TBT free SPC**	**TBT free low VOC SPC**

All technologies capable of dock to dock performance of up to 24,30,36,48 & 60 months

CHUGOKU MARINE PAINTS, LTD.

Website: http://www.cmp.co.jp

HEAD QUARTERS
Tokyo Club Building, 2-6, Kasumigaseki 3-chome, Chiyoda-ku, Tokyo, Japan TEL : 81-(3)3506-5844 FAX : 81-(3)5511-8022

CHUGOKU PAINTS B.V.
Sluisweg 12, Heijningen, Netherlands (P.O.Box 73, Fijnaart, 4793ZH Netherlands) TEL : 31-(167)526100 FAX : 31-(167)522059

The main deck's strengthening and free height of 7m allows maximum flexibility in the ship's payload, including heavy-laden rolltrailers, swap bodies and double-stacked containers. Right forward, a special deck provides for tight stows of cars, vans and SUVs 0 (sports utility vehicles) at a headroom of 2m, reached by hoistable ramp.

A fixed ramp on the starboard side of the main deck enables ro-ro freight transfers to be made to the upper trailer deck, from where the weather deck ro-ro laneage aft of the forward superstructure is reached by way of a further fixed ramp. This uppermost ro-ro deck is certificated for hazardous cargo categories, to be carried in designated slots. Additional, albeit very limited, carrying capacity is provided on the tank top, in an area aft of the ship's machinery spaces. Access is by means of a fixed ramp on the port side of the main deck.

Specialist manufacturer SP Consultores supplied the shipset of cargo access equipment as a turnkey delivery, including the stern ramp/door, the side-hinged cover to the lower hold ramp, and the car deck, fabricated as an open steel grating, with its associated, hoistable ramp. Each vessel has a Rolls-Royce Intering anti-heeling system.

Jose Maria Entrecanales provides a new showcase for powerful German wide-bore, medium-speed machinery in the ferry market. Four MAN nine-cylinder L48/60B main engines represent a primary power concentration of 43,200kW. The vessel also has an exceptionally powerful auxiliary plant, based on three, eight-cylinder L21/31 diesels from the same stable.

Jose Maria Entrecanales stops off at tenerife.

The four propulsion engines deliver maximum output at 500 rev/min, and are distributed between two compartments, one immediately forward of the other. These are served by a twin-input, single-output Renk gearbox arrangement in the aftermost engine compartment, whereby the propeller shafts run on the outboard sides of the two engines in the aft machinery space. The gear configuration confers a high degree of flexibility as to usage of the main engine plant, in keeping with considerations of operating efficiency, redundancy and safety.

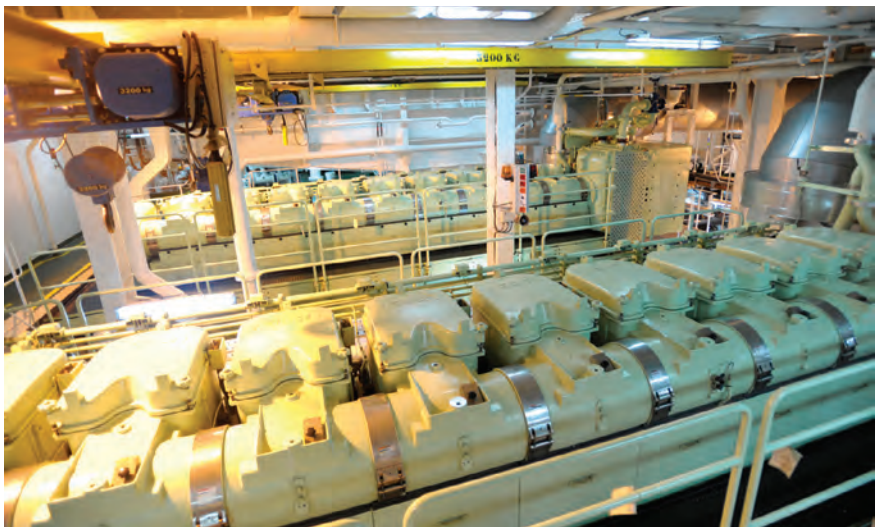
The MAN propulsion plant satisfies the need for raw power to meet the demanding nature of a very long ferry route, part of which is along northwest Africa's Atlantic periphery, that requires the vessel to sustain a significant cruising speed so as to ensure a weekly round-trip. Designed and manufactured in Augsburg, the 48/60 series in its B version encapsulates advances such as high-pressure injection and variable injection timing (VIT) to minimise emissions of nitrogen oxides(NOx). The machinery's performance and efficiency also benefits from the adoption of proprietary, TCA66-model axial-flow turbochargers.

The 26knot *Jose Maria Entrecanales* blends power and speed with a high degree of manoeuvrability, a factor which also contributes to quay-to-quay operating efficiency and scheduling. Aft of the propellers on long open shafts are Becker flap rudders of high lift, twisted flow type. With two 1350kW Rolls-Royce tunnel thrusters in the bow, the new ro-ro class has a small turning circle and good crabbing properties.

The sizing of the genset installation, using three 8L21/31 engines of 1935kW apiece, reflects the high electrical load imposed by the reefer trailers. Because of the plant's added role in cargo care and contribution to delivery condition, the attributes of the auxiliaries have increased significance. The so-called "pipe-less" design of the L21/31 series includes a cylinder-unit concept, encompassing cylinder heads, liners, pistons, conrods and fuel injection valves. This facilitates changeover with a spare cylinder unit aboard, dispensing with the need to incur unscheduled downtime by breaking a voyage to undertake repairs in the event of a breakdown.

While the huge funnel casing is located three-quarters aft, on the starboard side, the bridge and accommodation superstructure is positioned forward, with three of its decks providing for the ship's company of 26 plus up to 12 drivers. ***NA***

Engine room onboard Jose Maria Entrecanales.



Lightweight Austal aims high

Targeted at the ro-pax market, a new range of aluminium-hulled vessels designed for efficient operation at more moderate speeds than previous lightweight fast ferries has been unveiled by Austal Ships, reports David Tinsley.

The initial offering includes a 100m catamaran and 102m trimaran, each laid out for a payload mix of passengers, cars and freight, and powered by four-stroke, medium speed diesels driving controllable pitch propellers for maximum speeds of up to 28knots. The new designs give first form to what is dubbed as the medium speed series, distinguishing the range from Austal's established, faster Auto Express ferries and other types which provide for speeds in the region of 35-40knots. One of the proposed types is a so-called medium speed version of Austal's 39knot, 102m 'next generation' trimaran class, conceived for a 25knot laden speed.

Side view of the medium speed variant of Austal's 102m trimaran.

Economy in relation to existing, conventional ferries at comparable speeds has been the Australian specialist's principal goal, as it pursues a strategy of broadening the market reach of lightweight, aluminium designs at a time of operators' increasing attention to all facets of running costs and design efficiency.

Austal's technical manager James Bennett explained that the company wanted to bring its world-renowned brand of aluminium multi-hull platforms to a market previously typified by steel monohull, SOLAS-regulated technology. "Our aluminium platforms deliver a significant reduction in lightship weight compared to traditional steel ro-pax vessels. This means lower fuel consumption and thus lower emissions and operating costs, while still carrying the same passenger and vehicle loads," he said.

"As operators continue to face rising fuel costs, increased emphasis on environmental factors and new regulatory requirements on energy efficiency, we expect the use of aluminium hull forms in the medium speed market to grow," stated Mr Bennett. The transport efficiency of an Austal medium speed aluminium catamaran is reckoned to be 14% better than that of a comparable steel monohull operating at the same speed. Previous Austal studies had indicated that a steel ro-pax ferry would use approximately 23% more fuel than the same design constructed in aluminium.

Another potential benefit highlighted by the company is the fact that each of the new range is still High Speed Craft code(HSC)

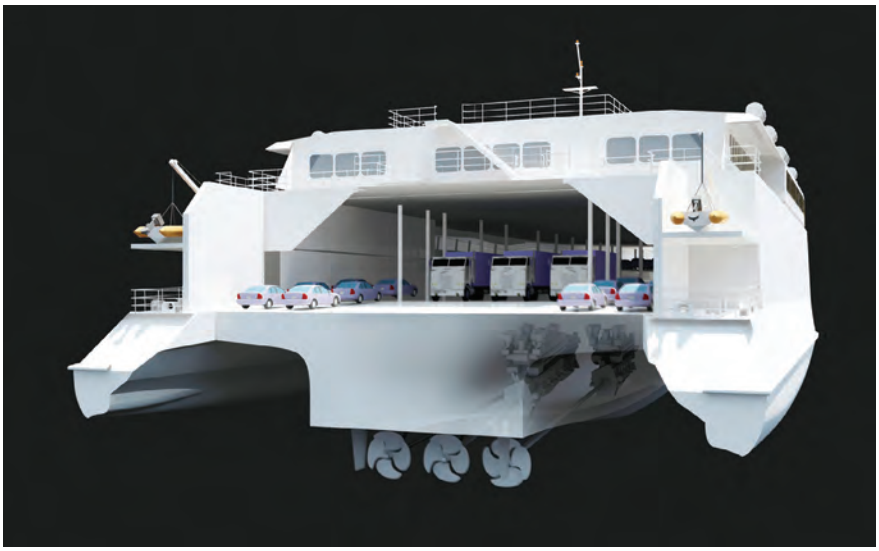
compliant, thereby avoiding the additional regulatory costs associated with non HSC-compliant, comparable-speed vessels of traditional construction.

Although the economic recession and fuel price volatility have halted the trend towards higher design speeds in other sectors of the shipping industry, swift transit speed remains an important competitive factor in the shortsea ferry business. Passenger expectations are an overarching consideration, and the indications are that there is a still a desire among passengers not to have to travel at speeds under about 16knots. An aluminium hull form, it is contended, allows higher speeds to be obtained for the same propulsion-related costs as those entailed with steel-hulled tonnage.

While conferring relative cost savings, Austal's designers have also sought to ensure that the new medium speed ferry range would ensure the high levels of manoeuvrability, stability and seakeeping demonstrated by the faster catamarans and trimarans turned out by the Henderson yard and its associated USA builder. So as to confer the requisite manoeuvrability in harbour, the proposed trimaran features drop-down azimuthing bow thrusters, while the catamaran can be specified with a drop-down thruster or tunnel thrusters, according to an owner's wishes. In addition, high-lift rudders are aligned with the propellers in each of the designs.

As one of the pre-eminent drivers of aluminium-hull fast ship technology, the Western Australian firm suggests that the dimensions of a typical multi-hull not only allow for a more open, comfortable passenger space, but also demonstrate superior stability and hydrodynamic efficiency compared to a monohull.

The nomination of controllable pitch propellers in conjunction with multiple main engines presents operating and scheduling flexibility, suited to the particular needs of ferry services, where traffic composition can change substantially from day to night and from summer to winter. The arrangements mean that power can be better matched to needs at any one time, for instance allowing full-speed navigation on all engines during day passages, or reduced engine operation for night crossings when the emphasis may be on freight carrying. To achieve further efficiencies, propellers that are not being used may be feathered, reducing drag and fuel consumption.



Stern view of the medium speed version of Austal's 102m trimaran, with three controllable pitch propellers driven by medium speed diesels.

A drive-through configuration has been adopted for the new design range, using both bow and stern doors, in recognition of the importance of expeditious turnrounds to both service performance and vessel productivity. Fast turnrounds bear significantly on total round-trip times, enabling operating speed to be kept to more economically-favourable levels.

The trimaran member of the medium speed family is a variant of the 102m next generation design, of which the first representative has now been completed and is lying for sale at the company's Henderson yard. The intake capacity of the new version is almost identical, at 1165 passengers and 145 cars plus 190 truck lane-metres, or alternatively 254 cars all-told. However, whereas the original design is installed with three examples of MTU's potent 20V8000 high-speed diesel driving Wartsila LJX waterjets, the new addition to the portfolio would be laid out for three medium-speed main engines of 320mm-bore, driving controllable pitch propellers.

Engine choice could be Wartsila's 9L32 type or MAN's 9L32/40 diesel, to deliver speeds of up to 25knots at 600dwt. By contrast, the existing 102m vessel is attributed with a 39knot speed, albeit at 340dwt. Overall fuel consumption of the medium speed trimaran, including the generators, is stated as no more than 2.1tonnes per hour at 85% maximum continuous rating(MCR) of the main engines. The existing vessel is attributed with a 4.9t/h consumption on the basis of 39 knots at 90% MCR on 340dwt, and with ride control fitted.

The 100m catamaran of the medium speed range has been conceived for operators requiring a somewhat higher deadweight without the need for the superior, rough weather seakeeping capabilities afforded by the trimaran. With a maximum deadweight of 800tonnes, the catamaran has seating for 1000 passengers and 154 cars plus 205 truck lane-metres. Maximum utilisation of the garage spaces for cars would equate to 208 units.

Four medium-speed diesel engines would form the propulsive power installation, using seven-cylinder examples of the 320mm-bore designs also favoured for the new trimaran offering. The options are the Wartsila 7L32 or MAN 7L32/40, driving controllable pitch propellers. In combination with Austal's refined, lightweight catamaran hull form, overall fuel consumption, including that of the auxiliaries, would be just 2.17t/h at 85% MCR on 800dwt.

From an environmental perspective, each vessel in the range is eligible for Green Passport classification notation, a feature that is available for all ships from Austal. The largest catamaran ordered to date from the Australian yard, BornholmerFaergen's 113m, 40knot newbuild due for handover next year, has in fact been specified to Green Passport credentials. *NA*

Canary investment offers mainland link

Four ro-pax newbuilds will cement Naviera Armas' position in the trade out of the Canary Islands, writes David Tinsley.

A further round of investment in the vigorous programme of ferry fleet modernisation and development undertaken by Tenerife-based Naviera Armas is signalled by the construction of the fast, stylish ro-pax *Volcan del Teide*.

Scheduled for completion this year, the vessel is the first of four newbuilds which will couple a further advance in unit capacity with a maximum speed of 26knots, conferring the capability to maintain a 24knot service speed on the company's Canary Islands-gravitating route network.

Volcan del Teide represents a reinforced commitment to the classical ro-pax concept at a time when catamaran and trimaran high-speed ferries have emerged as major elements of the transport system serving the Canary Islands. Having consolidated its operations within and between the seven islands of the archipelago, Naviera Armas has undertaken a rapid international expansion, entailing the forging of links with mainland Spain, the Cape Verde Islands, Portugal, Mauritania and Morocco. Fleet growth has been at a correspondingly fast pace.

The latest ship will be the seventh new vessel to have been introduced by Armas in the space of as many years. Market and economic circumstances have seen the delivery schedule for the quartet of current newbuilds extended into 2013, although finalisation had originally been projected for 2011. Nonetheless, the result will still be the injection of 10 high-grade ferries in a 10-year period by a single operator.

The common link throughout the various phases of vessel contracting has been the selection of H.J.Barreras as the yard of build. Although the Galician firm has shown its mettle in other specialised fields of construction in recent years, the Vigo yard's identification with bespoke ro-ro tonnage has found fresh expression in the new generation of Armas ships.

Volcan del Teide has been laid out for a maximum freight intake of just over 2000 lane-metres, although her ro-ro spaces provide for many permutations of cars, trailers and other vehicles. One such mix could be 353 cars plus more than 1000 lane metres of trailers, for instance. The overall maximum complement of passengers and crew is in the order of 1500. The mix and flexibility of payload capacity reflects the dual-role of the ferry services in meeting the year-round transport needs of the islands' economy, including catering to the seasonal peaks in the holiday traffic.

Armas has consistently opted for swift tonnage, but the incoming series takes that element to a new high. The extra cost premium entailed in providing the wherewithal for making transits at 24knots, and with the potential for still faster speeds, plus the additional expenditure in creating high standards of onboard comfort, are indicative of a business and asset philosophy shaped by the very long-term view.

The initial pair of ships from Barreras were the *Volcan de Tindaya* and *Volcan de Tamasite*, delivered in 2003 and 2004. These

TECHNICAL PARTICULARS

Volcan del Teide

Builder	H.J.Barreras
Length extreme, incl ducktail	175.70m
Length overall, hull	171.55m
Length b.p.	159.00m
Breadth, moulded	26.40m
Depth, to main deck(No 3)	9.50m
Depth, to upper deck(No 5)	14.94m
Number of decks	11
Draught, design	6.40m
Corresponding deadweight	4850dwt
Draught, scantling	6.70m
Freight capacity, car deck hoisted	2010 lane-m(trailers)
Capacity, car deck deployed	1578 lane-m(trailers) + 1088 lane-m(cars)
Maximum car capacity, car deck deployed	1772 lane-m(cars) + 1045 lane-m (trailers)
Complement, passengers + crew	1500
Passenger cabins	122
Passenger cabin berths	476
Main engines	4 x MAN 7L48/60
Main engine power	4 x 8400kW
Service speed	24knots
Service range	3600 miles
Maximum speed	26knots
Class	Bureau Veritas

were followed over the next two years by the *Volcan de Timanfaya* and *Volcan de Taburiente*. The next phase of investment saw the introduction in 2007 and 2008, respectively, of the *Volcan de Tamadaba* and *Volcan de Tijarafe*.

As a development on the *Volcan de Timanfaya*-class, the 154m *Volcan de Tamadaba*-type was longer and faster, offering a service speed potentially in excess of 23knots. Furthermore, the design had been specified with improved passenger facilities, to raise standards on year-round inter-island duties while also increasing the operator's flexibility to run short mini-cruises. It is clear that the process of capacity and design enhancement has continued in the *Volcan del Teide*-led series.

Payload increases over the course of the fleet programme have been such that the new ship has a design draught deadweight of some 4850dwt, compared to the approximately 3350dwt of the *Volcan de Tamadaba* and *Volcan de Tijarafe*, and the 2350dwt of the *Volcan de Tindaya* type.

In the sphere of propulsion alone, the latest progression is substantial. Each of the preceding *Volcan de Tamadaba* duo employs two Wartsila 12V46B main engines, such that 24 cylinders yield 23,400kW. In the *Volcan del Teide*, which is just over 20m longer, a total of 28 cylinders encapsulated by four MAN diesels will turn out 33,600kW.

In fact, the latest Canarian ro-pax will provide a new showcase for MAN's wide-bore design of medium-speed engine, the 48/60 series, produced at the Augsburg plant in southern Germany. The four examples of the seven-cylinder model, affording individual ratings of 8400kW at a crankshaft speed of 500rev/min, will confer the substantial power and attendant reserve to ensure year-round schedules at service speeds of up to 24knots in waters of the eastern Atlantic rim. With her 33,600kW propulsive power plant and hydrodynamically-optimised hull form, the vessel is expected to have a maximum speed of 26knots.

The main machinery will turn twin controllable pitch propellers through twin-input, single-output reduction gearboxes and open shaftlines. Power take-offs (PTOs) from the gearboxes will drive shaft alternators of 1500kW apiece, giving added effect to the rotational energy delivered by the main engines. The diesel genset installation comprises three MaK 1140kW auxiliaries coupled to Leroy Somer alternators of 1045kW.

Volcan del Teide sets to modernise Naviera Armas fleet.

To assist manoeuvring at restricted berths, and in strong winds, the vessel is fitted with two 1100kW, electrically-driven Rolls-Royce bow thrusters, incorporating variable pitch propellers.

Conditions in the waters around the Canaries can be rigorous at certain times of the year, prompting the owner to adopt a pair of retractable, Rolls-Royce fin stabilisers in the interests of passenger comfort and cargo security.

The high sustainable service speed of the vessel and her large concentration of power gave added reason for the close attention, which Armas has paid to noise and vibration issues at the design project stage. Copenhagen-based specialist consultancy ScanVibra carried out a noise level prediction using the company's in-house developed ShipNP software, and undertook analyses for airborne- as well as structure-borne noise transmission in the hull.

A key objective was to ensure that the ship's interior layout and design concept could be fully realised while achieving weight reductions and minimising vibration. In line with target dB(A) noise levels, systematic decisions were taken on damping and insulation treatments. All sources of noise were investigated, including the heating, ventilation and air conditioning (HVAC) systems. As well as addressing such issues and solutions influencing onboard comfort and habitability, the study team looked into the potential environmental impact of the ship on port and harbour communities in terms of radiated noise.

As a primary measure, the four MAN propulsion engines have been resiliently mounted so as to reduce the transmission of vibration and structure-borne noise into the hull. In collaboration with the propeller manufacturer Rolls-Royce and hydrodynamic test and research institute Marin, a careful optimisation exercise has been undertaken for the propellers, shaft arrangement and aft underwater body lines.

All cargo working in *Volcan del Teide* will be over the main deck's stern threshold, accessed across two stern ramp-doors of 16m length and 8m width apiece, allowing simultaneous handling of two streams of vehicles. Two fixed ramps lead from the main deck (No 3) to the upper vehicle deck(No 5), and a moveable car deck has been incorporated in the ro-ro garage between No 5 and No 7 decks.

Cabin accommodation has been laid out on decks 7 and 8 for up to 482 of the passenger complement. Lounges, buffet, self-service restaurant, bars and other public facilities are also arranged on these two decks, atop of which are the crew's quarters.

Particular attention has been paid to the design of the public spaces so that travellers, be they tourists or local dwellers, are not only comfortable but also derive a feeling of wellbeing from the sea passage. ***NA***

Power revolution headed by MAN

An ability to operate with 10% extra power for one hour out of every six allows MAN's upgraded engine to set the fast ferry pace. By David Tinsley.

Classification society type approval for the overload rating on MAN's upgraded, 20-cylinder 28/33D engine has provided the high-speed vessel market with an endorsement of a significant advance in power delivery capacity from an already potent machine. The 113m catamaran under construction in Western Australia for Denmark's Faergen (formerly Nordic Ferry Services) will be an early beneficiary of this development.

With a 10% overload capacity possible and permissible for one hour every six hours, the 9100kW at 1000 revs/min obtainable as standard at 100% maximum continuous rating (MCR) increases to a power yield of 10,000kW at 1032 revs/min during those periods. The four-stroke, medium-speed engine is accordingly the first in its class to achieve 10MW. Type approval was awarded this year by Det Norske Veritas (DNV) following tests at the MAN group's St Nazaire works in France.

Four examples have been specified for the new vehicle/passenger catamaran, which Faergen has ordered from Austal Ships for introduction to the Bornholm traffic in the southern Baltic next summer. The 113m, aluminium twin-hulled ferry has been laid out to carry up to 1400 passengers and 357 cars on sailings between Ronne, on the Danish island of Bornholm, and Ystad, in southeast Sweden. The Ronne/Ystad route already employs another Austal catamaran, the 86m Villum Clausen, which entered service in 2000.

The nature and power concentration of the propulsion plant reflects the owner's attention to issues of scheduling efficiency and dependability in meeting its long-term contractual obligations as the provider of ferry transport services to and from Bornholm. The power margin built into the catamaran newbuild offers greater scope for reliability and flexibility in fulfilling agreed, year-round timetables, including schedule recovery in the event of delays attributed weather or other problems.

MAN's latest development offers significantly better power delivery.

The first upgraded 20V28/33D engines are scheduled for delivery in the autumn of 2010. In attaining values of up to 500kW per cylinder, turbocharger efficiency is a critical aspect of the design. MAN's new TCA33 axial-flow turbocharger has been specifically designed to meet the needs of the V28/33D-series engine, based on two turbochargers being fitted.

The compressor side of the TCA33 is mainly derived from the company's TCR radial series. New compressor wheels have been developed to deliver the 5.2 pressure ratio requirements necessary for engines to meet IMO Tier II emission limits.

The V28/33D range encompasses 12- and 16-cylinder, as well as 20-cylinder, configurations. Fast ferry applications, together with naval vessels and mega yachts, constitute a primary market for the new engine class in multiple-engine propulsion applications. It has also been tailored for offshore genset installations and, furthermore, for applications where a sequential turbocharging (STC) system is stipulated.

For use in naval ships in particular, the optimal engine-turbocharger matching attained with STC gives the engine an extended torque envelope offering economical operating modes and improved engine acceleration characteristics. MAN's STC system consists of two identical turbochargers, one providing copious charge-air at low- and medium-speed, with the second cutting in at higher speeds. This is distinct from two-stage turbocharging, where one turbo exhaust feeds into a second to give further boost effect.

MAN's V28/33D engines have been specified for multi-engine plant in proposed new designs for production by Incat. The 20-cylinder model is the favoured option for a 130m wave piercing catamaran dubbed the ecoship 130 type, while the 12-cylinder model or Caterpillar's C280-16 are the options for an 85m wavepiercer. The most recent delivery from Incat's yard in Tasmania, the 112m *Norman Arrow*, has four 20V28/33D engines. ***NA***

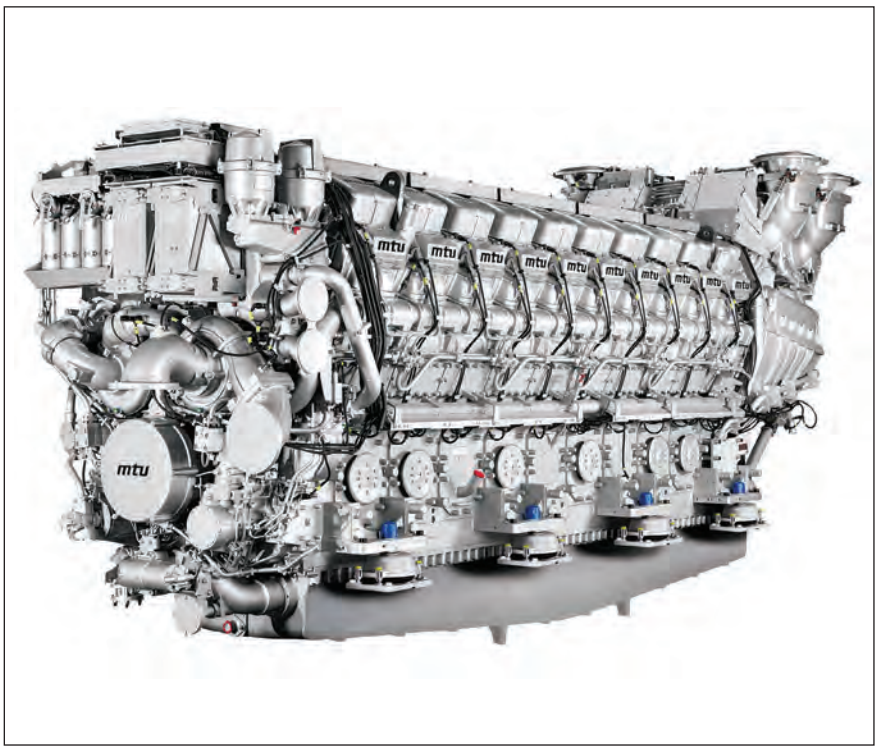
MTU power in efficiency drive

The power-to-weight ratio of propulsion machinery is a crucial consideration for high-speed ferries, of course, although users' increasing sensitivity to fuel costs means that high performance, compact plant also has to demonstrate comparative efficiency, writes David Tinsley.

MTU's 20-cylinder Series 8000 design, the most potent engine in the German producer's range, has found growing favour since the debut application in Lineas Fred Olsen's 127m trimaran ferry *Benchijigua Express*. The seminal vessel was built by Austal Ships and delivered into the Canary Islands traffic during 2005.

The accumulated running hours and service record from that and subsequent installations over the past five years has strengthened the hand of the MTU marketeers. Another factor influencing 20V8000 selection by operators, as in the case of Virtu Ferries' new 107m catamaran, is fuel consumption. The population of engines already in service has returned fuel consumption figures of under 190 grams per kilowatt-hour (g/kWh).

Compared with the 8200kW obtained from the engine in the M70L version of the original M70 series, the follow-on M71 generation of 20V8000 engine gives a maximum continuous output of 9100kW, at the same running speed of 1150rev/min.



MTU's top-of-the-range 20V8000 M71L engine, with a maximum output of 9100kW.

At the time, the all-diesel, four-engine solution based on the Series 8000 enabled Fred Olsen to meet its higher power and all-weather scheduling dependability criteria without having to adopt gas turbine technology. The engine design employs common-rail fuel injection, sequential turbo-charging and advanced electronics, all contributing to reduced unit fuel consumption, improved performance and lessened environmental impact in terms of both emissions and noise.

With an average pressure of 27.3bar at maximum power, the Series 8000 uses high-performance turbochargers and sequential turbo-charging, developed in-house by MTU and producing a broad power band and consequently enhanced acceleration properties. More turbocharger boost pressure and more air, combined with the common-rail system, bear on improved fuel consumption and exhaust emission figures relative to conventional arrangements, especially at mid-range power outputs.

As one of the largest catamarans ever built for service in European waters, the recently-commissioned, twin aluminium-hulled *Jean de la Valetta* has provided a new showcase for the Series 8000. Virtu Ferries' fleet addition has been phased in to replace another, earlier Austal-built catamaran, the 68m *Maria Dolores*, on the Malta/Sicily route. Designed to convey 800 passengers and 230 cars at a speed of approximately 39knots, the new Auto Express 107-type vessel ranks among the largest aluminium catamarans in the European market.

In a bold move, Austal Ships initiated construction of a 102m derivative of the 127m trimaran *Benchijigua Express* to its own account. That vessel has completed sea trials, and is now available for sale, awaiting only final customisation to a buyer's requirements. While the selection of 20V8000 primary power is a further endorsement of the design's perceived benefits, the installation in the latest trimaran has added significance for being based on three engines, rather than four.

A three-engine layout has been chosen primarily so as to save weight compared to the four-engine concept, which will mean lower fuel and maintenance costs. With a power concentration of 27,300kW from the three 9100kW prime movers, and the potential to make 40knots, it is claimed that the 102m trimaran will achieve lower fuel consumption than other high-speed craft with similar installed power when operating at the same speeds. *NA*

Incat targets fast freight

Ecoship 130 is aimed at satisfying both the green regulations, and the economic imperatives that drive modern shipping. Fast turnarounds and a light weight are the hallmark of Incat's latest catarmaran. David Tinsley reports.

An accent on environmental features, in conjunction with optimisation to more moderate service speeds and new scale economies, distinguishes the latest and largest offering from Australian wave piercing catamaran technology specialist Incat. Increased freight loading capability and transport efficiency are complemented by the design's faster turnround potential.

Prepared by Revolution Design for construction at Incat's main yard in Tasmania, the ecoship 130 marks a seminal point in the evolution of lightweight fast vessels. While it has the raw power to make 39knots or so in a lightly loaded state, the design has been optimised for economic operation at speeds of up to 30knots, while carrying full vehicular payloads.

On 130.5m overall, there is capacity for 46 articulated goods vehicles on the main deck, compared to 28 on Incat's previously largest wave piercer delivery, the 112m *Norman Arrow*. In addition to the very significant increase in the number of truck-trailer combinations provided for by the ecoship design, there is also laneage for 214 cars or 184 vans, or any corresponding mix, on the dedicated upper vehicle deck. The passenger spaces surmount the ro-ro decks, and can be configured to clients' specific requirements. Total passenger and crew complement will be around 1000.

Exceptionally fast turnarounds are promised by Incat's ecoship 130, which offers a major advance in freight capacity over previous wave piercers.

Another advance is the incorporation of double-deck bow and stern access to effect full-load port turnrounds in just 15 minutes where compatible shoreside facilities are available. The dual levels, allowing heavy vehicles to work on and off the main deck at the same time as, and separate from, the handling of cars on the fixed deck above, also promote safety and convenience by ensuring that car passengers are isolated from commercial vehicles.

Incat emphasised the need for improvements at the interface so as to maximise the economic and environmental advantages that can flow from prudent and innovative ship designs: "Speed reduction is beneficial in terms of reducing emissions and improving efficiency, but the real effectiveness of such a scheme depends on the possibility of reducing port time as well. This means that the role of ports is of paramount importance for overall ship emissions. The dual level bow and stern loading of the ecoship 130 will help develop an efficient on/off loading capacity on every route."

Incat had been a longstanding customer of diesel machinery from the Ruston stable in the UK, and that legacy manifests itself in the ecoship 130 through the nomination of MAN series 28/33D engines, as were used in the 112m wave piercer class and which have also been fitted in the newly-built 85m type. While based on the original RK280, MAN's Augsburg technicians have developed the design further into the 28/33D.

The plant specified for the 130m wave piercer comprises four 20-cylinder vee-form models, each rated at 9000kW at 1000 rev/min, to give a power concentration of 36,000kW. The choice was influenced by considerations of fuel consumption relative to power, to the effect that the installation promises lower fuel usage per cargo tonne per hour than any other high-speed catamaran, together with strongpoints as to durability, low noise and low maintenance costs. Furthermore, the 28/33D will meet future as well as current International Maritime Organization (IMO) edicts governing NOx emissions.

Hull design in conjunction with the

TECHNICAL PARTICULARS

Incat ecoship 130

Builder	Incat Tasmania
Designer	Revolution Design
Length overall	130.5m
Length, waterline	123.6m
Beam	31.2m
Beam, individual hulls	6.0m
Draught, approx	4.0m
Deadweight	1700dwt
Complement, passengers + crew	1000
Main deck freight capacity	46 articulated units @16.5m + 1 truck @10.4m
Upper vehicle deck capacity	214 cars @4.5m or 184 vans @5.1m
Main engines	4 x MAN 20V28/33D
Main engine power	4 x 9000kW
Propulsion power, total	36,000kW
Speed, maximum	39knots
Speed, economic, 1700t@90% MCR	29knots
Class	Det Norske Veritas

propulsion arrangements has been conceived to ensure that the vessel will be capable of sustained economic service, at a speed below the resistance 'hump', with maximum load and 1700dwt at 90% maximum continuous rating(MCR) of the main engines. The crucial speed is around 29knots. Lower loads at substantially less power, for example 200tonnes at 50% MCR, will correspondingly be attainable.

At 29knots, the vessel will be operating in displacement mode. As a consequence, the hull form has been optimised for displacement speeds by shifting the longitudinal centre of buoyancy further forward, and by taking measures to reduce transom immersion. Low profile or retractable appendages are necessary to minimise appendage drag. The influence of size or capacity on transport efficiency, using the calculation 'deadweight multiplied by speed and divided by power', the 130m catamaran's efficiency is 1.42, relative to 0.97 for the 112m series of wavepiercers, and 0.86 for the 85m design.

Engine power will be converted to propulsive thrust by way of LJX-series waterjets from Wartsila, which made their debut in the 112m class of wave piercers built by Incat. In comparison with other designs, the LJX confers a 25% reduction in mounting flange diameter, a 10% overall weight reduction and a 35% increase in cavitation margin, all contributing to the lighter seaframe, more efficient ship.

The Wartsila propulsor has a 1500mm-diameter, high flow impeller and employs an inboard layout for steering and reversing hydraulic cylinders, resulting in lower vibration levels and less noise as well as enhanced vessel manoeuvrability. Not only will the ship have bow thrusters, but these will be integrated with the Wartsila waterjet control system, contributing to slow-speed manoeuvring and berthing precision. Furthermore, it is claimed that the combination of thrusters and high mass flow jets will reduce power requirements in such circumstances, with the added advantage of reducing the impact on the seabed and marine life within the port.

Another strand of environmental engineering which is likely to assume increasing importance in the coming years, that of noise attenuation, has also been carefully addressed. "The world's most stringent 'low noise emission' standard will be met by the ecoship 130 through a series of engine room innovations, reducing machinery noise while the ship is alongside, and ensuring interior noise levels are well below recommendations," stated Incat.

The 'green' credentials attributed to the latest design of large catamaran passenger/vehicle ferry also spring from a specification which includes solar panels and wind turbines on the superstructure roof, as sources of energy for the shipboard electrical power network, and the adoption of a waste heat recovery system, based on the main engine exhaust lines, and providing heat for cabins and the domestic water system.

Other aspects of the outfit that offer environmental benefits include thermal reductive glass in the passenger spaces, the use of emerging LED (light emitting diode) lighting technology, and the adoption of toxin-free hull antifoulings. Furthermore, a minimum of 20 sockets will be provided for refigerated containers or trailers, to allow connection with the ship's electrical network, so that the units' integral reefer power packs can be turned off while onboard, reducing harmful exhaust emissions.

The Tasmanian yard's past three deliveries have all been examples of the Evolution 112 class, its largest ships to date. The most recent completion, the 112m wave piercer *Norman Arrow*, was initially assigned by charterer LD Lines to Dover/Boulogne service in June 2009. At the time, she was the largest high-speed ferry to have been introduced to the cross-Channel traffic between England and France.

Norman Arrow has this year been allocated to a longer Channel run, the Portsmouth/Le Havre route, for the period between Easter and September. The vessel has enabled crossings to be made in three hours 15 minutes compared to conventional ferry transit times of five hours 30 minutes on day sailings.

Norman Arrow can accommodate 1200 passengers and crew, and has capacity for 567 lane-metres of goods vehicles plus 195 cars on a separate car deck, with a service speed of some 39knots attainable on a draught of 3.93m. The ro-ro freight intake corresponds to 28 truck-trailer combinations. Her four-engine, MAN 20V28/33D installation and associated drive arrangements confer a dual-speed operating capability, at 23knots or 39knots-plus, allowing power to be closely matched to actual scheduling requirements, and benefiting efficiency.

Relative to earlier-generation high-speed ferries used on the Channel, the Evolution 112-class cat is also claimed to offer improved seakeeping qualities and passenger comfort, vital operational and commercial attributes for year-round duties.

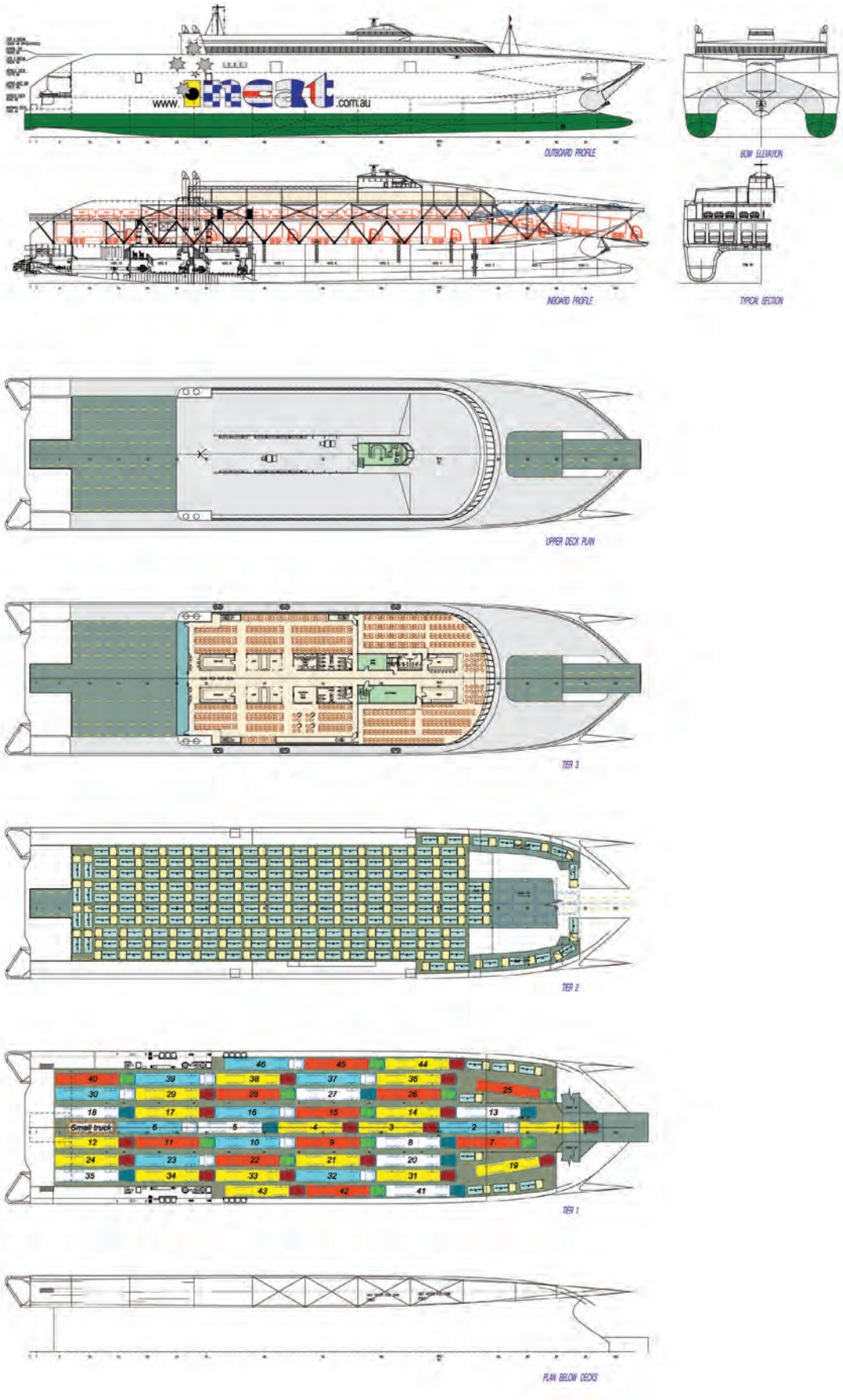
Incat has recently also augmented its range with a new wave piercing design of approximately 85m length, offering a number of options as to vehicle deck and cargo access arrangements, main machinery and hull appendages. While the ability to make at least 36knots on a deadweight of 500tonnes, and 40knots-plus with 200tonnes, is core to the performance attributes, Incat says that improved efficiency and overall economy have been key considerations.

Vehicles load from shore-based ramps over the stern or by way of an optional stern quarter ramp from alongside. Furthermore, customers may specify a bow ramp. An optional mezzanine deck can be fitted to increase car capacity if required, while the design also lends itself to the installation of the proprietary, rectractable T-foil system to reduce motions. By these and other means, an operator can customise the design to the specific needs of a service route and customer base.

The 85m cat provides for about 600 passengers, with facilities concentrated on Tier 2 deck and including three lounges. The vehicle deck below offers 545 lane metres for passengers' cars, corresponding to 121 units, and alternatively provides 330 lane metres for trucks at 4.6m clear height, plus 300m^2 at a minimum 4.0m headroom.

The choice of main machinery is four 12-cylinder models of MAN's 28/33D engine, giving total propulsion power of 21,600kW, or four 16-cylinder versions of Caterpillar's C280 diesel. *NA*

GA of Ecoship 130.



Great Danes collaborate on green gas project

An innovative approach to raising efficiency in the high-speed vessel sector, through the adoption of advanced gas turbine technology in conjunction with LNG (liquefied natural gas) fuel, is expressed in one of the projects encompassed by the Green Ship of the Future programme, writes David Tinsley.

Leading names in the Danish maritime industries are cooperating in the overall research endeavour, to develop environmental and energy-effective technologies with the aim of reducing pollutant emissions and optimising fuel consumption.

Two of the participants are involved in the high-speed vessel sub-project, under the working title "LNG-powered fast ferry". In this, the Danish Technical University's Mechanical Engineering Department (DTU-Mekanik) and ferry operator Mols-Linien are studying the efficiency and practicality of LNG-fuelled gas turbines in different types of energy-optimised systems.

"ORC offers the potential to improve efficiency by as much as 30-35%"

The final proposal will be the subject of detailed calculations as to total efficiencies. The template for the various arrangements will be an outline specification of an Incat design of 112m wave piercer catamaran ferry. The study team has recourse to computational tools developed within the Danish Centre for Maritime Technology (DCMT).

The compactness of gas turbines relative to the most commonly-used propulsion machinery solution that of diesel engine plant, has particular relevance to high-speed ferries because of weight and volume issues. Heavier machinery in itself increases the vessel's propulsive power requirement.

The nomination of LNG fuel reflects its superior environmental attributes relative to other hydrocarbons, promising a 25% reduction in carbon dioxide (CO_2) emissions, 35% less nitrogen oxides (NOx), and the virtual elimination of sulphur oxides(SOx). Further reductions in emissions and attendant efficiency gains are being sought through advanced machinery design. For instance, it is claimed that the adoption of gas turbine recuperative methodology in combination with the so-called Organic Rankine Cycle (ORC) offers the potential to improve efficiency by as much as 30-35% in relation to existing propulsion plant solutions.

Recuperation in a gas turbine implies that the compressed air is heated prior to entering the combustion spaces, using the exhaust gases, and resulting in less fuel input relative to power. Another option is a combined-cycle arrangement, whereby heat is recovered from the gas turbine's exhaust gases. While water/steam is usually the medium in combined-cycle systems, the ORC concept, employing an organic fluid, might offer benefits for smaller plants where minimum weight and volume usage are vital considerations.

The working principle of the ORC is the same as that of the Rankine Cycle, where the working fluid is pumped to a boiler, evaporated and passed through a turbo-generator, and finally re-condensed. In order to recover low-grade heat, the fluid generally has a lower boiling temperature than water. *NA*

Banking on growth

German containership operator Jochen Döhle expects owners to start ordering vessels again within 18 months as the economy turns around and the vessels now being delivered find employment.

According to Peter Döhle president Jochen Döhle the current market conditions are seeing cargo being rolled over in many export ports around the world and with the growth having returned to 2008 levels there is an expectation that laid up ships will return to service.

At the start of the year there were some 592 container vessels laid up and by the beginning of the summer that had fallen to 263 ships; "But another 70 to 80 ships were scheduled to re-enter service" by mid-summer claimed Mr Döhle.

As a result of the laid up ships returning to service there will inevitably come a time when re-entered service and with continued growth the need to speed up ships will arise again.

"Slow steaming will stop in 12-18 months time and the capacity problems will mean that cargo prices will increase again," said Mr Döhle. In addition the president of the Germany-based ship operator said that the orderbook has been "stretched long", of the 1357 container ships on order before the crisis there are now around only 600 remain today and they will be delivered, "not next year, but in 2013 and 2014," he said.

In a particularly upbeat message, not uncommon in the container shipping sector which regularly predicted 13-15% growth in the Asia/Europe trades (most of which proved to be close to the mark, until 2008), Mr Döhle said that the container lines would need to start ordering new ships soon in an effort to meet the growth expected by around 2012.

Peter Döhle has already made provisions for the expected upturn in the markets with an order of six vessels of the latest design by CSBC Corporation, Taiwan. CSBC has rearranged the positions of the fuel oil tanks and the ballast water tanks to reduce the amount of ballast water required and to raise the cargo carrying capacity of the new vessels.

In all CSBC has delivered three ships of this type already and the yard will deliver two more by the end of this year. CSBC has 10 orders for the 6600TEU container ships; six are from Germany's Peter Döhle and four from Taiwan's Yang Ming Marine Transport.

Taking the decision to order vessels was difficult, however, according to the company which is aware of a raft of new green regulations heading down the line towards the shipping industry in general.

Mr Döhle explains that the smaller operators must wait for the larger companies to set the tone in new orders so that more environmentally friendly vessels can be adopted by the industry.

"Can you take the risk of ordering ships designed to operate at slower speeds if the rest of the industry is moving fast, it needs companies like Maersk and Evergreen to set the pace," he said.

He went on to say that operating at significantly slower speeds is only possible under certain economic conditions. "If inflation in Europe rises to 6% and the interest rates rise to 12% then slow steaming will be a problem because the cost of the inventory aboard the vessels will increase significantly."

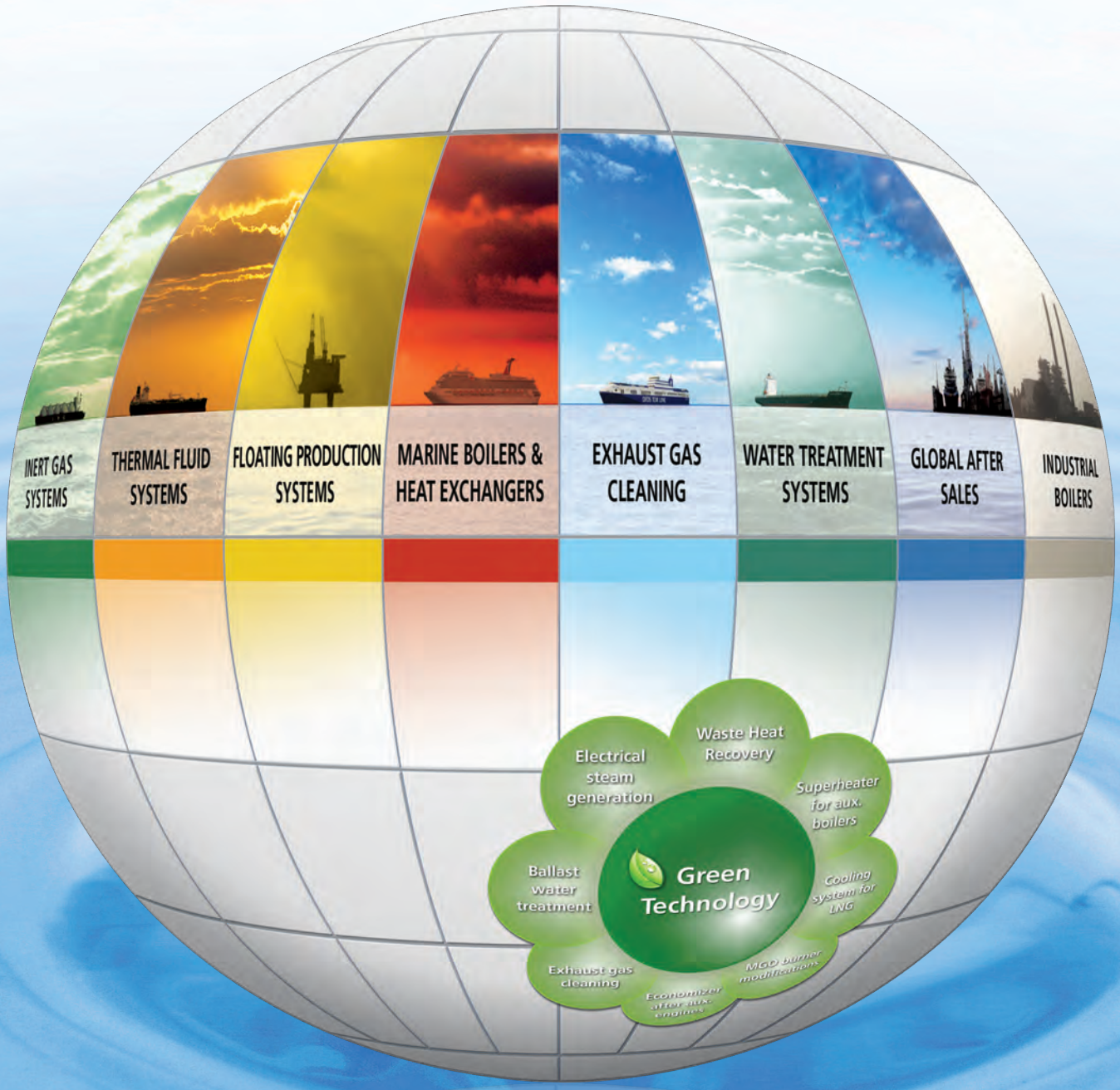
If oil prices are above US$40/bbl then slow steaming can be cost effective, if all companies adopt similar technology and operate at similar speeds. Other cleaner technology, such as LNG power, is less likely to be adopted. "There is a space problem for container ships operating engines that use LNG fuel," said Mr Döhle.

Ship size is unlikely to be a factor as ships are probably at their optimum size, he said: "economies of scale are not found in ships that are much larger than the existing vessels".

Moreover, the KG system that financed the German shipbuilding spree of the last 15-20 years is over with Asian banks that can lend at substantially cheaper rates than their European counterparts at this time will take the lead in ship finance in the future.

It is the cost of financing which is increasing in spite of the capital rich banks in Asia that Mr Döhle believes will shape the industry in the future. "It is market circumstances and not regulations that will decide any changes in direction for shipping," concluded Mr Döhle. And at the moment the market is demanding faster delivery of an increasing amount of cargo. *NA*

AALBORG
INDUSTRIES



Towards a Greener Tomorrow

www.aalborg-industries.com
Aalborg Industries A/S • Gasvaerksvej 24 • PO Box 844 • 9100 Aalborg • Denmark • E-mail: aal@aalborg-industries.com • Tel.: +45 99 30 40 00

ECA beavers in gas-fuelled feeder frenzy

Regulation and costs are conspiring to change the way we power new ships. Benjamin Scholz and Ralf Plump of Germanischer Lloyd's Environmental Research division believe the Baltic region will benefit from the latest design, the Gas-Fuelled Feeder Container Vessel.

As the regulatory squeeze on emissions from the maritime industry continues the race is on to find alternative fuels, new designs and more efficient operational methods that will reduce the impact on the environment and thereby improve the financial efficiency of the shipping company.

Germanischer Lloyd (GL) has linked with its partners MAN Diesel & Turbo SE, TGE Marine Gas Engineering and Neptun-Stahlkonstruktions GmbH to develop a liquefied natural gas (LNG) fuelled container feeder ship that could save as much as US$4million a year in fuel costs for owners if the price differentials that we see today continue until 2015 and beyond.

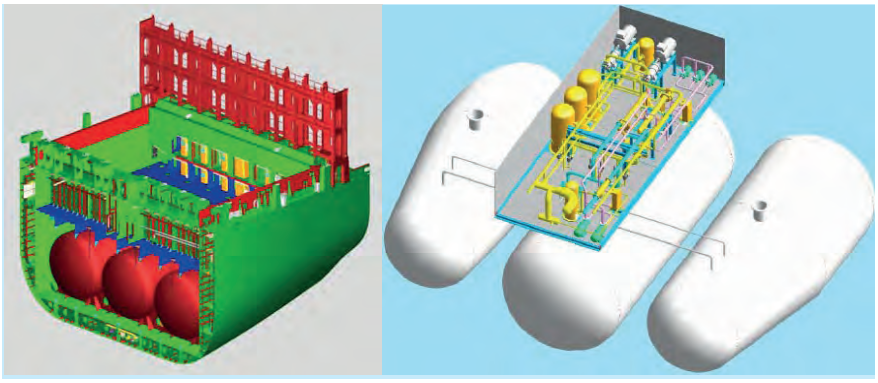


Figure. 1 Tank design of the gas fuelled feeder container vessel, source: TGE Marine Gas Engineering.

Motivation and objective

Reduction of emissions is the focus for the global community and is very much a part of the of the public's awareness at this time. Emission targets adopted by the International Maritime Organization's (IMO) Marine Environment Protection Committee (MEPC) and introduced into the MARPOL-Code (Annex VI) will affect the maritime industry in the next 10 years. Numerous limitations, which will come into force step-by-step, have been developed and will reduce the emissions of Nitrogen- and Sulphur Oxides, un-burnt hydrocarbons, particulate matter as well introducing CO_2 changes of between US$25-100/tonne.

Local areas like Sulphur Emission Control Areas (SECA, North Sea and Baltic) or Emission Control Areas (ECA) have considerably more stringent requirements regarding emission targets than is required globally from the MARPOL regulation. A new ECA will come into force around the coasts of Canada and the US in August 2011. Additional ECA's are expected in other regions of the world.

From 2015 the maximum sulphur content of fuel oil is limited to only 0.1% for all vessels operating in SECAs/ECAs.

From 2016 NOx emissions for new buildings operating in ECAs are limited to so-called Tier III. To fulfil this NOx limit, diesel engines burning marine fuel oils require exhaust gas after-treatment measures which means additional investment and operational costs.

One possible approach to meet these emission requirements is to use natural gas as fuel for propulsion and electric power generation onboard. The usage of gas as fuel is associated with environmental benefits compared to any oil based fuel. LNG as fuel has the potential to reduce the CO_2 emissions by around 25 % to 30 % depending on the gas composition. SOx and particulate emissions can be reduced to almost zero NOx-emissions are reduced by more than 80 %.

Gas fuelled feeder concept

Motivating the industry through financial mechanisms, the price of fuel and the requirement to pay for polluting, means that owners will be open to new concepts and ship designs and MAN Diesel and GL and their partners have modified an existing feeder vessel design.

The basic design for the integration of a gas-fuelled main engine is the CV Neptun 1200, which has a capacity of 1284TEU, by Neptun-Stahlkonstruktions GmbH. The vessel has a length of 166.15m overall and is equipped with a MAN 8L58/64, 11200kW diesel engine.

Within the research project the conventional main engine has been replaced by the dual fuel engine MAN 9L51/60DF and the engine room systems have been modified accordingly. The LNG-tanks, designed as a pressure vessel (Type-C) according to the IGC-Code, are located in the aft cargo hold. The outer tanks in this arrangement are reduced to the aft due to the shape of the hull and to keep the required distance from the outer shell of the vessel. The gas processing equipment for gas conditioning is located above the LNG containment system and designed in accordance to MSC.285(86). Both rooms are planned next to the engine room to minimise hazardous areas and the potential risk that might affect the safety of the ship, personnel and equipment, cp. Figure. 1/Figure 2.

The engine room concept is based on the gas safe machinery configuration which considers that the arrangements in machinery space are gas safe under all conditions. Therefore all gas supply piping should be enclosed in a gas tight enclosure within this concept. The required redundancy for the fuel supply of the main

Changing dead load into paying load with Saint-Gobain ISOVER

ISOVER's high performance insulation material ULTIMATE is for the fourth time rewarded with an award by ISO 2010, the trade fair for insulation technology. A new product in the lightweight ULTIMATE range is the Marine Wired Mat. The unique qualities of ULTIMATE permit the construction of a new generation of ships with increased load capacities, reduced weight and lower fuel consumption. Among others, the vessels concerned include the cruise liners Celebrity Equinox and AIDAblu, with weight savings of several hundred tonnes respectively, thanks to the impressive properties and effectiveness of ULTIMATE, the new generation of mineral wool. The numerous product advantages of ULTIMATE also convinced the independent international jury of the ISO 2010. Isover has now received the award four times for different solutions.

Celebrity Equinox. Incorporating Isover's insulation material, 'Ultimate'

NEW PRODUCT

ULTIMATE Marine Wired Mat, a new product in the ULTIMATE range, combines high performance in thermal, acoustic and fire protection with weight savings up to 50 percent. Above all, the outstanding thermal conductivity helps to save energy and thus reduce emissions. Furthermore the effective and innovative packaging saves logistic and installation costs.

PARTICIPATION AT SMM

Isover is member of Saint-Gobain Marine Applications, created in 2004. This platform offers its customers the best solution in shipbuilding, with full creative freedom, the highest possible effectiveness and the ease of one all-round advisor Consisting of ten international Saint-Gobain companies: Isover, Weber, Vetrotech, Kinon, Sully, Interior Glass Solutions, Dubrit, Gyproc, Raab Karcher Fliesenwelt and Technical Fabrics. They work in cooperation with Halton. SGMA's exhibition booth will be located in **Hall B5, Stand 420**, where further information about ULTIMATE can be found.

engine (in case of a gas shut-down) is given with the dual fuel concept. In practise the change-over from gas to diesel oil will not be recognised.

The diesel oil capacity has been increased by 36% to 432tonnes due to the additional demand for the pilot fuel injection of the engine. The LNG tank capacity is about 400tonnes LNG and increases the operational range of the vessel from 12600sm ("heavy fuel oil" design) to 15800sm. The container capacity is reduced by 48TEU to 1236TEU.

A cost-benefit analysis was performed using the HFO/MGO-fuelled vessel as reference design. It was assumed that the price of MGO will be 80% higher than for HFO from 2015 on. It was further assumed that the price of LNG will remain linked to HFO. In addition, a 20% premium for LNG distribution was added. The base case for the cost-benefit analysis considered only the fuel cost differences, the investment for the gas supply system, the dual fuel engine and structural changes as well as a slightly reduced earning capacity due to the use of the aft most cargo hold as gas tank space. The base scenario assumes a delivery of the vessel in 2014 and gas-fuelled operation starts fully in 2015. Annual fuel cost advantages for the gas-fuelled feeder are about US$4million/year reflecting the price difference between MGO and LNG. In 2009, LNG prices decreased significantly compared to the base scenario and this would lead to even larger cost advantages for gas-fuelled vessels if the LNG price remained at this level.

However, the price differential between LNG and HFO and MGO is set to remain significant enough to offer LNG users savings. According to Dr Pierre Sames, GL's Senior VP for Strategic R&D, believes that the price differential between HFO, MGO and LNG will remain. "Demand for HFO will increase from Asia in particular and with high production costs through drilling in deep water or in the Arctic region with severe weather this will push HFO prices higher while there has been a surge of new suppliers of LNG in Qatar, Russia, Malaysia and Brunei."

LNG supply chain

Current developments in Northern Europe indicate that LNG as a fuel will be available for bunkering within the next years due to new liquefaction plants like NORDIC LNG in Stavanger, Norway. These developments will establish the basis for a LNG supply chain for dedicated markets. Further with re-export from existing large-scale LNG terminals it is feasible to feed the supply chain for LNG fuel gas as shown by the loading of *Coral Methane* at Zeebrugge in May 2010.

Small scale LNG carriers (10,000m^3, built for regional supply) will then be the link between these liquefaction plants or re-export terminals and bunkering in harbours. A number of small LNG carriers like *Norgas Innovation, Coral Methane and Pioneer Knudsen* are already in service and further new buildings are under construction.

Regulatory framework

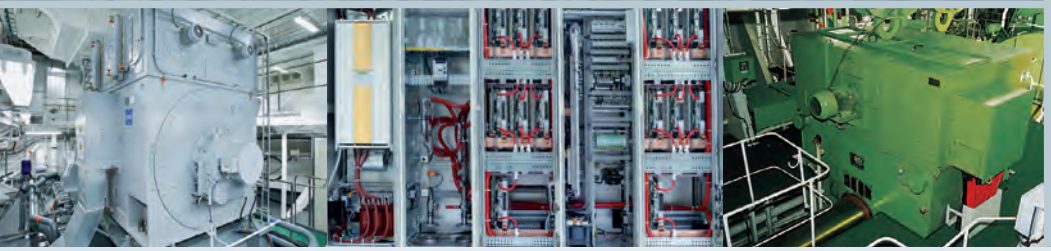
According to the IGC-Code (International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk) only LNG carriers are allowed to utilise LNG boil-off gas in the machinery space as fuel. Since 2000 a few LNG fuelled vessels, which are not covered by the IGC-Code, have come into service with the permission of the national administration, and they are only allowed to sail in these national waters.

Because of the obvious lack of international safety requirements for gas as fuel for non-LNG tankers the development of an International Code for Gas as Ship Fuel (IGF-Code) was proposed to the Marine Safety Committee (MSC) of IMO in 2004. The goal of the Guideline is to provide an international standard for ships with natural gas-fuelled engine installations. The Interim Guideline (MSC.285(86)) was adopted in June 2009 and gives criteria for the arrangement and installation of LNG fuelled machinery to achieve an equivalent level of integrity in terms of safety, reliability and dependability compared to conventional oil-fuelled machinery. The Interim Guideline is the international safety standard until the general Code is developed and set into force as a part of the SOLAS convention. The IMO is currently developing this code and the schedule is the next SOLAS revision in 2014.

The research project shows the feasibility of such a project and has not identified any technical obstacles for the integration of a gas fuelled propulsion system onboard of a container feeder vessel. The economical analysis documented the cost advantages for a gas-fuelled container feeder vessel operating in an emission control area from 2015 on. The cost advantage will be increased if CO_2 emissions costs and NOx limitations are included in the analysis. ***NA***

Power Converter Solutions for Energy and Drives

Efficient Technology onboard Ships



SAM Electronics GmbH
Behringstrasse 120
22763 Hamburg · Germany

Phone: +49 - (0)40 - 88 25 - 27 20
Fax: +49 - (0)40 - 88 25 - 41 02
DSS@sam-electronics.de
www.sam-electronics.de

SAM Electronics
an L3 communications company

Please visit us at SMM Hamburg, 7-10 September 2010, Hall B6, Stand 340.

The future of propulsion. That's what moves us.

Safety and precise maneuvering on waterways and harbors of the world is of maximum importance. Safe and eco-friendly drive systems are an essential prerequisite for this. For over 80 years, Voith has been designing systems that are safe for people and the environment. Voith Turbo offers tailor-made propulsion systems for a wide variety of applications – for harbor assistance and escort duties, ferries, supply- and special vessels for the oil industry as well as for special ships.

Please visit us: SMM 2010, 7 – 10 September in Hamburg, hall A4, booth 112

Voith Turbo

VOITH
Engineered reliability.

Beluga Hochtief JV set to reap rich harvest

Bremen-based heavy lift specialist Beluga Group is moving into the offshore wind-farm sector with its partner the Essen construction services company Hochtief in a big way with a significant order of up to four offshore wind farm erection vessels along with cable layers and support vessels.

Offshore wind farm construction is the fashion as global warming picks up pace and the demand for renewable energy increases. In a joint venture that will link one of the world's best known major project construction companies with a major player in the heavy lift industry Beluga Shipping and Hochtief are developing Beluga Hochtief Offshore with the specific purpose of offering their vessels for the construction of offshore wind-farms.

Latest developments for the JV are the ordering of a number of vessels including up to four offshore wind-farm construction jack-up, vessels, two cable layers and a number of offshore support ships.

As we have come to expect from Beluga Shipping the offshore company has opted for a high specification for the new offshore erector vessels which will be built at the Crist yard in Poland, with the first vessel due for delivery in the first half of 2012. A second vessel will be delivered at the end of the same year, said Niels Stolberg, president & CEO Beluga Shipping. He added that a total of four vessels are planned "initially", but a final decision on the second pair has not yet been taken. Beluga Hochtief Offshore plan to deploy the vessels in the North Sea and Baltic, on the German coasts initially.

"Each jack-up vessel is able to load, transport and directly install the most powerful wind power plants. Its outstanding features: 1500tonne crane capacity on board, 8000tonne deadweight loading capacity, own propulsion system, dynamic positioning 2 system and accommodation facilities for a crew of up to 120 nautical, technical and offshore experts," said Mr Stolberg.

The ships will be able to work in water depths of 35m or more, setting up offshore power stations of over 100m height which provide for an output of five or more megawatts.

"The vessel design and planning is configured in a way that enables the installation of up to 80 plants – foundations and windmills – per year with one jack-up unit. Additionally, the special vessel is able to operate in not only beneficial weather conditions but, indeed, on up to 300 days a year: safely, reliably, and most efficiently, thus keeping the total installation costs comparatively low," explained Mr Stolberg.

These same ships will also be used for the maintenance and repair of wind farms once the windmills have been erected and are operational and this market could also prove lucrative as Mr Stolberg estimates that there will be 25,000MW output by 2030 in Germany alone.

"We want to expand our involvement in the fast growing offshore segment and offer the combined transportation and installation units that the market is missing today. In fact, the economical power, the technical know-how and the innovative spirit which both partners combine in the joint venture Beluga Hochtief Offshore allows us to build the largest and most specialised jack-up vessels the market knows today," claimed Mr Stolberg.

Beluga Shipping is also planning the construction of two cable-laying ships and two supply vessels for the offshore wind farm sector. "However, for the time being we are not yet in such an advanced state as to be able to announce any details regarding where they are going to be built at what costs," explained Mr Stolberg. *NA*

An artist's impression of Beluga Hochtief's offshore wind farm erection vessel.

TECHNICAL PARTICULARS

Heavy-lift jack-up vessel, self-propelled

Length o,a	147.00 m
Breadth	42.00 m
Depth	11.00 m
Water depth for jacking	up to 50m
Significant wave height	for jacking and DP 2.00m
Wind speed for crane operation	up to 18m/s
Operating draft	70m min 7.00m max
DP capability	vessel complying with DP2 requirements
Number of legs	4
Leg cross section	lattice legs
Jacking system	rack and pinion
Jacking speed	> 1m/min
Accommodation	Up to 120 persons incl. crew. Cabins can be used as single or double cabin. Vessel is fitted for 200 persons onboard.
Helideck	D=20.88m, suitable for Sikorsky S92 with a MTOW of 12.8tonnes
Vessel speed	12knots
Category	crane around the leg
Capacity	500tonnes @ 31.5m
Cargo load	up to 8000tonnes
Sample scenarios	up to 7 WTG / W+ 2 jackets up to 1000tonnes incl. piles 4 jackets up to 600tonnes incl. piles 7 monopiles up to 500tonnes

Cargotec drives forward for 2011

Cargotec has remained steady through 2010 but, expects to be able to push harder in 2011 with further research and development, Erik Hägglund, senior vice president, merchant ship division, Cargotec explains.

Cargotec gets €20 million orders for MacGregor cranes and hatchcovers

Cargotec has received orders worth around €20 million to deliver MacGregor bulk handling cranes and hatch covers for 17 37,000dwt Handysize bulk carriers and hatch covers for nine 82,000dwt Kamsarmax bulk carriers to be built at Zhejiang Ouhua Shipbuilding Co. Ltd., China. MacGregor is a Cargotec subsidiary. Each 37,000dwt bulk carrier will be equipped with four cranes with a safe working load (SWL) of 30tonnes when handling general cargo and 24tonnes SWL when grab handling. The cranes will be manufactured at Cargotec partner plants in China and delivery is planned by the end of 2012. The hatchcover order for these vessels comprises design and key components for MacGregor 2 + 2 folding type hatchcovers, with a total of 20 panels on each ship. Additionally, Cargotec is contracted to deliver design and key components for MacGregor hatchcover sets for nine 82,000dwt bulk carriers to be built at the same shipyard, Zhejiang Ouhua Shipbuilding Co. Ltd. The hatchcover sets comprise MacGregor rack-and-pinion side-rolling hatch covers to be delivered starting from mid 2011. "The crane and hatch cover outfits are an integral part of the cargo access and handling ability of the vessels, and the MacGregor cargo handling solution offers an efficient and reliable system for the ship owner," says Per-Erik Nilsson, Cargotec sales and marketing director.

Erik Hägglund, senior vice president, merchant shipping, Cargotec.

Although the shipping industry has been hit hard by the financial downturn, with not many ships being ordered in the early part of this year (against some predictions) the economics has left many with concerns for the next year. However, this year has been a stable one for Cargotec with a steady flow of orders received.

Mr Hägglund has noted that a budget for this year has been very hard to set considering the recent market for different ship sectors, although Cargotec has still seen a number of orders go through this year for the bulk carrier market, which for Cargotec has remained strong.

"The sales that we see this year will be on the same level as 2009, we need to keep this positive trend," Mr Hägglund said. "The bulk carrier market will not continue the way it is, but we have now seen the container market starting to move again with the number of idling vessels going down. The transport market is gradually starting to move and with this the market will start to come back in different size bulk carriers and also the general cargo market will also come into play, although when this will be is still unsure."

The orders that Cargotec has got going through at the moment have short delivery times Mr Hägglund noted. Handling these types of orders has meant that Cargotec has had to be flexible in its approach. "To meet these delivery times it has meant that our organisation has had to be flexible in its approach and also in production, Cargotec has production facilities in Japan, China and Korea. To meet these deliveries we have adjusted our production capacity accordingly and have worked with a number of product partners," Mr Hägglund said. "The need for short delivery times has increased due to shipyards having slots in the yard that they want to fill," he added.

Looking to what lies ahead Mr Hägglund has said that Cargotec is focusing on further R+D in the area of electric drives, as the company currently has the financial strength at the moment to do this. It is expected that further developments in the area of electric drives on cranes and the expansion of the product portfolio will come from this R+D. What is driving the development in this area is that the electric drive presents a 'green' and financially better product for the customer, says Mr Hägglund.

JOTUN

SeaQuantum

The ultimate fuel saver

applied to more than

5000

vessels

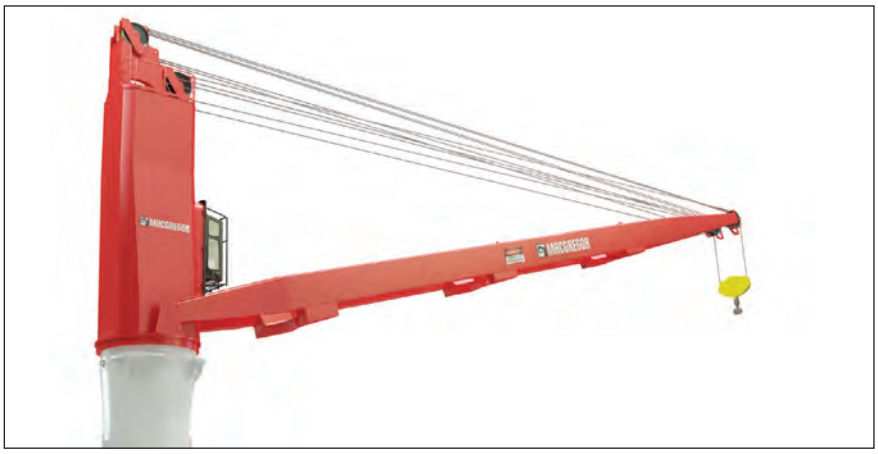
We believe our world leading antifouling technology is the reason

JOTUN

Jotun A/S
P.O.Box 2021, 3248 Sandefjord,
Norway
tel: +47 33 45 70 00
www.jotun.com

Recently, Cargotec has announced that it has received a €20 million order for its MacGregor electric-driven cranes. The order is to supply six open-hatch cargo ships that are on order from Grieg Shipping which will feature 24 MacGregor variable frequency drive (VFD) cranes. The vessels will be 48,700dwt open-hatch general cargo ships that are to be constructed at Hyundai Mipo Dockyard, South Korea.

In total, the order comprises 24 VFD electrically-driven cranes; with each vessel having four 75tonne SWL units installed. The cranes are planned for delivery from 2012 until 2013. Per-Erik Nilsson, sales and marketing director, comments: "We work closely together with our customers which enables us to produce innovations that improve the safety, efficiency and sustainability of their operations." "The MacGregor electric crane series inherits the best characteristics of proven designs, but also combines improved operability with a low environmental impact," he adds.



MacGregor VFD electric crane series inherits the best characteristics of proven designs, but also combines improved operability with low environmental impact.

Cargotec developed its electric drive for cranes in 2005 with sales of the first crane in 2007, since then focus on development of the drives and environmental regulations coming into play has made these cranes a more viable option for ship owners. Further development of the electric drive has also seen Cargotec launch its electric-drive side rolling hatch cover in 2001, with its second generation, MacRack, being launched on to the market at the end of last year. *NA*

API break's the ice

API Marine has recently announced that it has won a contract to supply an ice-breaking tanker with its API Marine technology.

The contract will see API Marine deliver its cargo monitoring and level indication system to Arctic tanker *Nordic AT 19* for German-based shipyard Nordic Yards.

The special ice-breaker tanker was ordered by MMC Norilsk Nickel. The tanker will be able to break through ice thickness of 1.5m and will transport fuel, lubricants and gas condensate in the Far North territories of Russia.

Designed to operate in the harsh Arctic weather conditions, where temperatures can reach -50 C. The tanker will comply with two classification societies, Russian Maritime Register of Shipping and Det Norske Veritas and is scheduled for delivery in September 2011.

"We are proud to announce commencement of a successful collaboration between API Marine and Nordic Yards with our shared strategic focus on Arctic shipping. We are the leaders in supplying special equipment for challenging operating conditions, both for marine and offshore applications, and we constantly develop our cutting edge technology in order to ensure ultimate precision and high reliability of our products. This contract continues the reference list of successful Arctic applications for our advanced products," comments managing director of API Marine, Sven Egelund Rasmussen.

This recent contract with Nordic yards has added to what has been a successful year with other contracts earlier in the year for the cargo control system. In January API received an order to supply 10 oil/chemical tankers for Turkish Ship owner Palmali.

The contract was signed with Besiktas Shipyard, Istanbul, Turkey for the supply of full integrated cargo control, monitoring and alarm systems for a new series of tankers. The 10 tankers will be built as the third series of "ARMADA" project RST22M and will be equipped with fully integrated API system for cargo management, control and ships stability calculations.

The ships combine river and open sea operations and fit the Volgo-Don and Volgo-Balt channels in respect of dimensions. The total capacity of six tanks and two slop tanks is 8090m^3, and will have a 7050dwt on 4.60m draught, and on rivers 4700dwt on 3.60m draught.

The vessels will be equipped with API TGD (Tank Gauging Device) in cargo tanks, a unique multi-functional unit for measuring level, pressure and temperature using non-contact acoustic GLF (Guided Low Frequency) self calibrating methods. Monitoring and control of ballast tanks, service tanks, fuel and lube oil tanks will be a combined integrated system based on API range of sensors - UTS (Ultrasonic Tanks Switch), UPT (Universal Pressure Transmitters) and API Bubbling System.

"With this new contract we continue successful cooperation with Palmali Group of Companies. The unique technology for accurate and reliable tank gauging developed by API Marine, based on acoustic principles, in combination with fast and flexible service support, securing overall reliable operation - has proved again to be the key points for the owners decision. To secure this important contract, API Marine has worked closely with Emarine Engineering Ind. &

API's cargo control sensors.

API has received an order to supply oil/ chemical tankers for Palmali Group.

API cargo control system gets put to the test in extreme weather conditions.

Trade Co. Ltd., Istanbul, Turkey - now appointed as official authorised API Marine representative for the Region," comments Sven E. Rasmussen, managing director of API Marine.

The API TSS/cargo system is designed for complete control and monitoring of cargo during loading and unloading on tankers and gas carriers. By using modern measuring methods based on Guided Low Frequency Wave Technology (GLF), the API TSS/cargo system is able to accomplish fast and reliable cargo handling, as well as the cargo's safe storage, said API Marine. The GLF technology ensures accurate and constant measurements from any shape of tank, in any kind of liquid and at any temperature.

The API TSS/cargo control system calculates level, volume, mass and temperature of all types of liquid cargo. The calculations are based on information from various sensors placed in the cargo and ballast tanks, manifolds and from draught positions. Data from the sensors are transmitted to a computer where the calculations are carried out by the designated API MasterLOAD software. This programme has been developed especially for onboard operations and can be used online with the sensors as well as off-line for cargo planning.

"Designed to operate in the harsh Arctic weather conditions, where temperatures can reach -50 C.

The API TSS/Cargo system meets with all International Maritime Organization (IMO) and US Coast Guard requirements for oil tankers. These requirements include weight calculations of stored and released oil products and necessary precision. and US Coast Guard requirements for oil tankers. These requirements include weight calculations of stored and released oil products and necessary precision.

The cargo and ballast information system is based on various API Marine sensors; tank gauging device, liquid level switch, tank level alarm, ballast and manifold sensors and draught sensor. Using modern data transmission technologies, only two cores are needed in the API TSS/Cargo system to transmit data from all sensors in one tank to the control room. This makes installation easier and saves a great deal of cabling. *NA*

WAVE RADARS

DIRECTIONAL WAVE AND CURRENT MONITORING

SM-050 WAVE AND CURRENT RADAR
Microwave Doppler Radar of High Accuracy.

WAVEX
Wave and Current Extractor for Marine Radars. Type approved by DNV.

DIRECTIONAL WAVE AND CURRENT RADARS ARE WELL SUITED FOR:

- Offshore structures and vessels.
- Catamarans and high speed vessels.
- Naval and merchant vessels.
- Research and service vessels.
- Shore installations for ports and coastal stations.

NON-DIRECTIONAL WAVE MONITORING, AIR GAP AND TIDE GAUGE

SM-048 ALTIMETER AND SM-094 RANGE FINDER,
High Performance Microwave Sensors.

NON-DIRECTIONAL MIROS RANGE FINDERS FEATURE:

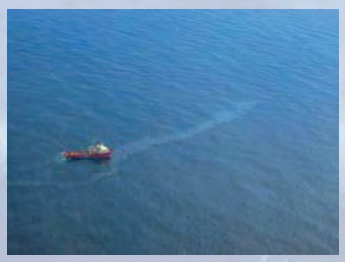
- Wave profile and air gap from vessels and offshore structures.
- Sea level and tide measurements, water level in ports and canals etc.
- Bridge clearance monitoring.
- 10, 20, 50 and 85 meter range.
- No influence by fog, rain or water spray.

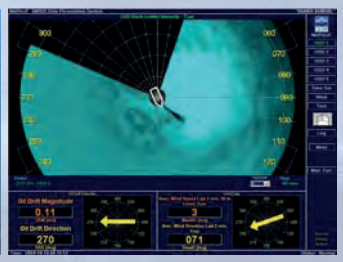
6.5 FEET WAVEX ANTENNA

SM-094 RANGE FINDER

SM-050 WAVE RADAR

OIL SPILL DETECTION





OIL SPILL DETECTION BY MARINE X-BAND RADARS, A NEW SYSTEM BASED ON PROCESSING OF DIGITIZED RADAR IMAGES

MAIN FEATURES:

- Early detection of oil spills.
- Enables 24 hours a day skimmer operations.
- Prediction of oil spill drift.
- Flexible user interface.
- Add-on to the WAVEX system, providing additional sea state information.

AREAS OF USE:

- Stand-by and oil recovery vessels participating in oil spill clean up operations.
- Coast guard vessels for oil spill monitoring.
- Oils rigs, FPSOs and tankers for oil spill monitoring.
- Oil terminals and refineries for oil spill monitoring in the terminal area.

Developed in cooperation with NOFO –
Norwegian Clean Seas Association for Operating Companies

MIROS

Solbråveien 20-22, P.O. Box 364, NO-1372 Asker, Norway
Tel: +47 66 98 75 00, Fax: +47 66 90 41 70
E-mail: office@miros.no, Web site: www.miros.no

- measuring the ocean surface

Visit us at SMM, Hamburg Stand 444, Hall B7

Kongsberg extends its capabilities

Kongsberg has enlarged its range of tank monitoring solutions with the launch of its GL300 system that will give enhanced performance of tank gauging, pressure and temperature monitoring, said Kongsberg.

The latest tank gauging monitor from Kongsberg has been approved by all major classification societies and is also lightweight and easy to install say the Norwegian-based company. The gauge will offer increased reliability, accuracy and durability over existing tank monitoring systems, which has been made possible through a range of sophisticated new sensors designed by Kongsberg Maritime's in-house sensor technology unit.

"We have been developing radar tank gauging solutions for over 25 years and have employed our technical expertise and application experience to develop our most accurate, reliable and durable solution to date," said Børge Hävard Jenssen, project manager for GL300 development at Kongsberg Maritime. "We have had a pilot installation onboard an oil/chemical tanker since September 2008 and reports from the customer are that everything is working perfectly."

Kongsberg's latest tank monitoring solution.

The GL-300 can be fully integrated with Kongsberg Maritime's class-leading K-chief automation solution, remote operator station (ROS) and I/O units for other cargo instrumentation form the K-Gauge cargo monitoring and control system. It is a modular system based on the new, highly accurate to 2mm GLA-300 Radar Tank Gauge, GC-300 Cargo Temperature Unit and centrally located for each tank GLK-300 Signal Processing Units. Additionally, a GT-450 pressure sensor is fully integrated to reduce cabling and simplify installation. The modular design enables simple design of custom solutions and supports easy trouble-shooting, enabling crew to change units if necessary.

The GLA-300 radar tank gauge draws its high-accuracy and durability from the already proven offset parabolic antenna design, which is capable of withstanding the harsh tank environment. The antenna radiates a high frequency (24GHz), narrow beam, which makes it easy to position in the tank and very resistant to the problems caused by condensation and deposits from the cargo.

The latest tank gauging monitoring solution is applicable for most liquid cargo tankers including oil and chemical, across the entire temperature range and is suitable for sockets with inner diameter 200mm or larger (JIS flange). The monitoring system makes use of several features from the inspection hatch on the GL-300 radar tank gauge to a focus on minimising cabling across the entire system. *NA*

SMM Hall B4 – EG 460

www.meyerwerft.de

MEYER WERFT
PAPENBURG 1795

Palfinger expands with NDM

Palfinger Group is set to expand the growth of the company with the recent acquisition of 75% interest in Dutch-based Ned Deck Marine (NDM).

Palfinger announced in July this year that it had acquired 75% shares in Ned Deck Marine the Dutch manufacturer of rescue boat davits. Adding to its truck-related business and its ship-mounted cranes will see that the acquisition of the shares in NDM expands Palfingers business.

"Despite the 30% market decline, the revenue generarted by NDM in 2009 remained stable. Further growth will also significantly add to the importance of the servicing business of existing equipment on the SOLAS market certified quality is of top priority," explained Herbert Ortner, CEO, Palfing AG.

To further expand its ship crane business Palfinger is already planning another acquisition. The target is the marine crane division of Palfinger systems GmbH, which is owned by the Palfinger family and includes a business with a staff of approximately 150 ,generating approximately €30 million in revenues. The due diligence of the business was carried out in July. "We have been interested for quite some time in reintegrating the marine crane business into Palfinger AG as a meaningful and profitable supplement to our strategy," explained Herbert Ortner. *NA*

Palifinger invests in NDM.

NDM receives order

Norwegian Deck Machinery (NDM) has announced that it has received an order from Lamprell Energy, Dubai for the supply of anchor windlass winches for two Windcarrier jack-up rigs being constructed at Lamprell Energy. Both vessels are for Fred Olsen Energy in Norway and are scheduled to be delivered in the second and third quarter of 2012, with the anchor systems to be delivered in July and October 2011. The vessels will be of Gusto MSC 9000C design, with four jack-up legs. The vessel will be equipped with dynamic positioning features, high speed jacking systems, an 800tonne crane and a rotary propulsion system that will give a speed of 12knots. Each unit will have accommodation for 80 persons and a payload capacity in excess of 5000tonnes.

The latest jack-up rigs from Lamprell Energy that NDM will supply its anchor handling systems to.

RWO

CleanBallast®

The RWO Ballast Water Treatment System

Worldwide performance and low running costs

RWO GmbH

MARINE WATER TECHNOLOGY
Thalenhorststrasse 15 A
28307 Bremen/Germany
Phone: +49 421 53705 0
Fax: +49 421 53705 440

rwo@veoliawater.com
www.rwo.de

VEOLIA WATER

Solutions & Technologies

Lashing down the problem

The amendments to the code of safe practice for cargo stowage and securing (CSS) from the International Maritime Organization (IMO) will tighten up safety for those not only working with containers but also the vessels themselves.

Although containerisation has greatly improved the safety of cargo-handling, cargo-related accidents to ships crews and dockworkers still continue. At the 2006 DSC meeting the UK submitted research which showed that 40% of accidents to dockworkers had occurred onboard ships and the majority of these accidents were related to lashing activities on container ships.

In many cases the design and layout of the lashing arrangements on such ships did insufficiently account for the safety of the crew and dockworkers required to handle the lashing equipment. The UK proposed at the time that additional guidance on providing a safe working platform for the securing of containers should be incorporated in the Code of Safe Practice for Cargo Stowage and Securing.

What was then further discussed was that the situation with cargo securing is not confined to older ships. As container ships have grown bigger, an increasing number of containers are being carried on deck. The tendency to maximise deck stows has led to the situation where the space available for lashing and securing operations at deck level has been squeezed. In some cases onboard new ships insufficient consideration at the design and building stage has resulted in the lack of the provision of a safe working platform for lashing operations.

The proposal for research to be carried out was laid out as follows;

- Chapter 3 of the Code of Safe Practice for Cargo Stowage and Securing recognises the principal that ships should be so designed that standardised cargoes can be safely secured onboard but gives no advice on the provision of a safe working platform for personnel.
- The UK proposes that additional guidance on providing a safe working platform for the securing of containers should be incorporated into the Code of Safe Practice for Cargo Stowage and Securing in the light of the above. The UK undertakes to submit more detailed proposals to the Sub-Committee on Dangerous Goods, Solid Cargoes and Containers.

As cargo quantities increase the safety requirements for vessels and those working onboard also increase.

It was highlighted at the Maritime Safety Committee (MSC) 87th session on 12-21 May 2010 amendments to the CSS code, as well as revised guidelines for the preparation of the cargo securing manual, amendments to the guidelines for securing arrangements for the transport of road vehicles on ro-ro ships and amendments to the elements to be taken into account when considering the safe stowage and securing of cargo units and vehicles in ships, would be added.

Previously, it was established in the sub committee Dangerous Goods, Solid Cargoes

We protect more than your investment.

Ballast Water Filtration

BOLLFILTERS protect BWT units against wear, defect and failure. Furthermore, they help you to operate your system with less energy and chemical substances. Thus, you can reduce costs, save natural resources, biodiversity and the livelihood of future generations.

Contact us and find out how you can save while we protect.

BOLLFILTER
Protection Systems
Marine & Power

BOLL & KIRCH Filterbau GmbH • Postfach 14 20 • D-50143 Kerpen
Tel. +49 2273 562-0 • Fax +49 2273 562-223
e-mail: info@bollfilter.de • www.bollfilter.de

BRUNEL
MARINE COATING SYSTEMS

Marrying the environment to the exacting needs of the marine industry

Brunel Marine Coating Systems is responsible for developing revolutionary coating systems for the marine industry

- Non metallic, contains no biocides or solvents, applied by standard airless pump.
- 100% solids, extremely hard and does not wear off - surface microtexture less that 20 microns.
- Proven to reduce operating costs and carbon footprint - zero VOC!
- Non porous and does not support marine growth.
- Easily and economically cleaned, if needed, without affecting the coatings life or integrity.
- DNV Certified compliant for deductions from Norwegian Shipowners Environmental fund.

Discover the best kept secret in the Marine Coating Industry - visit

www.brunelmcs.com

and Containers, in 2008, that the following amendments should also be applied to the current CSS Code. The report to the MSC stated;

- 5.1 The Sub-Committee recalled that DSC 12, having established the working group on providing safe working conditions for securing of containers and the CSS Code and having considered the report of the working group (DSC 12/WP.4) in part relating to the item, took action as follows:
- 1) noted the group's views on the best way to disseminate information on local regulations, particularly the Russian Federation rules for safe carriage of cargoes by sea, form for cargo information and method of calculation of non-shift criterion for structuralising cargoes, relevant to specialised cargoes and regional trade, contained in document DSC 12/8 (Russian Federation), and that it could not reach an agreement on this issue and decided to request the Secretariat to consider the options suggested by the group and advise DSC 13 accordingly;
- 2) agreed to the deletion of proposed amendments to the CSS Code contained in the sections 7.2 (Container stowage) and 7.3 (Containership condition report) of the proposed amendments to the CSS Code contained in the annex to the report of the correspondence group (DSC 12/10/1). However, it also agreed that matters on container stowage should be taken into account when the Guidelines for the preparation of the cargo securing manual (MSC/Circ.745) is further considered for amendment. Additionally, the Sub-Committee noted the group's opinion that the proposal on the Containership condition report (document DSC 12/10/1, annex, section 7.3) had merit; and
- 3) noted the progress made on the draft amendments to the new annex to the CSS Code, further noted that, due to time constraints, the group was not able to finalise the draft amendments to the CSS Code and agreed to invite the Committee to extend the target completion date of this item to 2008.
- 5.2 The Sub-Committee noted that there were three issues for consideration, namely means of dissemination of information on local regulations, information on the joint industry research project Lashing@Sea and the finalisation of the CSS Code.

Lashings@Sea is a joint industry research project that aims to prevent lashing systems from failing and to increase safety and lashing

Lloyd's Register delivers software for safer operations

Lloyd's Register has developed and released its latest container-securing rules and software that will provide a framework that is safer and more effective with the use of modern ships.

The new rules have been developed along with the assistance of major container-shipping lines and manufacturers of lashing equipment.

"These rules are the culmination of a great deal of detailed work with operators, builders, designers and port operators," said David Tozer, Lloyd's Register's global business manager for container ships. "Safety, as always, comes first. But ensuring flexibility in loading and discharging operations is vital for operators. So these new rules were created to combine safety and flexibility, allowing more sophisticated and varied container stows to save time and expense in port."

The rules and software follow last year's release of Lloyd's Register's Guidance on Ergonomic Container Lashing (ECL), supported by the ECL notation. The main benefits of the latest set of rules from Lloyds Register are;

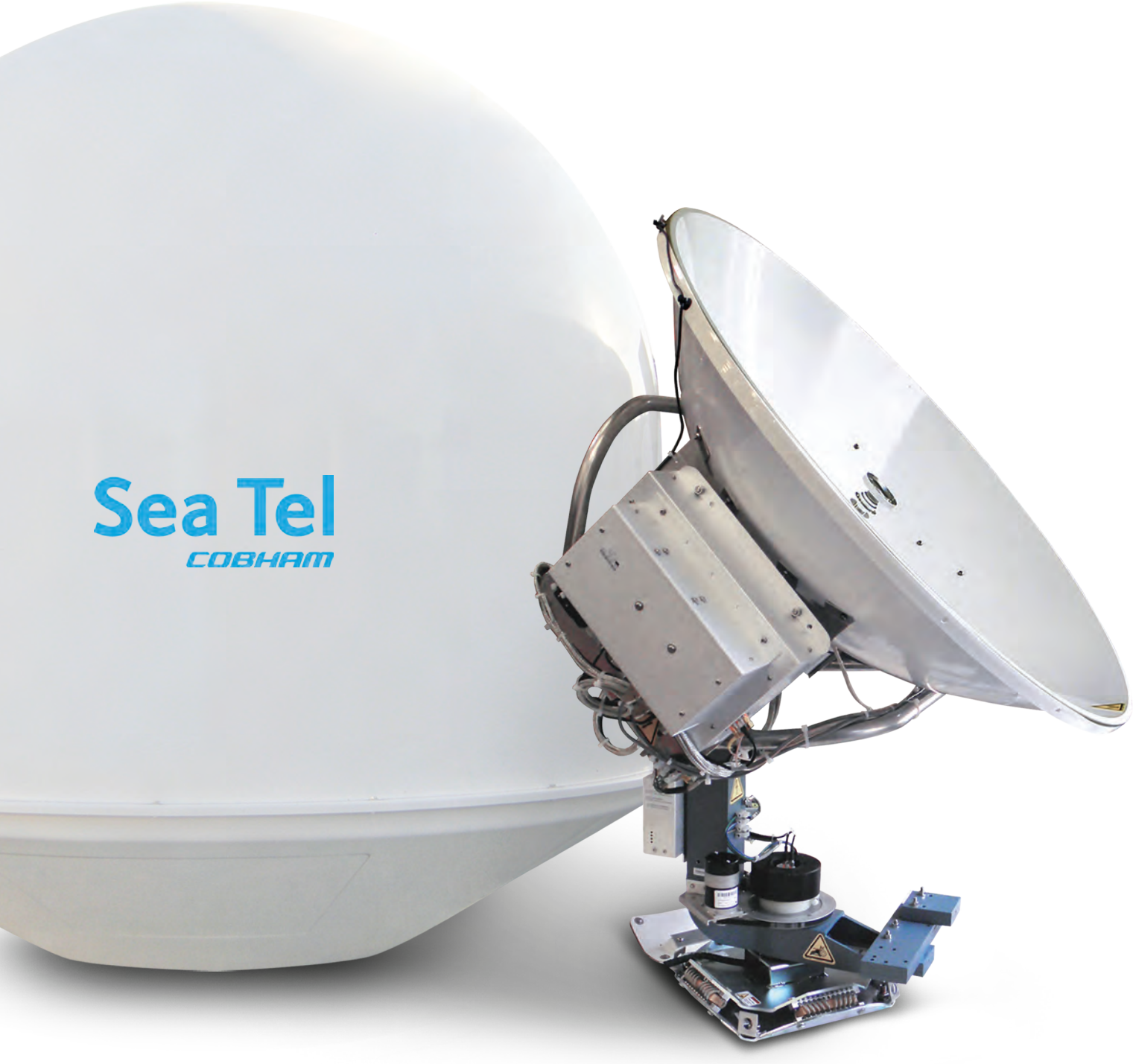
- **a reduced risk of losing containers overboard, with associated environmental risks and cost**
- **a reduced risk of loss of life or serious injury to stevedores and crew engaged in container lashing**
- **more effective lashing techniques for new, much larger, container ships**
- **increased potential for innovative and flexible lashing designs and arrangements**
- **increased flexibility in the allowable weight of containers in certain configurations.**

Lloyd's Register's LashRight software is the latest in the Group's dedicated container-securing software. It calculates the forces acting in lashed and unlashed stacks on deck and validates the results against the requirements contained in Part 3 of Lloyd's Register's Rules and Regulations for the Classification of Ships.

LashRight can quickly identify areas which have failed the assessment, helping designers to make the required changes to container arrangement, weight distribution or lashing equipment. This helps to ensure compliance with requirements and reduces the risk of containers being damaged or lost overboard.

Key features of the software include;

- **step-by-step 'wizards' help designers to carry out analyses quickly and efficiently**
- **calculations are performed in real time; changes are accommodated as they are made**
- **results are calculated for pitching, rolling and combined conditions, in accordance with the Rules or user requirements**
- **covers industry standard containers and lashing equipment, or users can add custom specifications to the software's library.**



Introducing the NEW Sea Tel 10 Series

Affordable bandwith for the *Always-On* network, lighter weight and easier to install Sea Tel's new 1 to 1.2 meter antennas feature the most radical redesign yet

The new Sea Tel 10 series antennas enable bandwidth conscious maritime customers to enjoy the benefits of the *Always-On* VSAT network.

Communications-at-sea is only as good as your antenna. Superior global and remote support means higher uptime.

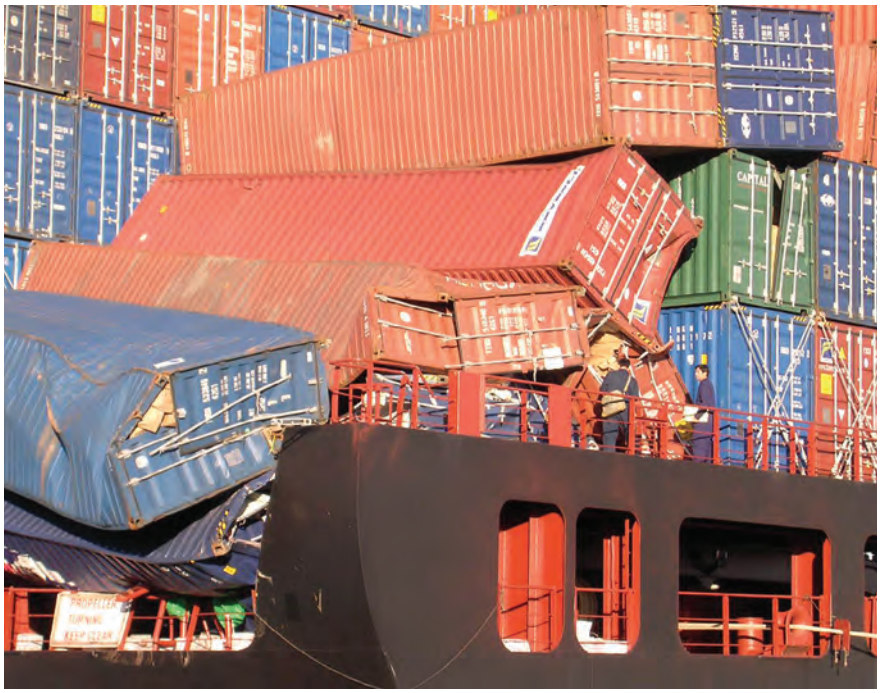
Available in 40 and 50 inch reflector sizes, compatible with all Ku-Band frequencies, co-pol for global and cross-pol for regional customers.

Proven Sea Tel stabilization platform that meets the most stringent design specifications such as EN 60945, MIL STD 461, MIL STD 167-1 and IEC 60950.

Sea Tel
COBHAM

Cobham SATCOM Marine Antennas
USA: +1 925-798-7979
Europe: +44 2380 671155
ASIA: +65 6795-2205
www.cobham.com/seatel

Sea Tel offers the widest range of USAT and VSAT antennas from 60cm to 3.7m for commercial and pleasure maritime needs worldwide. Sea Tel also provides a huge selection of TV-at-sea antennas.



The amendments to the CSS code will see further training in securing cargo.

efficiency where possible, which was started in 2006. The project ended in January this year with the flag states that are involved in the project looking to have a further follow up of the findings presented to the IMO. Marin is set to present its findings at the DSC 15 meeting this month.

Marin has carried out a monitoring campaign of five ships in operation, model tests of secured cargo and an extensive survey asking crew for their input was conducted in the container, ro-ro and heavy-lift sectors. A consortium of 24 participants representing flag states, classification societies, ship owners and lashing equipment manufacturers, as well as crew from 160 vessels has taken part in the three year research project that was sponsored by the Dutch government.

The main findings with respect to container lashings on the big ships (smaller vessels such as feeders were not addressed in the study) were that high loads may develop when stack interaction can develop. Such interactions may occur as a consequence of excessive stack weights and "off" vertical weight distributions by non properly loaded containers (heavy over lights) or in combination with loosening lashings. If such effects can occur than combination with high environmental loads by weather and possibly in combination with extreme GM (high GM) may result in loads that may progressively collapse adjacent rows.

Marin believes that in order to improving safety attention must be paid to:

- Increase the reliability that the cargo is in fact loaded in agreement with how it is supposed to. Ie that the loading computer assumed loading actually reflects the situation onboard allowing a proper assessment of loads and limitations.
- Increase the ability of the crew to avoid excessive vessel response in adverse weather.
- Increase the reliability of the condition of lashing gear, containers themselves and deck fittings.

The amendments in the MSC circular that came out earlier this month to the CSS code will mainly affect ships that are constructed after 1st January 2015, which looks closer at how containers are secured and placed onboard a vessel; whilst in the mean time the use of lashing and the types of lashings used in regards of training crew will need to be addressed. Research is still being carried out to make container stowage safer for both crew and vessel through industry research projects such as Lashings@Sea. *NA*

COMLASH investigates

British-based TMC marine has recently updated its software COMLASH to include a buttress lashing system in the holds of several tweendeck vessels, with the additional feature to allow parallel lashing at the click of a button. COMLASH was originally written in 1979 with the view to allowing those onboard a container ship a quick and easy way to check the stack and lashing forces of all the container stacks loaded onboard.

For any given set of conditions, ie. Roll angle, windforce, vessels metricentric height (GM), etc. and for all major classification society rules, COMLASH will, at the click of a button check each and every lashing, twistlock and container frame for any overloading. Combined with a BAPLIE file import facility the checking of the stack and lashing forces of several thousand containers loaded onboard a modern container ship can be done in the matter of minutes. The use of COMLASH also removes the uncertainty associated with checking tier weight distributions and mixes of container lengths and heights which arise when checking bay plan weights against a vessel cargo securing manual.

COMLASH is also used extensively in container stow collapse investigations and in subsequent litigation work. Having a lashing programme which, was developed originally in-house and which is maintained and updated in-house means that any situation, no matter how unique can be modeled in COMLASH by our engineers.

Kawasaki

is the top brand of steering gears and deck machinery — manufactured in the world's major shipbuilding countries.

For manufacturing Kawasaki-brand steering gears and deck machinery, we have production centers in Japan, Korea and China, three countries that together account for more than 80% of the new ships built in the world today. Local production in countries where new ships are regularly manufactured is, we believe, the key to both reliability and economy.

UK / Kawasaki Precision Machinery (UK) Ltd.

Korea / Flutek, Ltd.

Japan / Kawasaki Precision Machinery Ltd.

China / CSIC/Wuhan Marine Machinery Plant Co., Ltd.

90 years of experience in hydraulic technology — guarantee safe, economical operation.

High-pressure, compact, easy to install and maintain, Kawasaki steering gears are proud of long history and rank No. 1 in the world in terms of quantity delivered: over 16,000 ships have been equipped with them. As quiet, high-pressure systems, our deck machinery has also earned a superior reputation, and in this field, too, we have achieved world-class results, equipping over 5,500 ships.

KPM
Kawasaki Precision Machinery

http://www.khi.co.jp/kpm/

Head Office / Main Plant
234, Matsumoto, Hasetani-cho, Nishi-ku, Kobe 651-2239, Japan
Phone: 81-78-991-1133 Fax: 81-78-991-3186

Kawasaki Precision Machinery (UK) Ltd.
Ernesettle Lane, Ernesettle, Plymouth, Devon PL5 2SA, United Kingdom
Phone: 44-1752-364394 Fax: 44-1752-364816

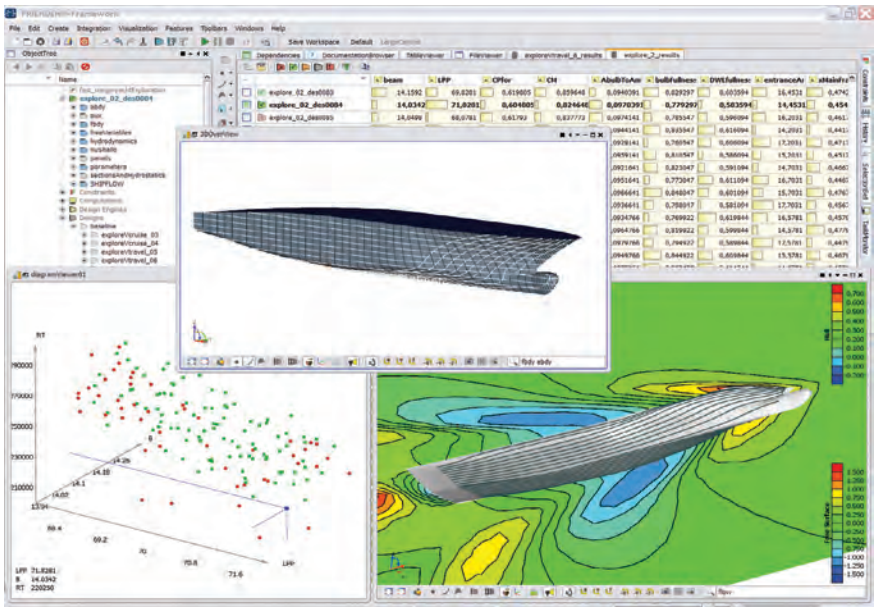
For the sake of better designs

Simulation-driven design is seen as a drag on developing experienced naval architects and a possible future hindrance to the process of ship design. Anne Wenzek of Friendship Systems argues that man and machine must work in harmony to improve new designs.

In periods such as the current tough economic climate it is noticeable that ship owners, operators and builders reconsider their capacity to offer suitable solutions to growing demands in a competitive market. In days gone by it was, for the most part, the shipyard's experience with certain vessel types and the skilfulness of senior naval architects, which guaranteed reliability and prosperity.

Today, a shift toward novel approaches in design and their adept application is apparent. The emergence and permanent improvement of simulation tools and formal optimisation processes are proof for the influence and power of an innovative design approach.

Simulation-driven design and integrated simulation have become signal words in maritime design. Despite all merits, the approach is no fast-selling item. Reluctance paired with false assumptions and improper presuppositions lead to misunderstandings if not misconceptions.



The graphic above details the performance assessment of a hull geometry and the evaluation of the geometric variation study.

The approach has no doubt the potential to surpass traditional design methods. It provides potent strategies to help designers deliver suitable answers to ever more challenging market demands for higher efficiency, economic viability, safety and product intelligence. This potential is rooted in the idea of simulation-driven design, however, bound to certain conditions.

Simulation, by definition, means determining key system behaviour while deliberately neglecting less important aspects. Integrated simulation is employed in the design process to assess a large set of variants which are created by algorithms for the exploration and exploitation of the design space.

Feeding the findings thoughtfully back into the variation, simulation becomes the driving force of the geometry development, the field for which the technology is commonly used in maritime design.

It becomes clear that a good engineering understanding and experience with simulation codes are important prerequisites for successful employment. Contrary to traditional manual variation, simulation-driven design achieves an unrivalled scale and scope of geometry generation and assessment.

Managing this knowledge is pivotal as is its quality. Naturally, it is critical to supply the simulation with correct data. Even if the geometric model is suitable, a challenge is imposed by the definition of correlations, constraints and objective functions for optimisation, not least by drawing correct conclusions from the analyses' findings. The experience of the designer is as decisive for these two points as for the evaluation of the data captured.

Monitoring variation and optimisation requires deep insight into the fundamental mechanisms of the system ship. It is, therefore, advisable if not crucial to have both experienced and technologically versed designers work in a team. At no point is it reasonable for the designer to take the simulation's results at face value or for the ultimate answer.

The proper use of the technology and its functionality is essential. Despite its blatancy, the fact does seem to fuel a certain hesitation to employ simulation-driven design in maritime product development more comprehensively and to seize the benefits of this technology.

Hesitation is fuelled by the apprehension that errors drawn from incorrect evaluation of simulation's findings are dragged on and further as the design process evolves and that this might displace proven ship design. This means that, in other words, employing simulation for geometry development is a means to an end. The fear is no doubt reasonable. However, the opposite is true: Only on the basis of experience can simulation-driven design excel traditional designs.

This is why the team of senior and junior naval architects is decisive for the successful operation of the approach. The potential

improvement in efficiency, performance, stability, robustness, etc. which is gained by developing geometry through simulation is, evaluation shows, significantly higher than that of traditional, manual form variation.

It is, therefore, not about accumulating data and sheer number crunching. It is about the suitable application of the technology and about coping with potential pitfalls. Such are, and these are additional conditions for the beneficial use of the technology, mainly rooted in due technical development.

Integrating computational fluid dynamics has gained momentum in hull form development at much the same pace as the provision of computer capacity for their operation.

Ongoing developments in, for instance, distributed computing as well as generally faster and more powerful computer technology will make the large-scale deployment of simulation easier. The use of existing programmes is another vital factor. In-house developments, active commercial licenses and ongoing R&D need inclusion in the design process, not merely as a matter of economics but as a means to arrive at better designs.

The integration of existing tools is provided by suitable coupling solutions and dedicated interfaces of respective simulation-driven design environments. As the demand for energy efficient solutions steadily grows, the number of designs to check and optimise for performance has to grow, quite naturally. Suitable answers are provided by simulation.

There is no alternative technology on the market which would make available a comparable set of designs and an equally comprehensive depth of performance data. Simulation-driven design can make design correlations clearer. The number and type of analysis can show the designer cause and effect relations for an individual design which, firstly, would otherwise not be as evident, and which, secondly, would not necessarily be seen in much the same depth and clarity by a skilled designer.

For example, generating 500 geometric variants of a bulker model and checking their performance will make comprehensible the correlation between the length of the vessel and its stability or its resistance. Likewise between any of the design parameters which are investigated.

Regression curves in evaluation graphs will give a clear tendency for the most feasible design in the assessed design space. Through optimisation better designs will be expedited. Even for mature baseline designs hydrodynamic optimisation frequently achieves an efficiency improvement of an average 5%. Naturally, all assumptions that are made for the system ship will not only represent, but also restrict the designer.

This is, however, not an inherent issue of the simulation-driven approach, but fundamentally true for the assertive stance of the engineer toward his subject. Real-life experiments, for instance in a model basin, will become less by number, however, not by quality if few very promising, optimised model variants are being subjected to tests.

Does a black box of concerted programmes replace the art of hull form development? A paper on simulation-driven design asked in 2008 and the question remains. It does not. It enhances it. At least it has the potential to help naval architects develop better designs.

Experience and insight into the system ship are indispensable for the right employment of integrated simulation. It is about making the technology work in the most meaningful way. Hesitation is eligible with regard to a cautious balancing of the proper use of simulation.

It is important—and indeed decisive if not essential—for ship design to supply today's and tomorrow's market with sustainable solutions. System imminent presuppositions may hinder simulation-driven design from being applied faster and more comprehensively.

Technical issues like applicability; heterogeneity of the design environment; downsides in data handling between different system components, etc. are subject to ongoing development. Providers of dedicated simulation-driven design environments assist users in finding suitable solutions for making the software systems work.

Aside from these pitfalls, why would approved naval architects want to embrace change and openly use new technology? Because it is, at the end of the day, their expertise which makes the technology work and that will in the end deliver better designs. It is their experience which, meaningfully contributed to team-based design work, guarantees suitable, reliable results.

It is their insight which supervises, prepares and assesses both the design process and the results and which eventually omits less important and potentially false factors and findings too.

It is not least their knowledge which fuels further development. And it is, as simulation-driven design rapidly gains ground, a matter of meeting present and future market developments. Skilled naval architects are asked to take the lead—for the fruitful application and further improvement of a promising, powerful technology. *NA*

NUPAS CADMATIC

3D Ship Design Software

Ship model courtesy of Wärtsilä Ship Design Norway AS

Nupas-Cadmatic latest software version, V6, is an extremely powerful tool for ship design and engineering. The most eye catching feature of V6 is the introduction of a new user interface that will further ease work and bring new efficiencies throughout the ship design process.

The new user interface combines a modern Office 2007 look and feel with enhancements welcomed by both novice and experienced users. It will change the way the software is used and allow for faster and more efficient work. In V6 it is available in Plant Modeller with other modules to follow in due course.

The software's easy-to-use 3D modelling tools can be used for early and basic design, detailed engineering, and the production of workshop drawings and generation of ready-to-use production data for production machinery.

With Nupas-Cadmatic you can successfully carry out the entire ship design project, right from the early start, up to the detailed engineering and final production phase. It improves engineering quality and shortens design and construction times. Nupas-Cadmatic seamlessly distributes engineering projects globally between different sites while ensuring effective communication between project partners.

Version 6 highlights

New GUI For the first time in history an Office 2007 style User Interface has been applied to 3D software, making it easier and faster to learn than comparable systems. Nupas-Cadmatic's intuitive and efficient User Interface speeds up design projects. **Distributed design** Nupas-Cadmatic's CoDesigner technology is the most advanced and easiest tool to use for distributed projects. It does not require massive hardware or very fast internet connections. **Easy administration** Administration of 3D software has never been so easy. Nupas-Cadmatic has the most modern tools for library and catalogue management. **Internet-based technology** Nupas-Cadmatic was the first developer to launch an Internet-based 3D model viewer and data query tool on the market in 2003. Today eBrowser is the most advanced software to visualize 3D models, to walk through, to query data and to communicate design details interactively with other users and project parties. The internet-based technology has unlimited scope for easy integrations.

VERSION 6

increases ease of use and efficiency

Design and engineering of:	Comprehensive information for:
GA and MA	Plate and profile cutting
Classification drawings	Plate and profile bending
Hull structures	Pipe spools and isometrics
Piping and other diagrams	Pipe cutting and bending
Machinery & piping, HVAC	Other material lists
Accommodation & interior	Weights
Outfitting	Centers of gravity
Virtual 3D models	Logistic data
On-line Walk Around	Data for production robots
Windows AVI Video files	FEM Analysis
	Interfacing other systems

See you in Hamburg at SMM
7-10 September 2010
SMM
Stand 440
Hall B7

www.nupas-cadmatic.com
sales@nupas-cadmatic.com

Numeriek Centrum Groningen B.V.
Osloweg 110, 9723 BX Groningen, The Netherlands
Tel: +31 50 57 53 980, fax: +31 50 57 53 981

Cadmatic Oy
Itäinen Rantakatu 72, 20810 Turku, Finland
Tel: +358-2-412 411, fax: +358 2 412 4444

OPTIMIZING RESOURCES

Passing examinations

Following is part two of a three part paper written by Lloyd's Register's David J Howarth and John Durkin (part one appeared in the July/August issue and part three will appear in the October issue of *The Naval Architect*). Part two looks at methods of examining welding work and defect detection.

Radiography is normally preferred for the examination of butt welds of 10mm or less. Ultrasonic testing is acceptable for welds of 10mm or above and is always used for the examination of full penetration of tee butt or cruciform welds.

Radiography works on the principal that radiation passing through an object will be differentially absorbed based on the differing density of the object under test. The resulting image can then be recorded on a radiographic film.

In the eyes of many, the largest advantage for the selection of radiography is based on the availability of a permanent record of the examination and the ability to compare the results against the radiographic report. While radiography is capable of producing a permanent record, it suffers from several major limitations/disadvantages, these being:

a. Health risks

- Ionising radiation presents a serious health hazard and its use is strictly governed by both national and international law, which in most cases state that radiography must only be used when no other form of non-destructive testing is available
- Before carrying out radiography, it is essential to ensure that the area where radiography is to be carried out is clearly marked with visible and audible barriers to prevent personnel entering the controlled area. A typical controlled area for an unshielded 10 curie source of Iridium 192 would be a radius of 80m from the source. These large controlled areas therefore have a direct effect on production schedules.

b. Defect detection

The detection of volumetric defects such as slag, porosity, metallic and non-metallic inclusions are relatively easy to detect using the standard radiographic techniques employed in ship construction. On the other hand, planar defects such as lack of fusion and cracks are sometimes very difficult to detect. Trials have shown that cracks are readily detectable when the source of radiation is perpendicular (+/- 20degs) to the vertical axis of the crack. Detection of Lack of Fusion (LOF) type defects, particularly lack of side wall fusion, is nearly impossible unless the radiation beam is placed normal to its axis. The factors directly affecting defect detection are:

- defect alignment relative to the direction of the beam of radiation
- the ratio of component thickness to relative defect thickness
- radiographic sensitivity
- the skill of the interpreter.

c. Interpretation

Radiographic interpretation requires the surveyor to have a good technical understanding of the welding process, weld geometry, radiographic technique, material type and thickness and the reference application code and acceptance standard. Interpretation is divided into two stages, the first being to assess the quality of the radiograph itself, and the second to assess the weld quality.

d. Radiograph quality

- Film density: The degree of darkening or film density should be measured using a densitometer, or compared against a calibrated film density strip, to confirm that the film density is in accordance with the referencing code or standard. Lloyd's Register recommends a minimum film density of 2.0, based on the fact that defects are more readily detected at higher film densities and high film contrast
- Sensitivity: Radiographic sensitivity can be measured using image quality indicators (IQI) or penetrameters. These indicate sensitivity by specifying, for IQIs, an essential wire thickness, and, for penetrameters, an essential hole size, for a given material thickness
- Identification: The identification should clearly identify the weld being tested
- Artefacts or processing and handling damage: Films should be free from processing and handling damage such as scratches, water marks, fogging, mechanical damage or any other blemish which will directly interfere with film interpretation.

e. Weld quality

- Interpretation of weld defects is reliant on the inspector's technical knowledge and experience
- Identified defects should be assessed against current classification society rules, or alternatively, national standard acceptance criteria, provided the latter is considered equivalent and has been agreed with the classification society.

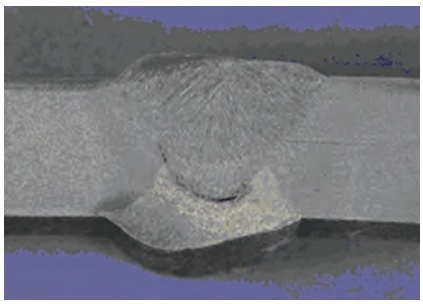


Figure 1: Weld containing lack of sidewall and inter run fusion.

Ultrasonic examination

Ultrasonic examination of welds during new construction has become the method of choice in most shipyards for carrying out volumetric examination of welds. In terms of quality control, the technique is problematic as they have to rely solely on the operator's report, which is unlike radiography where the actual radiograph can be viewed against the actual report.

In ultrasonic examination a pulse of sound energy is transmitted from the ultrasonic probe into the material under test. The elapsed time between the transmission of the sound pulse and the reception of the reflected signal can be used to measure distance, assuming that the velocity of the material is known.

A typical ultrasonic flaw detector used for weld examination during ship construction normally has an 'A' scan display which records time or distance on the horizontal scale 'X' axis and signal amplitude on the vertical 'Y' axis. Before being able to carry out any ultrasonic examination, it is necessary to calibrate the distance on the 'X' axis of reflected signals from the zero point using a calibration block. In order to calibrate signal amplitude on the vertical scale, 'Y' axis reflectors such as flat bottom holes (FBH), surface notches and side drilled holes (SDH) are used.

According to Lloyd's Register's *Rules* [2], defects are to be assessed on signal amplitude and length, apart from cracks which are to be rejected regardless of signal amplitude. This approach is further adopted by an IACS recommendation [6] and most national and international standards. While this is considered to be an acceptable approach it is necessary to recognise that this amount of reflected energy is dependent on the shape of the defect and the type and orientation of the defect relevant to the ultrasonic beam. For optimum defect detection the ultrasonic beam should strike the defect at 90degs. This is particularly true for smooth planar defects such as lack of side wall fusion, and can be clearly demonstrated by using a 60degs probe to ultrasonically examine a weld containing lack of sidewall fusion. With the weld preparation having a 60degs included angle, and noting the signal response, the examination is repeated using a 70degs probe. The signal amplitude from the 70degs probe would be significantly lower after allowing for the greater distance travelled by the sound. This could result in a defect that was originally rejected using the 60degs probe now being accepted.

Advantages of ultrasonic examination are:

- Portability: the majority of equipment is battery powered
- Economics: typical examination costs are significantly less than radiography, particularly when factoring in loss of production attributed to radiography safety issues
- It can be used on multiple weld configurations, and on very thick welds
- There are no health hazards compared to radiography
- It enables better detection of planar defects compared to typical radiographic techniques, and is able to size defects in the length, width and depth
- It enables quick, real-time analysis to be carried out.

Disadvantages of ultrasonic examination are:

- Surveyors must rely on reports with little possibility of confirming the results or traceability
- There is no permanent record of results except for a report
- Operator training and competency is required
- It is easy for results to be falsified
- Complex weld geometry can make it difficult to interpret results
- Defect alignment with ultrasonic beam is particularly important on smooth planar reflectors
- Defects under high compressive load may be forced shut and not detected as the ultrasound passes through the defect
- Operator fatigue and environmental conditions adversely affect results
- Over sizing and under sizing of defects can occur.

The following is an example of a difficulty with ultrasonic examination where the defect is out of plane with respect to the ultrasonic beam. Welds that contain significant amounts of lack of inter-run fusion (see Figure 1) can be difficult to detect during routine ultrasonic examination carried out in accordance with national standards. Such standards often specify an assessment of signal amplitude only.

Figure 2: UT Screen showing response to an imperfection using a 70degs probe.

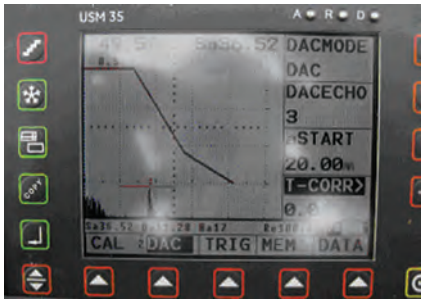


Figure 2 shows the weld being examined using a 70 degs shear wave probe, with sensitivity in compliance with requirements of the national standard. The low signal amplitude possibly indicating an area of lack of fusion can just be seen in the centre of the screen. In accordance with the acceptance standard this indication would be disregarded.

Figure 3 shows a 0 degs compression probe placed directly on the cap surface. In this instance the signal from the imperfection at a depth of 14.69mm is large and would be

Figure 3: Response to defect from 0degs UT probe.

rejectable.

Ultrasonic testing is an excellent tool but the example above highlights the need for operators to be experienced and provided with the correct procedure to allow full interpretation of defects found by the initial scan.

Phased array ultrasonics

Although phased array ultrasonics were originally explored in the early 1960s, and initially used for medical diagnostics in the early 1970s, it was not until the late 1980s that it started to be adopted by most major industries; namely, nuclear, oil and gas and petrochemical. Since their introduction, phased arrays have become very widely recognised by national and international codes. Phased arrays are now widely adapted by pipeline users for the inspection of pipeline welds during construction, thus eliminating the need for radiographic inspection. A further benefit of phased arrays is the ability to accurately size defects in the through wall direction (height). This is of particular importance when deciding defect size allowances based on fracture

mechanics, and has allowed pipeline engineers and designers to significantly increase the size of weld defects compared to what would normally be permitted in quality standards; thereby reducing the numbers of welds requiring repair.

One area where phased array has not been widely adopted is ship new construction. This could be due to several factors, the main ones being economics, reluctance to adopt new technology and relatively low inspection requirements.

Phased arrays can be defined as "A mosaic of elements in which the timing of the elements' excitation can be individually controlled to produce effects such as beam focusing and beam axis steering". Ultrasonic phased arrays consist of a series of individual elements, acoustically insulated from each other with their own individual connection to a time delay circuit and A/D (analogue to digital converter). To achieve phasing, the elements are pulsed in groups using pre-calculated timings for each element.

By phasing the elements, it is therefore possible to focus and steer the ultrasonic beam, and by utilising a sectoral scan during weld inspection it is possible to inspect the weld fully. This will ensure that all relevant beam angles are used and will dramatically improve defect detection and allow for more accurate sizing of the defects found.

Phased arrays have several major advantages over manual pulse echo techniques for the volumetric examination of welds:

- High inspection speed
- One phased array probe array is capable of producing multiple probe angles
- Advanced signal processing
- Improved visualisation of signals through colour pallets and ability to display data as A- scan, B–scan (E-Scan), C-scan, S-Scan
- Increased probability of detection of defects
- Accurate and reliable sizing of defects
- A permanent record of results
- Reduced probe size
- Auditable and reproducible data
- Repeatable inspection as calibration data files can be stored.

It also has a few disadvantages:

- It is complex to initially set up
- Operator training is required and there is a lack of skilled operators
- There can be unwillingness to adopt new technology
- Cost: it is more expensive than conventional manual ultrasonic equipment.

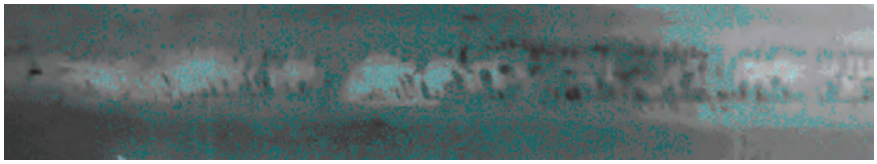


Figure 4: Radiograph of weld in 20mm plate.

Figures 4 – 6 show the benefits of phased array over both standard ultrasonics and radiography. They compare the results of a 20mm carbon steel plate welded using the FCAW process.

Figure 4 shows the radiographic image which clearly identifies lack of fusion, slag, wormholes and porosity, but provides no indication of through thickness depth of the defects. Figure 5 shows the screen of a standard ultrasonic examination of the same area, which shows an indication at a depth of approximately 12.4mm from the plate surface, considered by the operator to be lack of fusion. Finally, Figure 6 shows the phased array image of the same area: the greater detail and ease of interpretation are easy to see.

Weld defects

A perfect butt weld joint, when subjected to an external force, provides a distribution of stress throughout its volume which is not significantly greater than that within the parent metal. This is achieved as long as the following features apply:

- Welds should consist of solid metal throughout a cross section at least equal to that of the parent metal
- All parts of a weld should be fully fused to the parent metal
- Welds should have smoothly blended surfaces
- Welding is carried out in accordance with the welding procedure specification.

If any of these requirements are not fulfilled then the weld is imperfect and the stress distribution through the joint is disrupted. A weld imperfection (or discontinuity) is therefore any object or shape which is capable of creating a stress concentration within a welded construction. It should be remembered that, in practice, all welds contain small imperfections. However, the majority of these are so small that they have no significant effect on the performance of the joint. If an imperfection is considered of sufficient size to be detrimental to the structure (as defined by an acceptance standard), it is classified as a defect.

Stress concentrations are detrimental to the performance of a structure as they can:

- lower the load bearing capacity of the joint
- initiate brittle fracture
- nucleate a fatigue crack, and
- initiate stress corrosion cracking.

The greater the stress concentration produced by an imperfection, the more likely it is to cause failure of the weld in service. Therefore, imperfections need to be assessed according to the severity of their stress concentration. This is achieved mainly by the geometric descriptions 'planar' or 'non-planar'.

Planar imperfections (those which are essentially two-dimensional) are effective stress raisers and are almost invariably treated as unacceptable.

Non-planar imperfections (those which have three significant dimensions) are less effective stress raisers and are usually accepted in limited quantity and size.

It is important that an imperfection is correctly identified to allow the welding procedure to be suitably modified to prevent their re-occurrence. Weld imperfections can be grouped into five distinct types according to their nature and shape:

a. Cracks

- Solidification cracking.
- HAZ hydrogen cracking.
- Weld metal hydrogen cracking.
- Lamellar tearing.

Cracks are more significant than other types of imperfection as their geometry produces a very large stress concentration at the crack tip, making them more likely to cause fracture. Note that this section is concerned only with cracks produced at the time of welding, not subsequent service cracking, such as fatigue or stress corrosion cracking. Cracks can occur in the weld metal or heat affected zone. Due to

Figure 5: Standard ultrasonic screen showing defective weld.

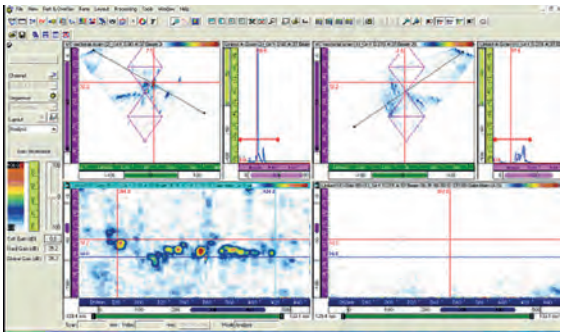


Figure 6: Phased array screen shot showing detail available to operator.

their severity of stress concentration, crack-like imperfections are always classed as defects and require repair.

b. Lack of solid metal

- Porosity
- Worm holes
- Crater pipe
- Root concavity
- Under fill
- Slag inclusions
- Inter-run imperfections.

These imperfections are formed when there is insufficient weld metal to completely fill the cross-section between the parent metal plates. They are volumetric (blunt) in shape, and as such are usually only associated with a reduction in the load bearing capacity of a weld.

c. Lack of fusion

- Incomplete root penetration
- Lack of sidewall fusion.

These imperfections occur when there is incomplete fusion between the parent metal and weld metal or between weld runs. They are essentially two-dimensional in shape and so are effective stress raisers within the material. Therefore it is important to control them as they can lead to cracking within the weld.

d. Lack of smoothly blended surfaces

- Surface porosity
- Excess weld metal (reinforcement)
- Excessive penetration
- Undercut
- Overlap.

It is not immediately obvious that irregularities on the surface of the weld are serious imperfections. However, any sudden changes in the contours of the surface produce local stress concentrations. This can especially lead to the formation of fatigue cracks (most commonly at weld toes).

e. Miscellaneous

- Misalignment
- Arc strikes
- Spatter.

Several miscellaneous imperfections do not conform to any particular category.

Misalignment has a major effect on the fatigue life of the weld. Figure 7 shows the combined effect of membrane stress and bending stress induced by the misalignment.

The stress magnification factor km (by which the applied stress is increased as a result of the axial misalignment) is given below:

$$k_m = \frac{\sigma_s}{P_m} = 1 + \frac{3e}{t}$$

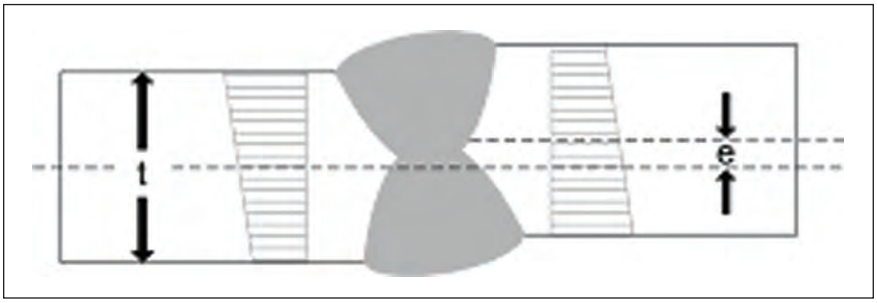
where σS is the bending stress; Pm the membrane stress; e the misalignment inmm; and t the thickness inmm. Therefore, a 20mm plate with a 3mm axial alignment gives a stress multiplication factor of 1.45.

Similarly, angular misalignment creates additional bending stresses dependent on the angle of misalignment. Recent research carried out by Lloyd's Register [7] showed:

$$k_m = \frac{\sigma_s}{P_m} = 1 + 0.1\theta$$

The term θ is the angle of distortion given in degrees. This relationship was confirmed recently when some fatigue specimens were found to have distortion and finite element modelling of the specimens confirmed the relationship. The additional bending stresses arising from both axial and angular distortion will have the greatest effect on surface anomalies such as undercut and excess weld reinforcement. However, little or no effect will arise with internal defects unless they lie near to the surface. *NA*

Figure 7: Axial misalignment.



References

2. Lloyd's Register, '*Rules for the Manufacture, Testing and Certification of Materials*', July 2009.

6. IACS, '*Recommendation No.20, Non-destructive testing of ship hull steel welds*', December 2007.

7. H.Polezhayeva, '*Effect of weld gap and penetration on fatigue strength of transverse fillet welded specimens*' Lloyd's Register. Research Report No: 04/01/R.1, April 2004.

Hamworthy lauds its scrubbers

Krystallon technology for removing SOx and particulate matter from exhaust gases is proving its value with a four shix order set to be followed by more orders from significant players in the maritime industry.

Hamworthy's growing role as a systems integrator able to offer ship-wide engineering solutions is adding a new dimension to its ability to meet and exceed new and coming environmental regulations.

In an effort to meet the requirements of upcoming regulations the company has sought to acquire firms that have taken significant steps towards achieving cleaner shipping. Last year, for example, Hamworthy acquired Krystallon, the company responsible for ensuring that exhaust gas scrubbing was included as an alternative to distillates to meet sulphur emissions limits set by the European Union (EU) and the International Maritime Organization (IMO).

The effectiveness of marrying an innovative technology with an established engineering brand supported by worldwide service was quickly verified. Krystallon secured high profile shipboard trials with leading shipping companies, in the process proving that the technology could achieve 98% sulphur suppression while burning MDO. Other suppliers have subsequently secured test installations.

However, it was only after the establishment of Hamworthy Krystallon that the first commercial order for exhaust gas scrubbing was secured.

Sigurd Jenssen, managing director, Hamworthy Krystallon Ltd, said there is a lot of interest in the Krystallon scrubbers from European and Asian yards alike.

Last month, Italian owner Ignazio Messina & C. selected Hamworthy Krystallon seawater scrubbers for four new 45,000dwt con-ro ships under construction at Daewoo Shipbuilding and Marine Engineering (DSME), South Korea.

Sigurd Jenssen, managing director, Hamworthy Krystallon Ltd, said: "This is an important milestone for Hamworthy Krystallon, but also for exhaust gas scrubbing in the marine industry in general. Messina, DSME and Hamworthy are leading names in the shipping industry, demonstrating that seawater scrubbing will become a mainstream marine technology."

Messina's £5 million order is for four sets of scrubbers, which includes a scrubber for each of a vessel's main engines and one attached to the auxiliary engine. According to Mr Jenssen the pay-back time will be around two years, calculated on the current price difference between the distillate, gasoil and HFO (heavy fuel oil).

"We are in discussions with other owners," confirmed Mr Jenssen, "but these first commercial orders show that shipowners can use HFO, there is a lot of interest from European yards for retrofits and from Korean and Chinese yards also," he added.

The company said it is particularly targeting the 4000-5000 vessels that will be operating in the North Sea and Baltic emission control areas (ECA), though he did concede that some older vessels may not be able to fit scrubbers.

The system will also be able to document compliance with new regulations, either through a system monitor that is connected

Monitors in the funnel that are also linked to GPS will be able to record emissions and the time and position of the vessel when readings are recorded.

to a GPS signal which will log the vessel's position at a given time and monitor the SO_2 content in the smoke stack. This method does not need any human monitoring intervention. Alternatively compliance can be proved through the type approval of the systems themselves.

Danish operator, Maersk, one of the world's largest shipping companies, is in the process of evaluating its vessels with a view to either retrofitting scrubber systems to existing ships or adding them to new vessel designs, a spokesman confirmed.

A matter of choice

Hamworthy said that it can custom design solutions for scrubbers that will fit particular ships. The company says it works to assist customers in their environmental choices, rather than to dictate to them.

In an alternative marine fuel initiative, Hamworthy Gas Systems has taken a key role in offering the technology so that two ferries under construction at the Bharati Shipyard in India for Sea-Cargo can run on environmentally-friendly liquefied natural gas (LNG).

With Rolls-Royce Marine supplying the main engines, Hamworthy will deliver two LNG fuel tank skids, piping and interface nozzles, the fuel tank (a double shell insulated pressure vessel), safety systems, the prismatic gas tight tank room and two bunkering stations.

It is Hamworthy's group-wide specialisation in fluids handling technology that gives its aggressive, environmentally driven acquisition programme coherency.

The company's complimentary leading edge role in water systems was no better demonstrated recently than through an order for the largest ever Membrane Bioreactor (MBR) wastewater treatment plant for installation onboard a cruise ship. The twin process tank system, delivered to Meyer Werft's Papenburg yard, Germany, is being installed onboard a 5600 passenger capacity vessel. Featuring 64 membranes, the system has the capability to treat all of the ship's black and grey water.

This is the technology that Hamworthy has pioneered in the cruise, naval and offshore sectors, surpassing even the most stringent regulatory requirements.

Based on biological degradation and membrane separation, the MBR process achieves the highest quality discharge without requiring any addition or generation of chemicals hazardous to the marine environment.

Hamworthy Water Systems Engineering Manager, Trevor Dodd, said: "International standards on wastewater discharge have steadily tightened and will continue to do so. Hamworthy's MBR system continues to develop in anticipation of these regulations and remains at the forefront of shipboard wastewater management."

Again, it was Hamworthy that recently became the first non-domestic sewage plant supplier to achieve CCS Type Approval for its Super Trident-C enhanced sewage plant for merchant marine customers, which uses an extended aeration process. The approval came at a pivotal point in marine environmental legislation as new IMO MARPOL Annex IV guidelines came into force requiring all vessels to be fitted

Gastech

Conference & Exhibition

The Netherlands | Amsterdam RAI | 21-24 March 2011

25TH EDITION

Hosted by Shell

Gastech 2011 is where the commercial and technical gas worlds meet, bringing together the most influential players from the upstream, midstream and downstream sectors of the global gas business.

24 industry Associations lend their support to Gastech

energy API · CEDIGAZ · EIC · EFET European Federation of Energy Traders · Agentschap NL Ministerie van Economische Zaken · FME CWM · GPA · Gasification Technologies Council · gie · gti · IACS International Association of Classification Societies · IGEM Institution of Gas Engineers & Managers · iif iir · IACCM International Association for Contract and Commercial Management · IRO · marcogaz Technical Association of the European Natural Gas Industry · nof energy · OGP · Bridging Products & Services Association · The Royal Institution of Naval Architects · sbgi · SIGTTO · SUT Society for Underwater Technology · VGT

CONFERENCE REGISTRATION NOW OPEN

Book your place before 31 October and Save €250

www.gastech.co.uk

with compliant sewage treatment plant. Accordingly, Hamworthy has followed up with a significant number of orders.

New horizons

Now slotting into the company's water treatment capability is ballast water management – the issue identified by IMO as one of today's four main concerns in the marine environment.

Last year, Hamworthy acquired Greenship, the innovative developer of the SEDINOX ballast water management, then at an advanced prototype stage. Bringing the operation under its Water Systems division, itself already augmented in recent years through the acquisition of Serck Como, Hamworthy has moved quickly from prototype to commercial offering, and towards the approvals that will bring the SEDINOX system to a wider market.

The Hamworthy SEDINOX management solution uses a combination of cyclonic separation in its first stage to manage the removal of sediment down to 20 microns, and electrolysis as the means of killing organisms in the second stage.

Competing approaches that use first stage filtering tend to achieve a 50 micron sediment level, which has consequences for power use in second stage treatment. In the second stage of the Hamworthy process, lower power is required and, critically, no chemicals are injected, but the system still achieves a 99.9% disinfection rate of the zooplankton, phytoplankton and bacteria contained in ballast water.

In picking out SEDINOX from a range of possible acquisitions, Hamworthy homed in on the fact that, not only did the technology address the environmental issue at hand; its wider environmental impact could be shown to be less than competing systems through its eco-friendly solution to sediment build up.

Hamworthy's SEDINOX system separates organic and inorganic matter, preventing particles from passing through the system and being carried to the ballast tanks, where they can settle and a new breeding ground for micro-organisms could be created. Unlike other systems, the Hamworthy approach thus eliminates the particulate matter responsible for settlement.

It is sometimes overlooked that the full intention of the Ballast Water Convention is: '*Control and Management of Ships Ballast Water & Sediments*'. Permanent ballast sediment formed in ballast tanks also concedes displacement available for cargo carriage, as well as meaning a higher fuel bill and higher emissions. It may also bring additional disposal costs, if such sediment were deemed hazardous waste.

Further demonstration that environmental concerns touch all aspects of today's marine market is through the encouragement Hamworthy Svanehøj, Hamworthy's specialized cargo and fuel pump specialist, is giving ship owners to choose electrically-driven pumps over their hydraulically-driven counterparts. Hamworthy's electrically-driven deepwell pumps offer operators a reliable, safe and energy-saving alternative for handling crude product on FPSO/FSO vessels.

The company points out that in the operational phase electric equipment is more environmentally friendly because CO^2 emissions are cut due to higher efficiency. Hence lower power utilisation, less fuel usage and there is no risk for spillage of hydraulic oil. Significant interest in the merits of electric driven deepwell pump systems has been expressed by tanker owners and builders for crude and clean oil products handling in the Handy-sized to Panamax tonnage range. *NA*

Changes to ISM Code aim to improve vessel safety

Changes to the International Safety Management (ISM) Code were among amendments to existing regulations that entered into force on 1 July 2010, writes Sandra Speares

According to the International Chamber of Shipping (ICS), the scope of the proposed changes to the ISM Code, which were adopted at the International Maritime Organization (IMO's) Maritime Safety Committee meeting in December 2008, were relatively small.

According to the Chamber: "The most significant amendment is that internal audits of the Safety Management System will now have to be conducted at least once every 12 months. However, this has always been recommended by ICS and International Shipping Federation (ISF) since the Code first entered into force, and this 12 month requirement is already reflected in existing IMO Guidelines to Companies and Administrations which are applied by most Recognised Organisations (classification societies) when conducting external audits prior to the issue of ISM certification."

The other amendments, according to the Chamber, "are relatively minor and mostly involve giving additional emphasis to certain issues, such as the use of checklists, analysis of non-conformities, and certification procedures".

The ICS and the International Shipping Federation have launched a new set of guidelines with incorporate changes that came into force on 1 July.

The guidelines on the application of the ISM Code include additional information on risk and environmental management and the safety culture.

Guidance includes how to maintain safety management systems and the role of the designated person who provides the link between ship and shore-based facilities.

The guidance also includes analysis of why accidents happen.

While the ISM Code is concerned with safety at sea, it also covers marine pollution, the ICS has pointed out. The new guidance reiterates the importance of environmental management.

The amended code puts more focus on risk assessment, according to Dr Phil Anderson, who heads ConsultISM.

While he said that the ISM Code was not intended to crease new inter-party liability, but was intended to make ships safer, lawyers and the courts have "started to realise that it could be used as a sword against operators, and operators could use it as a shield". The big issue, Dr Anderson says is how to balance minimum risk and maximum profit. "There is nothing wrong with making a profit, be we have to manage risk".

Other changes to regulations that came into force on 1 July this year include those to Marpol Annex VI to reduce harmful emissions from ships, as well as emissions of sulphur oxide in certain specified emission control areas.

The main changes to MARPOL Annex VI will see a progressive reduction of SOx emissions from ships, with the global sulphur cap reduced initially to 3.50% (from the current 4.50%), effective from 1 January 2012; then progressively to 0.50 %, effective from 1 January 2020, subject to a feasibility review to be completed no later than 2018.

The limits applicable in sulphur emission control areas (ECAs) are reduced to 1.00%, beginning on 1 July 2010 (from the current 1.50%); being further reduced to 0.10%, effective from 1 January 2015. This means that ships trading in the current ECAs will have to burn fuel of lower sulphur content (or use an alternative method to reduce emissions) from 1 July 2010.

Further amendments coming into force on 1 July include those concerning the safety of passenger ships. The amendments to the Safety of Life at Sea convention (SOLAS) follow the concept of the ship being its own best lifeboat.

Given the increasing size of passenger vessels, the emphasis behind the changes is on trying to prevent an accident happening in the first place, and if it does, keeping passengers onboard, in a safe location, while the ship returns to port.

Design concepts like the amount of damage a ship can sustain and still return safely to port have been incorporated in the amendments.

The amendments offer a degree of flexibility to ship designers when approaching the safety issue.

Amendments include: alternative designs and arrangements, provision of safe areas for passenger, redundancy or propulsion, onboard safety centres, fixed fire detection and alarm systems and time for orderly evacuation and abandonment, specifying those systems that should remain operational if any one main vertical zone is inoperable due to fire.

- onboard safety centres, from where safety systems can be controlled, operated and monitored
- fixed fire detection and alarm systems, including requirements for fire detectors and manually operated call points to be capable of being remotely and individually identified
- fire prevention, including amendments aimed at enhancing the fire safety of atriums, the means of escape in case of fire and ventilation systems; and
- time for orderly evacuation and abandonment, including requirements for the essential systems that must remain operational in case any one main vertical zone is unserviceable due to fire.

Other SOLAS amendments

Other important SOLAS amendments entering into force on 1 July 2010 include the following:

December 2008 amendments to SOLAS *Amendments to the SOLAS Convention and to the 1988 Load Lines Protocol.*

These amendments make mandatory the International Code on Intact Stability, 2008 (2008 IS Code). The 2008 IS Code provides, in a single document, both mandatory

requirements and recommended provisions relating to intact stability, taking into account technical developments, in particular regarding the dynamic stability phenomena in waves, based on state-of-the-art concepts. The Code's mandatory status, under both the SOLAS Convention and the 1988 Load Lines Protocol, will significantly influence the design and the overall safety of ships.

May 2006 amendments to SOLAS;

Amendments to SOLAS Chapter II-2 - Fire protection.

These include amendments relating to Regulation 9 - *Containment of fire*, to include a requirement for water-mist nozzles which should be tested and approved in accordance with the guidelines approved by the Organisation; and to Regulation 15 - *Arrangements for oil fuel, lubricating oil and other flammable oils*, in which new text is introduced relating to the application of the regulation to ships constructed on or after 1 February 1992 and on or after 1 July 1998.

Amendments to SOLAS Chapter III - Lifesaving appliances and arrangements.

In Regulation 7 - *Personal lifesaving appliances*, the amendments add a new requirement for infant lifejackets. For passenger ships on voyages of less than 24 hours, a number of infant lifejackets equal to at least 2.5% of the number of passengers on board is to be provided; and for passenger ships on voyages of 24 hours or greater, infant lifejackets are to be provided for each infant onboard. A further amendment relates to the provision of lifejackets for larger passengers and states that, if the adult lifejackets provided are not designed to fit persons with a chest girth of up to 1750 mm, a sufficient number of suitable accessories are to be available onboard to allow them to be secured to such persons.

Amendments to SOLAS Chapter IV – Radio-communications.

The amendments relate to the provision of radio equipment, in Regulation 7, to require ships to carry an EPIRB capable of transmitting a distress alert through the polar orbiting satellite service (COSPAS-SARSAT) operating in the 406MHz band; and, in Regulations 9 and 10, to clarify that the means of initiating ship-to-shore distress alerts may be through the Inmarsat geostationary satellite service by a ship earth station.

Amendments to SOLAS Chapter V - Safety of navigation.

The amendment adds a new paragraph to Regulation 22 - *Navigation bridge visibility* to allow ballast water exchange at sea, provided that the master has determined that it is safe to do so and takes into consideration any increased blind sectors or reduced horizontal fields of vision resulting from the operation to ensure that a proper lookout is maintained at all times. The operation should be conducted in accordance with the ship's ballast water management plan, taking into account the recommendations on ballast water exchange. The commencement and termination of the operation should be recorded in the ship's record of navigational activities. *NA*

SOLUTIONS FOR MARINE BUSINESS

Offshore market:
jack-up, supply vessels,
tugboats, substructures,
windmills foundations,
jackets, topsides,
steel constructions

Car and passenger ferries

Multipurpose cargo ships

GREEN LIGHTS
FOR NEW IDEAS

OVER 40 YEARS EXPERIENCE IN THE SHIP CREATING INDUSTRY

www.wsy.lt

WESTERN SHIPYARD
BLRT GRUPP

Flood of BWMS orders ahead of new rules

Over the past month the influx of ballast water management systems (BWMS) being ordered has reached an all time high, even with the delay in the ratification of the ballast water management convention (BWMC), ship owners are preparing for the inevitable.

Alfa Laval has recently announced that it has received two orders of a record size for Alfa Laval PureBallast systems from two shipyards in Korea. The systems will be installed onboard a series of 14 container vessels built for Danish ship owner A.P Møller – Maersk. The total order value is about SEK80 million (US$10.85 million) and the delivery is scheduled for 2011 and 2012.

"These are groundbreaking orders in many ways", says Lars Renström, president and CEO of the Alfa Laval Group. "They include the 100th system sold, and are of record size, both in terms of value as in number of systems – on top of that it also involves some of the major players in the marine industry. The orders confirm our market leading position in ballast water treatment."

Continuing in the surge of BWMS sale OceanSaver has also announced signing a major ballast water management system contract for six Very Large Crude oil Carriers (VLCCs) to be built in China. Furthermore, OceanSaver has signed Letter of Intent for five VLCC's with another major Asian shipbuilder thus lifting its order book to some US$40 million, which it claims making it the leading BWM system supplier to the large ship segment.

"We are confident that the market now has accepted the OceanSaver technology as we are taking the lion's share of the large vessel segment, which mainly is tankers and gas carriers as well as large bulk carriers. Ship owners are acting on Inetrnational Maritime Organization (IMO's) International Convention for the Control and Management of Ship's Ballast Water and Sediments which takes effect from 2012 for new vessels and we are witnessing an increased demand for our BWM system technology," said Stein Foss, CEO, OceanSaver.

OceanSaver's breakthrough came earlier this year when it won BWM system contracts with one of the leading Asian yards for three VLCCs, which together with current and other projects in the pipeline could bring their total order book up to US$80 million or more within this year.

Wilhelmsen's Unitor ballast system receives Type Approval.

"Our first commercial contract was the first of its kind within the large ship segment and signified a major breakthrough for IMO's Ballast Water Management convention, as well as for OceanSaver. However, our recent and potential orders position us as the market's foremost provider of BWM systems. We estimate the overall BWM market to be about US$35 billion from 2010 to 2020," said Tor Eiken, sales director, OceanSaver.

OceanSaver's latest contract also includes six VLCCs that are currently under construction at the Shanghai Waigaoqiao Shipbuilding Company. The contract is for the supply of OS BWMS 6000 EX, which will be installed within the existing pump room size on all the contracted vessels. Ballast pumps will be steam driven with increased delivery head as the only major design change caused by installing a BWM system.

BWMS 6000 EX treats 6000m^3 ballast water per hour and can be installed in gas hazardous areas and is proven to quickly handle ballasting and de-ballasting operations.

"OceanSaver is a robust and suitable ballast water management system for shipboard environments and offers a unique flexibility related to installation. The corrosion benefits looks very promising compared with competing technologies and the system is an optimal solution for marine applications" said Thor Jørgen Guttormsen, president, Leif Höegh & Co.

OceanSaver BWM system will meet one of the strictest and most complex compliance procedures of the International Maritime Organisation and other approval authorities, say OceanSaver. In addition, it looks also to have the potential to meet the California Performance Standards, governing ballast water management requirements for vessels over 300grt.

Following speedy BWM system rollout for all the contracted deliveries, OceanSaver sees very good prospects for the further extension of its global activities. "We have clearly defined goals which include being the leading BWM system supplier within our selected tonnage. The large vessel market represents 20% of the total number of ships worldwide, but approximately 40% of the total value of the BWM market. With a market potential of some US$12 billion in our segments alone, it is expected that this will secure rapid and sustainable growth over the next years," says Foss.

With type approval certificates in their pocket and a stream of orders rolling in, OceanSaver is now focussing on successful commercialisation, manufacturing and logistics in order to meet the demand and to assure quality in its deliveries to clients worldwide.

"We have established a strong global network of highly capable sales- and service agents and secured production capacity to accommodate significant orders this year and in years to come," concludes Foss.

"We are very pleased with the commercial breakthrough of OceanSaver. The company brings a truly unique and innovative offering

Principal Sponsors

DnB NOR

Lloyd's Register 250 YEARS OF SERVICE

RIGHTSHIP

Held during

SINGAPORE maritimeweek 2011

Sea ASIA

12-14 April 2011
Marina Bay Sands®
Singapore

The definitive conference for the **Asian Voice in World Shipping**. Conference highlights to be announced in autumn!

A Proven Platform that **Connects** You to the **Global** Maritime Community

Sea Asia 2011 on target to deliver:

13,600 sqm of exhibition space (gross)

12,000+ participants

380+ exhibiting companies

REGISTER YOUR INTEREST TODAY!

Organised by

Seatrade® In Print Online At Events

Sponsors

ABB · ABS · GAC · INCE & CO INTERNATIONAL LAW FIRM · Jurong Port · SMF Singapore Maritime Foundation · Keppel Offshore & Marine · MMM · PSA The World's Port of Call · SHIPSERV Find. Connect. Trade. · The Standard

Tel: +65 6294 2280 | **Fax:** +65 6294 2780 | **Email:** info@seatrade-asia.com

www.sea-asia.com

ready for a fast growing international market." says Arne Frøiland, Partner and Founder of Energy Capital Management.

Wilhelmsen Ship Equipment's Unitor Ballast Water Treatment System (Unitor BWTS) has announced that it also has passed another major milestone in mid-July when it successfully completed the six months testing onboard *Toronto*, to receive Type Approval.

"We are very pleased to receive the positive results of the Type Approval testing onboard *Toronto*," says Peter Stockley, president Wilhelmsen Ships Equipment. "The test results are extraordinary and beyond official compliance requirements, showing zero organisms per cubic meter greater than 50microns, 0.386 organisms per ml for the organisms 10 to 50microns and no bacteria present in the treated water."

Unitor BWTS combines the use of cavitation, sterilisation and physical separation to provide extra safety, peace of mind and a system equally efficient in all water conditions. This combination of methods also allows it to handle diverse conditions such as high turbidity due to organic and mineral matter or polluted water. Unitor BWTS only treats ballast water on intake, which from simplifies the process from an operational perspective.

"As these test results show, using a combination of treatment technologies, the Unitor BWTS can meet the strictest of compliance requirements. The test results suggest it should have the potential to meet the strict standards for US waters (such as the Californian Performance Standards)" continues Stockley.

Central to the Type Approval are a series of three shipboard trials over a six month period. The first and second shipboard tests were successfully performed at the end of November last year. The third and final test was successfully completed in July. The water sample for the final test was done in the North Sea, outside Zeebrugge on 6 July.

Alfa Laval get a large order from A.P Moller-Maersk for 14 container vessels.

"Wilhelmsen Ships Equipment is currently awaiting confirmation from the South African Department of Transport (DoT) regarding the Type Approval," states Peter Stockley. In addition, Wilhelmsen Ships Equipment is currently engaged in gaining DNV approval, scheduled for completion in September 2010.

Adding to the recently gained approval Wilhelmsen Ship Equipment (WSE) has also received orders for three new Unitor Ballast Water Treatment Systems (Unitor BWTS). One system is for a platform supply vessel being built at Hellesøy Verft, and the other two systems are for two new Fjordline ferries to be built at Bergen Group Fosen. To date WSE has won contracts for nine systems, including newbuilds at Hyundai Heavy Industries (HHI) and Mitsubishi Heavy Industries (MHI).

"These new orders show that there are forward looking early takers amongst owners in the market. They are ready to make an investment now," says Peter Stockley, President Wilhelmsen Ships Equipment. "The motivation to make a decision now may also be that the owners want to demonstrate that they are innovative and environmentally conscious."

The system sold to Hull 148 at Hellesøy Verft. (on the West coast of Norway) is for a platform supply vessel, to a Norwegian owner. "The flexible design and price were among the reasons for selection of the system," says Stockley. The equipment is to be delivered in Q4 2010.

The capacity of the Unitor BWTS to Hellesøy is 150m^3/h, the smallest system in its range. Additionally, in June, WSE received an order for two systems of 200m^3/hr, one for each of two new ferries under construction for Fjordline at Bergen Group Fosen yard. "Securing this order now shows that the customer has confidence in our technology and in WSE's competence to deliver," comments Stockley.

The market is arguably seeing the most competition within this size range at the moment, with many systems on offer among strong global players. However, the technical and commercial strengths of the Unitor BWTS won the deals. The systems for Fjordline are due for delivery in Q1 and Q4 2011.

"Feedback from our customers suggests that they chose Unitor BWTS for a range of reasons. The small footprint and very low power consumption of the system are two important parameters, making the technology a flexible and economical solution for both newbuilds and retrofits," closes Stockley. *NA*

The Royal Institution of Naval Architects

FUNDAMENTALS OF CONTRACT AND CHANGE MANAGEMENT FOR SHIP CONSTRUCTION, REPAIR & DESIGN

13 - 15 October 2010

Dr Kenneth W FISHER, FRINA

RINA is pleased to announce another opportunity to attend Kenneth Fisher's highly successful three day training programme. The course is primarily designed for project managers who handle day-to-day relations with other parties, people who form contracts and senior managers who monitor contract-related cash flow for marine related projects. Those attending the course will be better able to identify the pitfalls and traps experienced within the industry, and be more prepared to identify all the costs,schedule changes and to properly assign responsibilty for those changes and effects. This will save companies considerable sums in each major contrtact.

Topics to be covered:

- Contract management & mis-management
- Engineering/drawings
- Change orders
- Critical path
- Owner-furnished materials
- Contract performance documentation
- Hourly rates and overtime
- Post-delivery negotiaions
- Claim avoidance
- Delay, disruption and accerleration

"Excellent course which will pay for itself over and over again" - B A Menzies - Babcock Rosyth Defence Ltd

"After this training course you feel obliged to review all your procedures" -F Fernall - Account Services Maritimes SA

"This was a very thought provoking course providing valuable lessons, learned through experience" - G Primrose - BAeSEMA

"Excellent course for all who are involved in ship construction or repair and design" - A Cresswell - The China Navigation Co. Ltd

To register, simply complete all sections of this form and return it with your payment to:

THE CONFERENCE DEPT, RINA, 10 UPPER BELGRAVE STREET, LONDON SW1X 8BQ.

Tel: +44 (0)20 7201 2401 Fax: +44 (0)20 7259 5912 email: conference@rina.org.uk

http://www.rina.org.uk/fundamentalsoct2010

Name: Postion:

Company:

Address:

Postcode:

Telephone: Fax:

Email: RINA Membership No (if applicable):

Please indicate your prefered method of payment:

I enclose a cheque/Eurocheque for: £ _____
Please send me an invoice for: £ _____
Bank Transfer details enclosed for: £ _____
Please debit my credit card: £ _____

Card Number: _____

Expiry date: _____

Signature:

Payment must be made in pounds sterling by Eurocheques, cheque drawn on a bank with a UK branch address, credit card (VISA/AMEX/ Mastercard) or bank transfer. Please note RINA requires payment ***before*** the conference date.
Account Name: The Royal Institution of Naval Architects
Account Number: 10042127 **Account code:** 160016
Bank address: Royal Bank of Scotland PLC, Belgravia Branch, 24 Grosvenor Place, London SW1 7HP, UK.
The following charges will be made in the event of a cancellation: £100 if received by 13th September 2010 and £300 after that date but before 6th October 2010. Cancellations made anytime after that date will not be refunded.

Registration fee: RINA Members: £1080+VAT (Total £1269) Non Members: £1200+VAT (£1410) Group Fee (3 delegates or more): £1060+VAT (£1245.50)

The William Froude Conference
"Advances in Theoretical and Applied Hydrodynamics – Past and Future"

Organised by:

The Royal Institution of Naval Architects

and

Lloyd's Register Strategic Research Group

In association with:

QinetiQ

and supported by:

ITTC

24-25 November 2010, Portsmouth, UK

Second Notice

2010 will mark the 200th anniversary of the birth of William Froude, and the 150th anniversary of the founding of the Royal Institution of Naval Architects, both of whom have made a significant contribution to advancing the understanding of hydrodynamics during their time. The William Froude international conference will provide an appropriate opportunity for those who are involved in the research, development and application of hydrodynamics to meet and discuss current and future advances in theoretical and applied hydrodynamics. The two-day conference will present 20 papers, with a session devoted to the work being undertaken by universities involved with the Lloyd's Register strategic hydrodynamic research programme. Selected papers from this conference will also be presented in a special issue of the International Journal of Maritime Engineering. The conference will include a visit to the QinetiQ towing tank and exhibition at Haslar.

The scope of the Conference will be broad, covering all the aspects of theoretical and applied hydrodynamics. Papers are invited on the following and other related topics:

- Linear and non-linear waves and currents
- Ocean dynamics
- Ship hydrodynamics for resistance, propulsion, seakeeping, manoeuvrability and stability
- Ship hydrodynamics for impact problems (slamming, sloshing, impact, green water, wake flows and shock)
- Hydromechanics for the design of concept ship designs
- Computational fluid dynamics
- Advanced experimental techniques
- Multiphase flows
- Theoretical and mathematical hydrodynamics with emphasis on Euler equations
- Emerging numerical methods for the prediction of non-linear hydro-structural loads (e.g. body non-linear and large amplitude methods, RANS CFD, SPH, MPI, CIP etc.)
- Hydrodynamic reliability analysis for the prediction of global and local dynamic loads
- Ship hydro-structural design assessment methods
- Damaged ship hydromechanics and hydroplasticity

☐ I wish to receive details on exhibition space and sponsorship opportunities

☐ I would like to receive a full programme brochure and registration form

Name: Position:

Company:

Address:

Postcode:

Telephone: Fax:

Email: **(WF2010)**

Please return to: Conference Department, RINA, 10 Upper Belgrave Street, London SW1X 8BQ
by fax on +44 (0)20 7259 5912 or by email: conference@rina.org.uk

YOUR PASSPORT TO SUCCESS
CRUISE SHIPPING MIAMI

Today's voyage of doing business could offer some unexpected twists and turns. Navigate smoothly by making Cruise Shipping Miami, the world's largest and most important cruise industry event, your point of embarkation. Upon arrival you will make important and valuable connections with the international cruise market that will set your business on a profitable journey.

Cruise Shipping Miami, Homeport of the Cruise Industry

March 14 - 17, 2011 Miami Beach Convention Center, Miami Beach, Florida

SEATRADE CRUISE SHIPPING MIAMI
HOME PORT OF THE CRUISE INDUSTRY

www.cruiseshippingmiami.com
sales@cruiseshippingmiami.com

UBM Live
212 Carnegie Center, Suite 203
Princeton, NJ 08540-6236, USA

Join Our Networks:

Cruise Shipping Miami is supported by:

Florida-Caribbean Cruise Association
CLIA Cruise Lines International Association

Marine Industry Careers

Principal Naval Architect (Structures)
Rosyth, Scotland Up to £50,000 - Job ID 213580
An exciting opportunity exists for a Principal Naval Architect (Structures) with an organisation that provides engineering and design support to the Marine and Offshore sectors, both in the Defence and Commercial markets.

Naval Architect (Stability)
Plymouth Up to £35/hr 6 months - Job ID 215561
We are currently recruiting for a Naval Architect with a Stability bias for a high profile yacht project working in the Devonport dockyard. Applicants will ideally be working towards Chartered status and will be required to model stability characteristics of Yachts using Maxsurf or Paramarine.

Naval Architect (Structures)
Plymouth Up to £35/hr 6 months - Job ID 215562
Working on a high profile yacht project we are currently recruiting for a Naval Architect with a strong Structures bias for a 6 month contract opportunity in the Devonport dockyard.
Suitable applicants will be Chartered Engineers capable of producing finite element structural assessment of marine platforms using Ansys or Staad from Inventor models.

Call 01489 898160 or email marine@matchtech.com

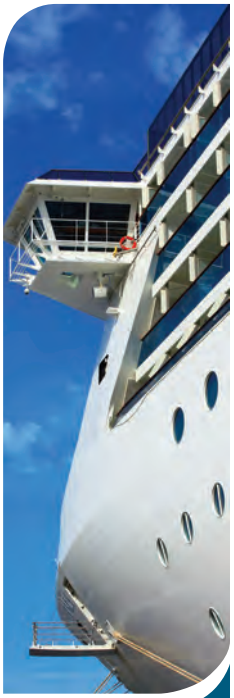
Matchtech Group plc
1450 Parkway, Solent Business Park
Fareham, Hampshire PO15 7AF
www.matchtech.com

matchtech GROUP

Specialist recruitment to the marine industry

Marine Industry Recruitment

Matchtech is an AIM listed recruitment company, with a dedicated Marine Division, specialising in the supply of contract and permanent staff for UK and overseas marine engineering jobs.



Our team of dedicated consultants have over 60 years of experience in the placement of personnel within the areas of shipbuilding, design, new-build, refit and conversion.

Matchtech are delighted with their invitation to become a corporate partner member of RINA and look forward to a long and beneficial association.

Contact Simon Blake on 01489 898831

Email simon.blake@matchtech.com

Matchtech Group plc
1450 Parkway, Solent Business Park
Fareham, Hampshire PO15 7AF
www.matchtech.com

matchtech GROUP

Specialist recruitment to the marine industry

WWW.UNI-DUE.DE

At the University Duisburg-Essen, Campus Duisburg, there is the following position to be filled as soon as possible in the Faculty of **Engineering Sciences, Department of Mechanical and Process Engineering:**

Professorship (W2) for Structural Design and Integrity in Ship Technology and Ocean Engineering

Teaching duties concern the accredited Bachelor and Master Degree programme "Mechanical Engineering", in the academic studies "Ship Technology and Ocean Engineering", covering the subject areas structural design, strength in ship and ocean engineering, fatigue, vibration, finite element methods for marine structures, etc. The successful candidate is required to continuously update the teaching material by implementing research results.

The holder of the position is expected to have relevant experience in the field of steel and lightweight construction, especially as far as the maritime field is concerned. Experience in fatigue and/or dynamics is desirable. In this respect, the willingness to deal with theoretical and application-oriented topics as well as to co-operate with companies and/or other institutions are expected. Relevant experience would be appreciated.

Publications in peer-reviewed journals as well as experience in the acquisition and accomplishment of third-party funds are requested.

Soft skills and the ability to take over a leadership position are expected. Co-operation in the main research fields of the faculty is required. Moreover, it is expected that the successful candidate will be able and willing to use modern media in teaching and updates her/his teaching methods regularly. This includes the willingness and the ability to teach both in German and in English as well as the willingness to participate in didactical further trainings. Participation in the academic self-administration is required.

Close co-operation with other departments of the Faculty of Engineering as well as with the Development Centre for Ship Technology and Transport Systems (DST) in Duisburg is expected.

For further information on the professorship to be assigned please visit www.uni-due.de/ingenieurwissenschaften/stellenausschreibungen_professuren.shtml.

According to the German/North-Rhine Westphalia university regulations (§ 36 Hochschulgesetz NRW), a first degree, PhD and additional academic qualifications acquired during a junior professorship, state doctorate or a scientific post are required. Such experience and qualifications will have to have been obtained at an institute of higher education, or in business or industrial research institutes, in Germany or abroad.

The University of Duisburg-Essen was awarded the "Total-E-Quality-Award" for its efforts in gender equality. The university is an equal opportunity employer and strives to increase the proportion of female scientific personnel and thus especially encourages women with relevant qualifications to apply.

Handicapped applicants will be given preferential treatment if their qualifications and experience are the same as those of other suitable candidates.

Applications (in writing and additionally by CD-ROM) with the usual documents (CV, list of academic publications, certificates concerning the academic and professional career (copies), description of one's own research profile and the resulting prospects at the University of Duisburg-Essen, details about previous teaching experience and participation in academic self-administration as well as acquired external funds) are to be sent until September 20th 2010 to the **Dean of the Department of Engineering Sciences, University of Duisburg-Essen, Campus Duisburg, Professor Dr.-Ing. Dieter Schramm, Forsthausweg 2, 47057 Duisburg, Germany.**

THE SUPERYACHT PAVILION AT METS 2010

Getting down to business

What is the SuperYacht Pavilion?

The SuperYacht Pavilion (SYP) and its service-oriented Refit Boulevard form a show-within-a-show at METS. Dedicated to companies who offer equipment and services specifically to the large leisure yacht sector, the SYP is a destination in its own right, but also sits at the heart of METS, the world's biggest and best attended leisure marine trade show. Over 115 exhibitors assembled in the SYP and Refit Boulevard in 2009 – to sell, promote and network. It's busy, it's professional – and it's special.

Why special?

The SYP/METS combination is unique. At no other trade-only event can you visit a thriving superyacht equipment exhibition and also have access to over 1,000 other marine trade exhibitors, some of whom also cater to the superyacht sector. It's also a unique launch pad, as Ian Taylor, group sales manager of Quest International, reveals: "As a supplier of new and novel technology we were looking for the right approach to allow us to undertake a technology transfer into the superyacht and megayacht arena. METS provided us with a fantastic platform... and the organisers invited our managing director to be part of the Superyacht Forum. All of this support led to a fantastic reception from the industry and what we believe to be an unprecedented level of interest on the stand."

Why should you attend?

The SYP is a meeting point for true industry professionals - superyacht captains, designers, builders, project managers, brokers and owners, and many others. The SYP is of interest to nearly half of the 20,000 professionals who visit METS each year and is also a must-visit for all the speakers and delegates who take part in the associated Global Superyacht Forum (GSF), the high profile HISWA Yacht Symposium and the Member's Mixer event organised every year by the International Superyacht Society – the society for captains and crew members. The result is a varied and appropriate display of products, a vibrant conference programme and networking galore.

What is the GSF?

The GSF is one of the world's leading summits for superyacht professionals. As a conference, it delivers in every way – with top profile presenters and excellent interaction between speakers and delegates. Organised and presented by The Yacht Report Group in association with METS organisers, Amsterdam RAI, the Global Superyacht Forum attracts around 650 delegates and includes social highlights like the Global Superyacht Party. To register as a delegate for GSF, go to www.globalsuperyachtforum.com.

All GSF delegates have free entrance to SYP. Visitors of the SYP do not automatically have access to GSF.

Register for your free entrance badge

To visit the SYP you need a FREE three-day entrance pass to METS 2010. Please pre-register for this on metstrade.com. To help with your planning, Amsterdam RAI can also book hotel rooms for you and assist with other travel requirements. Go to metstrade.com and click on 'visit' and 'hotel & travel service'. To exhibit at the SYP, please contact the organisers.

METS – at a glance

"It sounds simple but just by attending METS, you will be able to take advantage of networking opportunities. Your contacts will introduce you to other contacts. Remember, the world comes to METS!" Tom Douglas, vice president global sales, Teleflex Marine.

- **18,454 visitors from 86 countries in 2009**
- **Over 1,260 exhibitors from 38 countries in 2009**
- **15 national pavilions**
- **3 specialist pavilions including the SYP**
- **Strictly professional – strictly trade-only**
- **All year round promotion via metstrade.com**

'extra bonus: the beautifull city of Amsterdam'

SUPERYACHT PAVILION

Incorporated by:

MARINE EQUIPMENT TRADE SHOW METS 2010

16-18 I NOV I AMSTERDAM I NL

THE YACHT report the official magazine for the SuperYacht Pavilion

ADVERTISERS' INDEX

If you would like to receive further information on the advertisers featured within *The Naval Architect* please contact **John Payten, Group Sales Director,** jpayten@rina.org.uk

RINA publications

Books

Please note all prices include postage & packaging

HUMAN FACTORS FOR NAVAL MARINE VEHICLE DESIGN & OPERATION

By Jonathan M Ross MRINA Ref: HFNM

There is a driving need for naval professionals to focus on human factor issues. The number of maritime accidents is increasing and the chief cause is human error, both by the designer and the operator. Decreasing crew size, lack of experienced operators, operations in higher sea states and fatigue worsen the situation. Automation can be a partial solution, but flawed automated systems actually can contribute to accidents at sea. This book integrates knowledge from numerous resources as well as the advice of a panel of eight recognised experts in the fields of related research, development and operation.

Member price UK £50.00 EUR £55.00 OVS £57.50
Non- Members price UK £55.00 EUR £60.00 OVS £62.50

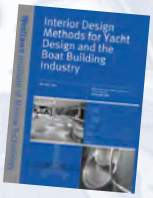
SAFETY MANAGEMENT AND ITS MARITIME APPLICATION

By Professor Chengi Kuo FRINA Ref: SMMA

The author introduces this book by asking a seemingly obvious question "What is safety?". To show there is no straightforward answer he illustrates from his experience in conducting a number of safety workshops worldwide. In the foreword to this book Mr E E Mitropoulos Secretary General of the IMO writes: "As Professor Kuo points out early in his book, safety is not an absolute concept and the levels chosen are based on shared values. It is for this reason that this book is so useful because it introduces safety concepts, explains safety terms, and demonstrates how the different techniques can be applied in practice.

Member price UK £28.75 EUR £31.00 OVS £33.50
Non- Member price UK £31.75 EUR £34.00 OVS £36.50

INTERIOR DESIGN METHODS FOR YACHT DESIGN AND THE BOAT BUILDING INDUSTRY



By Lisa C. Hix Ref: IDMYD

In a first-time release to industry and the general public, the Westlawn Institute of Marine Technology announced in April 2009 this textbook was now available for purchase. Specifically prepared as a textbook for Westlawn's intensive Yacht & Boat Design Program, and also used as the text for Westlawn's continuing education course in boat interior design this book provides detailed technical information not available from any other source. Heavily illustrated, with numerous line drawings and photos on nearly every page, this textbook will answer almost any question a designer, builder, surveyor, crewmember, or serious boater may have about the accommodations and arrangements required for safe, comfortable, and efficient crew and passenger spaces. Though focused on boats (vessels under 200 feet or 60 meters), the information is equally valuable for commercial vessels of all sizes.

Member price UK £57 EUR £57 OVS £57
Non Member price UK £67 EUR £67 OVS £67

SHALLOW WATER AND SUPERCRITICAL SHIPS

By Anatoly Lyakhovitsky Ref: SWSS

This book presents systematic and detailed results of studying the hydrodynamics of ships in shallow water. Due to the current trend of building larger and faster ships, many coastal waters and inner waterways become shallow for these and future ships. Clear and detailed explanation is given how ship performance declines in shallow water at speeds approaching the critical speed, and how wasteful can be attempts to boost the propulsion engine unless the ship is designed for optimal regimes at sub critical speeds and can transit to supercritical regimes. Detailed description is also given how the energy wasted for propelling a ship at near-critical speeds in shallow water is transformed into generating destructive and dangerous waves.

Member price UK £82.00 EUR £82.00 OVS £82.00
Non member price UK £92.00 EUR £92.00 OVS £92.00

MULTI-HULL SHIPS

By V. Dubrovsky FRINA, A. Lyakhovitsky Ref: MHS

Catamarans, SWATH, and other multi-hull ships are among the dynamically progressing types of marine vessels both in terms of performance and production growth. This progress has been accompanied by a remarkable growth in the number of technical publications. Although these publications, scattered over many sources, decades, and languages, constitute a great database they cannot fulfill the demand for a comprehensive state-of-the-art reference book. This monograph satisfies such demand. For multi-hull ships it is what "Principles of Naval Architecture" (PNA) is for traditional ships.

Member price: UK £192.50 EUR £192.50 OVS £192.50
Non-Member price: UK £202.50 EUR £202.50 OVS £202.50

SHIPS AND SHIPBUILDERS: PIONEERS OF SHIP DESIGN AND CONSTRUCTION

By Fred Walker FRINA Ref: SAS

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

Member price UK £19.00 EUR £20.50 OVS £25.00
Non member price UK £24.00 EUR £25.50 OVS £30.00

Journals

THE NAVAL ARCHITECT

Published 10 times a year

quarterly publication
OFFSHORE MARINE TECHNOLOGY
bi-monthly publication
WARSHIP TECHNOLOGY

- Providing up-to-date technical information on commercial ship design, construction and equipment.
- Regular reports on centres of shipbuilding activity worldwide.
- Comprehensive, technical descriptions of the latest newbuildings.
- News, views, rules & regulations, technology, CAD/CAM, innovations.

2010 Subscription

Period	12 Months	24 Months	36 Months	Ref: J6
Inland:	£150	£260	£375	
Europe:	£156	£272	£390	
Overseas:	£168	£292	£420	

SHIP & BOAT INTERNATIONAL

Published 6 times a year

- In depth coverage of small craft/small ship design, building & technology.
- Specialist sections include: fast ferries, tugs, salvage & offshore, patrol & paramilitary craft, coastal & inland waterway vessels, pilot boats, propulsion and transmissions.
- Advances in construction materials, electronics, marine equipment.
- Contract news and the latest market developments.

2010 Subscription

Period	12 Months	24 Months	36 Months	Ref: J7
Inland:	£114	£200	£285	
Europe:	£120	£208	£300	
Overseas:	£138	£240	£345	

SHIPREPAIR & CONVERSION TECHNOLOGY

Published Quarterly

- In depth coverage of all aspects of shiprepair and conversion work and comprehensive technical descriptions of major conversion projects.
- Regular regional surveys on the major shiprepair centres.
- Developments in shipboard and shipyard equipment technology.
- Contract news, appointments, industry views, new regulations.

2010 Subscription

Period	12 Months	24 Months	36 Months	Ref: J8
Inland:	£52	£92	£130	
Europe:	£58	£100	£145	
Overseas:	£64	£110	£160	

RINA publications

Conference Papers

If the CD ROM format is required please add CD after the reference number.

		Non-Members	*Members*
2010	**INNOV'SAIL - Innovation in High Performance Sailing Yachts** Ref INNOVSAIL10	£120	£100
	Warship- Advanced Technologies in Naval Design & Construction Ref: WS10	£120	£100
	Marine Renewable Energy & Offshore Wind Energy Ref: MRE10	£120	£100
	Ship Design & Operation for Environmental Sustainability Ref ES10	£120	£100
	Marine Offshore Coatings Ref: COAT10 - **CD ROM only**	£120	£100
	Marine Offshore Composites Ref: MOC10 - **CD ROM only**	£120	£100
2009	**Historic Ships** Ref: HIST 09	£120	£100
	ACV & Surface Effect Craft Ref: Ref: ACV09 - **CD ROM only**	£120	£100
	ICSOT - Ice Class Ships Ref: ICSOT09	£120	£100
	ICCAS International Conference on Computer Applications in Shipbuilding Ref: ICCAS09 - **CD ROM only**	£120	£100
	Warship - Air Power at Sea Ref: WS09	£120	£100
	SURV 7: Surveillance, Search & Rescue Craft Ref: SURV09	£120	£100
	Super & Mega Yacht Design Ref SMY09 - **CD ROM only**	£120	£100
	Human Factors Ref HF09	£120	£100
	Int'l Conference on Innovation in High Speed Marine Vessels Ref: HSMV09	£120	£100
2008	**Waterjet Propulsion 5** Ref: WP08	£120	£100
	Marine Renewable Energy Ref: MRE08	£120	£100
	Design & Operation of Container Ships Ref: CS08	£120	£100
	Warship - Naval Submarines 9 Ref: WS08 - **CD ROM only**	£120	£100
	INNOV'SAIL - Int'l Conference on Innovation in High Performance Sailing Yachts Ref: INNOV08	£120	£100
	Marine CFD Ref: CFD08	£120	£100
	Marine Heavy Transport & Lift II Ref MHTL08	£120	£100
	Design & Operation of LPG Ships Ref: LPG08	£120	£100
2007	**Military Support Ships** Ref: MSS07	£120	£100
	The Modern Yacht Ref: TMY07	£120	£100
	ICCAS 07: International conference on computer applications in shipbuilding Ref: ICCAS	£120	£100
	Warship - The Affordable Warship Ref: WS07	£120	£100
	Design & Construction of Vessels Operating in Low Temperature Environments Ref: LT07	£120	£100
	Design & Operation of Passenger Ships Ref: PASS07	£120	£100
	Human Factors in Ship Design, Safety & Operation Ref: HF07	£120	£100
	Historic Ships Ref: HIST07	£120	£100
	Developments in Classification & International Regulations Ref: DCIR07	£120	£100
2006	**High Speed Craft-ACV, Wigs & Hydrofoils** Ref: HS06	£115	£95
	ICSOT 2006: Design, Construction & Operation of Gas Carriers and Offshore Systems Ref: ICSOT06	£115	£95
	Warship 2006 - Future Surface Warships Ref:WS06	£115	£95
	Education,Training & Continuing Professional Development of Engineers in the Maritime Industry Ref: CPD06 - **CD ROM only**	£115	£95
	International Symposium on Marine Design Ref: MD06	£115	£95
	Advanced Marine Materials & Coatings Ref: AMM06	£115	£95
	Learning from Marine Incidents 3 Ref: MI06	£115	£95
2005	**Safety Regulations & Naval Class II** Ref: SR05	£115	£95
	Design and Operation of Bulk Carriers Ref: BC05	£115	£95
	Heavy Transport & Lift Ref: HEA05	£115	£95
	Warship 2005: Naval Submarines 8 Ref: WS05	£115	£95

Payment Details: Payments must be made in pounds sterling to **RINA** by sterling cheque drawn on a UK bank, International Money Order or Credit Card, we accept Visa, Mastercard, or AMEX.

I enclose a cheque for _____ payable to RINA.

Please charge my Credit Card No: _____

Expiry date: ____/__ Security code: _____ Signature: _____

Name: _____

Address: _____

Country: _____ Postcode: _____

Tel: _____ Fax: _____ Email: _____

Please allow 30 days for dispatch and delivery. Post to:

The Marketing Department, RINA, 10 Upper Belgrave Street, London SW1X 8BQ, UK.

Tel: +44 (0)20 7235 4622 or **Fax: +44 (0)20 7259 5912.**

ORDER FORM

Please send me the following:

REF:NA/Sept10

REFERENCE	QUANTITY	PRICE
	TOTAL:	

For a publications catalogue please call the Publications Department on
+44 (0)20 7235 4622 e-mail: publications@rina.org.uk or visit our website at http://www.rina.org.uk

September 22-25, 2010
Monaco Yacht Show, international yacht show, Monaco.
Contact Monaco Yacht Show S.A.M., 57, rue Grimaldi - Le Panorama AB, MC 98000, Monaco.
Tel +377 93 10 41 70
Fax +377 93 10 41 71
E-mail info@monacoyachtshow.mc
www.monacoyachtshow.com

September 29-30, 2010
High speed marine craft, international conference, London, UK.
Contact Conference Department, RINA, 10 Upper Belgrave Street, London, SW1X 8BQ, UK.
Tel +44 20 7235 4622
Fax +44 20 7245 6959
E-mail conference@rina.org.uk

October 3-5, 2010
Interferry 2010, international conference, New York, USA.
Contact Interferry, 1619 Warren Gardens, Victoria, BC, V8S 1S9, Canada.
Tel +1 250 592 9612
Fax +1 250 592 9613
www.interferry.com

October 13-15, 2010
Fundamentals of Contract & Change Management for Ship Construction, Repair & Design, international conference, London, UK.
Contact Conference Department, RINA, 10 Upper Belgrave Street, London, SW1X 8BQ, UK.
Tel +44 20 7235 4622
Fax +44 20 7245 6959
E-mail conference@rina.org.uk

October 21-22, 2010
Systems Engineering in Ship & Offshore Design, international Conference, Bath, UK.
Contact Conference Department, RINA, 10 Upper Belgrave Street, London, SW1X 8BQ, UK.
Tel +44 20 7235 4622
Fax +44 20 7245 6959
E-mail conference@rina.org.uk

October 26-28, 2010
Middle East Maritime Dubai, international conference, Dubai.
Contact Nicky Hale, Project Manager, Seatrade Communications, 42 North Station Road, Colchester, CO1 1RB, UK.
Tel +44 1206 545121
Fax +44 1206 545190
E-mail nhale@seatrade-global.com
www.seatrade-middleeast.com

October 25-29, 2010
Euronaval 2010, international conference, Paris, France.
Contact Sogena,19/21 rue du colonel Pierre Avia, 75015 Paris, France.
Tel +33 1 47 36 80 80
Fax +33 1 40 93 57 72
E-mail info@euronaval.fr
www.euronaval.fr

November 9-11, 2010
MAST 2010, international conference, Rome, Italy.
Contact Evolution International Events Ltd, 58 Maidstone Road, Pembury, Kent, TN2 4DE, UK.
Tel +44 1892 824418
Fax +44 1892 824455
E-mail admin@mastconfex.com

November 11-12, 2010
ICSOT 2010: Developments in ship design and construction, international conference, Surabaya, Indonesia.
Contact Conference Department, RINA, 10 Upper Belgrave Street, London, SW1X 8BQ, UK.
Tel +44 20 7235 4622
Fax +44 20 7245 6959
E-mail conference@rina.org.uk

November 16-18, 2010
METS Marine Equipment Trade Show, international conference, Amsterdam, The Netherlands.
Contact Amsterdam RAI, Metstrade.com, P.O. Box 77777, NL-1070 MS Amsterdam, The Netherlands.
Tel +31 20 549 12 12
Fax +31 20 549 18 89
E-mail mets@rai.nl
www.metstrade.com

November, 2010
RINA President's Invitation Lecture, Dinner, London, UK.
Contact Conference Department, RINA, 10 Upper Belgrave Street, London, SW1X 8BQ, UK.
Tel +44 20 7235 4622
Fax +44 20 7245 6959
E-mail conference@rina.org.uk

November 24-25, 2010
William Froude Anniversary, international conference, Portsmouth, UK.
Contact Conference Department, RINA, 10 Upper Belgrave Street, London, SW1X 8BQ, UK.
Tel +44 20 7235 4622
Fax +44 20 7245 6959
E-mail conference@rina.org.uk

November/December 30-2, 2010
Seatrade Med, international conference, Cannes, France.
Contact Seatrade Communications Ltd., Seatrade House, 42 North Station Road, Colchester, CO1 1RB, UK.
Tel +44 1206 545121
Fax +44 1206 545190

January 26-27, 2011
The Damaged Ship, international conference, London, UK.
Contact Conference Department, RINA, 10 Upper Belgrave Street, London, SW1X 8BQ, UK.
Tel +44 20 7235 4622
Fax +44 20 7245 6959
E-mail conference@rina.org.uk

February 23-24, 2011
Design & Operation of Passenger Ships, international conference, London, UK.
Contact Conference Department, RINA, 10 Upper Belgrave Street, London, SW1X 8BQ, UK.
Tel +44 20 7235 4622
Fax +44 20 7245 6959
E-mail conference@rina.org.uk

March 2-3, 2011
Innovation in High Speed Marine Vessels, international conference, F8u7remantle, Australia.
Contact Conference Department, RINA, 10 Upper Belgrave Street, London, SW1X 8BQ, UK.
Tel +44 20 7235 4622
Fax +44 20 7245 6959
E-mail conference@rina.org.uk

May 26-27, 2011
HSMV 2011, international conference, Naples, Italy.
Contact P. Cioffi, Dipartimento di Ingegneria Navale, Università degli Studi di Napoli, Federico II, Via Claudio, 21, 80125 Naples, Italy.
E-mail hsmv2011@unina.it
www.hsmv.unina.it

GustoMSC,
worldwide offshore player,
is looking for a

The GustoMSC alliance, part of the SBM Offshore Group of companies, offers design and engineering, procurement, project management and consultancy services to the offshore energy industry.

(Senior) Naval Architect

GustoMSC is an alliance of Gusto B.V., Schiedam, The Netherlands, Marine Structure Consultants (MSC) B.V., Schiedam, The Netherlands, GustoMSC, Houston, USA. Our main activity is developing complete and certified designs for all types of offshore units such as jack-ups, semi-submersibles, dynamically positioned drilling vessels, crane vessels, pipelay vessels, MOPU's, FPSO's, and for special equipment such as pipelay systems, heavy duty offshore cranes and special process modules. Besides pure engineering, we do turnkey hardware delivery of our special products, either in combination with our designs, or as stand-alone systems. GustoMSC employs more than 500 employees, in a wide variety of jobs.

We offer dynamic and challenging jobs, many with (international) education opportunities. Our corporate culture can be characterized as a no-nonsense atmosphere, being open and direct, having short communication lines and working on challenging and innovative projects.

Check our website for more information:

www.GustoMSCjobs.com



Your challenge

SBM OFFSHORE GustoMSC

Acquisition in connection with this advert will not be appreciated.

www.GustoMSCjobs.com

ClassNK NIPPON KAIJI KYOKAI

www.classnk.or.jp

110th Anniversary