THE NAVAL ARCHITECT

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

Diesel technology / Tankers /
Bridge and communications systems /
Italy / **March 2012**

LEG/LPG/LNG/CO_2-Carrier

www.meyerwerft.com

MEYER WERFT
PAPENBURG 1795

Editor Nick Savvides
Assistant Editor Samantha Fisk
Design/Production Manager Sandy Defraine
Group Sales Director John Payten
Assistant Advertisement Manager Daniel Payne
Advertisement Production Manager Stephen Bell
Subscriptions & Publications Manager Josie Pearlson
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 2012 subscription to *The Naval Architect* costs:

	12 Months	24 Months	36 Months
Inland	£158	£274	£395
Europe	£165	£288	£412
Overseas	£177	£309	£444

Average Net Circulation 10,574
1 January to December 2011
ISSN 0306 0209

essential.

121 Years of Excellence

MarelliMotori®

1891-2012

www.marellimotori.com

24-42 Features

On-line Edition

The Royal Institution of Naval Architects is proud to announce that as of January this year, *Shiprepair and Conversion Technology* 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/srct 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.

ICSOT 2012: International Conference
Ship & Offshore Technology
Developments in Fixed & Floating Offshore Structures

23 - 24 May 2012, Busan, South Korea

Second Notice

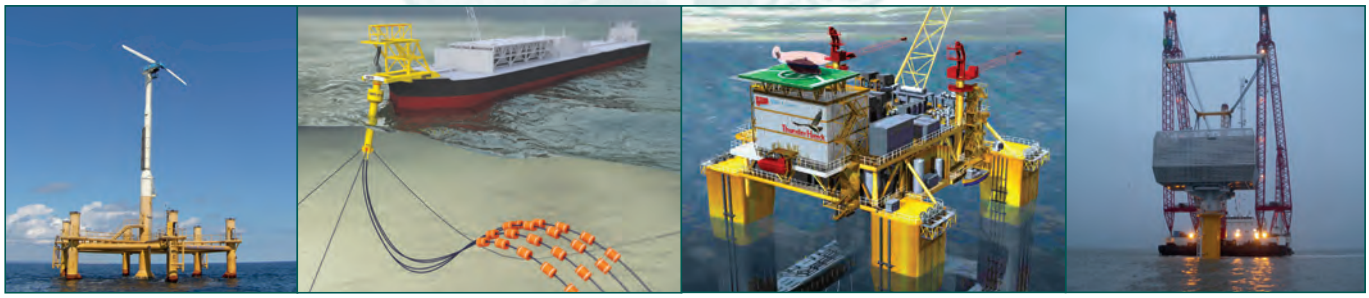
Fixed and floating offshore structures, whether associated with the production of oil and gas, or with marine renewable energy, present complex technical challenges to the maritime industry, particularly as such structures are increasingly employed in deeper waters and extreme climatic conditions when the support of such structures then presents an additional challenge.

The International Conference on Ship & Offshore Technology Korea 2012 will provide an opportunity for the global maritime industry to present and discuss the developments in the design, construction and maintenance of fixed and floating offshore structures.

RINA invites papers from naval architects, class societies, operators, researchers, and builders on all related topics, including:

- Oil and gas production
- Wind, wave and tidal power production
- Front End Engineering and Design (FEED)
- Construction
- Transportation and installation
- In-service support and maintenance
- Safety, regulation and classification
- Equipment technology
- Emergency response
- Risk assessment and management

www.rina.org.uk/ICSOTKorea2012



☐ 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: **(ICSOT2012)**

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

The Chinese are coming

Tanker and bulk carrier design is under the spotlight as research shows that they have become less efficient over the last 20 years.

China's growth and development in the maritime industry over the last 20 years has been nothing short of spectacular. This, of course, is not news to those who even take just a moderate interest in maritime affairs.

Perhaps what is less appreciated is that alongside the growth in the maritime industry China's maritime journals have also prospered.

Consequently we have asked China Ship News to enter into a swap deal with *The Naval Architect* so that our readers can get a flavour of what is being discussed in China's maritime circles. The first translated piece from China Ship News appears this month and I hope it will be a foretaste of what is to come. The story on LNG and river shipping shows the way China's authorities are thinking and the moves they are making towards meeting the requirements for cleaner ships.

Of course this is not a one way street, or seaway. And so *The Naval Architect* has reciprocated by sending one of our stories to China in, what could be, a fruitful co-operation for both parties.

Hopefully China Ship News' readers will find this exchange just as fulfilling as our readers. And if they get to read this month's story on the development of tankers over the last 20 years which reveals how design has been driven by economics rather than efficiency or a desire to reduce greenhouse gases this will interest them as much as their counterparts in other parts of the world.

Tanker design is expected to change significantly following the introduction of the Energy Efficiency Design Index and it was this regulation that prompted the Danish Technical University to take a look back at tanker design over the last 20 years.

Astonished university researchers had expected to see steady progress in efficient design, but in fact they discovered that basic design principles were ignored in favour of designing ships that were vastly more powerful and, therefore, faster and had much larger cargo capacity. It is not a shock that commercial vessels are designed to increase owners' income, but the surprise is that, until now, there has been no driver to make ships more environmentally friendly. It simply has not been a consideration even after the Kyoto agreement of 1997.

Frustrations with the maritime industry from those outside of the industry, but who were charged with dealing with climate change, such as the then head of the United Nations Framework Convention on Climate Change (UNFCCC) secretariat Yvo de Boer, became angered by the lack of progress from those within the industry. In 2009 de Boer told delegates at the IMO that unless shipping got its act together, bodies from outside of the industry would start to implement the necessary regulations.

The message appeared to get through as a raft of new regulations were finally formulated and are now coming to fruition in what is a comparatively short space of time.

What the DTU study brutally exposes is that even with the progress made over the last three years since de Boer's impassioned speech changes need to be made and quickly. Tankers and bulk carriers are responsible for some 60% of shipping's greenhouse gas emissions, which is one of the reasons that the EC has decided to back a project that will seek to significantly reduce emissions from these vessels. ULYSSES is tasked with reducing emissions from what are already slow moving vessels, a fact that makes the task more challenging.

"The objective of ULYSSES is to demonstrate, through a combination of ultra-slow speeds and complementary technologies, that the efficiency of the world fleet can be increased to a point where the following CO_2 targets are met: 'Before 2020, reducing greenhouse gas emissions by 30% compared to 1990 levels. Beyond 2050, reducing greenhouse gas emissions by 80% compared to 1990 levels," said the EC.

Developments over the last 20 years have been slow in coming, the industry has moved with all the speed and nimbleness of a VLCC. Improvements in design, materials and the sheer will to reduce emissions should see the industry make mammoth strides towards a cleaner future over the next 20 years. *NA*

LNG

South Koreans eye GTT

Several South Korean companies are considering bids for the French LNG membrane containment system design company GTT (formerly known as Gaztransport & Technigaz).

Philippe Berterottierre, president and CEO of GTT said four major yards, DSME (Daewoo Shipbuilding & Marine Engineering), Samsung Heavy Industries (SHI), Hyundai Heavy Industries (HHI) and STX, along with Korean gas major Kogas, are interested in buying GTT. "The buyer will have a 95% market share just by buying GTT", he added.

DSME, SHI and HHI are reportedly considering a joint bid for GTT, but confirmation of any bids will come at a much later date Berterottierre said. He added that "Non-disclosure documents are currently being put together… shareholders would be interested at the right price, around US$1-1.5billion".

SHI, which builds GTT's MKIII system under licence, and GTT had been locked in a dispute over the Korean's new membrane containment which the French company suggested had taken significant elements of the GTT design. However, *The Naval Architect* understands that these discussions are now on hold.

"SHI alone accounts for half of GTT's current orderbook," Berterottierre pointed out, adding there was little point in getting into conflict with a major customer. But he said: "we are vigilant, if SHI makes a sale [of the SCA system] then litigation could follow".

GDF Suez, a 40% shareholder in GTT with Total and investment fund Hellman & Friedman LLC, both 30% shareholders, are said to be ready to sell following a lull in the LNG shipbuilding market during 2009 and 2010, an upturn in orders meant that Hellman was reportedly ready to cash in on its asset and its shareholding partners agreed it was the right time to sell.

Bulk carriers

Crown 63 takes a bow

Sea trials of the first Crown 63, 63,500dwt bulk carrier, were successfully completed at the end of last month said the shipbuilder Sinopacific.

French owner SETAF took delivery of *DY4001*, the lead ship in a series that will see 22 vessels delivered in 2012 alone, shortly after the vessel completed the sea trials. The shipbuilder said the vessel's speed trial proved to be beyond design predictions, meeting all the guarantee criteria specified in the delivery contract.

In comparison to the Crown 58 design – 58,000dwt bulk carrier – the Crown 63 series will increase deadweight by 9% and reduce fuel consumption by 13% at the same service speed. Jean Labescat, technology general manager at SETAF said: "*DY4001* features outstanding performance and its design gives consideration to the owner's operating benefits," adding "Crown 63 is with special advantage in the bulk carrier sector and we are looking forward to the next delivery."

Sea trials of the Crown 63 bulk carrier *DY4001* were completed on 18 February and the ship was delivered to SETAF at the end of the month.

Crown 63 has optimised body lines and an improved bulbous bow design, propeller and rudder bulb improving vessel efficiency significantly, said the yard. By adopting a low-sulphur fuel system, the vessel's SOx emissions have been reduced and, on this vessel, space has been reserved for the retrofit of a ballast water treatment system.

The vessel has a low-speed, two-stroke electronic injection diesel engine from Doosan Engine installed which has an electronic injection system that is efficient in reducing fuel consumption as well as NOx emissions.

Shipbuilding

LNG orders boost HHI

Hyundai Heavy Industries (HHI) has announced that it has taken orders for four LNG carriers and one LNG floating storage re-gasification unit worth US$1.1 billion.

Orders for two 162,000m^3 LNG carriers for Golar LNG of Norway on 10 February and two similar ships for an unnamed European shipowner on 8 February make up the carrier element of the orders.

The contract with Golar LNG includes an option exercisable by the Norwegian company for two additional vessels of the same size. The Golar vessels will be built by Hyundai Samho Heavy Industries, an HHI affiliate.

These membrane-type LNG carriers, scheduled to be delivered between the second quarter of 2014 and the first half of 2015, will feature the Dual Fuel Diesel Engine System (DFDE) which allows the ships to run on oil fuel or natural gas.

A100. Currently the last word in single stage turbocharging.

Taming the trade-off: the high pressure ratios and efficiencies of the A100 turbocharger generation are helping achieve IMO Tier II compliance at optimized fuel consumption. Stretching performance: the A100's wide compressor maps are enabling dual engine ratings with minimum system modifications for rapid, cost effective conversion from standard cruising speeds to economical slow steaming.
www.abb.com/turbocharging

Power and productivity
for a better world™

ABB

In addition, HHI has won an order to build a third LNG floating storage regasification unit (FSRU) for Hoegh on 13 February. The contract for the FSRU is an option exercised by Hoegh from the original contract signed in June 2011. The contract is for a 170,000m^3 LNG FSRU which is scheduled to be delivered by the second quarter of 2014.

Fuel technology

Jo flicks a switch

Meeting environmental regulations has been simplified, says Norwegian operator Jo Tankers, after it fitted a diesel switch mechanism that allows its ships to easily switch fuels when necessary.

Approved by Germanischer Lloyd the JOWA Technology Diesel Switch DS MKII allows the operator to meet sulphur emissions regulations in both California Air Resources Board (CARB) and Sulphur Emission Control Areas (SECA).

Developed by Sweden's JOWA Technology, the company claims that the DS MKII Diesel Switch provides a reliable solution that will prevent any short-term or long-term problems for crew, engine, environment and the owner that an incorrectly performed changeover could create.

"Since we installed the DS MKII we have been experiencing very positive results onboard our vessels", said Jo Tankers' fleet manager Andrew Hills.

After installing DS MKII, Jo Tankers says it has achieved automatically controlled, safe and economical changeover procedures from HFO to MDO and vice versa.

The DS MKII has unique software developed by JOWA Technology that controls a blend fuel valve and it has an overall architecture that can be adapted to the available space on board.

JOWA Technology says that the low-cost investment for the DS MKII gives a rapid return on investment.

"We now know that we meet the strict sulphur levels requested in the SECA Areas and in other environmentally controlled areas. They can be reached both by using the diesel switch DS MKII for a complete change-over or for running on blend fuel.

"We appreciate the software feature including the history log for change-over and/or blend fuel procedures performed," said Hills.

Bulk carriers

Delphin takes delivery of supramax

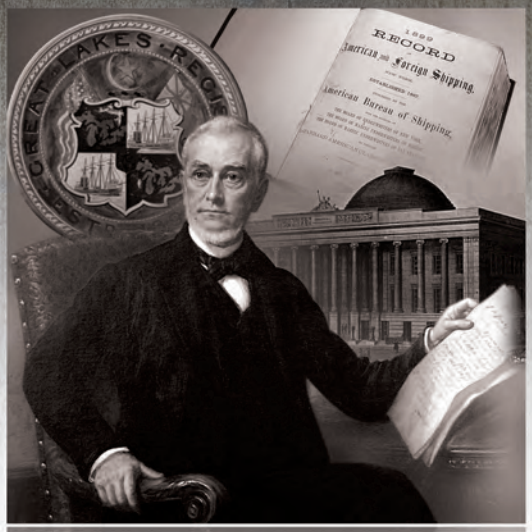
Owners Delphin took delivery of its fuel-efficient 57,000dwt supramax bulk carrier *Aquila* in late January from China's Jiangsu Hantong (HTS) yard.

Sea trials confirmed that the vessel can achieve a 14% reduction in fuel consumption as a result of the improved SDARI design. Sea trials were supervised and appraised by class society Lloyd's Register.

Aquila is the first in a series of bulk carrier designs that have been optimised for fuel efficiency. The efficiency improvements have been achieved by carrying out a number of straight forward changes including: de-rating the main engine, a new propeller design which has been optimised for the de-rated engine, and fitting a mewis duct.

"The daily main engine consumption at a speed of 14knots at ballast, which would have been about 29.4tonnes, is now about 26tonnes and the daily main engine consumption at a speed of 13.5 knots at design draught, which would have been about 29.8tonnes daily, is now about 26.30tonnes. The engine's output has been reduced by nearly 1000kW to 8500kW," confirmed Lloyd's Register.

Ship designers SDARI said that the structure of the BC57K design has been, "optimised, satisfying the latest requirements in the Common Structural Rules for bulk carriers, especially to accommodate the severe strength requirement of steel coils. The new ship will be able to load about 54,000tonnes of steel coils during one voyage with little increase of light weight. Now, the vessel also meets the requirements of EEDI-PHASE I."



150 years
Tradition in safety

Setting the Standard for Service

Promoting the security of life, property and the natural environment.

www.eagle.org

ABS
FOUNDED 1862

Korean consortium eyes GTT

The sale of French liquefied natural gas (LNG) containment company GTT (formerly Gaztransport & Technigaz) has sparked interest from a number of industry players with South Korean shipbuilders leading the pack, writes *Julian Macqueen*.

GTT's monopoly position in the market for membrane containment systems for LNG carriers makes it an attractive proposition.

The French equipment maker is expected to carry a price tag of US$1bn to US$1.5bn, according to its CEO and president Philippe Berterottierre.

"The buyer will have a 95% market share just by buying GTT," the chief executive told *The Naval Architect*.

By his reckoning, four major yards – Daewoo Shipbuilding and Marine Engineering (DSME), Samsung Heavy Industries (SHI), Hyundai Heavy and STX along with Korean gas major Kogas – are interested in buying the company.

Meanwhile, the *Financial Times* has reported of a possible joint bid by Hyundai Heavy, DSME and SHI which could also include steelmaker Posco.

While it is redolent on the boss to talk up the firm, GTT's premier position in containment systems for LNG ships is not in doubt.

LNG shipowners have had two systems to choose from: the moss spherical system and the GTT membrane containment system. Given that the membrane system is the cheaper of the two, its rise to pre-eminence at a time when the LNG market has been able to attract significant investment was assured.

But that prime position could be up for grabs as other systems, not least from one of GTT's main customers, SHI, come on to the market in the next couple of years. Certainly, SHI's smart containment system advanced has ruffled feathers in the GTT boardroom. But SHI is hardly alone.

Braemar Seascope has announced a new, flat plate technology system that it is to develop with US shipbuilder General Dynamics NASSCO.

"The system is built off hull and allows significant reductions in LNG carrier build time," the company says.

Buying GTT would make sense for the users of its technology since installing its membrane system on licence is said to cost between US$5 million to US$7 million per vessel. Losing that cost would boost competitiveness.

Whether GTT's existing licensing deals would complicate a potential sale is a moot point. One ship financier, who preferred to remain anonymous, suggested as a caveat that the company's existing licensing deals should be closely read by any potential buyer.

On the global stage, controlling LNG shipping's containment system of choice would help the South Koreans beat off Chinese competition by cementing their position at the top end of the global shipbuilding market.

However, although GTT's dominant market position has added to its allure, its membrane containment system has not been without technical hitches.

Ships fitted with membrane systems experienced de-bonding problems, in which membrane layers came unstuck. These appeared in the Mark III system soon after the delivery of BG Group's 2004, SHI-built, 138,200m^3 *Methane Kari Elin*.

Since then, similar concerns have arisen on some 20 vessels. The downside for shipowners has been the time spent in dry dock to fix the problem. The 2008-built, BP-controlled, 155,000m^3 *British Diamond* LNG carrier, for example, undertook a four-month repair job on its Mark III membrane-type containment system.

GTT, class, shipowners and SHI have worked hard to get to the root of the bonding problems. It seems that these relate to a combination of factors the importance of which were perhaps not well understood when the systems were first installed. New glues, installation procedures and tests have been introduced to ensure the integrity of the secondary barrier.

De-bonding is thought to be a potential hiccup for LNG vessels built between 1997 and 2007. Since then, a different method, called hot-pad curing, has been introduced.

Latest developments in the field include a new company, Cryovision, and its Thermal Assessment of Membrane Integrity (TAMI) procedure. According to GTT, this is "an innovative and cost-effective method of assessing the condition of the membrane system during operation, thereby avoiding costly testing during dry-docking".

It would seem, then, that such problems are closer to the file marked 'teething problems' than a reflection of anything more fundamental.

Unlike other shipping sectors, LNG is positively perky. In February, SHI landed an order with Golar LNG for two LNG vessels while STX nabbed a two-ship order with Russia's Sovcomflot for delivery in 2015 in the same month.

With that kind of market movement, and the optimism about future opportunities that it implies, there is much to play for. GTT is currently owned by GDF Suez (40%), Total (30%) and Hellman & Friedman (30%). *NA*

Joined up thinking

A ship is made up of a million decisions, big and small. It's a complex flow of people, logistics, designs and schedules. Success requires collaboration, and a complete understanding of strategic activities and events.

With AVEVA's integrated shipbuilding strategy, all project data can be exploited and shared at every stage of the build process, joining up the details to show the big picture. The result is an accurate and efficient project that delivers the right information, material and resources to reduce risk, time and cost.

With a global sales and service network in more than 40 countries, AVEVA is a leader in engineering design and information management solutions for the shipbuilding and offshore industries.

Choosing AVEVA will be one of the best decisions you ever make.

www.aveva.com/joinedupthinking

Be part of the breakthrough in engineering and design efficiency with the latest release of

AVEVA Marine

– available now

www.aveva.com/marine

AVEVA

CONTINUAL PROGRESSION

Interiors

Dutch decks for German-built passenger ships

German shipbuilder Meyer Werft contracted the Dutch deck specialist Bolidt Kunststoftoepassing BV to install decking on a 130,000gt passenger ship that was delivered last month from Meyer Werft's Papenburg shipyard. The project saw the ship fitted with 15,500m^2 of Bolidt material for the outdoor decks.

The majority of the deck areas, as well as the stairs and steps, have been covered using Bolidt's environmentally friendly Bolideck Future Teak, a composite decking product that replicates the look and feel of traditional teak decks, but offers further benefits through reduced installation times and easier onboard maintenance.

Other products used in the outdoor deck areas include Bolideck Select Soft, for some of the more colourful design features onboard, and Bolideck Select Hard for inside the pool wading areas. Bolidt has also supplied a special pool coating system and bespoke base design for the bottom of the pools. The vessel also features more than 3400m^2 of indoor deck coverings and in excess of 3500m^2 of C-Rail from Bolidt.

Two further cruise vessels at Meyer Werft due for delivery this year will also feature Bolidt products. For *Celebrity Reflection* and *AidaMar*, the fifth and sixth in their respective series, Bolidt is supplying all the outdoor decks using Future Teak, as well as Bolideck Select Soft in colourful areas, while the balconies will feature Bolideck 525.

www.bolidt.com

Bolidt installs decking on latest cruise ship from Meyer Werft.

Ballast water systems

OceanSaver supplies Chinese shipyard

Rongsheng Shipbuilding Heavy Industries has chosen the OceanSaver's Mark II for two 317,000dwt VLCC newbuildings.

The contract comes just weeks after DNV type approval, certifying Mark II to fully meet the requirements of the International Ballast Water Convention, and previous system orders placed by Bohai Shipbuilding Heavy Industry (China) and SPP Shipyard (Korea) for two suezmax and four bulk vessels.

Scheduled for completion in June 2013, the contract is valued at US$3 million and represents OceanSaver's first VLCC system delivery for its new Mark II technology. The delivery covers the supply and installation of two sets of Mark II BWT units, granting ballast water flows at a rate of 6000m^3/hour.

www.oceansaver.no

CAD/CAM

Dassault Systèmes opens new horizons

Dassault Systèmes has announced the pursuit of a new strategy based on a 3D Experience platform that will change the way industry leaders and marketers create value for their end consumers. The 3D Experience platform transforms the way "innovators will innovate with consumers" by connecting designers, engineers, marketing managers and even consumers, in a new 'social enterprise'.

"We have evolved the V6 platform with our customers over the last few years. The addition of intelligent information search-based technologies, social innovation capabilities and realistic 3D virtual experiences made us ready to pioneer a new technological wave: a 3D Experience platform to serve the social enterprise of the 21st century," said Bernard Charlès, president and CEO, Dassault Systèmes.

3D Experience enables any enterprise stakeholder to participate in the innovation process and to drive value for the end consumer. Monica Menghini, executive vice president, industry, marketing and corporate communications, said: "Our objective is to provide our clients with a powerful platform, which uses the universal language of 3D and the Web as the user interface, to help them to connect the dots for a game-changing increase in end-user value."

www.3ds.com

Ancillary equipment

Elcometer detects more

Elcometer has announced its Elcometer 280 Pulsed DC Holiday Detector. Using state-of-the-art electronics to safely generate the required high voltage DC pulses, the Elcometer 280 detects holidays in coatings without the need to ground the gauge to the substrate – ideal for pipeline, and large surface, porosity inspection.

The detector is fully charged in four hours and weighs 3kg (6.6lb), the Elcometer 280 can provide up to 30 hours of continuous use. It is also shockproof, water resistant and safe: with its two-stage safety switch, LED's, screen icons and buzzer signifying when the high voltage is on, and extended ribbing to protect the user from spark creep. Users can either set the test voltage manually or can let the internal voltage calculator automatically set the gauge to the correct voltage required for their coating thickness value.

The Elecometer 280 detector.

The detector is supplied complete with rechargeable battery packs (and charger), 5m trailing earth lead, rolling spring holder and 250mm extension rod propriate probe electrode from the comprehensive range of accessories to suit application. The Elcometer 280 Holiday Detector Inspection Kit is supplied in a rugged, lightweight wheeled transit case, designed to hold up to 6m of stainless steel or up to 20m of phosphor bronze rolling spring.

www.elecometer.com

Ancillary equipment

Holmatro introduces CylinderFinder

CylinderFinder, is the latest cylinder selection wizard from Raamsdonksveer-based hydraulic specialist Holmatro that helps customers make the right choice when choosing to purchase from its range of hydraulic cylinders.

The web-based CylinderFinder supports Holmatro customers at an early stage of the purchasing process, when they are seeking the appropriate cylinder for a specific application. Various filters, relating to issues such as tonnage and the stroke length of the cylinders, gradually reduce the selection. This selection can also be further refined by choosing the type of cylinder, the return form and the material of which it is made. The wizard then provides a summary of the appropriate cylinders on the basis of the specifications entered.

The CylinderFinder can be consulted via Holmatro's website and is currently available in five languages. Holmatro dealers can also integrate the wizard into their own sites.

www.holmatro.com

Bridge & communications

Kongsberg's Polaris bridge simulator gets approval

Kongsberg Maritime's Polaris Bridge Simulator has received DNV approval for the product category Bridge Operation Simulator, which includes notifications for training on integrated bridge systems including integrated navigation systems.

The approval, which was awarded 18 January 2012 is according to the revised standards laid out by DNV – Standard for Certification of Maritime Simulators No. 2.14 January 2011, which is based on the requirements of STCW Convention, Regulation I/12 and includes the new 2010 amended convention that came into force from 1 January 2012.

The new certification ensures that the Polaris Bridge Simulator meets or exceeds the highest standards set out by DNV with regards to simulator training and follows a round of certification for the Kongsberg Neptune Engine Room Simulator, which was approved to the latest DNV standards in December 2011.

The Kongsberg Maritime Polaris Bridge Simulator enables flexible training in ship handling, manoeuvring and navigation, based on cutting-edge visuals and realistic hydrodynamic modelling. Polaris may be delivered as a full-mission, 360degs, motion platform-based integrated simulator, a part task simulator (ECDIS, radar etc), a PC-based desktop simulator or as any combination of these.

www.kongsberg.com

A full-mission Polaris simulator.

Fat is a maritime issue

Shocked by the catastrophe that befell *Costa Concordia* the maritime industry must now take stock and look again at some of its safety regulations and ask: "Are the expectations in these rules realistic?" Says Francis Chan, who is currently serving as a senior officer on a modern cruise vessel.

Who says size does not matter? Passenger ships are getting bigger every day. This means more decks, restaurants, bars and facilities. It also means more places for large amounts of people to congregate which may be a long way away from the designated muster stations and the lifeboats' embarkation deck. While safety experts insist in an emergency, the evacuation procedures of a 360m long vessel such as the *Allure of the Seas* with its capacity to carry 8500 souls is no different to a ship carrying one hundred persons, the recent capsize of *Costa Concordia* clearly shows otherwise.

Do the safety precautions on cruise vessels create their own safety issues?

SOLAS Regulation 21, 1.3 states: "All survival craft required to provide for abandonment by the total number of persons on board shall be capable of being launched with their full complement of persons and equipment within a period of 30 minutes from the time the abandon ship signal is given after all persons have been assembled, with lifejackets donned." While the Life-Saving Appliances (LSA) Code 4.4.3.1 states: "Every passenger ship lifeboat shall be so arranged that it can be boarded by its full complement of persons in not more than 10 min from the time the instruction to board is given."

An ambitious notion, since it is not just the dimensions of the vessels that are increasing; the size of the average passenger is too. Obesity is a problem affecting many western societies; it is from these very countries that the majority of passengers hail. Cruise vessels with a length of 289m typically utilise lifeboats having "a bums on seat" space of 150. This in essence gives four seconds for each person to enter the lifeboat, be directed to a seat and sit in an orderly fashion. While SOLAS takes into account the logistics of evacuating a ship, it does not factor in the human element.

Having witnessed crew drills where the "fill to capacity" lifeboat exercise is conducted, understandably, while alongside, in daylight, without any adverse weather conditions using a disciplined crew, of average weight, without any disabilities, thanks to the requirement of having to pass the ENG1 or an equivalent Medical, the exercise still invariably manages to exceed the allocated time.

Having to sit next to each other, literally cheek-to-cheek, in an enclosed space is an uncomfortable one. To try and hope for the same results, under emergency conditions, when the ship may be listing, blacked out or affected by adverse weather conditions is idealistic. Filling a lifeboat in such circumstances in an orderly manner, with the 150 assigned people, some of whom may be disabled, obese, panicked or looking for loved ones are all scenarios that are not being taken into account.

Also, if filling a lifeboat to capacity during an exercise with a trained crew can take more than 30 minutes, surely a ship the size of the *Allure of the Seas* with its catamaran style lifeboats that can carry up to 370 people on two levels cannot hope to abandon ship in the SOLAS-stipulated 30 minutes of time. Royal Caribbean asserts the Schat-Harding made lifeboats for their Oasis class vessels, which are 16.7m in length, can be loaded both fore and aft. Furthermore, since passengers can board them from its fixed positions, it makes for a speedy evacuation.

Bearing in mind that survival craft are designed to comply with the requirement of being able to be launched under all conditions of trim of up to 10 degrees and a list of up to 20 degrees, it means, each person has a mere 1.62 seconds under the most trying conditions to get into the boats and sit. Exceeding any of these parameters makes the outcome unknown.

You don't have to be a soothsayer to know the sea is a perilous place. Cruise ships may give the illusion of being floating hotels, but they are like any other vessel at sea, vulnerable to the elements, human error and behaviour. Making them bigger in size with bigger lifeboats while not taking into account the human element of mass hysteria in a crisis is I believe, a great folly.

Many captains of cruise vessels have expressed the opinion that the *Costa Concordia* accident was one that was waiting to happen. They have serious reservations whether they would be able to evacuate a ship in an emergency in the given time.

It might be too late to mandate changes in the life-saving appliances for passenger ships already in service, but perhaps it is high time for SOLAS to be reviewed for the newbuilds of the future. *NA*

把脉经济金融走势 权威解读行业政策
船舶经济贸易
SHIP ECONOMY & TRADE

Inland Navigation in a clean energy era

A representative of the International Shipping Federation said at a recent conference (in China) that the country "stands at the forefront in using natural gas as a bunker fuel." The application of LNG in the country's inland water transport has raised awareness of alternative fuels, but what is the current situation, asks Liu Ying of China Ship News?

The economic and environmental advantages of LNG as a bunker fuel are obvious. It is understood that for hybrid vessels that use both LNG and diesel, the diesel replacement by natural gas can reach around 70%, bringing economic and environmental benefits. According to statistics, dual-fuel engines' sulphur oxide and particulate emissions are 70% lower, nitrogen oxide emissions are 35-40% lower, and CO_2 emissions are 20-28% lower. Additionally, LNG has a strong price advantage when compared to diesel. In China, the price of diesel exceeded Rmb8000/tonne (US$1270/tonne) (at the time when this article was written), while natural gas cost about Rmb5000/tonne (US$794/tonne). Using LNG can reduce bunker costs by 25% based on market prices (when this article was written).

A Yangtze vessel fitted with LNG fuel containers.

On the technical side, natural gas is more suitable for ships (compared to diesel). Its advantages include a higher compression ratio – the compression ratio of LNG is as high as 625, allowing a larger storage volume in a single unit. Also, natural gas is easy to store – gas can be stored in containers for 30 days under normal temperature, based on experiences from usage on land. On top of that, the engines of existing inland river vessels can combust natural gas with suitable conversion, such as installing ECU (Electronic Control Unit). More importantly, it is safe to use natural gas. LNG, as a cryogenic fluid, vaporises quickly once there is a leakage. It is less dense than air, therefore, it will move upwards without polluting the water table. The flashpoint for LNG is higher than that of diesel, and LNG is easy to diffuse, therefore, it does not explode easily.

The use of gas has become more popular in river transport in China in recent years because of the advantages mentioned above. A number of dual-fuel vessel conversion projects have been completed, bringing social and economic benefits as well as experiences. In August 2010, China achieved a major technical breakthrough in diesel-to-LNG ship conversion as the trial launch of its first dual-fuel vessel *No.302 ferry* was carried out. The trial launch of another hybrid LNG-diesel vessel *SUSUHUO 1260* was also held successfully in the SuBei part of the Grand Canal (Jing Hang Canal) at around the same time. *SUSUHUO 1260* has started operations since then. In March 2011, China Changjiang National Shipping (Group) Corporation's *ChangXun No.3* was converted into the first bulk carrier with a dual-fuel propeller system running on the Yangtze River.

According to the experts from the China Classification Society (CCS), the conversion of *No.302 ferry* and *ChangXun No.3* include the installation of the LNG supply system which comprises of a LNG gas-tank, vaporiser, pipe system and valve fittings. *No.302 ferry* was installed with four 0.5m^3 LNG tanks, while *ChangXun No.3* was equipped with two 3m^3 LNG tanks. The vessels' engines have also been retrofitted: a gas fuel system was added into the inlet gas pipe of the engines; safety valves were added to the engines inlet and outlet gas pipe and crank shaft case; the gas storage tank and living area were retrofitted in order to satisfy fire structural requirements; inflammable gas detectors were installed in the engine room; mechanical ventilation of the engine room was upgraded by increasing its ventilation rate in order to satisfy the ventilation requirement; a water mist system and dry powder fire suppression system were added etc. The trial launches of the vessels have shown that existing river vessels can be converted to use natural gas to achieve better results in energy saving and emission reduction.

Multi-party cooperation sends LNG onboard

LNG vessel conversion projects in

China are mainly co-operations between various parties, including local maritime departments, natural gas suppliers and equipment suppliers etc. For example, the conversion of *SUSUHUO 1260* was led by Jiansu Province's Su Qian Maritime Safety Administration and funded by Beijing Oil Land Group. A total of eight parties were involved in that project. The conversion of *ChangXun No.3* was driven by China Changjiang National Shipping (Group) Corporation, Everthriving Investment Group and Fortune Oil Plc. The *No.302 ferry* conversion was a joint project between Xilan Natural Gas Group and Wuhan Ferry Company. Moreover, China National Petroleum Corporation's Kunlun Energy was also involved in the conversion of a 5000tonne diesel-LNG hybrid ship, while Wuhu Maritime Safety Administration and PetroChina Jiarun Natural Gas Co Ltd have joined hands to take part in the LNG vessel conversion projects of the Maritime Safety Administration of the Ministry of Transport. This multi-party cooperation model, especially with the keen participation and investment from LNG suppliers, is a strong driver behind the promotion of the use of LNG in river transport.

The support of a classification society is crucial to the "boarding" of LNG. CCS has actively participated in the above mentioned conversion projects. The CCS has initiated an "enhanced safety" tank concept, outlined the relevant technical standards and provided the solutions for the use of LNG on smaller river vessels.

The CCS has issued the Dual-fuel Engine Design and Installation Safety Guidelines (2007), Guidelines for the survey of Gas Fuelled engine Installations in ships (2008), and Dual-fuel Vessel Surveyor Notice (2011) based on the IMO's draft of International Code on Safety for Gas Fuelled Ships (IGF Code), Interim Guidelines on Safety for Natural Gas Fuelled Engine Installations in Ships, Code on Safety for Ships Using Gas or other Low-flashpoint Fuels with Properties Similar to Liquefied Natural Gas, IACS' UR M59 Control and Safety Systems for Dual Fuel Diesel Engines and the technical requirements on dual-fuel engines of other classification societies etc.

In 2011, the CCS issued a new set of guidelines – Guidelines for the survey of Gas Fuelled engine Installations - which sets standards for the scope of use, materials, setting, gas pipe design, system installation, gas fuel tank, distribution and refilling of gas, ventilation, fire control, electrical equipment, controlling, monitoring, and safety systems of using natural gas. The issuance of the new guidelines provides a hopeful solution to the standardization issues of hybrid diesel-LNG vessels, setting the foundation of further promotion of using LNG on ships.

There is a bright future for LNG in river transport. Inland water vessels in China are mostly fuelled by diesel which is less efficient, leads to higher emissions and more pollutants while incurring higher costs. As the rich and densely populated coastal regions and areas along the river keep raising their standards for environmental protection, promoting the use of LNG in river transport matches the country's strategy to speed up the development of a smooth, efficient, safe and green inland transport system. Therefore, LNG has a bright future as a bunker fuel in China's river transport.

Successful diesel-to-LNG conversion projects have shown that China possesses the basic technical know-how of ship conversion and LNG tank production. The next question is whether the supply of natural gas – deemed by the international marine industry as a bottleneck issue of LNG application – will affect the promotion of the use of LNG in inland water transport in the country.

First of all, the supply of natural gas in China is relatively stable. Apart from the imports from Australia, Indonesia, Qatar and Iran, China's own LNG production and storage volumes have increased significantly in recent years. In the coastal regions, the nation has also started to build LNG terminals in Shanghai's Yangshan, Fujian's Putian and Shenzhen's Dapeng. LNG terminals will be set up in Hebei's Tangshan, Liaoning's Dalian, Shandong's Qingdao, Jiangsu's Rudong and Zhejiang's Ningbo by 2015; and in Jiangsu's Lianyungang as well as Shantou and Zhuhai in Guangdong by 2020, according to the official timetable.

Other potential LNG terminal locations include Liaoning's Jinxi, Tianjin's Tanggu, Shandong's Rizhao, Jiangsu's Nantong, Zhejiang's Wenzhou, Guangxi's Fangcheng, Hainan and Macau. It shows that China is well prepared for using LNG in its river transport system. Moreover, the CCS has kick-started relevant programmes and drafted industry standards to speed up the replacement of low-efficient coastal and river vessels. All these have laid a solid foundation for the promotion of using natural gas in river transport in China.

Secondly, gas station and gas supply vessels are two feasible solutions for LNG refuelling. PetroChina has already started building LNG stations. There are also other companies planning to set up large-scale LNG storage bases at ports and cities along the Yangtze River in order to build a LNG supply network that includes storage and refuelling facilities. Wuhan Jiaofa Ship Design Co Ltd has come up with designs of LNG fuelling barges that suit China's waterways. The construction of these barges will commence soon. The barges are movable small-scale storage ships that can transfer LNG to vessels through pipes directly.

The CCS is studying and developing the technical requirements for LNG fuelling barges in order to match the needs of hybrid diesel-LNG vessels. The class society is also working with fuel suppliers and shipping companies to research fuelling solutions for vessels running on the Yangtze River and the technical and safety standards for parties involved in the supply chain.

In early 2011, the CCS together with PetroChina kicked off the "Gasifying Yangtze" programme. Under the programme, the two parties will carry out real ship experiments on LNG technologies based on the experience from *No. 302 ferry* and *ChangXun No.3* and the principles of standardised and sustainable operations. The programme aims to encourage the use of LNG in river transport.

According to the "Overall implementation plan of lower energy consumption and emissions for water transport" during the 12th Five-year Plan period (2011-2015) issued by the Ministry of Transport, application pilots of new technology of lower energy consumption and emissions will increase gradually over 2011-2015, with inland waterway diesel and LNG hybrid ship technology as one of the five pilot technologies. With all these favourable factors, the use of LNG in river transport has promising prospects and will hopefully help China achieve its goal of green water transport. *NA*

Flood prediction research finalised

The EU-funded research project FLOODSTAND, the Integrated Flooding Control and Standard for Stability and Crisis Management, was finalised in February, after three years of research work, writes Henrik Segercrantz.

The €4 million (US$5.2 million) FLOODSTAND project, part of the European Commission's (EC) 7th Framework Programme, focused on cruise ships and ro-ro-passenger vessels. The ambitious project had two main objectives: to increase the reliability of flooding simulation tools in design and onboard use by establishing modelling principles and uncertainty bounds[1]. And to establish a method for instantaneous classification of the severity of ship flooding casualty, with the following key objectives:

Two cruise ship designs were of different sizes, which were also designed according to SOLAS 2009 by STX Finland and Meyer Werft, were developed and used for the damage calculations, simulations and tests. The ro-ro-passenger vessel design used was that of *Estonia*. The effect on the progress of flooding of 'non watertight' doors and other constructions were studied. The results are used in flooding simulations, which are used for establishing reliable damage stability calculations, and also to assess the stability and flooding extent onboard a damaged ship for decision support. The work included, for example, assessment of the real flow through the air ventilation pipes from tanks, and tests and computational analysis to assess the water flow through cross-flooding ducts and through refrigeration areas. The doors and structures were tested in full scale by CTO in Poland. Model tests were done by Aalto University in Finland, SSPA in Sweden, and by MARIN in The Netherlands (where tests can be made under vacuum, to provide a correct Froude scale effect).

Brief results[2]

This work resulted in more precise input data for analysing water progression and the time it takes. Rough guidelines for modelling leakage and collapse of various A- and B-class doors, etc, for flooding simulations could be developed. Some improvements in the design of the watertight subdivision of cruise ships can now be made to enhance safety. Although, not providing any dramatic results with a significant influence on the global design of cruise ships, it showed that the explanatory notes of IMO's SOLAS could be improved. It was, for example found that the locking devices in some cases were the first to break, and that A-class fire doors collapse at a water column of some 2.5m, a very likely scenario under the bulkhead deck. Based on this, designers can more freely place these fire boundaries in, for example, the engine room reducing the risk of fire propagation without affecting the subdivision index negatively. On the other hand, it was concluded that adding fire doors in the service corridor above the bulkhead deck is advantageous. It was found that the regression equation on flooding progression through cross-ducts as currently recommended in IMO's Resolution MSC.245(83) gives about +30% higher values for the discharge coefficient, which may cause a significant under-estimation of the factual cross-flooding time.

The flooding phenomena can now be better modelled in the calculations carried out by the designers. The guidelines arrived at by the FLOODSTAND project have been made available to IMO to improve the SOLAS convention and its explanatory notes.

The second aim of FLOODSTAND was to develop a standard for decision making on abandonment during flooding crises situations and a standard approach for a comprehensive measure of damaged ship stability addressing the flooding risk. The project management described: "the key issue is the availability and reliability of the information needed for making a reasonable decision. A decision criterion, or a decision process must be able to robustly accommodate these problems and inherent uncertainties."

Much work was directed at looking into the time it takes for a ship to capsize or sink after damage through analytical and numerical methods, as well as through flooding model tests. Extensive tests with the studied damaged ro-ro-passenger vessel clearly showed that in many feasible flooding situations the time from damage to capsize is only several minutes, precluding an orderly evacuation.

FLOODSTAND provided important data relating to SOLAS regulation II-1/22.4

Full scale testing of the rigidity of fire doors in case of flooding was conducted by CTO in Gdansk, Poland. (Photo: CTO)

By using closed fire doors in the service corridor above the bulkhead deck flooding prevention is improved when the water coloumn is less than 2.5m.

addressing provisions to allow certain watertight doors to remain open during navigation, indicating a potential dramatic impact on ship survivability that a single door left open can have. A seven weeks field test onboard a cruise ship where the focus was directed at keeping watertight doors closed had resulted in a 45% reduction in median vulnerability of the vessel. The ship designers concluded that watertight doors must be kept closed at sea, and that the design of the ships must allow them to be kept closed.

A number of real ship accidents resulting in sinking or grounding were analysed in detail, through questionaires and also interviews of Masters and SAR-personnel. Work was also done on the modelling of the rescue process, looking at safety risks related to mustering, abandonment, and the rescue process with lifeboats and conventional rafts. Rafts with chutes were not part of this investigation.

An interesting conclusion arrived at through the simulations was that you cannot help determine the outcome of a flooding only based on the heel of the vessel, at any point after it has been damaged. The capsizing can take place, even quite a long time after an accident,

Aims of the FLOODSTAND project were:

1) establish new experimental and computational data and guidelines for modeling leakage through closed doors and the critical pressure head for collapsing under the pressure of floodwater,
2) simplified modelling of pressure losses (discharge coefficients) in flows through typical openings.
3) feasible and realistic modelling of compartments with complex layout, such as cabin areas, for flooding simulation tools
4) the use of flooding monitoring systems and time domain simulation for assessing the damage and flooding extent onboard the damaged ship.
5) stochastic ship response modeling: establish requirements and uncertainty bounds for methods for prediction of the time it takes a ship to capsize or sink after damage.
6) rescue process modellling: establish requirements and uncertainty bounds for models of mustering, abandonment and rescue operations.
7) standard for decision making in crises: (short:) establish a loss function for the integrated standard. The function will reflect the above requirements on the methods to be used for generating basis information on stability, evacuation and rescue process as well as the associated uncertainty,
8) demonstration: develop implementation system and test effectiveness of the standard in rating different decisions for various casualty cases as well as test the approach in design environment.

very rapidly over a very short timeframe. This was an important finding helping also in the studies aiming at establishing recommendations to support decision-making for the captain, a project headed by the University of Strathclyde (SSRC). Based on the extensive analysis of uncertainties, in particular relating to the assessment of the extent of flooding, the order of actions proposed was that mustering should always commence immediately after the first signs of distress, after which the decision to stay onboard should be taken only if the extent of flooding is known exactly (and the proposed simple risk criterion permits). Otherwise the vessel should be abandoned. The main logic behind this proposal was to provide as much time as possible for an orderly evacuation. The order of actions proposed obviously raised much discussion. One observation was that when a call for mustering is made, this may in practise be interpreted as 'abandon ship', hence very careful consideration should be taken.

The limited time span for an orderly evacuation was also evident from the findings of FLOODSTAND on crisis management and flooding control in real cases, with work headed by the National Technical University of Athens. The ro-ro-passenger vessel, as well as the modern cruise ship designs, were used for this purpose. The earlier EU-project 'HARDER' provided the collision statistics for the damage cases. Enhanced sub-division requirements and faster abandonment operations were proposed to achieve an orderly evacuation, as well as the need for including groundings in the studies.

The project was co-ordinated by Risto Jalonen, Lic.Sc. (Tech.) of the Aalto University in Espoo, Finland.

GOALDS project underway

The EU-funded FP7 project GOALD is another related project looking at damage issues of ships. GOALDS, Goal Based Damage Stability Objectives and Overview of Results, aims at responding to the concerns of the adopted formulations of the probabilistic damage stability regulations, SOLAS 2009, for the calculation of the survival probability of passenger ships, particularly for ro-pax vessels and large cruise vessels. The goal has been set to formulating a rational regulatory framework properly accounting for the damage stability properties of passenger ships, achieved through dedicated research studies. The project, which has 18 participants, many the same as in FLOODSTAND, is to be finalised this autumn.

Thoughts on *Costa Concordia*

In the aftermath of the *Costa Concordia* disaster, the Cruise Lines International Association (CLIA) supported by the European Cruise Council, and the Passenger Ship Association in the UK recently announced a policy that all their cruise ships will now conduct the emergency muster drill for passengers before they put out to sea. Earlier, ships were allowed to do this within 24 hours of departure. This expected decision reflects the requirement by the general public to swiftly address the disaster with some actions. It though still needs to be announced which changes in daily routines, both onboard and onshore, will result from the actions promised to be initiated by the big cruise operators. Before this takes place the passengers cannot, and should not, feel confident that their safety is assured. You still do not have to wear your life jacket during the emergency muster drill, at least on some of the bigger vessels. This should be changed, preferrably before public pressure.

At least one cruise ship operator, Star Cruises, applies a routine to report on any potential 'near accident', in order to foster an open attitude both onboard and ashore. Star also arranges a compulsory debriefing with each individual officer after every working period of eight weeks.

Research studies like FLOODSTAND could benefit from having a completely neutral body, with no relationship to shipping, on their Advisory Board, to address potential matters not necessarily seen by those which are too near the industry. Legal and financial consequences shall never prevent complete investigations of 'what actually took place' in any shipping accident. Also this implements neutral members in the accident investigating authority bodies. There is also an evident need for more 'experts' (psychologists) in the research projects, and, as it seems, in the operations departments of the shipping companies. With just 'technology experts' and 'operators' involved, the human element is not covered to a sufficient extent, as proven also by the *Costa Concordia* disaster.

Footnotes

1. As addressed in the IMO reports SLF47/INF.6 on Survivability investigation of large passenger ships.
2. Details of the project results are presented at http: //floodstand.aalto.fi/. *NA*

The Royal Institution of Naval Architects

Ice Class Vessels

4- 5 July 2012, London, UK

Second Notice

Pictures courtesy of:
Aker Arctic Technology Inc.

Recent years have seen a large increase in the number of vessels operating in polar and low temperature environments. This includes a broad range of vessel type; tankers, bulkcarries, LNG, container ships, multi-purpose ships, cruise ships and offshore support vessels. Compliance with just the basic ice class rules and regulations may not be sufficient for safe and effective ship operation in these environments.

There are vast oil and gas resources around Siberia in the Barents and Kara sea as well as in the Alaskan Chukchi Sea. The receding ice in the Northern Sea Route and North West Passage offers new marine transportation options between the two major oceans and Europe, North America and Asia.

Vessels of any kind operating in ice-infested waters and low temperatures are exposed to a number of unique demands. Operation in first- and multi-year ice adds uncommon loads and forces to hull, propulsion system and appendages and calls for suitable built. Extremely low temperatures, bad weather and low visibility affect the ship and the crew in a multitude of ways, including materials, machinery, operational process and human factors.

RINA invites classifications societies, shipyards, operators, surveyors and designers and those with an interest in the full of possibilities operation in ice, to submit papers on:

- ICE / Polar Classification
- Structural design and equipment selection
- Materials, welding and coatings
- Propulsion and machinery systems
- Cargo & ship systems adaptation
- Ice accretion and de-icing arrangements
- Winterization
- Safety & environmental systems consideration
- Crew consideration / human factors
- Rescue and evacuation in remote and extreme conditions
- New Arctic shipping routes

☐ 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: **(ICE2012)**

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

Herculean effort to raise emission standards

Finnish and Danish engine manufacturers Wärtsilä and MAN have joined forces in a long term project that should reduce emissions from marine diesels substantially. The HERCULEAN series of projects will end with HERCULES C, which began in January and aims to bring the project to a successful conclusion.

In 2002 the European engine manufacturers MAN and Wärtsilä decided to enter into a joint project that would look at substantially reducing emissions from marine diesels. Part funded by the EC and Swiss Government the Hercules series of projects was born.

Hercules itself is an acronym that stands for High-efficiency Engine R&D on Combustion with Ultra-low Emissions for Ships. In 2004 some 42 partners from industry and academia joined with the engine manufacturers to look for what they called "breakthrough" technology.

That technology is nearing fruition with the commencement of HERCULES C in January this year. Following the successful conclusion to HERCULES A and B, HERCULES C is now working towards three major objectives of achieving substantial reductions in fuel consumption, reducing emissions to "near zero" and maintaining the technical performance of an engine throughout its operational life.

HERCULES C partners, led by the co-ordinator Nikolaos Kyrtatos, aim to achieve the first target through developments in fuel injection and combustion and through the ship energy management systems. The second objective will be achieved through the further development and integration of technologies developed in previous HERCULES projects, including Exhaust Gas Recirculation (EGR) and Selective Catalytic Reduction (SCR) technology. And the third objective will be achieved through the introduction of advanced materials, measuring and sensor equipment and through the improved "controllability and availability of marine power plants," say the partners.

Hercules project coordinator Nikolaos P. Kyrtatos professor and director of the Laboratory of Marine Engineering at the School of Naval Architecture and Marine Engineering of the National Technical University of Athens, Greece.

HERCULES B results:

1. NOx (Measures are non-additive)
   - 50% reduction with Exhaust Gas Recirculation (EGR)
   - 90% reduction with gas after treatment via SCR – Selective Catalytic Reduction

2. CO_2 / fuel consumption (Measures are additive)
   - 10% with Waste Heat Recovery
   - 1% with Advanced Control
   - 0.5% with reduced engine friction
   - 3% with ship-engine overall optimisation during voyage

3. In addition to the above results already achieved, the developments in Extreme parameter engines and turbo-charging, will lead to an additional 2% reduction in CO_2 / fuel consumption in future (2020) engines with higher operating parameters.

Improvements to engine technology were brought about through the developments achieved in the previous HERCULES phases. HERCULES A had a total funding of €33 million (US$43.8 million) and it identified the

	Objective	Year 2015
#1	Reduction of fuel consumption (from BAT 2010)	-3%
#2	Reduction of emissions (from BAT 2010)	-80%
#3	Retaining performance over engine lifetime (20 years) - Divergence	<5%

Table 1: HERCULES C Objectives

technologies that would "push the limits of marine engine expertise. The focus of the project was on the development of a future generation of optimally efficient, clean and reliable marine power plants".

In the main the HERCULES A partners learned about how a diesel engine operates under extreme conditions with advanced research engines capable of coping with severe mechanical and thermal loads.

In addition three-dimensional CFD (computer fluid dynamics) simulation tools were applied to engine combustion for optimising the combustion systems, involving the development of new models as well as the extension and adaptation of existing sub-models.

"A particular achievement was the development, manufacture, installation and testing of a novel test rig for the fundamental investigation of fuel sprays, combustion and emissions formation in large-bore two- and four-stroke engine cylinders. This spray/combustion chamber has an internal diameter of 500mm and can operate at maximum pressures up to 200 bar," said the final report.

Furthermore, there were advances in turbo-charging systems and emissions reduction methods using water inside engine cylinders to reduce NOx emissions. And a complete EGR system for two-stroke engines was developed that included a newly designed exhaust gas scrubber. As a result of these tests the Hercules partners confirmed that it would be possible to reduce NOx emissions by up to 70%.

Other developments included an "intelligent engine" that monitored engine performance and adapts the engine performance under all conditions.

HERCULES B focused the results of the technologies identified in the first phase of the project and sought to find practical solutions that would improve engine performance. Specifically Hercules-B looked at extreme parameter engines, combustion, turbo-charging, emission reduction methods, power optimisation, advanced materials and electronics and control.

Due to conclude in 2015 the HERCULES C project is perhaps the most ambitious of all the Herculean efforts, but the benefits, to both the marine industry and society at large, are there for all to see.

To achieve the above objectives, the scope of the project includes all the technology interrelations needed for a holistic approach to marine engine efficiency improvement and emissions reduction. The integrated RTD work will allow the above objectives to be achieved simultaneously.

However, the project has already achieved many of its targets say the partners."The HERCULES programme has been successful in several ways: When completed the 10 years (2004-2014) of its duration, it will have mobilised 70 top organisations to work in 152 subprojects, spanning the whole spectrum of marine diesel engine research and development. It has allowed market competitors to work side-by-side and to jointly define cutting-edge research targets. The research results to date, show that the respective targets have been met or even surpassed," claims professor Kyrtatos. *NA*

HERCULES project aims

The scope of the Project includes the technology interrelations needed for a holistic approach to marine engine efficiency improvement, emissions reduction and reliability increase. Specifically, work will be performed in the following areas:

- **Multi-fuel switching and direct gas injection technologies**
- **Partially premixed combustion**
- **Low temperature, cool combustion with extreme Miller valve timing plus Exhaust Gas Recirculation**
- **Visualisation methods for flow inside fuel injection nozzles**
- **Laser optic methods for fuel spray field investigation inside full scale working engine**
- **Combustion analysis and modelling tools validated through full scale experiments**
- **Sequential After treatment Units including SCR and Scrubber**
- **Advanced multistage sequential turbo-charging schemes**
- **Combination of Exhaust Gas Recirculation and Water-in-Fuel Techniques**
- **Engine Thermal Process adaptation with adaptive control for extreme operating conditions**
- **Overall engine adaptive control combining individual cylinder controls**
- **Operating behaviour evaluation algorithms and model based diagnostic methods**
- **Vessel powerplant monitoring and asset management.**
- **Emission optimised lubrication**
- **Methods of friction reduction in bearings, piston rings, skirts**

Total defend universal lubricant

A debate over whether an universal lubricant can be an effective replacement for a range of lubricants with differing BN numbers in marine diesels intensifies as Total launches a defence of its "technological breakthrough", Talusia Universal.

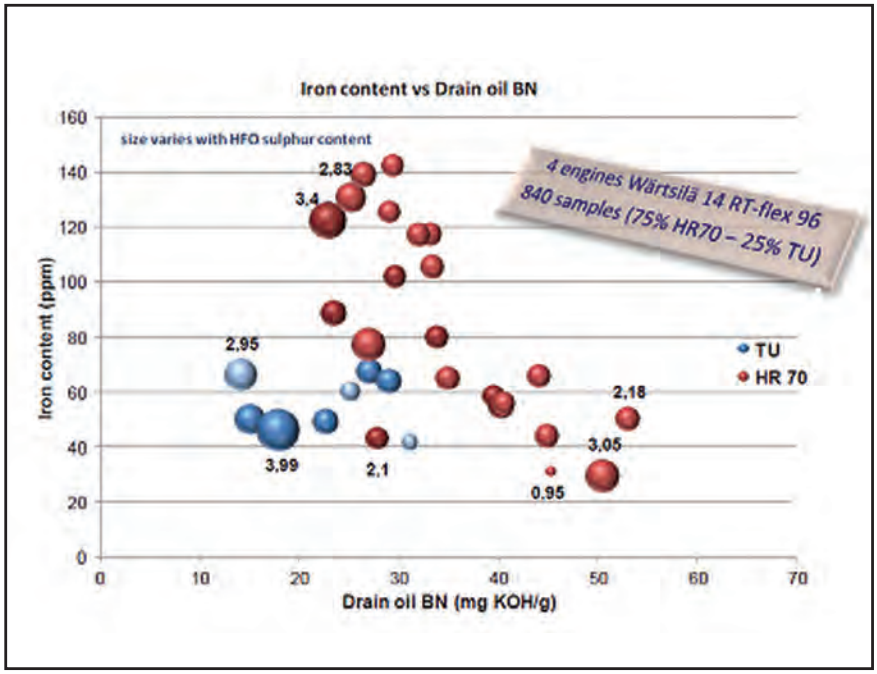
Following Castrol's broadside against universal lubricants, of which there is only one on the market so far, Total's Talusia Universal (TU), Total has released test results that it claims shows the lubricant can out-perform oil with high BN numbers after TU has already shown that it can replace low BN oils.

Castrol believes that universal lubricants will damage marine diesel engines as the build up of iron is compounded with a failure to adequately deal with the calcification that takes place in the cylinder during operations. Higher BN oils target and neutralise harmful chemicals protecting the engine from excessive wear. Castrol says that a universal lubricant cannot perform as efficiently as an oil produced to specifically target the acidic compounds that can be deposited on cylinder walls.

Total contests this view and claims that "new technology" contained in its TU lubricant can be as efficient or more efficient as existing lubricants. In defence of its product the company has released test results, performed on four Wärtsilä marine diesel engines, that Total says shows TU outperforms high BN lubricants in most cases.

Serge Dal Farra, in Total Lubmarine's marketing department, told *The Naval Architect* that TU "is already in use on over 3000 ships and is operating without problems." Before Total marketed TU, however, the company tested the product to ensure that it could perform to the highest standards, says Dal Farra.

Total customers using lubricants with low BN numbers have already replaced these oils with TU, but customers using the higher BN numbers are still able to use conventional oil in their marine diesel. TU offers these clients a choice to convert to a single lubricant if they will be using fuel with a range of sulphur content. This simplifies the storage and lubrication process on board a ship, says Dal Farra.



Total released these test results which it says show that its universal lubricant is as efficient as conventional oil.

The table above "illustrates how the TU behaves versus conventional BN 70 (our HR 70) at all operating conditions, including of course slow-steaming and various sulphur content-according navigation areas," says Dal Farra.

Some 840 samples of drain oil were taken and the graph illustrates the iron content on the vertical axis, in parts per million, while the horizontal axis shows the effective neutralisation of acidic compounds using potassium hydroxide (KOH) and the efficiency that the two lubricants display in neutralising acidic compounds in the cylinder.

This document illustrates how the Talusia Universal behaves versus conventional BN 70 (our HR 70) at all operating conditions, including of course slow-steaming and various sulphur content according navigation areas.

"As you will see, on an 840 samples-basis, the drain oil analysis shows that the TU basicity reserve is still available of about BN15 points (blue bubbles) after use, on the left part of the graph, this means that safety is not at all a 'border-line' issue. Furthermore, the wear level is equivalent (but actually very low) or even less with TU compared to a conventional BN 70, while the performance and anti-wear capability is superior," says Dal Farra.

In addition Total says that because TU is a BN57 lubricant rather than a BN70 oil the control of deposits for low sulphur fuels is considerably better.

"Of course we must remind the industry that we also offer the simplicity of a single BN solution for all fuel types to ship operators removing any complicating factors in operations," Dal Farra claims. *NA*

More haste, less speed

To the chagrin of marine engine manufacturers, it appears ships' engineers are reluctant to embrace the common rail system with the same grade of enthusiasm as those of the makers of these engines.

Engineers claim that while the common rail system works well in 4x4 vehicles, in marine applications the maintenance of common rail engines is labour intensive and parts are hugely expensive. So what is it about the common rail system that is proving to be more complex than expected?

Regulations on nitrogen oxides, sulphur oxides and smoke have tightened both regionally and internationally. Ships' engines need to have the ability to maintain fuel injection pressures sufficiently high at all engine loads and speeds especially in pollution sensitive areas such as SOx Emission Control Areas (SECAs), and the ever expanding list of US ports that have taken a leaf out of the books from the State of Alaska and are adopting stricter rules. In Alaska, smoke emissions for vessels calling at its ports have to be kept under 20% when alongside. In order to ensure ships comply fully with its regulations on smoke, the talents of visible emissions readers are utilised.

These individuals are trained and certified using a standardised national method known as the Ringleman's chart. The method requires readers to visually differentiate the opacity of the emissions using a set of examples. While some dispute this is not an exact science, since a critical part of the reading requires the sun to be behind the reader in order to reduce light scattering which makes the plume appear darker, heavy penalties can result if the state's smoke emissions regulations are exceeded.

Particulate generation in diesel engines is a complex process. It represents a broad mixture of partially burned and unburned hydrocarbons, sulphates, ash and soot. At high loads, ash and soot might contribute less than 20% to the particulates, but at low service loads, especially during rapid start-up manoeuvres and load changes, the intake air the engine needs for complete combustion is less, and the engine 'smokes' since there is not enough remaining combustion time to burn away the soot formed. Smoke also occurs, when more fuel is injected than can be burned in the available air in the cylinder.

Wärtsilä's medium speed 46CR engine.

Finnish manufacturer Wärtsilä advocates the employment of the common rail system which can maintain high injection pressures independently of engine load, thus ensuring good spray atomization even at very low loads. In mechanical fuel injection systems, the injection pressure is a function of engine speed and load, therefore, at low loads the pressure drops and the result is very large fuel droplets which remain as such until they contact the combustion space surfaces. Common rail fuel injection technology on the other hand, offers the option of maintaining a high injection pressure which means smaller droplets at all loads down to idling. The risk of over-injection of fuel is avoided by utilising a computer to monitor air temperature, pressure and rotational speed and using the resulting figures to calculate the amount of air trapped in the cylinder. Based on empirical maps, the computer then decides how much fuel can be injected. A further advantage of the common rail system is that injection timing can be varied during running of the engine to optimise engine performance, and provide further emissions control.

In Wärtsilä's 46CR engine, the common rail is built using one accumulator which feeds the injectors of two cylinders. The accumulators, mounted on the engine block, are connected to each other with small-bore pipes to eliminate pressure waves in the rail. By splitting up the fuel volumes in several accumulators the risk of pressure waves is avoided.

The flow to each fuel pump feeding an accumulator is controlled by a flow control valve driven by a double cam. The function of each accumulator is to take the fuel from the high pressure pump, store it under high pressure and distribute it to the injectors. The accumulator itself is an empty space. Flow fuses located at outlets from the accumulator to the injector, limit the quantity of fuel that can be transferred from the accumulator to the injector if the latter malfunctions.

The fuel injection valve is perhaps the most important part of the common rail injection system. It is designed to prevent fuel entering the combustion space when it should not. The main components are the nozzle seat, the shuttle valve, solenoid valve and the piston acting on the nozzle needle. The shuttle valve controls injections and de-pressurises the injector needle. In its closed position the valve isolates the injector passages and nozzle from the pressure source to ensure no pressure is applied to the nozzle seat between injections. Pressure is normally only applied to the piston at the start and end of injections, this promotes fuelling consistency. The automation system for the Wärtsilä CR engines controls the injection and rail pressure, which is incorporated within the standard engine alarm and monitoring system.

Rival manufacturer MAN Diesel & Turbo produces common rail engines as well. Daewoo Shipbuilding & Marine Engineering Co. Ltd. (DSME) of Korea, has recently ordered four common-rail 12V48/60CR Tier-II propulsion engines from the company to power a new RoPax ferry for Tunisian ship owner Compagnie Tunisienne de Navigation. The ferry will have a capacity of 3200 passengers and 1060 vehicles, and a top speed of 27.5knots. Delivery of the vessel is due in the first half of 2012.

The 48/60CR injection system uses the company's latest common-rail technology allowing independent setting of injection timing, duration and pressure for each cylinder allowing for the optimisation of fuel consumption, NOx and smoke emissions at any point on its operating profile, especially at part-load. Retarded injection timing delays the combustion-heat release, thus lowering combustion chamber temperature peaks and NOx emissions. The new piston design provides a higher compression ratio and faster temperature reduction after ignition and variable valve timing.

The injection system is totally integrated with the engine management system. The result, says the company, is extremely quick and accurate reaction times. The common rail system has been also designed for operation with heavy fuel oil (HFO) in accordance with specification DIN ISO 8217. The fuel oil system allows the engine to be started and stopped with HFO. This provides the advantage of allowing the ship's engines to use both high-grade fuel during periods alongside and when transiting coastal waters, while allowing for the switch back to heavy fuel oil when out of territorial waters.

The design of the MAN Diesel & Turbo common rail system includes safety features such as ensuring all high pressure lines, rails and high pressure connections are double wall insulated to ensure there is no danger of fuel spray through leaking or broken pipes. To protect against uncontrolled injections, flow limitation valves are placed at each cylinder to prevent unintended injection. Redundancy is provided both in high pressure pumps that guarantee engine operation in the event of pump malfunction as well as in the rail pressure and the speed/top dead centre sensor to ensure continued operation in the case of a sensor or pick up failure.

Despite the reservations of ships, engineers and the costs of parts, the order books for common rail engines have not waned. Until the new generation of dual fuel engines using LNG enters the marketplace, the common rail engine is here to stay. *NA*

One hundred years of diesel

On the 17 February 1912 the maritime industry changed forever with the launch of the first diesel powered ship, *Selandia*, from the B&W shipyard in Denmark. To mark the occasion MAN Diesel & Turbo has released a drama documentary of the building and operations of the vessel and RINA looks back at the debate held by members following their first view of the revolutionary vessel.

Following the delivery of *Selandia* to the East Asiatic Company of Copenhagen the ship arrived 10 days later on its maiden voyage to Bangkok in London's East India Docks where members of RINA were invited to tour the vessel to view its design.

Ivar Knudsen is described as "the father of the engine" on *Selandia* and is credited with the design and layout of the new power plant. Born in 1861, Knudsen was an engineer working for the municipality of Copenhagen. He was headhunted by Burmeister & Wain at the age of 30 and he encouraged B&W to build diesel engines.

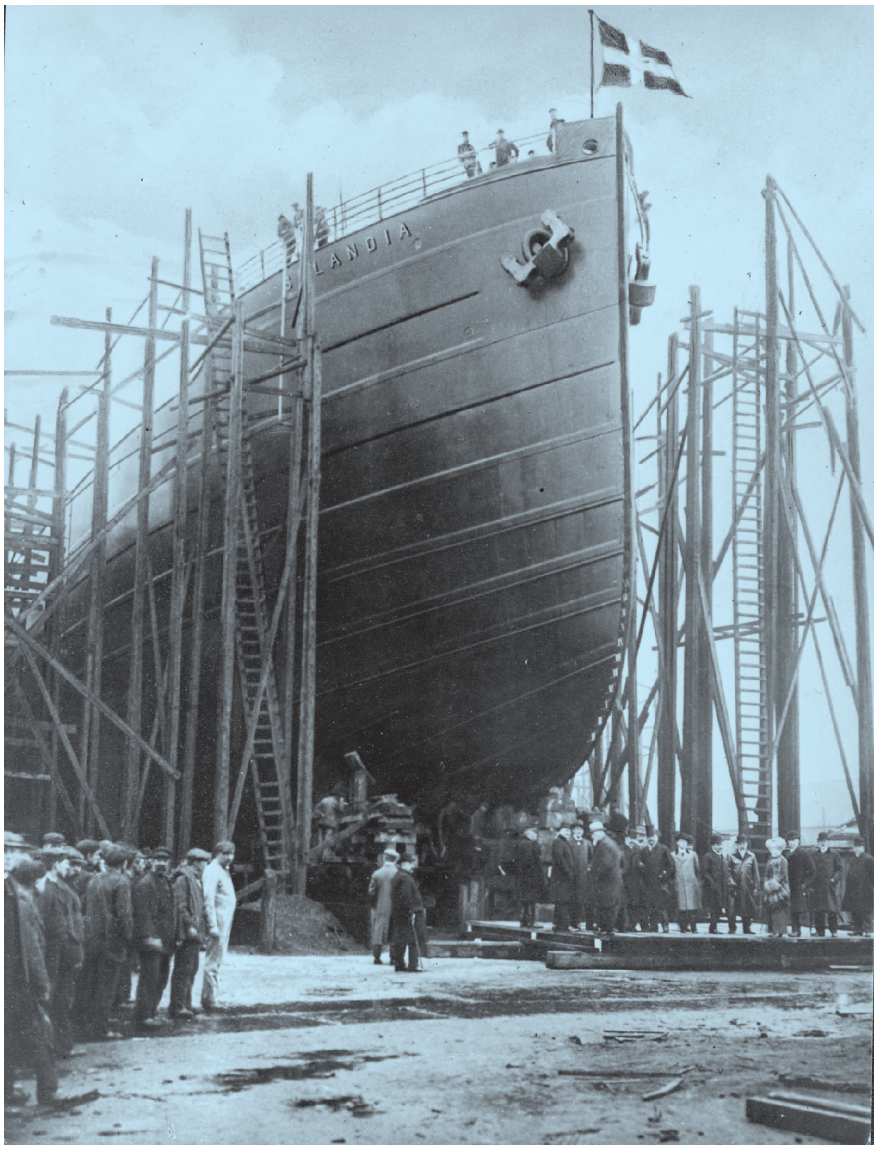
When *Selandia* arrived in London Knudsen had sent a paper to RINA describing the engines on the vessel and as an invitation for the members to engage in a discussion on the new vessel and its revolutionary engines.

If it was a discussion he was after, Knudsen was not disappointed. Members pored over the details and discussed the military and commercial advantages of the diesels as well as the power and manoeuvring capabilities of the ship.

Sir Fortescue Flannery remarked: "Reversing has been one great difficulty in regard to engines of this type for a considerable time, but the way in which the push rods are automatically disconnected from the cams, and then the head and sternway cam travel to engage or disengage automatically by means of a connection with the rods, is to my mind, and I think to the mind of all engineers who have seen it, one of the most beautiful mechanical devices, one of the most successful solutions of a difficult problem that has ever been carried out in mechanism."

He went on to say that he had seen the engines at work and had been very impressed: "Certainly it is thoroughly successful, because, in going down the West India Dock in leaving London on her present voyage, there was an immense amount of manoeuvring, and never once did the engines fail to respond in a very few seconds to the orders given by telegraph from the bridge."

In a lengthy monologue Flannery pointed out that liquid fuel produced about four times the power of coal "which is a very conservative estimate". If *Dreadnought* was arranged with a diesel engine rather than coal with a supply aboard which would take the vessel across the Atlantic and back, the



The 1912 launch of *Selandia* at the B&W yard in Denmark.

Selandia en route to the Far East.

radius of operations would increase four times. Or you can put weight savings into increased armour, ammunition or firepower.

However, it is Flannery's prophetic forward view that really shows the understanding of the members of the importance of *Selandia*: "She [*Selandia*] has cylinders of just under 21in in diameter. She develops 2500 Indicated Horsepower (IHP) in her main engines [16 cylinders]; that is, roughly about 160 HP in each cylinder of 21in in diameter. If you compare that with a steam cylinder of the same diameter and the same weight you will find that the power is very much less."

But Flannery and his contemporaries understood very well that this was the beginning of the revolution and that far more was to come: "The development, therefore, is to be found in doubling or quadrupling, as you ultimately will, the power that can be produced from a cylinder of a given size. These are four-cycle engines in the *Selandia*. The next step, which our friends on the Continent are working very hard to attain, will be to introduce the two-cycle engine. That will double the power. After that the next step will be in double-acting instead of the single-acting engine, and that will give you, with engines of practically the same size and of no greater weight [although, possibly in the first instance, somewhat greater consumption] 10,000 IHP from engines of the same capacity and weight as *Selandia*.

"I believe that there is no question whatever that in the comparatively near future that result [10,000HP] will be attained…when it is attained, we shall probably be quite sure that we have reached the stage when steam-propelled vessels will have become obsolete."

And enthusiastic members were not to be disappointed by Selandia as Knudsen reported to them through a written response to their discussion on the vessel's first voyage after leaving London: "During the voyage from Antwerp to Gibraltar the vessel encountered very high seas, and during 48 hours the propellers were racing continually. The Aspinall Governors, fitted to the engine, worked excellently and kept the revolutions at from 120-130 up to 150. The heavy sea had, in fact, no influence on the good working of the machinery." *NA*

Back to basics

When Hans Otto Holmegaard Kristensen, senior researcher at the Technical University of Denmark (DTU), decided to review the efficiency of tankers and bulkers over the last 20 years he expected a steady improvement, but the results startled the researcher and convinced him that naval architects must return to the basic principles of ship design.

Ship design is supposed to improve as we learn new methods, technologies and design concepts, or so Kristensen believed. So when he decided to calculate the Energy Efficiency Design Index (EEDI) numbers for tankers from 20 years ago up to the present day his expectation was that there would be discernible improvements to ship designs over the years.

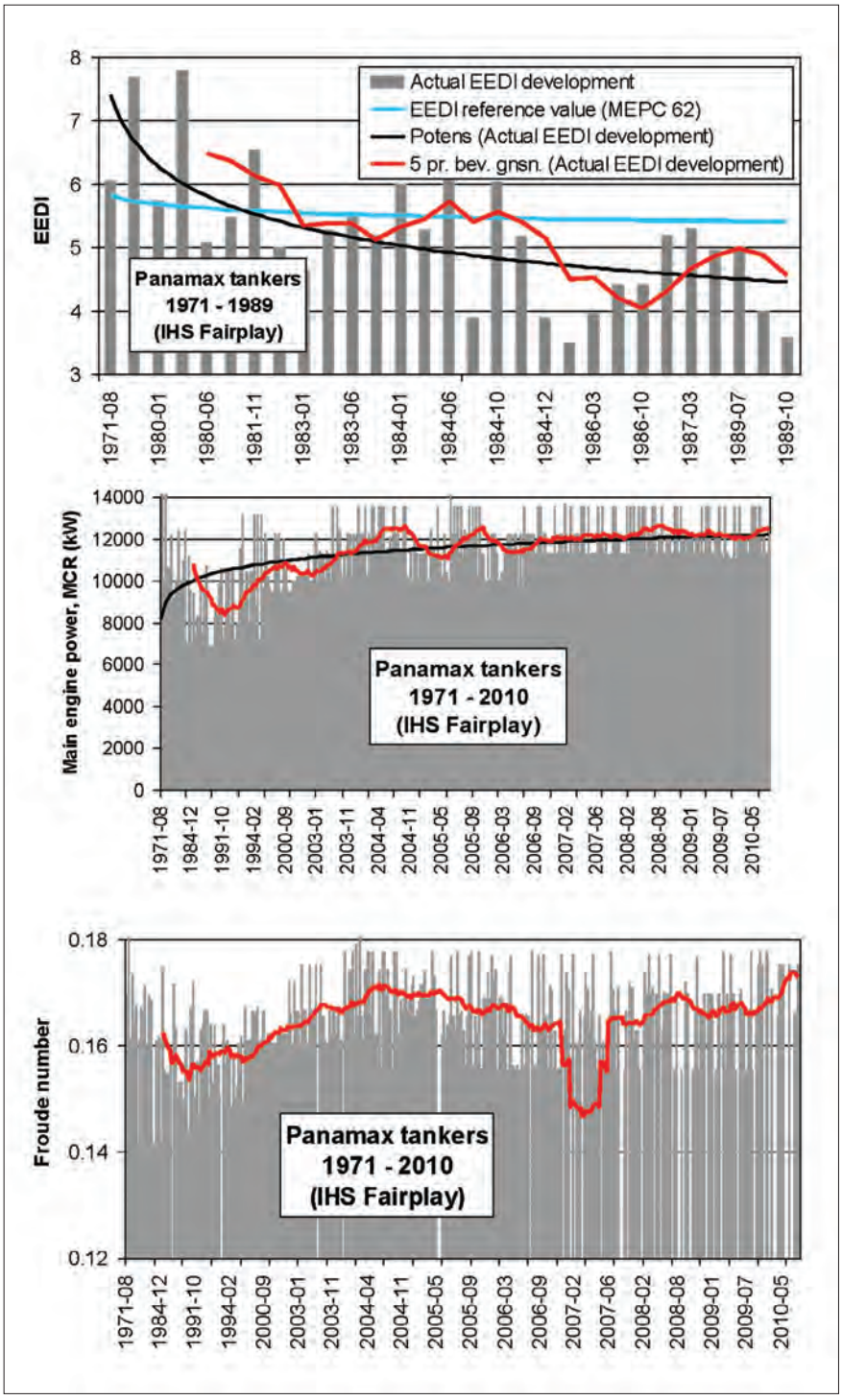
In fact what he discovered was that the designs were getting less energy efficient as they progressed mainly because owners and economics were driving the design process, not hydro-dynamic knowledge. "It [ship design] was driven by more cargo and money rather than sound design principles," he says.

According to the DTU the most efficient ships will have the lowest block coefficient (volume divided by length, beam and draught) possible, while the slenderness ratio (the length divided by the cubed root of the volume) will be as high as possible and the Froude number (velocity divided by the square root of ship length) should be as low as possible.

In fact what Kristensen discovered when he looked at the development of installed power on panamax tankers was that it had increased from a little under 9000kW in 1990 to over 12,000kW by 2010. In seeking a reason for the increase in power DTU discovered that vessel speeds have increased, the Froude numbers have increased, block coefficients have increased, but the slenderness ratios have decreased.

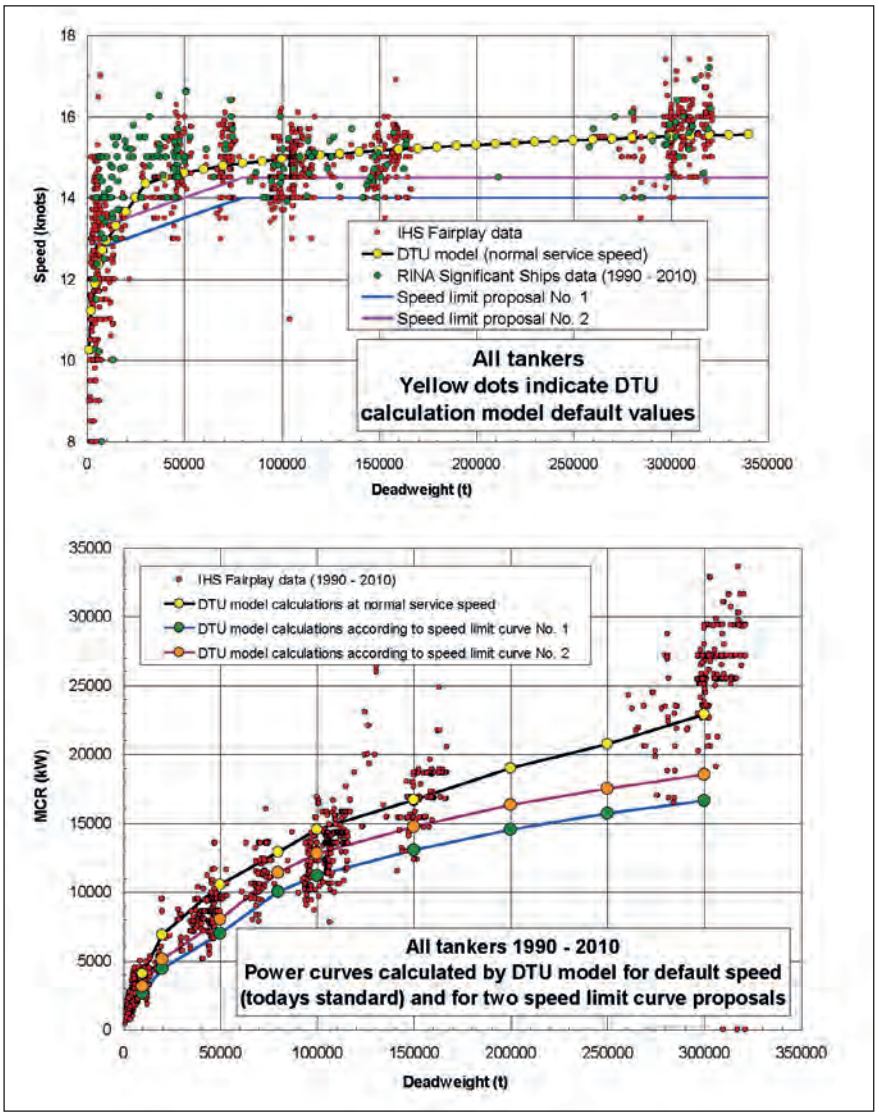
This information led the DTU to conclude that "common 'naval architectural' knowledge and guidelines have not been followed".

Essentially ships have become wider in order to carry more cargo and extra installed power means they are faster, but the extra



The historic development of panamax tankers.

The two diagrams to the right show the speed and power for tankers (both oil and chemical). For clarification the definition of design speed is speed at design draught (at aprr. 90% max dwt.) obtained at 90 % MCR with 15 % service margin. According to the attached output from the model that design speed is nearly identical with the reference speed according to EEDI.
As there is some doubt about the speed given in the IHS Fairplay database the service speed according to data from RINA´s annual publication 'Significant Ships' where the speed is often quoted to be the service speed at 90 % MCR and with 10 % sea margin has been added.
Calculations of the consequences of different speed proposals are also included: The speed as it is today, and limit curves imposed on ships in the future as an interim solution to the problem with safe manoeuvring speed.
The calculations have been carried out with a generic computer model developed at DTU. Hans Otto Holmegaard Kristensen.



speed comes at a high energy cost. As a result of the EEDI regulations DTU is expecting vessel speeds to reduce, but there may be a twist meeting the EEDI rules can still be achieved through good design.

Phase 1 of EEDI will require tankers and bulk carriers to reduce emissions by 10% compared to the EEDI reference line from 2015 onwards, this can be easily be achieved by simply slowing a 70,000dwt tanker to a little under 15kn.

Phase 2 EEDI will require a 20% reduction on the EEDI reference line between 2020 and 2025 while a 30% reduction will be required after 2025. These later targets will be harder to meet, but with a 5% elongation of the ship, ducted propeller, reduced steel in building the vessel and a de-rated engine will allow a 70,000dwt tanker to operate at 16kn and still be within the EEDI rules.

Speed will inevitably be an issue and in some instances will be the only way for vessels to achieve their EEDI target emissions. It is with this in mind that the EU has provided €2.6 million (US$3.44 million) in funding for the ULYSSES project that will look at the effect that slow steaming will have on what are already

Slow steaming – adverse conditions Wind and sea margins

IMO RESOLUTION MEPC. 203(62)
Adopted 15 July 2011

REGULATION 21.5
For each ship to which this regulation applies, the installed propulsion power shall not be less than the propulsion power needed to maintain the manoeuvrability of the ship under adverse conditions as defined in the guidelines to be developed by the Organisation.

Consequence
Normal design conditions have to be changed with more detailed definition of service margins. Wind and sea state have to be defined instead of a general percentage sea margin

Credit: DTU

slow vessels. The challenge for the 12 ULYSSES partners is to find the optimum safe operating speed for large tankers and bulk carriers that will allow the ships to improve their energy efficiency enough to meet the requirements of new regulations.

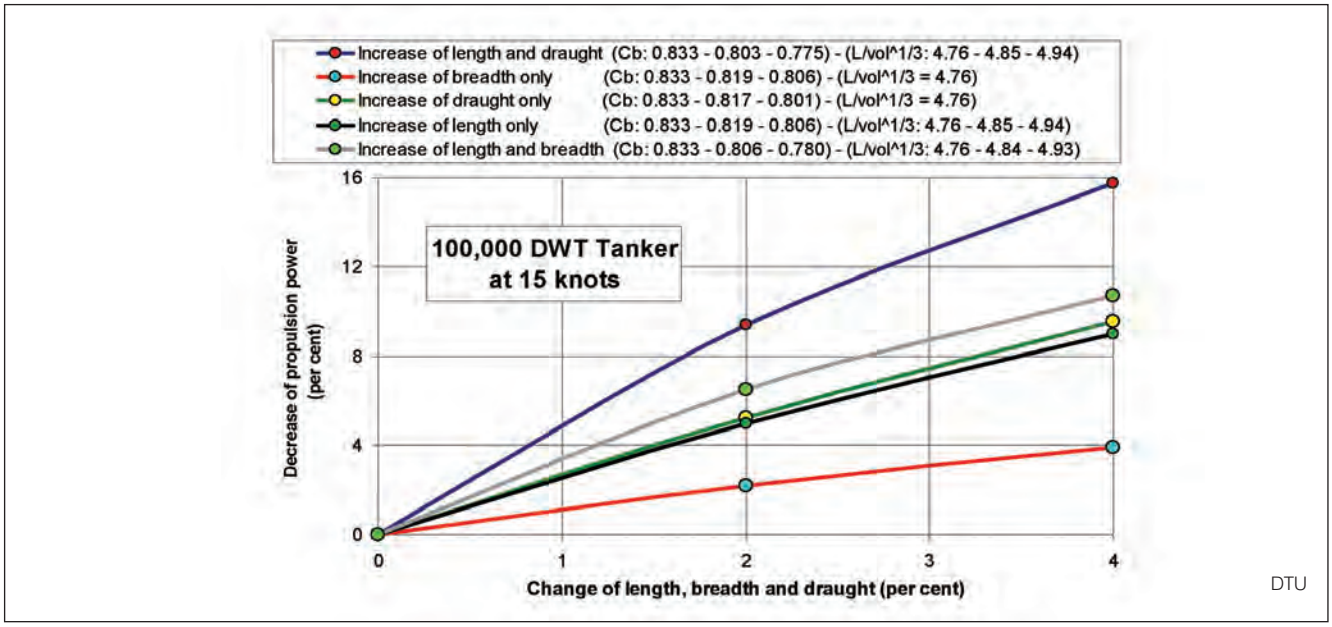
"The objective of ULYSSES is to demonstrate, through a combination of ultra-slow speeds and complementary technologies, that the efficiency of the world fleet can be increased to a point where the following CO_2 targets are met: Before 2020, reducing greenhouse gas emissions by 30% compared to 1990 levels. Beyond 2050, reducing greenhouse gas emissions by 80% compared to 1990 levels," says the EC.

Furthermore the EC says it is focusing on tankers and bulk carriers because "these ship types produce 60% of the CO2 from ocean-going vessels."

Tankers and bulk carriers are similar in design and operation, according to the EC and it feels that investigating these ships will give the best value for money in terms of the potential impact of the project.

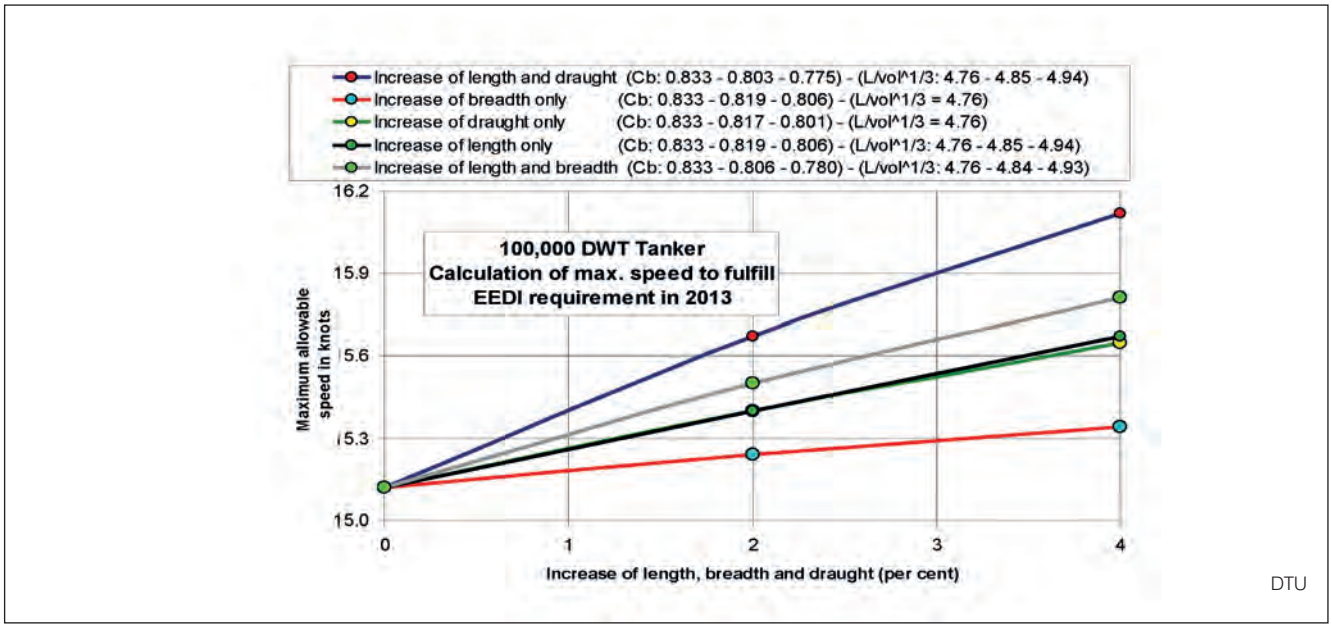
"Additionally, it is more technically challenging to reduce the speed of these ship types as they are relatively slow speed already and therefore it is expected that directional stability and other seakeeping issues will arise. However, the results of the project will be directly transferable to other ship types. To achieve these goals, it is expected that the target speeds will be: 'Phase I - Existing vessel in 2020: ~10 knots 'Phase II - New vessel built in 2020: ~7. 5 knots 'Phase III - New vessel built in 2050: ~5 knots," the EC said in a statement. *NA*

Decrease in power to maintain 15knot speed for various tanker hull shapes.



DTU

Calculation of maximum speed for 100,000dwt tanker.



DTU

To err is human

How people make decisions under stressful situations has been an important factor in Kongsberg's latest research project.

Kongsberg Maritime is leading a new research project called 'Situation Awareness and Decision Support Tools for Demanding Marine Operations' (The SITAWARE project), which started on 2 February. Part funded by the Norwegian Research Council and undertaken in collaboration with academic research partners Chalmers University in Sweden, Vestfold University College and Haugesund University College in Norway, the latest project has been implemented as the foundation for a new generation of support systems and solutions for marine operations.

Thor Hukkelås, principle engineer marine operations, Kongsberg Maritime AS commented: "Onboard modern offshore vessels have lots of screens and systems, there has never been so much data available. What we need to look at is the gap between what is available information and what the crew really needs."

The aim of the project is to study how people make decisions during demanding and advanced marine operations, particularly under stress. The purpose is to learn how to build optimal systems for situation awareness and operator decision support. It is expected that Kongsberg will seek to implement this knowledge in future product developments.

"Demanding and critical marine operations like anchor handling, rig moves, heavy lift operations, subsea construction, pipe-laying, and FPSO offloading all push people, vessels and systems to their limits," continues Hukkelås. "The consequences of making wrong decisions during failure or stress situations can be disastrous, but simple to understand decision support tools developed through user-centred design are vital. We believe the research will show that a shift in focus from boxes, systems and equipment to function, information and operation will have tangible effects on safety and operational performance."

The project will be carried out in three phases over three years. "We will start with a literature study followed by detailed analysis of one or two advanced marine operations and a System Design Specification. A prototype will be built and implemented in a simulator environment where experienced operators and users will evaluate it and give their feedback," explains Hukkelås.

Thor Hukkelås, principle engineer marine operations, Kongsberg Maritime AS, at the helm with K-Master.

The new Human Machine Interfaces are only a part of what Kongsberg will be looking into. The project will also address the following:

- the need for training of the crew, especially training of how to handle failure situations, similar to what pilots have to do once a year. What is the proper skill training needed? How can this be achieved by the use of simulators?
- how to develop systems where all participants in SIMOPS (Simultaneous Operations, involving many vessels and people) all have the same level of information and understanding of the current operation?
- how to expand the operation a envelope, i.e. how to minimise the "Waiting On Weather" time?
- how to build systems supporting the three main phases of all types of operations, - planning, execution and evaluation/lessons learned phases?

The goal, Hukkelås pointed out, is to design a product that is intuitive to use as an iPad or iPhone, where everything on screen is presented in an easy and understandable way. Having a system like this allows the users to feel like they are in control.

The SITAWARE project will also look at other industries to see how they have approached this subject. "We will look at what they have done in the airline industry, with the development of cockpits. Military command & control systems will also be studied", commented Hukkelås.

The new generation of systems that will be developed as a result of the project is expected to include functions that use all available information to predict the future state and thereby reduce the risk of situations developing in a critical direction. By doing this Kongsberg believes that it will have tangible effects on safety and operational performance. *NA*

Raytheon Anschütz expands its range

Keeping up with technical developments of bridge and communication systems, Raytheon Anschütz has launched its latest products on the market.

The latest launch of products from Raytheon Anschütz has been customer and safety driven, says the German-based bridge systems' company. The three latest items launched on to the market are the NautoSteer AS steering control, an integrated bridge system and the NautoPilot 5000.

Martin Richter, marketing manager, Raytheon Anschütz, points out "NautoSteer AS features developments that significantly add safety to the steering system. The steering control system is most critical for safe ship operations; failure in the systems can have dramatic consequences to life, ship and nature. Therefore, we have developed integrated safety features, but also concentrated on a standardised, easy to operate user interface to minimise the risk of handling errors."

The NautoPilot 5000.

Intelligent bridge system

Due to the demand of greater efficiency and ease of operation the latest bridge system from Raytheon Anschütz provides the user with functions that can be integrated intelligently and flexibly onto the system. The bridge system has a developed modern integration platform which improves both the nautical and the economical operation of the ship through the integration of functions. The platform makes it possible for integration and additional applications such as automation data indication, CCTV, DP system or load-and-ballast calculator, and also allows the system to be expanded in the future.

Richter describes the current complexity of bridge systems: "It depends on the type of bridge system. In fact, driven by carriage requirements the ship's bridge and related functions have become more complex. At the same time, the captain's administrative workload has increased. Installation and of stand-alone equipment, that purely fulfils IMO and class requirements may be a cost-efficient decision for a newbuild budget, but not for a ship's lifetime and operation costs. More integrated systems can add function to the bridge – this may result in less stress for the crew, this may simplify rotation in manning, but this also may help save hardware costs. Modern

Ease of use is top of the agenda for Raytheon Anschütz's latest bridge system.

bridge systems are laid out to provide the operator with a navigation system control and information at any workplace while adding functionality to software that makes daily work easier."

Richter also highlights the advantages of the bridge system: "There is an increasing need for an intelligent and extensive integration of functions which support the automation of routines and the economical operation of the ship. New bridge systems should be more efficient, help reduce ship's running costs and, above all, they should be easy to install and easy to operate for users. Key achievements of the new technology are Multifunctional Consoles, E-Navigation features, Intelligent Alert Management, and Consistent Common Reference System (CCRS). Other examples are Automatic Route Planning, Weather Overlay and AIS control on ECDIS, intelligent collision-avoidance functions on Radar or customer-specific Conning pages that provide relevant navigation data at a glance. The use of the same buttons, letters and indications as well as central and local change of colours should be a prerequisite for all bridge systems."

NautoSteer AS

The NautoSteer steering control offers improved handling, ease of installation and higher safety standards. The steering control system is based on CAN-bus technology, whereas all important components such as follow-up amplifiers, autopilots, interface units and alarm monitoring units are connected via redundant CAN-bus systems. In case of failures the steering control system automatically switches to a redundant CAN-bus, providing secure data communication and built-in reliability for the whole system.

Richter commented on the latest safety features of the steering system: "First is having a simplified steering selector switch, this was very important for the user interface but led us to the strict separation between main and secondary steering and steering mode selector with only two positions (main and secondary). The benefit for the user is that in case of any problems the user can switch to the other position and can be sure that a complete separated technical path is being used. In many other systems with steering mode selector switches with more than two positions it is possible to unintentionally switch from a defective steering control position to another defective steering control position, and this happens especially in emergency situations and is sometimes also caused by a lack of knowledge of the operators. So with the new system it is pretty easy, just switch to the other position and the operator can be sure that he has made the correct decision."

NautoSteer meets with latest safety standards.

Raytheon also says that the NautoSteer is easy to install as the autopilot uses standard serial interfaces for the operation as heading (NMEA Heading, Speed) or track Control system in combination with ECDIS. The steering gear control system can adapt to a large variety of steering gears with on/off solenoids or proportional valves, torques and motors. Other systems like Dynamic Positioning Systems or Joystick Systems can be integrated by use of an External Steering Interface AS.

NautoPilot 5000

The NautoPilot (NP) 5000 is the successor to the NP 2000 autopilot series. The NP 5000 is based on the same Raytheon Anschütz steering algorithms, but is enhanced to include highly advanced functions for economic and precise navigation such as an integrated steering performance display and new course control operation says Raytheon Anschütz.

The autopilot's most noted new feature is its large graphic display screen, which offers six different day and night modes operated by a touch screen. The screen has been designed in line with the colour palettes which are used for the display of the radar systems, chart-radar and electronic chart display and information systems (ECDIS). The functions are accessed via push buttons or the touch screen to ensure operation is kept as simple as possible.

The large display features an integrated heading and rudder plotter, which provides a graphical indication of heading changes and all used rudder angles. This indication shows the steering performance of the autopilot due to the effects of changes to parameter settings such as rudder, counter rudder and yawing. The operator benefits from simple adjustments of the autopilot's settings to gain optimised steering performance, which results in minimal rudder action and thus reduced fuel consumption.

Another contribution to economic navigation and reduction in fuel consumption is achieved by the Eco-Mode of the autopilot, which provides the automatic adaptation to the current sea-state and weather. Periodical yawing movements which, can be caused by roll and pitch would normally result in rudder actions with high amplitudes. As frequent rudder actions would not compensate the heading deviation due to environmental conditions, the autopilot reduces its sensitivity to such movements. As a result, the autopilot continuously adapts to current environmental conditions without a manual change of autopilot parameters. Subsequently less rudder action is required, which leads to lower levels of speed reduction and less fuel consumption. *NA*

Maris supports ECDIS move

The latest mandate for electronic chart display and information systems (ECDIS) will have an impact not only on the ship owners, but the crew that will have to operate the new systems.

Norwegian-based Maris has highlighted that for decades, navigators have relied on different information to plot their courses; paper charts, visual information, radar and communication by sign and voice with other vessels. The navigator has become an information integrator, assessing risks based on available data.

However, the implementation of ECDIS systems is an important factor for the maritime industry. Steinar Gundersen, deputy chief executive, Maris commented: "ECDIS is another important tool for the navigator, with all its advantages. As the IMO adopted the regime of mandatory ECDIS implementation on commercial ships, this has bought up the requirement for implementation of training."

Maris adds that from the ship owners point of view there are several issues such as onboard communication, cost control of annual subscriptions and electronic charts and services, remote support, training, IMO/ Flag state and Oil Companies International Marine Forum (OCIMF) requirements, new procedures and risk assessment. The added pressure of training crew in time for the mandate has become a concern, Gundersen commented: "This is an issue raised constantly within the industry and debated in the marine media; the verdict is clearly that there are concerns regarding a lack of capacity to train everyone that needs it, in time."

The pressure is on to train all crew on ECDIS before time runs out.

Maris has been addressing the need for training from both ship owners and ship managers by being in dialogue with the market and training providers. Maris said that it entered the market early with solutions for ships wanting to sail paperless, which mostly came from the oil and gas market. Together with the ship owners Maris has made arrangements with nautical schools so that their bridge officers can be trained in the use of Maris ECDIS and functionality in addition to the IMO Model course 1.27. *NA*

Pay as you sail from NavTor

Norwegian-based electronic navigation charts (ENC) company NavTor has launched its latest mapping service, Ultimo.

The latest ENC service offers an innovative service for its customers that will simplify ordering, licensing, updating and administration of ENC chart portfolios. The service aims at providing customers with a 'pay as you go' style distribution of ENC charts, making access to charts and route planning easier for ship's navigators.

"Currently you have to plan your route and order the charts that you need for the area that you are sailing. With this new service you have access to all the charts for the area's that you are sailing and then you are charged after you have used the charts", comments Willy Zeiler, marketing and communications manager, NavTor.

With the rise of administration onboard vessels, officers have less time to spend on navigation, with the toughest challenge being that of making sure that licenses and permits to access the electronic charts needed for the voyage ahead are ordered in time.

The NavTor service offers a solution where all ENCs and their permits are preloaded and are immediately available, for convience, but not least for safety and security as well. Once installed, the charts for planning purposes when the vessel is alongside dock and not moving is free of charge. The NavTor NAV Tracker automatically tracks the voyage and generates billing for the chart's cells actually used for a navigated route

NavTor believes that with the introduction of the compulsory electronic chart display and information system (ECDIS) will drive the commercial acceptance of pay as you sail (PAYS). The company has said that when the carriage becomes mandatory of ECDIS owners and operators will be left with the challenge of managing a chart portfolio.

Zeiler highlights that the latest service provided by NavTor is tailor-made for all ECDIS systems. The ECDIS mandate is expected to take effect between 2012-2018, NavTor believes that there will be a peak in demand for chart services in 2015, due to the mandate requirements of when vessels have to comply. *NA*

Satcomms get a boost

Thrane & Thrane has introduced its latest Sailor 900 VSAT terminal to the market, bringing with it new thinking to an old technology.

Complex procurement, installation and operation have until now been limiting factors to the wider adoption of maritime VSAT. Furthermore, many different satellite operators provide broadband connections based on Ku-band, which has to some extent limited the deployment of VSAT because of the great demands made on the interaction between modem, network and antenna.

Jens Ewerling, product manager, Thrane & Thrane, said that the development for the Sailor 900 started three years ago, whilst most companies built on technology that was already on the market; Thrane & Thrane took a different approach of carrying out its own research into its new product before producing it. Thrane & Thrane carried out a year of research before developing the Sailor 900 VSAT.

Ewerling commented that: "Before we started building the antenna we collected data from real life situations onboard vessels. For this we installed a data box on certain vessels to measure what forces ships were being exposed to. Next we built a three-storey extension to our facilities and placed a simulator on top to test the software that we were developing by imputing real life data that we were receiving; because of this full year of research it has given us a head start on developing a new product for the market."

The system dispenses with time-consuming testing, balancing and configuration of satellite antennas onboard vessels, as Thrane & Thrane performs such necessary processes prior to delivery, allowing the system to be installed faster and easier, and also making it more reliable. In addition, the Sailor 900 VSAT is compatible with all Ku-band satellite systems globally.

Ewerling commented that the challenges of the Sailor 900 was to keep the antenna light. To achieve this, the antennas are made from high tensile aluminium, which has high anti-corrosive properties and can be built in the same thickness as other antennas.

Jens Ewerling, product manager, Thrane & Thrane.

The Danish satellite communications provider Thrane & Thrane has also signed an agreement with Ericsson for the delivery of 290 units of the Sailor 900 VSAT. With the contract estimated at DKK60 million (US$10.6 million), Thrane & Thrane will provide a global service, support and training of the hardware that it will supply. The majority of the deliveries will take place over the next 12 months with a service agreement lasting the next seven years.

Ewerling commented on the installation onboard the vessels: "The contract is for 290 Maersk Line container ships. Thrane & Thrane will supply the antennas to Ericsson, who with trained roll-out teams in 12-15 ports globally will allow the vessels to be fitted over the next 12 months." The vessels will have antennas installed whilst they are in port, so no vessel will need to be taken out of service for this procedure.

Ewerling commented that there has been a paradigm shift in the shipbuilding industry, where the whole industry has grown and fragmented. Thrane & Thrane has highlighted that where other manufacturers only sell the hardware, Thrane & Thrane offers a complete package to its customers, making the system easier to use and quicker to deploy. *NA*

Sailor 900 VSAT.

New e-learning from Safebridge

Classrooms are what spring to mind when we think of education, but with Safebridge's latest solution this could be a thing of the past.

The Safebridge project was officially launched in February 2012 and is drawn from a trans-national partnership of seven European organisations. The aim of the project is to develop a new training and competence verification tool that could be used for navigators to fast track learning and improve safety in marine operations.

The Safebridge training software platform combines an e-learning component with original equipment manufacturer (OEM) software and electronic navigation charts (ENC). The learning process is controlled by Learning Management Software (LMS) to provide an interactive simulator that is true to the actual electronic chart display and information system (ECDIS) supplied.

Ulf Steden, managing director, Safebridge commented: "Officers today are faced with lots of different consoles, but are not familiar with all of them."

Ulf Steden, managing director, Safebridge.

The advantage of the Safebridge tool is that it uses real life software for the training, so that students who use the software are experiencing the actual navigation system without having to be onboard a vessel. Instructions are shown to the student throughout the training, which they go through at their own speed and at the end of the course, or when they feel ready, there is an interactive test.

Steden says "The officer or crew member can now study from his own home, via the internet."

Students work through a number of modules as if using the actual technology, and are shown how to use each feature in simulated scenarios. Courses are expected to take up to 16 hours to complete, but a maximum of three weeks is given for a course to be completed. Following completion, the student's online examination is graded by a qualified instructor and the student receives a certificate of competence, added Steden.

All courses cover the type-specific parts of IMO Model Course 1.27 and MCA MIN 405 M+F. The certificates that are issued at the end of the courses are certified by the manufacture of the software. *NA*

Data overload

The amount of information available on a bridge and what the crew actually needs is coming under scrutiny, as Jeppesen highlights.

With an increase in more efficient bridge systems for specialised vessels the amount of information that is carried by a bridge system is put under question and has been highlighted as something that could potentially pose a hazard. Jeremy Langdon, marine industry relations specialist for Jeppesen comments: "New data streams [weather, AIS- targets, ship sensors, wave and traffic information, etc] create more data points to be analysed for navigation. So data providing necessary information in some circumstances can be a distraction in others."

Langdon said Jeppesen's products are aimed at creating intelligent information. "Pre-processed and filtered data becomes situational information, a basis for knowledge that enables better and faster decisions. This requires integration of data streams, rather than just creating overlays, as is common in ECDIS. The currently debated "AIS AtoN" will only work if the data streams, which do not come from creators of electronic navigation charts (ENCs), are integrated. Just adding them to the ENCs could create AtoN duplications, which will distract and confuse navigators."

Michael Bergmann, director of maritime industry affairs and services, Jeppesen, explains how the company is working within International Hydrographic Organisation (IHO) and International Association of Lighthouse Authorities (IALA) working groups to raise awareness of the need to understand data harmonisation and construction methods: "An example is virtual navigational aids: they have been maintained by IALA member groups, while IHO member groups have received this data and put it on HO products [primarily paper charts and ENCs]. In the past, when the speed of data was slow, this was fine; with todays near instantaneous data, the industry has to think again. It will require some organisations and groups to release their control and others to take it on."

Langdon added: "Without a deconstruction of some of the old paradigms and development of new ones, the problem of duplicated information will get worse. My hope is that this will be prevented by forward thinking individuals in industry organisations and service providers like Jeppesen collaborating to utilise new knowledge, in part, lessons learned in the aviation industry." *NA*

Full steam ahead for T.Mariotti

The recession may have hit the shipbuilding industry hard, but the cruise industry is still contracting Italian yards to build its vessels.

Italian cruise ship and yacht builder T.Mariotti has been having a successful few years with the launch of its trio of vessels *Seaborne Odyssey*, *Seabourn Sojourn* delivered 2009/2010, and *Seabourn Quest*, which was delivered last year and completes the €550 (US$728.27 million) million order.

The last in the series of vessels, *Seabourn Quest*, has 225 suites, more than 120tonnes of marble (3800kg of that is for mosaics onboard) 7000kg of alabaster, 121m^3 of teak and about 3400m^2 for the interiors onboard. The vessel also has four restaurants, six bars, three boutiques, six whirlpool spas, two gyms, one beauty salon and a business centre.

Added to this, the vessel has been equipped with a safety management system control that assists the captain in every stage of sailing. *Seabourn Quest* has an independent, redundant, propulsion system with two separate engine rooms, which allows the vessel to meet the latest safe returns to port rules.

"Our company vision is oriented to the highest standard of design and technology. It is our philosophy and also a necessity for our niche market, as T.Mariotti is privately held and specialises in ultra-luxury ships. For this reason, with our research and development team we are always committed to understanding the rules that could come into force in the future and to anticipate them in the design of our newbuildings", said Marco Bisagno chairman, T.Mariotti shipyard and Genova Industrie Navali holding company.

T.Mariotti has said that the company is carrying out further major works, newbuilding and refit projects according to the holding company Genova Industrie Navali. Bisagno said: "Genova Industrie Navali in fact is really a maritime base in the Mediterranean that is intended to boost the synergies among the main shipyards T.Mariotti, San Gorgio del Porto and Chantier Naval de Marseille."

T.Mariotti joined Genova Industrie Navali back in 2008 to enhance business opportunities. The company has highlighted that it is an interesting project to be a part of as it promises to service the needs of all in the maritime field in the holding group. Not only will it draw companies together, but it will also allow for different skills and experience to be shared across the group.

Although the cruise ship market has been fairly stable it has still had its share of hard times. Bisagno said: "The cruise ship market is healthy despite the natural slow down due to the international economy event and the recent accidents. We're optimistic about the prompt response from the market to the recession."

T.Mariotti is also preparing for the future. With green regulations coming into effect, looking to other technologies is what many ship owners are now doing. T.Mariotti has taken steps of its own looking at the use of LNG as a fuel. "We took part in negotiations in recent projects and we're confident of the potential of LNG. A briefing for operators and customers to help them understand the validity is necessary to lead to a successful solution", said Bisagno. *NA*

T.Mariotti delivered the last in a series of three cruise ships, *Seabourn Quest*, in 2011.

T.Mariotti believes that the future will see more activity at the shipyard through the Genova Industrie Navali holding company.

The Royal Institution of Naval Architects

WARSHIP 2012: THE AFFORDABLE WARSHIP

"Achieving cost efficiency and savings through innovation in design, construction and operations"

20 - 21 June 2012, Bath, UK

Sponsored by:

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

Second Notice

This conference, the 32nd in RINA's successful Warship series, will look at the 'Affordable Warship'.The conference will be held in Bath on 20-21 June 2012.

How to meet the ever increasing cost of warship procurement, upkeep and operations, whilst at the same time meeting the need for ever more capable and sophisticated platforms is a dilemma faced by most navies today. "Warships 2012 – The Affordable Warship" will consider how innovation and advances in all aspects of design, construction and operation can contribute towards achieving lower through-life cost ownership whilst maintaining fleet capability.

Papers on the following related topics, covering all types of warship

- Procurement models for warship acquisition• Cost reduction
- Through life support
- Innovative design
- Designing to cost and capability
- Build in friendliness
- Technology insertion
- Lean manning
- Recoverability
- Management of risk
- Damage control, fire fighting, situation awareness and reconfiguration of systems.
- Innovative support solutions
- Regulation & legislation: concept to disposal

www.rina.org.uk/warship_2012

☐ 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: **(W2012)**

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

Marine Training you can trust.

Forthcoming training courses in UK:

ILO MLC (2006)
April 24-25, June 26-27, London
Price: £300 + VAT

A Practical Approach to Surveys
March 21-22, London
Price: £800 + VAT

ISM DPA
March 28-29, London
Price: £800 + VAT

Classification and Statutory Surveys
May 15-17, London
Price: £900 + VAT

Hull Inspection – Damage and Repair
April 17-19, London
Price: £1,100 + VAT

ISPS Company Security Officer
March 13-16, London
Price: £1,100 + VAT

Risk Management and Incident Investigation
May 29-31, London
Price: £1,000 + VAT

ISM Internal Auditor
May 23-24, London
Price: £800 + VAT

For further information, pricing details and registration, please contact Sarah Walsh at ukmarinetraining.liverpool@lr.org or call +44 (0)151 552 5214
www.lr.org/marine-training

Lloyd's Register
LIFE MATTERS

Naval Architects and Mechanical Engineers

Excellent Package
Various Locations

Ref:2204

QinetiQ are at the cutting edge of maritime research and technology. Through the innovation of our expert teams and world-class facilities, we create imaginative solutions for a vast range of military and commercial clients.

We are looking for talented people who are experienced practitioners in naval architecture, marine/mechanical or aeronautical engineering.

As a **Naval Architect**, you will be working on hydrodynamic problem solving, which forms the main part of project work: identifying a methodology for solving a client's problem mathematically or through model testing, conducting the test, reporting results and recommending a proposed solution. Projects may include the concept design of military and commercial vessels, potentially leading to feasibility design, detailed design, build oversight and trialling for vessel acceptance.

As a **Mechanical/Marine Engineer**, you will use your technical and domain knowledge to develop and promote mechanical and electrical system design and equipment selection.

You'll need a broad knowledge of the maritime industry, ranging from military vessels, through commercial shipping to the offshore industry, with an appreciation of the applicable design objectives, regulatory regimes and economic drivers. Your technical skills should include a broad understanding of areas such as computational fluid dynamics, model testing, full scale trials and numerical performance prediction techniques. You will be competent in the use of stability software, i.e. Paramarine, and the use of Maxsurf, AutoCAD and Rhinoceros. Experience of commercial and offshore vessels, sea load determination, finite element analysis of vessel structure and an interest in ship survivability would be an advantage. On occasions, you will also be required to travel, both domestically and internationally. You must have, or be eligible for full UK security clearance.

To find out more and apply online, visit **www.qinetiq.com/careers**

Making tomorrow work today

QinetiQ

faststream recruitment group

Naval Architect - South UK
A leading consultancy specialising in defence projects seeks a Naval Architect/Engineer to develop expertise in the field of propeller design and analysis within the Hydrodynamics department. Knowledge of model experiments and sea trials is essential. REF. SH5426675

Deputy Engineering Manager - Aberdeen
A global provider of consultancy services to the oil & gas sectors whose specialities cover the design, engineering and inspection of mooring equipment. Specialist knowledge of mooring systems is essential as is the desire to manage and lead a team. REF. OG0226290

More jobs available online
Tel: +44 (0)23 8020 8760
Email: marine-uk@faststream.com
@faststream www.faststream.com

Naval Architects
London

- **Structure**
- **Stability**

You will be joining a small, dynamic team with good opportunities to contribute and drive projects that covers areas such as initial design, basic design to approval level, conversion design, surveys, feasibility studies and more.

We are looking for candidates with five or more years experience in one of the disciplines and a proven track record in ship design gained from working at a consultancy, initial design department of a shipyard or similar.

You will be a strong team player while at the same time being a highly motivated self-starter. Creativity and an aptitude for problem-solving would be a definite plus.

It is essential that you have core experience in one of the required disciplines. Experience in other disciplines and/or with RoPax and passenger vessels will be beneficial for your application.

For both roles, experience with AutoCAD is required, and for the stability role, experience with NAPA is essential.

Please forward your application with CV, no later than 30/3/12, to Christian Bursche at chb@knudehansen.com

KNUD E. HANSEN (UK) LTD

www.knudehansen.com

matchtech®

Marine Industry careers

Naval Architect | London with travel to the Middle East | £70 - £100k | ref: 258432

Our client is looking for an experienced Naval Architect to join their consultancy business, helping them expand operations into the Middle East.

The ideal candidate will have a varied background, working with large and smaller vessels in both defence and commercial areas.

You will have experience working in a more business orientated role, a large amount of your duties will revolve around business development and helping to maintain and build client relationships.

Matchtech Marine & Shipping
@marine_careers

t: 01489 898160
e: marine@matchtech.com

British Marine Federation
RINA CORPORATE PARTNER

www.matchtech.com

MACDUFF SHIP DESIGN
NAVAL ARCHITECT

MACDUFF SHIP DESIGN is a leading consultancy with an expanding global clientele and design portfolio. The company is currently working on a wide variety of projects from Tugs, Pilot vessels, Workboats through to large Offshore vessels and has collaboration agreements with shipyards in Turkey, Malaysia and India.

We have a vacancy for an experienced and qualified naval architect to join our established team.

The role will encompass all aspects of ship design covering concept general arrangements through to construction and outfitting plans.
This is a permanent, staff position with a competitive salary and benefits.

Please send your C.V. to donald@macduffshipdesign.com

For more information on our company please visit:-

www.macduffshipdesign.com

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

BUSINESS FUNDAMENTALS FOR ENGINEERS
By Professor Chengi Kuo FRINA
This book deals with essential business topics, so often treated in a specialized and lengthy way, as related to practical engineering situations. Eight chapters cover: business and the engineer; fundamental elements of business; markets; management; money; manpower; case examples; and application. This volume provides engineering students and practising engineers with an affective and well integrated introduction to business.
Price: UK £25.00 EUR £25.50 OVS £26.50
(Amazon (UK) price: NA)

GRAND DAME: HOLLAND AMERICA LINE & THE S.S. ROTTERDAM
By Stephen M. Payne FRINA
Stephen Payne, Naval Architect of modern day cruise ships, fully describes the Holland America line's flagship, S.S. Rotterdam, designed and built over thirty years ago and discusses her owners in his above mentioned book. Various chapters describe the building of the ship, her construction, her technical features, her passenger accommodation, and the Holland America line transition from Atlantic ferry to cruise ship operators.
Price: UK £10.00 EUR £12.00 OVS £14.00
(Amazon (UK) price: NA)

LAMENTABLE INTELLIGENCE FROM THE ADMIRALITY
By Chris Thomas
HMS Vanguard sank in thick fog in Dublin Bay in September 1875 rammed by her sister ship. No lives were lost (except perhaps that of the Captain's dog) but this one event provides valuable insight into naval history of the late nineteenth century. Chris Thomas examines what happened, setting it in the context of naval life, the social and economic situation of officers and ratings. He describes the furore caused by the unjust verdict of the Court Martial, vividly illustrating the joys and trials of the seagoing life in the Victorian era, and the tragic effect on the life of Captain Richard Dawkins and his family.
Price: UK £11.00 EUR £12.00 OVS £13.50
(Amazon (UK) price: £12.74)

SD14: THE FULL STORY
John Lingwood
The SD14 is almost extinct, and this book is a fitting tribute to a much-admired British designed cargo ship. Indeed, it should become the definitive history of the SD14 its derivatives. It provides a first-hand account of the SD14's conception and planning from a member of the design team, with many personal insights into the shipbuilding industry of the 1960s. Included are full career details of every SD14, the Prinasa-121s, the SD15 and the three SD18s: a total of 228 ships built wby seven yards in four countries. Every ship is illustrated, usually at several stages of its career, 99% in full colour.
Price: UK £29.00 EUR £30.00 OVS £30.50
(Amazon (UK) price: £31.00)

SHIP DYNAMICS FOR MARINERS
I C Clark Ref:
This well illustrated and thoroughly researched book covers the subject of ship motion. Seafarers through ages have known what ship motion is because they experience it. However predicting motion in advance to better control a ship requires knowledge of the physical principles involved. This single volume contains a wealth of information. It is very thought-provoking as well as being very informative. Mr. Clark's unique style of illustrating complex hydrodynamic interactions enables this book to reach across the boundaries between naval architect and mariner. Even experienced naval architects and mariners will find much to interest them. The author is to be congratulated in putting across some quite complex physical phenomena in a way which is so easy to follow.
Price: UK £54.50 EUR £56.50 OVS £64.00
(Amazon (UK) price: NA)

SHIPS AND SHIPBUILDERS: PIONEERS OF SHIP DESIGN AND CONSTRUCTION
By Fred Walker FRINA
Ships and Shipbuilders describes the lives and work of more than 120 great engineers, scientists, shipwrights and naval architects who shaped ship design and shipbuilding world wide. Told chronologically, such well-known names as Anthony Deane, Peter the Great, James Watt, and Isambard Kingdom Brunel share space with lesser known characters like the luckless Frederic Sauvage, a pioneer of screw propulsion who, unable to interest the French navy in his tests in the early 1830s, was bankrupted and landed in debtor's prison. With the inclusion of such names as Ben Lexcen, the Australian yacht designer who developed the controversial winged keel for the 1983 America's Cup, the story is brought right up to date.
Price UK £12.50 EUR £16 OVS £21
(Amazon (UK) price: £16.58)

THE ROYAL INSTITUTION OF NAVAL ARCHITECTS 1860-2010
Published to commemorate the 150th anniversary of the founding of the Institution, The Royal Institution of Naval Architects 1860-2010 provides a history of the Institution as reflected in the development of the naval architecture profession and the maritime industry over that time. In the book, members give their personal views on the development of their sector of the maritime industry and how it will develop in the future.
Price UK £5.50 EUR £6 OVS £7

WAVES OF CHANGE
By John E Robinson
Waves of Change is the first in a new series of books commissioned by The Nautical Institute to explore Maritime Futures. In this remarkable book the author sets out to explain how innovative technologies, particularly information systems, are impacting on industrial practices.
Price: UK £20.00 EUR £22.00 OVS £24.00
(Amazon (UK) price: NA)

Each month RINA offers up to 70% discount on the normal price of its publications.
Please visit the website at www.rina.org.uk/bookshop-bargains
to see this months specials.

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.

2012 Subscription

Period	12 Months	24 Months	36 Months	Ref: J6
Inland:	£158	£274	£395	
Europe:	£165	£288	£412	
Overseas:	£177	£309	£444	

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.

2012 Subscription

Period	12 Months	24 Months	36 Months	Ref: J7
Inland:	£120	£211	£300	
Europe:	£127	£220	£317	
Overseas:	£145	£252	£363	

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.

2012 Subscription

Period	12 Months	24 Months	36 Months	Ref: J8
Inland:	£55	£97	£138	
Europe:	£61	£106	£154	
Overseas:	£68	£116	£168	

RINA publications

Conference Papers

If the CD ROM format is required please add CD after the reference number.

		Non-Members	Members
2012	**Managing Reliability & Maintainability in Maritime Industry** Ref: RM12	£125	£105
2011	**International Conference on the Education & Professional Development of Engineers in the Maritime industry** Ref: EDP11	£125	£105
	Developments in Marine CFD Ref: CFDIN	£125	£105
	Human Factors in Ship Design & Operation Ref: HF11	£125	£105
	ICCAS 2011: International Conference on Computer Application in Shipbuilding Ref: ICCAS11	£145	£120
	International Conference on Marine Design Ref: MD11	£125	£105
	Warship 2011: Naval Submarines & UUV's Ref: WS11	£125	£105
	Design & Operation of Tankers Ref: TANK11	£125	£105
	Super & Mega Yachts Ref: SMY11	£125	£105
	Marine CFD Ref: CFD11	£120	£100
	High Speed Marine Vessels Ref: HSMV11	£120	£100
	Design & Operation of Passenger Ships Ref: PASS11	£120	£100
	The Damaged Ship Ref: DS11 - **CD ROM only**	£120	£100
2010	**The William Froude Conference** Ref: WFA10	£120	£100
	Systems Engineering in Ship & Offshore Design Ref: SOD10 - **CD ROM only**	£120	£100
	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

International Journal of Maritime Engineering (IJME)

2012	*Members Part Ref: IJME12 Set Ref: ST12*	**Part A1 £14**	**Part A2 £14**	**Part A3 £14**	**Part A4 £14**	**Set £39**
	Non-Members Part Ref:IJME12 Set Ref: ST112	**Part A1 £21**	**Part A2 £21**	**Part A3 £21**	**Part A4 £21**	**Set £71**

International Journal of Small Craft Technology (IJSCT)

2012	*Members Part Ref: IJSCT12 Set Ref: SS12*	**Part B1 £14**	**Part B2 £14**	**Set £26**
	Non-Members Part Ref: IJSCT12 Set Ref: SS112	**Part B1 £21**	**Part B2 £21**	**Set £39**

For further information on previous editions please contact the Publications department on:
Tel: +44 (0) 20 7235 4622, Email: publications@rina.org.uk or Website: http://www.rina.org.uk

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: _____

Print name: _____

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/March12

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

March 28-29, 2012
The Systems Engineering Conference, international conference, London, UK.
E-mail conference@rina.org.uk
www.rina.org.uk/systems-engineering-2012

April 17, 2012
RINA Annual Dinner, London, UK.
E-mail: hq@rina.org.uk
www.rina.org.uk/annual-dinner

April 18-20, 2012
Sea Japan 2012,
international conference, Japan.
www.seajapan.ne.jp

April 30 – May 3, 2012
OTC 2012, international conference, Houston, Texas, USA.
www.otcnet.org

May 2-4, 2012
Fundamentals of contract and change management for ship construction-repair and design, course, London, UK.
E-mail: conference@rina.org.uk
www.rina.org.uk/contract-management-course

May 8-10, 2012
Europort Romania, international conference, Romania.
E-mail: info@europort.nl
www.europort.nl/about-europort/international/romania-en

May 15-16, 2012
UK Maritime Engineering: Identifying the Global Challenge and creating the Business Opportunities, Liverpool, UK.
www.maritimeindustries.org

May 22-23, 2012
Navalia 2012, international conference, Vigo, Spain.
E-mail: navalia@navalia.es
www.navalia.es

May 22-24, 2012
RoRo 2012, international conference, Gothenburg, Sweden.
www.roroex.com

May 22-24, 2012
Seawork 2012, international conference, Southampton, UK.
E-mail: info@seawork.com
www.seawork.com

May 23-24, 2012
ICSOT Korea: Developments in Fixed & Floating Offshore Structures, international conference, Busan, Korea.
E-mail: conference@rina.org.uk
www.rina.org.uk/icsotkorea2012

May 29-31, 2012
UDT, international conference, IFA, Spain.
E-mail: team@udt-europe.com
www.udt-europe.com

June 4-8, 2012
Posidonia, international conference, Athens, Greece.
www.posidonia-events.com

June 20-21, 2012
Warship 2012, international conference, Bath, UK.
E-mail: conference@rina.org.uk
www.rina.org.uk/warship-2012

July 4-5, 2012
Ice Class Vessels, international conference, London, UK.
E-mail: conference@rina.org.uk

August 1-3,2012
NavalShore 2012, international conference, Rio de Janerio, Brazil.
www.ubmnavalshore.com.br

August 28-31, 2012
ONS 2012, international conference, Stavanger, Norway.
E-mail: info@ons.no
www.ons.no

September 4-7, 2012
SMM, international conference, Hamburg, Germany.
www.smm-hamburg.de

September 11-14, 2012
Basic Drydock Course, London, UK.
E-mail: conference@rina.org.uk
www.rina.org.uk/basic-drydock-2012

September 12-13, 2012
IMPA, international conference, London, UK.
www.impalondon.com

September 26-27, 2012
Marine & Offshore Renewable Energy, London, UK.
E-mail: conference@rina.org.uk
www.rina.org.uk/marineoffshorerenewableenergy

October 3-5, 2012
Fundamentals of contract and change management for ship construction-repair and design, London, UK.
E-mail: conference@rina.org.uk
www.rina.org.uk

October 8-11, 2012
Gastech, international conference, London, UK.
E-mail: info@gastech.co.uk
www.gastech.co.uk

October 22-26, 2012
Euronaval 2012, international conference, Paris, France.
www.euronaval.fr

October 24-25, 2012
Marine Heavy Lift & Transport III, international conference, London, UK.
E-mail: conference@rina.org.uk
www.rina.org.uk/heavylift2012

October 27-29, 2012
Seatrade Med 2012, international conference, Marseille, France.
E-mail: info@cruiseshippingmiami.com
www.cruiseshippingmiami.com

November 7-8, 2011
ICSOT Indonesia: development in ship design and construction, Ambon, Indonesia.
E-mail: conference@rina.org.uk
www.rina.org.uk/icsotindonesia2012

November 27-28, 2012
Seatrade Middle East, international conference, Dubai, UAE.
www.seatrade-middleeast.com

November, 2012
International conference on the Education & Professional Development of Engineers in the Maritime Industry 2012, international conference, Singapore.
E-mail: conference@rina.org.uk

December 5-6, 2012
Historic Ships 2012, international conference, London, UK.
E-mail: conference@rina.org.uk
www.rina.org.uk/historic_ships_2012

The Royal Institution of Naval Architects

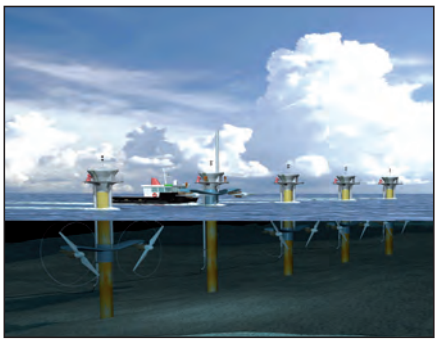
MARINE & OFFSHORE RENEWABLE ENERGY

26 - 27 September 2012, RINA HQ, London

First Notice & Call for Papers

Marine and offshore renewable energy sources have the potential to make a significant contribution to the increasing total global demand, as well as meeting targets for clean energy. However, the demanding environment in which they are found presents great technological challenges for those who wish to develop such sources.

Wave, tidal and offshore wind energy projects involve a wide range of disciplines and expertise. This conference will bring together the industry stakeholders to provide a forum for discussion and a means of professional development for those involved with using natural marine resources to generate energy.



The conference will cover a wide range of topics:

- Research, development and testing.
- Design and construction of renewable energy systems.
- Installation, maintenance and subsea operations.
- Transport / lift vessels and associated support infrastructure.
- Project management and integration.
- Economics and viability.
- Marine planning, environmental protection and sustainable development.
- Regulations, licensing and future directions for development.

www.rina.org.uk/renewable2012

☐ I wish to offer a paper (deadline 22th April 2012 for synopsis not more than 200 words)
☐ 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: **(MORE2012)**

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

As maritime needs grow, ClassNK has solutions.

As the world's economy grows and changes, the maritime industry is faced with ever greater challenges. With roughly 20% of the world's merchant fleet under class, we understand the requirements for the future of safe shipping, and we're working to develop new tools and technologies to meet the changing needs of the maritime industry. Learn more about our efforts to advance maritime safety and protect the marine environment at www.classnk.or.jp

Global Authority in Maritime Standards

ClassNK

www.classnk.or.jp