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Group Sales Director John Payten
Assistant Advertising Manager Valder Gates
Advertisement Production Manager Stephen Bell
Subscriptions & Publications Manager Josie Smith
Publisher Mark J Staunton-Lambert

Published by:
 The Royal Institution of Naval Architects
 Editorial & Advertisement Office:
 8-9 Northumberland Street
 London, WC2N 5DA, 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.

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A 2015 subscription to *The Naval Architect* costs:

NAVAL ARCHITECT			
12 months	Print only†	Digital Only*	Print + Digital
UK	£177	£177	£227
Rest of Europe	£185	£177	£235
Rest of World	£198	£177	£248

10 issues per year;

†Includes p+p
 *Inclusive of VAT

Average Net Circulation 10,933
 1 January to 31 December 2013
 ISSN 0306 0209



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Back to the future

Shipping must move forward and meet the challenges it is facing; technological advances may have to mix the technology of the past with the latest innovations to take those crucial steps

Today many countries have signed up to the cutting carbon emissions by 50% of 1990 levels in order to prevent the Earth's temperature increase surpassing the crucial 2°C mark. Shipping, along with many other industries, must play its part in achieving this. In order to meet these challenging targets the maritime industry will need to cut carbon emissions by more than 50%, however, as growth in demand, from the significant growth in the global population, increases so the level of emissions will increase accordingly.

Current emission regulations are already having an impact on the design and operation of ships. Many solutions to cut carbon emissions, as well as NO_x, SO_x and particulates, have already been found. Chief amongst these are other carbon based fuels such as LNG, Methanol and CNG. These fuels, while dealing effectively with the NO_x, SO_x and particulates problems, only cut carbon emissions by less than 20%. Other technical advances in engine developments and hull form design have further helped to cut emissions, usually by small amounts, to single digit levels. Other technology, such as scrubbers, will effectively clean exhaust of SO_x or NO_x but will use energy to achieve the cleansing process, inevitably releasing more carbon into the atmosphere.

Only one solution currently offers a more than 20% cut in carbon emissions and that is wind assisted power. Sail solutions can offer substantial savings and when combined with other carbon

cutting technology may well provide an answer to the carbon challenge outlined above.

Sail can offer fuel savings of up to 50% on some routes and if this is coupled with LNG or bio-fuel the savings could potentially be much greater. B9 Shipping developed a plan to build a 3,000dwt bulk carrier which was fitted with sails and a Rolls-Royce spark ignition gas engine that burns biomass. The plan, some five years ago, was to develop an anaerobic digestion plant in Kent to produce fuel and for ships to sail to Finland to pick up woodchip that would feed the energy plants on the UK's west coast.

Vessels of this size, according to B9, number around 10,000 globally, are mainly coasters and are capable of significantly reducing the overall emissions from shipping substantially. Other vessels may be able to use similar technology which will further boost global carbon savings from the industry.

Five years ago B9 Shipping was having difficulty selling its idea to potential funders, including the government, and shipowners were not interested in taking a risk. Some four and half years later, the group have formed an alliance with other organisations in an effort to help promote efficient shipping. The Smart Green Shipping Alliance (SGSA) (see pages 42-44) was formed late last year and is an interesting mix of academia, industry and class which it is hoped will help secure the funding to promote wind assisted power.

In essence the main driver for the development for wind assisted power in this way has not been technological but social. Society's demand that global warming be reduced is forcing companies and countries to act in unison, promoting collaboration that will, in the opinion of some, inevitably increase.

The SGSA now consists of class society Lloyd's Register, Southampton University and University College London, the UK's Meteorological Office, Humphreys Yachts and legal and corporate advisors Reed Smith. A collaboration on such a grand scale between these partners would have been unheard of only a few years ago, but the drive to collaborate in the industry is becoming irresistible.

That drive could well see, not only the development of wind assisted power, but further carbon saving technologies for other vessel types such as hybrid power (see pages 54-61) where ferries are using battery technology and solar power to supplement LNG main engine power cutting carbon emissions substantially in both highlighted designs in this month's issue.

Further technological developments will need to be made in order for the industry to meet its carbon targets, and designers are confident of meeting the technological challenge and looking at the technology of the past can teach us re-learn forgotten ideas. But for shipping, the main challenge posed by global warming may be how to work with others, rather than competing against them. *NA*

China

CSSC and CSIC swap leaders

China's two major state-owned shipbuilding entities, the China Shipbuilding Industry Corporation (CSIC) and the China State Shipbuilding Corporation (CSSC) have swapped senior executives in a move that some believe may herald a unification of the two companies.

Dong Qiang has joined CSSC as the Chairman of the Board after leaving his position as CSIC vice president. Wu Qiang, former CSSC Vice President has joined CSIC as president. This will be Wu's second stint at CSIC where he was vice president before he served as CSSC vice president.

The leaders of CSIC: Hu Wenming, the Chairman of the Board (and former CSSC Chairman); Sun Bo, the president at CSSC is the (former CSIC Vice President).

Both CSSC and CSIC are state-owned enterprises and each entity has state authorisation to make investments and for capital management, which is handled under the direct supervision of the government. So the big change will be how each government department will handle the investment. Interested parties within the Chinese ship building industry are now evaluating the changes and what they could mean for the companies in the future.

News of the changes had an effect on the stock prices for both groups in April and, in contradiction to the speculation CSSC and CSIC have announced that there are no plans to integrate the two companies at present.

Some observers say it is hard to predict the effect on the China shipbuilding industry now, but it is certain that the two groups will continue to operate smoothly, and, as a distinctive person, Hu will probably bring some new changes to CSIC.

LNG

Rolls-Royce in LNG first

NorLines' vessel *Kvitbjørn* has made the longest trip to date on LNG power claims Rolls-Royce (RR), whose engine powered the vessel.

Delivery of the vessel from the Tsuji Heavy Industries shipyard in Jiangsu province, China, was completed by delivering the vessel to the owners in Bergen, Norway on 29 March.

According to RR *en route* to Norway the vessel made bunker stops in Singapore, Cochin, India and Cartagena, Spain. "This was the longest voyage ever undertaken by a vessel running solely

on LNG and was completed in Bergen," said RR.

The 5,000dwt short sea cargo vessel, built to RR's Environship concept standard can be adapted for different ship types and includes a number of RR technologies. "These include a Bergen B35:40 gas engine powered by LNG, the Promas combined rudder and propeller, a hybrid shaft generator to optimise use of electrical power and an innovative wave-piercing hull design," said the company.

In all RR claims that its design and technology combined reduces CO₂ emissions by up to 40% compared to similar diesel powered vessels.

Oscar Kallerdahl, Rolls-Royce, Sales Manager-LNG Systems, said: "The realisation of *Kvitbjørn* is a significant milestone in the shipping industry's fundamental transition from diesel fuel to LNG. It is important to note that the Bergen B35:40 gas engines are not dual-fuel engines. A pure gas engine and shaft generator driving a controllable pitch propeller is the most effective configuration for keeping emissions low and improving fuel consumption."

RR added: "This arrangement is coupled with a hybrid shaft generator for electric Power Take In (PTI) which ensures flexibility and redundancy of the system when needed."



In a historic first NorLines' vessel *Kvitbjørn* became the first vessel to sail the Asia to Europe journey entirely under LNG power, arriving in Norway in late March

Bulk Carriers

Orders for Deltamarin's first self-unloaders

Texas-based Vulica Shipping Co. Ltd is the first company to order Deltamarin's B.Delta68 SUL self-unloading bulk carrier designs. The order for two ships from the Jiangsu Hantong Ship Heavy

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Industry, China, is valued at €3 million (US\$3.22 million) to Deltamarin includes basic and detailed design, procurement and site assistance.

The Panamax vessels are 229m in length with a 32m beam and a maximum draught of 12.8m with a service speed of 13.5knots and are scheduled for delivery in July 2017.

LNG

DSME and Alfa Laval seal deal

South Korea's Daewoo Shipbuilding & Marine Engineering (DSME) has signed a licence agreement with Danish equipment provider Alfa Laval. The deal will allow the Danish company to use DSME patents on high pressure fuel gas supply systems.

Alfa Laval says the agreement will allow it to develop its fuel conditioning modules which are used with high pressure gas injection engines designed by its fellow Danes MAN Diesel & Turbo.

The company added: "The agreement also paves the way for Alfa Laval to adapt its fuel conditioning systems using DSME technology in order to use LNG as secondary or tertiary fuels aboard commercial ships of the future."

The patent agreement with DSME complements the acquisition, in December of last year, of CorHex, the Korean-based manufacturer of compact printed circuit heat exchangers. "These diffusion-bonded compact heat exchangers are excellent for, among other things, high-pressure LNG fuel gas applications," said Alfa Laval.



Signing the patent sharing deal was Dong-Kyu Choi, Director at DSME (left) and Niclas Dahl (right), Market Unit Manager, Marine Energy, Alfa Laval

New design

LR and Chinese collaborate on low ballast design

China's Dalian Shipbuilding Industry China (DSIC), Dalian Ocean Shipping Co. and the UK's Lloyd's Register (LR) have developed minimum ballast designs for Suezmax and Aframax tankers.

LR says: "The 'Clear Advantage' reduced ballast designs provide substantial performance improvements over conventional tanker designs. The benefits are: reductions in energy consumption during ballast passages; a reduction in ballast water treatment capacity – and the associated time, energy and cost penalties incurred in treating ballast water; and a reduction in the harmful effects of mud or silt."

China's oil terminals are often located on rivers and the intake of river ballast has resulted in significant levels of mud and silt also being loaded with the river water ballast as cargo is discharged to the terminal.

Up to 1,000tonnes of mud and silt can become stuck in the ballast water tanks of the vessels as a result. This could lead to a loss of cargo capacity and would incur a cost for transporting the mud during cargo laden journeys as well as the cost of mud removal and the strain imposed on ballast water treatment systems.

DSIC's President, Yu Fengping said: "In close co-operation with the ship owners and with Lloyd's Register over the years, DSIC has taken the lead in completing the development of series of oil tankers with significantly reduced ballast water in the design – by 40% – and ship performance is improved through optimised hull lines. CFD analysis and model tests have played a key role combined with adoption of effective energy saving devices, innovative tank division and structural design as well as better piping layout. These new designs are not only suitable for some of China's silt-laden water ports, but can significantly reduce energy consumption while in ballast condition, realising energy savings and emission reductions to bring competitive advantages to owners." **NA**

Correction:

In the April issue we stated that NCG was The Netherlands Center for Geodesy in fact it is the Numeriek Centrum Groningen. *The Naval Architect* would like to apologise for the error.



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IMO BWMS survey to analyse system performance

Ballast water management systems (BWMS) are once again on the agenda at the Marine Environment Protection Committee this month and in advance of the meeting the IMO is encouraging industry players to complete a survey on BWMS to assess the performance of type-approved systems and implementation of the BWMS approval guidelines, writes *Sandra Speares*.

Other issues to be raised at the meeting include: independence of approval testing from system manufacturers; deviations from and use of standard testing methods; adequacy of reporting from land-based and ship-based testing; differences in member state approval protocols; scaling of systems; appropriate quality certification of testing facilities; ballast water holding times following treatment during testing and sampling and collection methods during shipboard testing.

The survey is directed at all those involved in the testing, approval, fitting and operation of BWMS and the study aims to provide a comprehensive review of the technical standards and approval testing procedures in the Guidelines for approval of ballast water management systems (G8).

The intention is to address concerns that the testing regime for approval of BWMS needs to be sufficiently robust and consistent in the ballast water convention which has yet to come into force.

The surveys can be accessed at sites.google.com/a/wmu.se/d2study/ and will remain open until 1 June 2015. The study is being carried out by the IMO Secretariat in partnership with the World Maritime University (WMU) and its outcome will be reported to MEPC 69 in the spring of 2016.

Jonathan Spremulli, technical director at the International Chamber of Shipping (ICS) said the ICS raised six fundamental requirements in terms of parameters against which systems should be verified during approval and these have been taken on board, while administrations who were previously reticent to re-open the guidelines have now added some 30 other issues to be discussed.

He says that the “hot potato” at the moment is the United States. So far he says there are no US type-approved ballast water management systems, so the only option for owners going to the US is – if they are in that tranche that has to comply with the regulations – to apply for an extension from the US Coast Guard, or to fit a system that has been

accepted as an alternate management system i.e. an IMO type-approved system that has been looked at by USCG and given a temporary acceptance.

Canada has made a submission to the next MEPC meeting outlining its concerns regarding ships operating on the Great Lakes, which pass through US, as well as Canadian waters.

“Shipowners who regularly conduct business in Canadian and US ports have indicated that acceptance by the United States of AMS does not provide the certainty needed to confidently proceed with investment in a BWMS. The risk to a shipowner of fitting an AMS is that it could need expensive modification or early replacement should it not ultimately be type approved by the United States,” the submission says.

“The entry into force of the Convention before the type approval of appropriate systems by the United States would pose challenges for these ships. They could no longer await US type approvals, as the Convention would require them to begin meeting the ballast water performance standard in accordance with its regulation B-3 as modified by resolution A.1088(28).”

According to Spremulli, what Canada is highlighting is the “investment conundrum” facing all owners visiting the US. The US has said clearly that AMS will only be accepted for five years, and there is no guarantee that an AMS will subsequently receive US approval.

Work on the G8 guidelines is going forward, he says and the MEPC resolution to do with port state control inspections in accordance with the ballast water convention is pragmatic. Going forward ICS would like to see the approach that is in the guidelines reflected in the articles of the convention, although obviously the convention cannot be changed before it enters into force. The approach, for example as far as sampling ballast water is concerned is different in the guidelines to the convention.

Another issue which is on-going as far as ballast water is concerned is the subject of exemptions for short sea shipping, for example in Denmark and Sweden where a ferry can be operating over a distance of six or seven kilometres and where the ballast water being taken up is essentially the same as that being discharged. The onus is on the ship owner to do the risk assessment and this is expensive so ICS is looking to IMO to have a pragmatic approach to the issue. *NA*

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Lubrication

OEMs approve Chevron lube

Both Winterthur Gas & Diesel Ltd (formerly Wärtsilä) and MAN have issued no objection letters for Chevron's latest marine lube oil the 100BN Taro Special HT 100.

According to Chevron its latest lube oil will help shipowners to meet the latest emissions regulations.

A Wärtsilä 8RT-flex82T engine has now completed 50% of its onboard test cycle, operating for 2,000 hours leading Winterthur Gas & Diesel to issue an interim No Objection Letter (NOL) and a full NOL is expected following the completion and analysis of samples of the full 4,000 hours test cycle.

"The interim approval allows the use of Taro Special HT 100 oil in Wärtsilä RTA, RT-flex and W-X engines as well as in Sulzer 2-stroke engines operating on fuels with sulphur contents in the range of 2.0 to 3.5% on a continuous basis," says Chevron.

MAN Diesel & Turbo has already upgraded its interim approval to full approval of the lube oil following the completion of tests late last year.

www.chevron.com

LNG

GTT set for Korean collaboration

The LNG membrane containment system designer GTT (Gaz Transport & Technigaz) of France is entering into development agreements with two of South Korea's major shipbuilders, Samsung Heavy Industries and Hyundai Heavy Industries, for the development of its Mark V system.

A cooperation agreement was signed in early April between GTT and Samsung and a similar deal is being finalised by the GTT and Hyundai and is expected to be signed soon.

GTT says that the two partnerships will allow the company to 'commercialise' its Mark V technology this year. The French company explains that the Mark V is an "optimised version of the Mark III system and its sister Mark III Flex".

According to GTT 146 LNG carriers are operating with the Mark III and Mark III Flex systems and the Mark V technology has received Approvals in Principle from the major classification societies.

As with the two earlier designs the Mark V technology has double insulation and is reinforced with polyurethane foam. However, the later system also includes an iron-nickel alloy corrugated second-

ary membrane which offers significant improvement to the daily boil off rate, says GTT.

www.gtt.fr

Waste water

USCG approves OMNIPURE

The United States Coast Guard has certified Severn Trent De Nora's OMNIPURE Series 55/64 sanitation treatment systems for use in its waters.

The OMNIPURE Series 55/64 technology uses an electrolytic treatment process, combined with electrocoagulation to treat wastewater and "provide sanitary solids for handling".

According to Severn Trent the OMNIPURE Series 55/64 system "can accommodate treatment capacities of up to 665 persons for black water and up to 219 persons for black and grey water." In total the systems have an individual capacity of up to 65m³/day (17,280 gal/day) but the systems can be combined to increase capacity.

The OMNIPURE Series 55/64 also offers operational benefits such as a small footprint, light weight, is easy to install and automatically removes concentrated solids in situ to the treatment process. The systems have Bureau Veritas certification for IMO Resolution MEPC.227 (55/64) and also comply with the EU MED regulation.

Meanwhile Severn Trent says that 10 of its Filtersafe system BALPURE BP 3000 systems with a capacity of 3,000m³/h will be installed on 110,000dwt Aframax tankers and a further four BALPURE BP 4000s with a capacity of 4,000m³/h will be installed on 160,000dwt Suezmax tankers currently under construction in South Korea.

www.stwater.co.uk

The Filtersafe units are IECEx explosion proof and rated for Zone Zero. The filters are Lloyds Register certified, witnessed and stamped.



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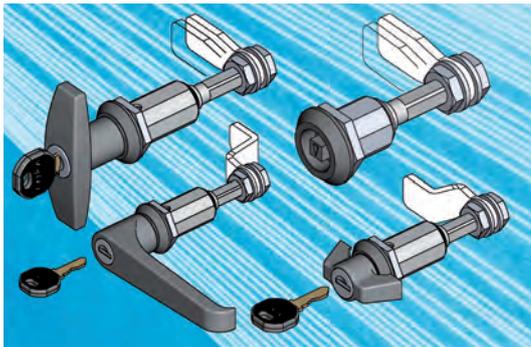
EMKA launches latest latches

Germany-based EMKA has launched its latest compression latches. The EMKA 1000 compression latches are designed for use on electrical, electronic and storage housings, particularly in areas subjected to vibration which may cause a non-compression latch to fail catastrophically, such as on gensets.

“Design of compression latches provides good protection from vibration plus enables simple depth adjustment. The added gasket pull-down available, coupled with depth adjustment, produces an improved gasket seal together with a more robust closure,” says the company.

The company adds that EMKA compression latches are normally sealed to IP65, but are available up to IP69.

www.emka.com



Vibration proof compression latches, EMKA compression latches are produced in zinc die, aluminium or stainless steel with 26 types of industry standard inserts, plus wing handles, L handles and T handles

Energy efficiency

AIDA employs EMMA

German cruise ship operator AIDA will install ABB energy monitoring and management systems (EMMA) on all 10 of its cruise ships.

EMMA is a decision support tool that will aid the vessel operator to meet ship energy efficiency management plan (SEEMP) requirements that have been mandatory since 2013.

Zurich, Switzerland, 14 April 2015 – ABB, the leading power and automation technology group, will deliver energy monitoring and management system EMMA to German-based cruise operator AIDA's entire fleet consisting of 10 vessels. The EMMA advisory suite, already installed on six of AIDA's cruise ships, is a decision-support tool to minimize the overall energy costs for individual vessels and entire fleets.

“EMMA [on AIDA ships] will cover seven top-level

categories: propulsion power, propulsion efficiency, vessel trim, hotel and auxiliary power, air condition power per person, specific fuel oil consumption of the main diesel generators and total fuel consumption,” says the company.

Analysis services from ABB will include simulations that will help AIDA on future business case analysis.

“All data generated onboard is transferred to a cloud-based application for vessel benchmarking. This can provide management onshore with full visibility of energy consumption across the entire fleet,” the company adds.

www.aida.de

Engines

MAN methanol unit completes testing

MAN Diesel & Turbo has successfully tested its ME-LGI methanol fuelled engine at its research Centre in Copenhagen Denmark.

The testing of the engine was demonstrated to MAN customers and Vice President and Head of R&D, Søren H. Jensen, said: “Attendees showed great interest in the demonstration,” and he added, “A number of years ago we identified the need to develop an engine that could run on more environmentally-friendly, competitively-priced fuels as an alternative to MDO/MGO. We believe the ability of the ME-LGI engine to run on sulphur-free fuels offers great potential. Methanol carriers have already operated at sea for many years. With a viable, convenient and economic fuel already on-board, exploiting a fraction of the cargo to power a vessel makes sense.”

MAN Diesel & Turbo has received orders for seven ME-LGI engines – including types such as 7S50ME-LGI and 6G50ME-LGI variants – from Mitsui O.S.K. Lines, Marinvest and Westfal-Larsen.

Methanol as a ship fuel is interesting for ship operators because it does not contain sulphur and is liquid in ambient air conditions and it does not need pressurised tanks, making it easy to store aboard ships. For ships operating in IMO Emission Control Areas (ECAs), methanol is a solution to the demands of sulphur-emission legislation.

www.dieselturbo.man.eu

Propulsion

RR supplies propulsion for research ship

Rolls-Royce has announced that it has been contracted to supply the propulsion system for the FF Kronprins Haakon research vessel currently under construction

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at Italy's Fincantieri yard.

Rolls-Royce says: "the vessel is a NVC 395 POLAR design from Rolls-Royce was ordered by the Norwegian Institute of Marine Research. Detailed design will be carried out by Fincantieri. It is designed to operate through rough ice conditions, and will be equipped to cover a wide range of marine research operations, such as monitoring fishing stocks, metrological studies, sea floor sampling and mapping."

Rolls-Royce will supply four diesel gensets, two Bergen B32:40L9ACD and two Bergen B32:40L6ACD along with a power electric system, azimuth main thrusters and Polar tunnel thrusters. The company added that a range of electrical systems will also be included.

www.rolls-royce.com

Engines

MAN awarded type approval for SCR

MAN Diesel & Turbo SE (MDT) has been awarded approval in principle for its selective catalytic converter (SCR) system, which eliminates NOx emissions, fulfilling Tier III regulations for all its medium speed engines.

In Shanghai last month a ceremony was held as the China Classification Society (CCS) approved the system following tests on a MAN 8L21/31 auxiliary engine with an integrated SCR system. The engine used in the tests will be installed on a DFDS Seaways ro-ro ship *Petunia Seaways*.

Dr. Daniel Struckmeier – Head of Emission 2016 – Senior Project Manager, MDT said: "This certificate represents an important milestone in our collaboration with CCS and is of utmost importance in providing a complete IMO Tier III package solution to our customers."

www.dieselturbo.man.eu

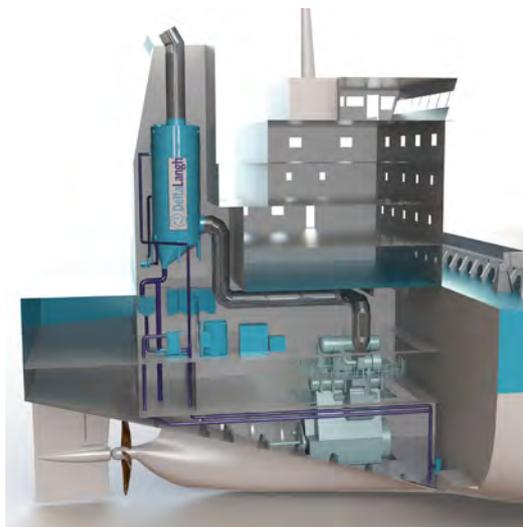
Scrubbers

DeltaLangh offers financing

Finnish scrubber manufacturer DeltaLangh is offering financing deals on its closed loop scrubbers and its latest hybrid scrubbers. The Finnish Export Credit Agency Finnvera can offer export guarantees through which DeltaLangh clients can arrange financing.

The company's latest hybrid scrubber can be operated in closed or open loop modes and will help ship operators meet SOx emission regulations now in force in SOx emission control areas (SECA).

The company says that as the development of



The DeltaLangh hybrid scrubber has a tower diameter of up to 320cm, a tower height of 1,050cm and a tower weight of up to 8,200kg

the scrubber systems was by a shipping company for shipping companies the price of the system was "especially important".

This is now evidenced with the company's campaign as it promises the scrubber for €975,000 (US\$1.05 million). "The price is calculated for a vessel with an engine of 8 to 9MW and includes all components for a fully functional hybrid ready system", explains DeltaLangh Technical Director Kimmo. Henriksson. He adds the company "supports the customer in all project stages providing material and installation instructions for yards. Also a full turnkey delivery is available."

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Deck equipment

Subsea ship gets lifting gear

Fujian Mawei Shipbuilding, which is building the world's first seabed mining vessel to be chartered by Nautilus Minerals Inc. of Canada, has awarded MacGregor, part of Cargotec, the contract to supply two subsea knuckle boom cranes for the vessel.

Delivery of the cranes is scheduled for the first quarter of 2017. The 227m production support vessel has a beam of 40m and has been designed by Singapore's SeaTech Solutions for Dubai-based owner Marine Assets Corporation (MAC).

The MacGregor order consists of two knuckle boom cranes; a 200tonne active heave-compensation (AHC) subsea crane with the capability to operate to a depth of 2,500m, and a smaller 100tonne subsea crane.

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Race for IMO Secretary-General approaching its climax

Since the current Secretary-General, Koji Sekimizu, announced his intention to stand down last year the speculation around who might replace him has grown. In this month's issue we profile four of the six candidates with a further two profiles to be published next month

Each candidate for the Secretary-General of the IMO has their priorities that they will focus on should they be elected. Here *The Naval Architect* gives a short run down of their key policies. The election winner will take up the position on the 1 January next year.

Vitaly Kluyev, Russia

It is clear that the current Secretary-General, Koji Sekimizu, is held in high regard, not only by Vitaly Kluyev, but by the other candidates featured here. All the potential Secretary-Generals have listed completing the work started by Sekimizu as one of their aims and in this regard Kluyev is no exception.

He also lists maintaining an adequate budget, keeping a sustainable level of secretariat staff and the effective implementation of the IMO Member States Audit Scheme due to be enforced from 1 January 2016 as major aims.

Kluyev also believes that the secretariat has room for improvement in certain areas. He says: "We must pay closer attention to the implementation of regulation by member states via a more effective technical support from the organisation".

In addition Kluyev says a "more effective use of Technical Cooperation programmes, reorganising the TC scheme and TC strategy," is necessary and that the secretariat must provide "more specific support to member states encountering implementation difficulties".

An assessment scheme that analyses the effect of regulations, both under development and existing rules along with "a comprehensive review of the existing regulations to provide more flexibility to the industry while maintaining the equivalent or higher level of safety," is proposed to evaluate how well the



Russia's Vitaly Kluyev has a comprehensive programme of reform for the IMO should he be elected

regulatory system is operating.

Educated at the Institute of International Relationships of the Far-Eastern State University, Vladivostok, Russia, Kluyev holds a degree described as a Doctor of Transport.

He was a senior lecturer in radio-navigation equipment and e-navigation at the Far-Eastern State Maritime Academy, Vladivostok, Russia, in 1985.

By 1999 Kluyev had been appointed head of the Asia-Pacific maritime information and coordination centre before joining the Ministry of Transport of the Russian Federation, Moscow, Russia, in 2006. Kluyev was the head of the maritime and river transport safety division, Deputy Director of the Department of State policy for maritime and river transport responsible for, among other things, legislation development in the maritime and river transport sector, maritime and river transport safety and security policy, bilateral and multilateral relations on maritime and river transport and IMO coordination.

Kluyev has also spent time at sea starting

as an able seaman and deck officer on seagoing vessels, including passenger ships, a dry cargo carrier, a timber carrier, a reefer ship and a container vessel. He was also a trainer aboard a training vessel.

Andreas Chrysostomou, Cyprus

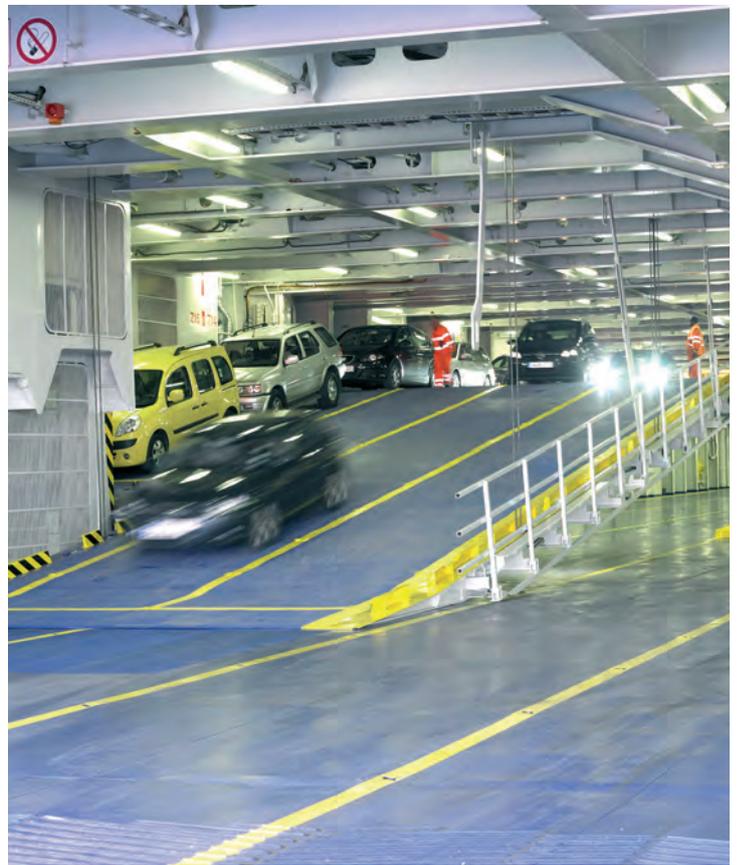
A graduate in naval architecture and shipbuilding at the University of Newcastle Upon Tyne, Andreas Chrysostomou went on to study for a master's degree in business administration at the same university before spending five years as a maritime consultant.

In 1993 he joined the Cypriot civil service as a marine surveyor, before moving to London in the Cyprus high Commission, representing Cyprus at the IMO where he was the chairman of the Maritime Environment Protection Committee. In 2004 Chrysostomou returned to Cyprus and the Department of Merchant Shipping as the Head of Policy and Standards, before this year being promoted to the position of Acting Director for the department.

Chrysostomou says that he would make "inclusiveness" the IMO's motto making sure the decision making process is member state driven, but includes the voices of the maritime industry.

"A considerable number of Member States, in particular the developing countries, continue to face difficulties in their efforts to give full and complete effect to the IMO-instruments, mainly because of knowhow-related constraints and the absence of the necessary resources.

"Under my persuasion I will strive to see the organisation establishing a more focused strategy on how to build the capacity of the developing countries with specific deliverables towards human and institutional capabilities so as to be able



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to adequately discharge states' obligations under the IMO instruments, in a long-term sustainable manner," says Chrysostomou.



Andreas Chrysostomou believes the Secretary-General has a duty to ensure that the IMO "continues to serve the emerging and foreseeable needs of the international maritime transport, the environment and the people associated with it"

Andreas Nordseth, Denmark

A seafarer by education and trade Andreas Nordseth spent his formative years studying for his Shipmasters' Diploma at the Copenhagen Nautical College which he achieved in 1982 before joining the Royal Danish Navy as a second Lieutenant, Nautical Officer of the Reserve, Royal Danish Navy in 1984. By 1989: he had returned to academia at the Technical University of Denmark as a Navigational



Danish candidate Andreas Nordseth wants to make certain that the IMO remains the focal point of maritime regulation

Instructor.

Nordseth joined the Danish Maritime Authority in 1997 as Head of Examinations for Masters and Mates and was promoted to Director for Maritime Education and Training two years later.

He was promoted again in 2003 to the position of Deputy Director-General, Danish Maritime Authority responsible for Danish maritime education and training, certification and manning (including policy development and implementation, Danish contributions to the STCW), operational issues (safety of navigation, radio com., maritime health and safety) and internal functions (HR, IT, internal service).

In 2009 Nordseth was appointed to the position of Director-General, Danish Maritime Authority.

Nordseth told *The Naval Architect* that he aims to ensure the IMO is "the focal point for maritime regulation". He says that if the world wants to see sustainable maritime activity it is "important to ensure that there is a global legal framework" for those activities.

Wearing his diplomatic hat Nordseth said that unilateral regulation, whilst not a threat to the industry, it will "distort the conditions that the industry operates in". He went on to say: "It is important to show the world that the IMO can produce results and will continue to do so in the future and that regional regulation will hamper that process."

Nordseth believes that the global community must find "balanced solutions" for regulatory conundrums that are "based on cooperation and a broad consensus as well as the common understanding that quality shipping is a shared responsibility."

Juvenal Shiundu, Kenya

Kenya's candidate Juvenal Shiundu who is the Deputy Director/Head of Programme Management at the IMO, in this position he is responsible for programme management of the Integrated Technical Cooperation Programme (ITCP) including planning, oversight, monitoring and evaluation.

In 1986 Shiundu attained his Master of Science degree in Maritime Safety Administration (Marine Engineering) from the World Maritime University, Malmo, Sweden. Three years earlier he had attained

his Bachelor of Science (Hons) degree in Naval Architecture and Shipbuilding from the University of Newcastle Upon Tyne, United Kingdom.

In his mission statement Shiundu says he will implement the strategic plan devised for the IMO for the six year period up to 2019, this includes safety and environmental concerns and the efficiency of shipping as well as piracy, concerns over illegal migrants.

Shiundu is also interested in promoting maritime education and training as a means of addressing the shortage of qualified merchant navy officers, I will continue to promote maritime education and training as a key contribution to a sustainable maritime transportation system.

Following the *Sewol and other* accidents Shiundu says he will promote the safety of domestic ferries and non-convention size vessels; he says: "I will continue to work with Member States, sub-regional forums and industry to explore every possible avenue so that the loss of lives in domestic ferry accidents, wherever they occur around the world, can be minimised. I am currently a member of a high level project team assembled by the incumbent Secretary-General to address this issue."

In addition the IMO Member State Audit Scheme (IMSAS) will enter into force in January 2016 and is expected to present challenges for member states. It is expected that the IMSAS will lead to requests for technical assistance increasing the budgetary requirements for implementing ITCP. **NA**



Kenya's candidate, Juvenal Shiundu has worked at the IMO since 1997, initially as the head of the Africa section and since 2010 as the Deputy Director/Head of Programme Management



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Chinese yards struggle to build profits

China's shipbuilding industry analysis for last year showed a mixed performance as core business revenue and profits both climbed. Nevertheless, the industry had difficulty maintaining growth with market demand on the wane. Meagre profits, plunging oil prices and new international standards brought added challenges



The collapse in oil prices and stuttering newbuild demand has seen China's shipyards report faltering returns

In 2014, with the global economic recovery losing steam and the Chinese economy feeling increased downward pressure and excessive production capacity troubling shipbuilders, the shipbuilding industry in China, at the guidance of government policies and market coercion, hastened adjustment and transformation.

Shipbuilders managed to overcome difficulties such as waning orderbooks, excessive capacity and a marine engineering equipment business exposed to higher risks. The industry made firm strides in structural adjustments and helped strengthen China's standing as a major shipbuilding nation in the world.

Decrease in completed vessels slowed

In 2014, shipbuilders in China completed vessels of total tonnage 39.05 million DWT, down 13.9% year-on-year, an improvement of 10.8% compared with the previous year. With fewer deliveries due, the number of completed vessels saw a more notable drop

in the third quarter, then it stabilised and was back on a steady climb in Q4.

During the year, China new vessel orders in terms of tonnage totalled 59.95 million DWT, claiming a 50.5% share of the global market, up from 47.9% in 2013, holding on firmly the top spot in the world. The industry received 31 marine engineering equipment orders and 149 orders for marine engineering vessels, valued at US\$1.476 billion or 35.2% share of the global market, 5.7% more than in 2013.

At the end of 2014, the industry had orders in hand with a total tonnage 148.9 million DWT, 13.7% more year-on-year. The first three quarters saw continuous growth but Q4 saw new orders fall, orders in hand also came down gradually month by month.

Core business revenue grew

According to China's National Bureau of Statistics (NBS), between January and November 2014, there were 1,492 national-scale shipbuilding enterprises in the country reporting core business revenues totalling

RMB562.69 billion (US\$90.56 billion), a 10.5% increase year-on-year. By specific business type, shipbuilding brought in RMB350.6 billion (US\$56.35 billion), up 8.7%, shipbuilding equipment RMB94.27 billion (US\$15.18 billion), 11.8% higher, and those in ship repairs accumulated RMB22.67 billion (US\$3.65 billion), 0.9% more, period-on-period. By scale, large enterprises accounted for RMB282.06 billion (US\$45.42 billion), an 8% increase, medium enterprises RMB137.97 billion (US\$22.22 billion), up 8.9%, and small players RMB142.66 billion (US\$22.97 billion), 17.6% higher, period-on-period.

Total profits increase

NBS numbers also showed that in the first 11 months of 2014, national-scale shipbuilding enterprises made a total profit of RMB24.4 billion (US\$3.92 billion), 21.3% more than in the same period last year. And, by specific business type, shipbuilding enterprises recorded profits of RMB14.68 billion (US\$2.36 billion), 20.3% higher, whereas shipbuilding equipment RMB4.69

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billion (US\$755.23 million), surging 15.5%, and RMB0.51 billion (US\$82.12 million) were paid for repair service, 8% more, against the same previous period. By scale, large enterprises booked RMB12.45 billion (US\$2.00 billion) in profit, up 11.8%, and their medium-size peers RMB5.28 billion (US\$850.2 million), 25.9% more, whereas the small enterprise profits increased to RMB6.68 billion (US\$850.2 million), up 39.2%, period-on-period. The numbers show the relatively strong risk resistance of small and medium shipbuilders in the country.

Drop in exports narrows

In 2014, the industry exported completed vessels with a total tonnage of 33.11 million DWT, down 7.3% year-on-year, and received orders for vessels of tonnage amounting to 55.51 million DWT, 14.3% less year-on-year. As at end of December, export orders in hand in all amounted to 142.80 million DWT, 23.7% more year-on-year, with completed vessels, new orders and orders in hand made up of respectively 84.8%, 92.6% and 95.9% of the tonnage.

Between January and November of 2014, the industry exported US\$22.8 billion worth of products, down by 14.7% when compared with the previous period, but the rate of decrease was slower by 12.2%.

By export product type, bulk carriers accounted for US\$7.58 billion, about 33.3%; container carriers US\$4.8 billion, about 21.1%; oil tankers US\$1.88 billion, about 8.3%; functional vessels – lightships, fire boats and crane ships, etc. – US\$2.44 billion, about 10.7%; floating or submersible drilling or production platforms US\$1.47 billion, about 6.4%; tugs and pushers US\$1.19 billion, about 5.2%, and mechanical multi-purpose vessels US\$1.18 billion, also about 5.2%. And, among all products exported, bulk carriers, container vessels and oil tankers were the mainstream.

By export market, Asia swept up US\$13.47 billion worth of products, 59% of the total; Africa US\$1.07 billion, 4.7%; Europe US\$3.94 billion, 17.3%; Latin America US\$2.78 billion, 12.2%, and Australia US\$1.34 billion, 5.9%. Asia remained the biggest export market for China's shipbuilding industry.

In 2014, the Chinese government encouraged early declaration and upgrading of dated transport shipbuilding



China has four yards in the top 10 shipbuilders in the world

capacity, supported administration and execution of policies and building of government vessels and updating of fishing boats. Policies were rolled out according to plan. They included policies supportive of development of the buyer's credit business, credit financing and innovative financing, enterprises making technological improvements and keeping control over adding production capacity, and also their efforts to adjust or restructure production capacity.

Hastened technological innovation

In 2014, the spine of China's shipbuilders took initiatives to align with international shipbuilding techniques and new product development trends, adjust their portfolio structure with market demand, push for the development of vessels with high technological specification and strong market potential such as green vessels and specialty ships.

In 2014, the industry shed production capacity of close to 10 million DWT, and with shipbuilders encouraged to transform their operations and move into the marine engineering equipment arena, production capacity of about 5 million DWT were transferred, and meanwhile, a number of planned large-scale shipbuilding establishments were shelved.

In addition, the country kicked off evaluation work as prescribed in the Shipbuilding Industry Rules and Regulations and announced the names of two batches of 60 enterprises given the stamp of approval; published as the Marine Engineering Equipment (Platforms) Industry Rules and Regulations to help strengthen management of related production and guide the industry's continuous healthy growth.

Last year, the three major shipbuilding bases in China, namely the Bohai Rim area, the Yangtze River Delta and Pearl River Delta, together accounted for more than 90% of the completed vessels, and the top 10, 20 and 30 most productive shipbuilders respectively turned out 50.6%, 71.6% and 83.8% of all completed vessels, growing 3.2, 5.9 and 7.4 percentage points.

These numbers indicate that the industry has become yet more concentrated. The country has four shipbuilding enterprises among the top 10 in the world with the most new orders. Among the four, China State Shipbuilding Corporation landed the most new orders among shipbuilders in the world, whereas China Shipbuilding Industry Corporation placed third worldwide in terms of orders in hand.

Marine equipment industry boost

In 2014, under the country's policies to rid obsolete shipbuilding capacity, projects underway leaped year-on-year and correspondingly the marine equipment industry recovered and grew. Statistics showed, in the first 11 months of the year, core operations of the industry made revenues totalling RMB94.27 billion (US\$ 15.8 billion), up 11.8% period-on-period; completed vessels were installed with more than five million-kilowatt of low-speed diesel engine power, 71.6% more than in the previous period; more than 12 million-kilowatt of medium- and low-speed diesel engine orders were received, doubling the number a year ago, and the production outputs of key marine equipment including anchor capstan, steering gear, crane, turbocharger, propeller and crankshaft all climbed significantly.

Statistics show 80% of the bulk carriers built in China using locally produced equipment and for oil tankers and

medium and small container carriers the number is about 70%.

Financial leasing development

Since the beginning of 2014, the country has launched a series of mild economic stimuli, helping to improve capital supply in the inter-bank market. The relatively fast drop in interest rates, for short-term loans in particular, presented shipbuilding enterprises with a good financing opportunity. As such, shipbuilding related financial leasing quickly developed to become another main financing channel for shipbuilders next to bank credit.

Stunted market demand

In 2014, the industry received new vessel orders with a total tonnage close to 60 million DWT, remaining comparatively high, but it dwindled from 25.84 million DWT, to 14.96 million, to 11.68 million and finally 7.47 million in quarter respectively.

Meagre profits

Declining profits has several causes. The first being, as demand shrank in 2014, it was hard to raise the price of new ships. Secondly, workers' salaries in the industry have risen to on average RMB45,000 (US\$7,243) a year, meaning labour costs have increased sharply slowly eliminating the industry's cost advantage.

Shipbuilders also continue to face financing difficulty and high financing costs continue to bother shipbuilders especially when the industry is deemed the fifth among industries with the most surplus production capacity. Between January and November 2014, the industry paid RMB4.43 billion (US\$713.02 million) in financial cost, 11.1% higher than a year ago and 2.5% more than its core business revenue. Finally, deliveries to be made over the next few years will be mainly low-price products ordered after the international financial crisis hit.

Excess capacity

In the past several years shipbuilders in the country have worked hard at addressing the problem of excess production capacity as obsolete yards have closed or been and absorbed into other operations. These efforts have helped trim excess capacity in the industry by 20 million DWT. However, the industry's production capacity consumption rate continued to be very low.

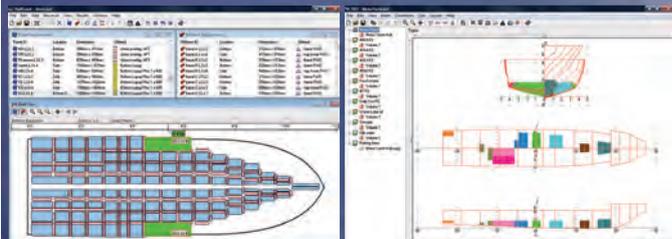
The plunge of international oil prices has sent the marine engineering market into a downward spiral with the consumption of marine engineering equipment following close behind. And, compounded by the fact that marine equipment orders placed with Chinese enterprises are typically of lower prices and few of these enterprises are able to secure payment ahead of delivery, in addition some vessel owners have no clients leasing from them, against the oil price drop and a slack market, the risk of order cancellation mounted rather significantly. **NA**



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Safety in numbers

Successfully evacuating large passenger ships during an emergency is a challenge that can be improved using computer analysis tools such as AENEAS to analyse pedestrian movements, say Dr. Daniel Povel, a member of the Risk Assessment Team of Maritime Advisory at DNV GL, and Tim Meyer-König, TraffGo HT

A step towards improving the safety of passenger ships was taken at the second meeting of IMO's Ship Design and Construction sub-committee (SDC) in February this year; the participating countries agreed, that evacuation analyses, which are currently mandatory for ro-ro passenger ferries, should become mandatory for all passenger ships carrying more than 36 passengers.

"The draft SOLAS amendment will be brought to the attention of the Maritime Safety Committee (MSC) in June. Its approval is the next step towards a mandatory application", explains Christian Müller, representative of the German Ministry of Transport and head of the German delegation to IMO's SDC.

The methods to assess the dimensions of assembly routes are well established under the regulations. It is primarily done by using a so-called prescriptive approach. Under the Fire Safety Systems (FSS) Code, this is based on the calculation of the minimum allowable widths for doors, corridors and stairs, as determined by the amount of persons passing through them.

"Although it seems relatively simple, this method of calculation is still in use today and is sufficient for a basic dimensioning of egress routes", says Dr. Daniel Povel. However, these simplified calculations are very conservative, since they do not take into account the time dependent movement of different groups of persons through the escape route. "For the purposes of these calculations, most of the persons are assumed to pass through each section at the same time, so the effect of persons passing through sections at different times is not considered in a fully realistic manner".



Tim Meyer-König founded TraffGo HT in 2001

In order to understand better how large passenger vessels are evacuated, class society DNV GL and software company TraffGo began looking at how people behaved in emergency situations around the year 2000. The end result: AENEAS, a software tool to analyse and improve evacuation plans and concepts.

"There are a lot of things that you cannot deterministically predict about people's behaviour," admits Tim Meyer-König, "so we carry out a statistical analysis and use statistics to run 500 simulations in just two hours. The results then allow for a statistical evaluation of what is most likely to happen."

At around the turn of the century IMO targeted new goals with regards to evacuations, establishing new criteria for assessing evacuation concepts. Instead of simply calculating corridor

widths, evacuations had to be analysed in terms of their performance.

As well as meeting a time criterion, the concept had to prove its flexibility in reacting to changes such as blocked evacuation routes. Currently, conducting such a performance-based evacuation analysis is mandatory for ro-ro passenger ferries with the circular MSC.1/Circ.1238 being the guideline on how to perform it.

The guideline consists of two methods which exist in parallel: The simplified method, describing how the overall evacuation duration is calculated by hand and modern simulation methods, which require a software tool.

"The simplified method looks very straightforward", says Povel, "however, when conducted for a large vessel, it requires a lot of work and you end up with pages of spreadsheet calculations which are not self-explanatory." Furthermore, since the time-dependent development is not taken into account, the simplified method delivers results which may not account for the complex geometries of large vessels.

In addition you have to make assumptions, explains Meyer-König, "a basic assumption is that the crew will assist passengers". This is a key factor which everybody in the industry is fully aware of. Both Povel and Meyer-König point out that large cruise vessels and their evacuation concepts have become so complex, that a fast and smooth evacuation cannot be achieved without an active role from a well-trained crew. They argue that evacuating a vessel without the help of the crew would offer far too many variables in route choice and would render the analyses pointless.

"The IMO circular defines four

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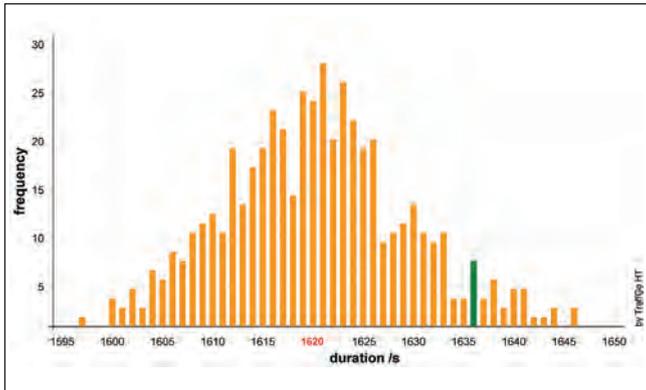
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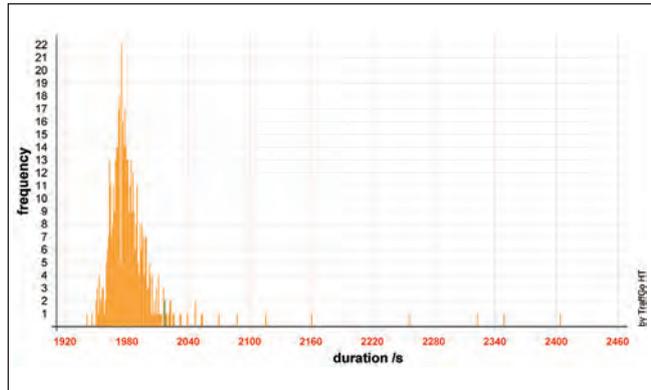


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Duration distributions of 500 simulations for an embarkation analysis, where all life boats are available



The loss of one life boat slightly increases the significant duration (green column), however, statistics show, that some scenarios can lead to a marked increase in the duration

benchmark scenarios for which the analysed vessel has to meet certain acceptance criteria,” says Meyer-König. However, to take possible uncertainties into account, the IMO criteria introduce a “safety factor of 25%”.

Early in development, the correlation between walking speeds and densities implemented in the simulation were found to be too conservative in comparison with land-based events. Over time however, Meyer-König and Povel, were able to refine their parameters to a point where simulated incidents on land, including evacuations in a cinema and theatre, matched the actual outcomes much more closely.

In addition to the land-based evacuation simulations DNV GL and TraffGo, in cooperation with the towing

tank basin HSVA, implemented the effect of ship motion on the pedestrian behaviour. Using historical incident data,, analyses confirmed, that AENEAS’ measurements of the number of people that were able to leave the virtual ship correlated closely to recorded historical data.

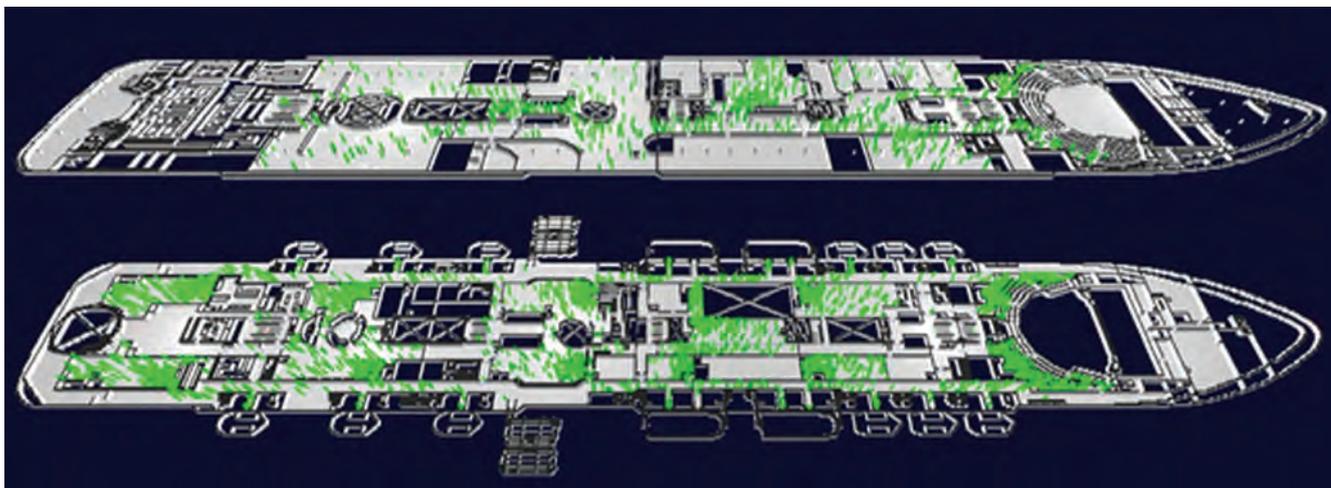
Modelling the geometry in the AENEAS programme is conducted by dividing the vessel model into 40cm quadratic cells, like a chess board. Through this tiny simplification, the AENEAS system can run simulations extremely rapidly: “We can use statistics to run 500 simulations overnight,” says Povel, “whereas other programmes will take 100 times longer to complete the work.” A one-hour simulation on AENEAS would take 100 hours

on competing programmes, so by simplifying the geometry a bit, we can take statistics for the abilities and decisions of our simulated people into account”, admit Povel and Meyer-König.

Fifteen years ago the then Germanischer Lloyd (before its merger with DNV to become DNV GL) started a co-operation with TraffGo HT, a company which specialises in pedestrian simulations, with the AENEAS software being the eventual result of this fruitful partnership.

“The simulation gives us a lot more flexibility when assessing evacuation concepts, being faster and more intuitive to use when it comes to comparing various scenarios. In addition, the range of results covering screenshots, density plots and diagrams allows for a much better and

AENEAS can conduct simulations some 100 times faster than its competitors claims Dr Daniel Povel



intuitive evaluation”, says Povel.

For both methods, the guideline precisely defines the parameters to be taken into account. This covers demographic properties, like the age and ability distribution of the population as well as scenarios to be considered. Currently, a day and a night scenario are defined, the difference being the initial distribution of persons throughout the vessel and the speed at which they react to the evacuation signal (reaction duration). For each scenario, an additional case with deteriorated conditions due to a blocked stair case was added.

At its last meeting, the SDC sub-committee also established a correspondence group which will discuss a revision of the guideline. Alongside formally restructuring and simplifying the circular, the revision will also deal with the way, the results are used. Until now, the evacuation duration was the only criterion which mattered and elimination of congestions was a byproduct. If the time criterion was met, the evacuation concept was considered to be compliant and the results were generally not used on board. “This should change, since the evacuation analysis could generate valuable information for the crew”, says Christian Müller. A guideline revision could help to inform the crew about congestion points or areas, where crew could help to improve the process.

Another point of discussion at the SDC sub-committee is the scenarios to be considered. A refinement of the existing scenarios is planned, but additional scenarios are also discussed. Mikko Illus, designer at Meyer Turku says: “I would see embarkation analyses as a standard procedure in any larger passenger ship project nowadays”. The guidelines demand, that embarkation and launching of the life boats takes 30 min max. Povel of DNV GL agrees: “Embarkation is a highly logistical process of cleverly organising the groups of passengers. Analyses for many cruise ships have shown that the embarkation concepts have to be really optimised in order to meet the time criterion. This is also valuable information which should

reach the crew.”

Open decks are another area where potential exists for the guidelines to be adapted and updated. Presently, open deck space is considered to be safe in terms of evacuations and fire safety. As a result, there are no regulations regarding the dimensions of stair cases and other access ways leading to and from open deck areas. However, in light of actual usage patterns onboard large modern cruise vessels, with densely populated open decks very common, these assumptions should be revisited.

It is proposed that future evaluations include evacuation analysis for such spaces.

“The schedule is tight and a lot has to be discussed”, says Povel, who also leads the correspondence group. “But systems like AENEAS improve our ability to analyse and predict passenger movement in evacuation scenarios and day-by-day situations, giving results that can be helpful to regulators, designers, and the crew on board as we seek to further improve passenger ship safety.” *NA*



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IMO considers new safety rules in wake of *Concordia* accident

Passenger ship safety has been high on the cruise ship agenda in the last year in the wake of the *Costa Concordia* accident in January 2012 with the loss of 32 lives, the sinking of which was followed by a massive wreck removal project

The issue will be debated at the next Maritime Safety Committee meeting in June following continuing work on its long-term action plan on passenger ship safety, following consideration of the outcome of the Sub-Committee on Implementation of IMO Instruments on the casualty report on the *Costa Concordia* and other proposals received.

The updated long-term action plan includes, among others, a new item on the possible extension, to existing passenger ships, of the SOLAS requirement relating to computerised stability support for the master in case of flooding and a new item on watertight doors maintenance.

At the Sub-Committee on Human Element, Training and Watchkeeping (STCW) meeting from 2-6 February 2015, passenger ship specific training amendments were endorsed in principle. The Sub-Committee agreed, in principle, to draft amendments to regulation V/2 and section A-V/2 of the STCW Convention and Code, related to mandatory minimum requirements for the training and qualifications of masters, officers, ratings and other personnel on passenger ships.

The amendments, would require personnel serving on board passenger ships to have completed passenger ship emergency familiarisation appropriate to their capacity, duties and responsibilities.

They would also require masters, officers, ratings and other personnel designated on the muster lists to assist passengers in emergency situations on board passenger ships to undergo passenger ship crowd management training.

New sections in the STCW code Section A-V/2 Mandatory minimum requirements for the training and qualification of masters, officers, ratings and other personnel on passenger ships would cover passenger ship emergency familiarisation and safety training for



Passenger ship safety is high on the IMO's agenda as the Maritime Safety Committee considers the outcome of the *Costa Concordia* report

personnel providing direct service to passengers in passenger spaces.

Meanwhile VIKING Life-Saving Equipment's VIKING LifeCRAFT alternative life-saving appliance (LSA) for passenger ships was presented at the IMO Sub-Committee on Ships Systems and Equipment in March with input from Niels Fraende, VIKING Life-Saving Equipment vice president and Henning Luhmann, Meyer Werft head of naval architecture.

With full prototype testing of the LifeCRAFT nearly complete Fraende said the approvals process for the alternative LSA had been "a challenge", but added that progress had been made by taking a practical approach to IMO guidelines. VIKING Life-Saving Equipment aims to secure the first approvals from flag states by the end of 2015.

LifeCRAFT is a hybrid lifeboat/liferaft system, designed to combine the advantages of both solutions. Self-propelled, with four battery-powered electrical motors, one at each corner, each survival craft unit is fully equipped as a lifeboat, with a fire retardant

canopy and a simple steering system that offers a high degree of manoeuvrability.

Each craft has capacity for 200 persons in an ergonomically designed and secure seating arrangement. Tests have demonstrated that the construction is highly stable in sea states up to Force 6 plus, Fraende pointed out, while rapid acceleration and high bollard pull makes it easy to pull clear of the mother vessel. Four units can be stored on deck in a storage container or integrated into the shipside, operated by gravity and stored mechanical power to provide a controlled descent with minimal handling by crew members.

Each LifeCRAFT system has four 'escape ways', with capacity to evacuate 1,816 persons in 30 minutes. However, Fraende told delegates that that as a four LifeCRAFT arrangement would have maximum capacity for 800 persons, there is a capacity safety factor of 2.27, and therefore 800 people can be evacuated in just 15 minutes.

"Our focus has been on ensuring operational safety," he told the audience.

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DuPont development

Tempered laminated glass with DuPont SentryGlas has been fitted for the exterior glass balustrades on *Ruby Princess* at a reduced weight versus standard PVB laminates.

Fincantieri adopted a balustrade system from Somec Marine, saving 50 tonnes by using laminates made with DuPont SentryGlas.

Laminated tempered safety glass was used on *Ruby Princess* balcony rails, windscreens and public areas.

DuPont explains that beyond their visual appeal, glass construction elements in the marine industry are required to withstand both human and wave impacts and harsh climates, thereby ensuring passenger safety. As a consequence, all glazing used on ships is subject to norms and standards developed by a national or international standards organisation as well as being approved by a classification society.

In this instance, it was a change in Lloyd's Register's safety rules for exterior glass balustrades on ferries and passenger ships in 2005, requiring tempered monolithic glass to be replaced by tempered laminated glass for enhanced safety, that presented a significant challenge for the design of glass balustrades intended for *Ruby Princess*.

The change in safety rules, and consequent increase in weight for standard balustrade systems, prompted cooperation between Fincantieri and Somec Marine to find a new, lighter solution. “We were already familiar with the structural performance of laminates made with SentryGlas® interlayer,” says Christian Sossai, engineer at Somec.

The high stiffness of the DuPont interlayer, approximately 100 times that of PVB, means the glass laminate remains intact in the event of accidental breakage, with glass fragments adhering to the interlayer, reducing potential danger to passengers. Extensive product testing, including salt spray fog testing, during which glass panels with SentryGlas are exposed to 500 consecutive hours of salt spray, has shown the laminated glass panels to remain unchanged in terms

of their structural performance and their transparency.

In accordance with marine industry requirements, the new light balustrade system was extensively tested and approved at facilities belonging to Somec Marine and in the presence of Lloyd's Register. “Our testing verified the performance attributes of Somec's light balustrade system with SentryGlas laminates at a reduced thickness versus standard PVB laminates,” says Mario Croce, manager of the Trieste design support centre. “I believe the adoption of SentryGlas interlayers from DuPont will facilitate the replacement of tempered glass with tempered laminated glass in marine balustrades, bringing with it increased safety without compromising weight.”

Wave energy

The refurbished BOLT Lifesaver wave energy converter has been delivered to owner Fred. Olsen by Supacat following a three-month project refurbishing the converter's ‘intelligent systems’ at the Devon engineering firm's facilities in Dunkswelland Blackhill Engineering. The “Lifesaver” captures the energy of waves and converts it into clean, sustainable electricity.

Supacat is a strategic partner to Fred. Olsen on Lifesaver and has provided vital design and manufacturing skills both during and after the innovative technology project, which was part funded by the Technology Strategy Board (TSB).

Even Hjetland, Project Manager for Fred. Olsen Limited said: “When testing

prototypes, problems will always present themselves, and having partners like Supacat to bring their design and manufacturing experience together with a willingness to assist has been key to the success of this stage of the project.

The test site at FaBTest has presented the device with a wide range of operating conditions – including some significant storm events – that have helped to prove the robustness of the design and construction and this helped us understand the real world operating performance. The next step is to demonstrate this experience to new markets and set the scope for the next stages of the development of the technology”.

With the advent of the emission control areas from 1 January this year, scrubbing systems are one alternative to burning low sulphur fuel.

One such product is provided by DuPont, whose BELCO Marine Scrubber systems enable vessels to meet sulphur emission limits as required by IMO MARPOL Annex VI regulations without switching to low-sulphur fuel.

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New safety glass from Dupont was fitted to *Ruby Princess*

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Cruise roundup

Cruise giant Carnival recently signed two strategic memorandums of agreement that will add a total of nine new cruise ships to the company's industry-leading fleet over a four-year period from 2019 - 2022. The shipbuilding agreements, which include options for additional newbuilds in the coming years, are subject to several conditions, including satisfactory financing.

Fincantieri and German shipbuilder Meyer Werft will each build new ships based on Carnival Corporation's next-generation ship designs, which Carnival says will produce the most efficient ships in the company's history. The new ships are expected to serve established cruise markets in North America and Europe, as well as newer markets, including China. Each new ship will be specifically designed and developed for the brand and guests it will serve.

Fincantieri will develop and construct five ships at its shipyards in Monfalcone and Marghera. Carnival recently announced it had signed a memorandum of understanding with the China State Shipbuilding Corporation (CSSC) to explore the possibility of a joint venture aimed at accelerating the development and growth of the Chinese cruise industry, expected to be one of the largest cruise markets in the world with 4.5 million passengers by 2020, according to the Chinese Ministry of Transport.

Becoming official at a signing ceremony at the Ninth China Cruise Shipping and International Cruise Expo in Tianjin, the MoU outlines the framework for exploration of a partnership between Carnival and the CSSC that includes the possibility of forming a shipbuilding joint venture that could become a three-way arrangement involving Fincantieri, in support of the Chinese government's plans to grow the cruise industry in the country.

As part of the possible shipbuilding joint venture, Carnival would work closely with CSSC and Fincantieri to help define the first-ever, world-class cruise ship built in China. Under the joint venture concept, Carnival Corporation would provide its ship design and shipbuilding expertise to create the vision, definition and overall

specifications for the China-built cruise ship.

So far information on the new design has yet to be released by Carnival as well as which of the company's nine leading global brands will add these next-generation vessels to their fleets.

Carnival Corporation's fleet enhancement strategy will add two new ships to its fleet in 2015 and remove four ships from the fleet. P&O Cruises UK recently launched *Britannia*, the largest ship ever designed exclusively for Britain and later this year, the AIDA Cruises fleet take delivery of *AIDAprima*, which is expected to be one of the most technically advanced and sustainable cruise ships ever built.

Construction work by Meyer Werft on the *Norwegian Escape* has started as well with the production of two floating parts in the yard's

“Environmental performance is of ever increasing importance throughout the marine industry, but especially so for cruise ships and ferries”

building dock II. The ship will be delivered to Norwegian Cruise Line in the autumn of 2015. All told, the yard's order book comprising eight ships will last into 2019.

The order book of Neptun Werft in Rostock comprises an additional 17 river cruise vessels for Viking River Cruises. In the future Neptun Werft will also build blocks and fully completed engine room modules for Meyer Werft so the workload for the yard in Warnemünde is secured until well into 2016.

The first piece of steel was cut recently at Meyer Werft in Papenburg, for the construction of the first ship for Asian operator Star Cruises.

The first plate of steel was cut by the plasma torch in the yard's state of the art facility laser centre. Delivery of the ship is planned for

autumn 2016. A sister ship will be delivered in autumn 2017. Both new ships for Star Cruises will be about 151,000gt and have a capacity of approximately 4,500 passengers.

Each ship is 324m in length, 39.7m across the beam with a cruising speed of approximately 23knots. These new ships are designed for the fast growing Asian cruise market.

Meanwhile Royal Caribbean took delivery of *Anthem of the Seas* in April. The ship was built at Meyer Werft's yard in Bremerhaven. The 168,666gt vessel is 348m long, 41.5m across the beam and has a 8.5m draught and a 22knot cruising speed. The ship is equipped with four bow thrusters of 3,500kW each. Innovations on board include the North Star aerial observatory, a glass capsule that takes guests more than 91.5m above the ocean and the RipCord by iFLY skydiving and FlowRider surfing simulators.

Cunard's *Queen Mary 2*, is being fitted with a Wärtsilä advanced wastewater treatment system. This installation will enable the vessel to fully comply with the IMO's requirements concerning the prevention of pollution from ships. The Wärtsilä Hamworthy Membrane BioReactor (MBR) solutions are designed to facilitate the management and treatment of both 'grey' and 'black' wastewater, and to monitor discharges to the sea. The contract was awarded by Cunard Line during the third quarter of 2014.

“Environmental performance is of ever increasing importance throughout the marine industry, but especially so for cruise ships and ferries. Wärtsilä's in-house know-how and broad experience in wastewater treatment and management systems for ships were crucial factors in the award of this important contract,” says Juha Kytölä, vice president of environmental solutions at Wärtsilä Ship Power.

Wärtsilä's MBR system is an evolution of the company's proven sewage treatment technology for handling grey and black water waste. The technology is an advanced wastewater treatment process based on biological degradation and membrane separation. It delivers the highest quality discharge without requiring any addition or generation of chemicals hazardous to the maritime or shipboard environments. The Wärtsilä Hamworthy MBR is capable of meeting both current and anticipated effluent quality standards. **NA**

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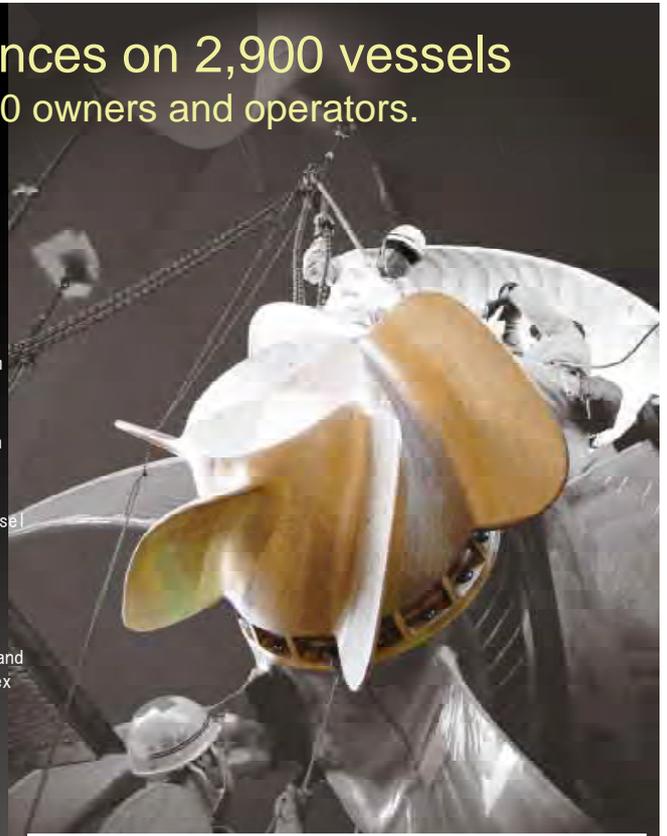
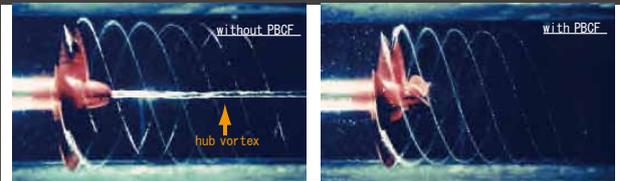
PBCF is the originated device to be focused in the recovery of energy from the flow out energy in propeller hub vortex.

Research and development on the PBCF started in 1986, and sales began the following year. Since then, an increasing number of shipowners, mainly in Japan, began to adopt the system.

By 2006, the 19th year since the start of sales, the PBCF had been ordered for 1,000 vessels. Since then, it has gained worldwide recognition by vessel owners and operators, and the number of ships adopting it has doubled in just five years, reaching the 2,000 vessel milestone.

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Sparring partners

Collaboration between industry, academia, government, financial institutions, shipowners and designers is edging shipping closer to its target of reducing vessel emissions by up to 50% using wind-assisted power to propel a ship. Development of smart green ships is reaching a critical point as the project collaborators overcome each technical challenge

Deliverance is near at hand. In this case deliverance refers not only to the saving of the human race, but the preservation of humanity through the development of clean ships.

Deliverance also happens to be the name of a tanker designed by Richard Sauter which uses solar and wind energy to reduce carbon emissions from a vessel by 75% or more of 1990 levels (see *The Naval Architect* January 2012 pages 37-38).

Perhaps saving the world is overstating the case a little, but companies such as B9 Shipping, now working as the Smart Green Shipping Alliance, and Dutch naval architects Dykstra with its 8,000dwt Ecoliner, multi-purpose vessel designed for the Atlantic trade, as well as naval architects such as Richard Sauter, have been busy developing methods for the shipping industry to meet its carbon challenge, namely to reduce emissions from shipping by 50% by 2050 as stated by the EU. A target that is made all the more challenging when you factor in the growth in the global population and the consequent increase in shipping demand that is expected as a result of that population increase.

Using wind-assisted power to supplement main engine power has been considered by a number of designers, but the difficulty for all of these naval architects is to persuade financial institutions and owners to take the risk on a new design. B9 and its collaborators appear to have taken their design to the brink of reality with the prize a cleaner, more efficient world.

B9 Shipping had already been working on the ship design with Rolls-Royce's Blue Ocean team (see *The Naval Architect* January 2010 pages 52-53) and steel manufacturer Tata had promised steel plate for the first vessel which has an



Yildiz Williams of Lloyd's Register (left) and Diane Gilpin in the Southampton wind tunnel where the model was tested

automated square rig sail system. The lead design is by Humphrey's Yacht Design. B9 has expanded and consolidated its collaborative network last October through formalising The Smart Green Shipping Alliance which now includes Lloyd's Register, Southampton University and University College London (UCL), Met Office, legal and corporate advisors Reed Smith and together the companies formed the Smart Green Shipping Alliance (SGSA) last October.

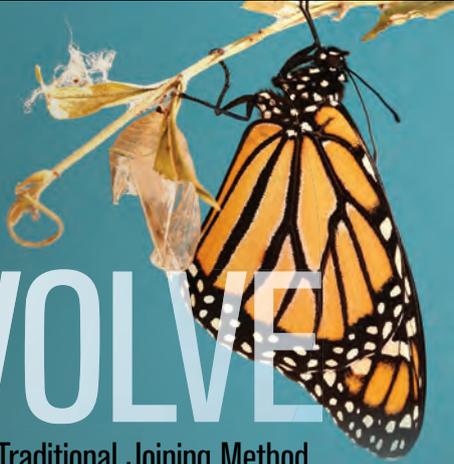
In 2010 B9 had identified an defined operational profile for a 3,000dwt ship operating with biofuel produced from a plant in Kent and with sail assistance could reduce carbon NOx, SOx emissions and particulates. The concept vessel was to sail to Finland to pick up its cargo of wood chip destined for power stations on the UK's east coast. B9 calculated that this route would see the ship operate under wind power for on average across the year

60% of the time.

Development of the vessel has proved to be slow and part of the problem is convincing all the possible collaborators including financial institutions and owners that the project is viable. Diane Gilpin, of B9 Shipping and founder of the SGSA, believes that the collaboration with LR and the other members of the SGSA will lead to a break through.

"Part of the problem is taking ideas and then turning them into tangible entities. We have been working with UCL and their research has provided a fantastic validation to the concept of hybrid ships," says Gilpin.

That research included a systemic assessment of how the world will look in future, what energy services are likely to be available and at what costs, how that supply and demand may impact on global industry, and what shipping services and energy demand might look like.



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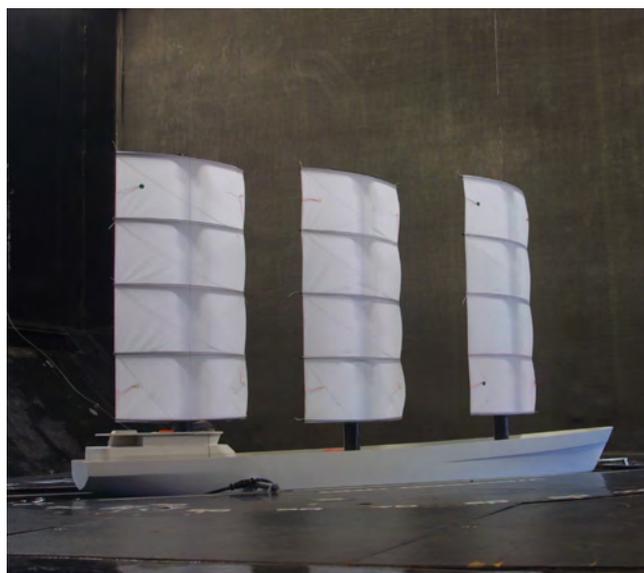
The SGSA is working with an end-user who is defining a new operational profile and the revised design will be for a significantly larger ship with the capacity to run both deep sea and coastal voyages. Vessels of this size account for about 10,000 ships in the global fleet operating in meteorologically favourable conditions. The ship will be fitted with a conventional engine and propulsion unit and an industrialised evolution of the automated square rig sails designed by DynaRig which the SGSA is branding Fastrigs (future automated sailing technology rigs!) as used successfully since 2009 on the 88m megayacht *Maltese Falcon*.

Tom Humphreys of Humphreys Yacht Design says the development of the cargo vessel is significantly different from the yacht design which looks at reducing drag rather than maintaining the stability of the vessel for crew comfort.

“Stability is a problem,” admitted Humphreys, “it has forced us into a slightly more beamy and a shallower draught design.”

According to Humphreys the group have been testing vessel design at the Wolfson Unit in Southampton and the wind tunnel in order to find a design that will “migrate volume away from the centreline so you get a lift, a righting lever, you have to move the centre of buoyancy.”

However, the collaborators are still faced with significant challenges and with “an enormous amount of work” with heel and yaw tests in both the wind tunnel and towing tank in order to get “a better idea of the forces at work,” explains



Tank tests of the square rig sails are ongoing says yacht designer Tom Humphreys

Humphreys.

Part of that work will be to see what materials will be used in the construction of the masts and a comparison of the costs and weight distribution for the different materials. *Maltese Falcon* has been constructed with composite materials, but cheaper alternatives may be steel, which would add weight, an alloy and composite version is also being evaluated.

“High tech’ composites have better stability and keep the weight down,” says Humphreys, explaining that the composite mast performs better overall from the balance point of view, but the capital expenditure and payback time issues are greater when composite materials are used.

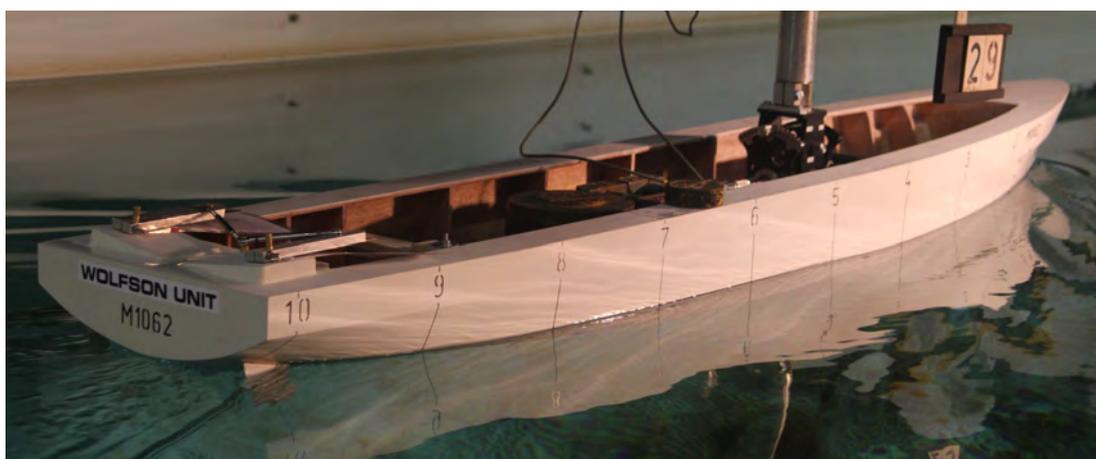
“We know that the problem can be solved,” says Humphreys, the

problem is to finding the right solution.

In addition, Lloyd’s Register (LR) has developed its Assessment of Risk Based Designs (ARBD) to test whether innovative designs meet safety and other regulatory requirements. “Each installation will need a specific appraisal to ensure compliance with classification and statutory requirements. As the technology matures and experience is gained, prescriptive rules and guidance are expected to be developed,” LR explains.

Sail-assisted vessels will need to demonstrate compliance with SOLAS rules on visibility, installed power to maintain the ability to manoeuvre in all conditions of heel and trim that may be a result of the use of the wind assisted power. In addition an automated control

Hull form design and tank tests were performed at the Wolfson Unit



system, controlled from the bridge is required and masts must be of sufficient strength as to prevent buckling in under all loading conditions.

As the technical challenges are overcome, however, other challenges come into focus. For example a business case established for a sailing hybrid ship specific to one route will be different on another voyage where prevailing weather conditions will affect the contribution of the wind element to the overall cost saving. This means that a change of route requires a re-evaluation of the fuel savings.

The SGSA has created an automated analysis tool known as Tradewind where the operational performance data of the ships – either from test or from full size ships – is run through a weather routing system – adapted by America's Cup software designer Graeme Winn – for commercial shipping. Tradewind looks at hindcast meteorological data from the last 20 years and can predict how the ship will likely perform over any day, month, season or year on that route. The fuel saving estimates are then fed into a commercial analytical tool jointly developed by UCL and SGSA which calculates the financial value of operating on an end-users route of interest.

In addition route specific hull designs will be necessary in order to develop the vessel's performance. According to LR optimisation is best if the technology and the ship are designed together, so that optimising the hull for motorsailing (sailing with the main engine and wind assisted power) will allow the addition of elements such as retractable keels and the optimisation of the propeller design point.

Capital intensive solutions to the carbon challenge require owners and charterers to rethink the norm as far as charterparty contracts are concerned so that new technology can be encouraged. Owner's need to be more open to new technology and innovators need cash to innovate and show industry that new ideas can offer substantial cost savings while reducing the carbon hull print of the industry.

Designers such as SGSA need significant capital to bring a project through its design and development phase and then to take the project on to develop a full size working version so that owners can evaluate the performance of the design. And as companies are often starved of development cash much of the funding will need to come from public spending, says LR.

The class society adds: "Amazing advancements in the offshore and yacht sectors have been transferred into commercial shipping. For example, advancements in Formula One racing cars have led to significant advances in ordinary family cars. This development has not occurred in a similar magnitude in commercial shipping.

Salvation, for the world, if it comes, will necessarily be a collaborative effort, between technology providers, innovators, designers, financiers, government and other commercial interests such as ship operators and charterers. Such a collaboration would be a breath of fresh air in a commercial framework that is increasingly structured to facilitate competition between entities in furtherance of company profit rather than collaboration for the common good. *Deliverance*, then must be a communal effort. **NA**



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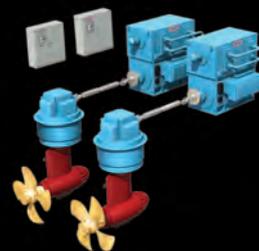


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Stena Germanica meets methanol challenge

The world's first ship to run on methanol will soon sail international waters after the fire risk assessment by SP Fire Research was approved. Franz Evegren, research scientist, SP Technical Research Institute of Sweden, Department of Fire Research explains further

Methanol has for some time been handled with traditional fire protection in cargo pump-rooms on tankers, but a deeper understanding of the fuel called for a new approach to design fire safety. With the sulphur emission regulations taking effect at the beginning of the year, this has also brought methanol back in to the picture for alternative fuels for operations in sulphur emission control areas (SECA).

Stena Germanica is a ro-pax ferry, bringing vehicles and passengers across the Baltic Sea. This area, together with the North Sea and the English Channel, is a designated SECA region where regulations to minimise emissions have presented the shipping industry with some serious challenges.

Similar restrictions apply around North America and several more restricted areas are planned around the world in the future. The new requirements have demanded new technological solutions, including the use of alternative fuels and exhaust gas after-treatment.

Many shipping companies have chosen to make use of LNG to meet the requirements and avoid exhaust gas after-treatment. The same is achieved using methanol, but for this fuel the transportation and storage is far less complicated, both on the ship and ashore. Furthermore, there is another great benefit with methanol with the possibility to make renewable energy from biomass in large scale in the future, which contributed to Stena choosing methanol for *Stena Germanica* when it came to complying with the new regulations.

The regulatory way for low flashpoint fuels

The flashpoint of methanol is not as low as that of LNG, but is still lower than that permitted by the international ship fire safety regulations in SOLAS (Safety of Life At Sea).

An international code under SOLAS on safety for ships using gases and other



The smoke from *Stena Germanica* is merely a memory as the ship converts to methanol

low-flashpoint fuels (the IGF Code) is under development. However, until such a code is ratified the only regulatory way forward is to show equivalent safety through SOLAS regulation I/5 or II-2/17. These regulations provide openings for alternative designs and arrangements for fire safety, but require that safety is not compromised. Hence, use of a low flashpoint fuel such as methanol and the necessary safety arrangements can be treated as alternative design and arrangements for fire safety. It is then necessary to carry out a fire risk assessment to demonstrate how the particularities of methanol are managed to assure that fire safety is not adversely affected.

The greater use of LNG means that class rules and draft IMO regulations have been further developed for this fuel than for methanol. These are in many parts also applicable for methanol installations. However, the sparse requirements on fire safety and the particularities of methanol made it clear that a fresh approach was necessary to address fire safety. The fire risk assessment was performed by SP Fire Research as part of the large technical methanol conversion project at Stena, involving classification society Lloyd's

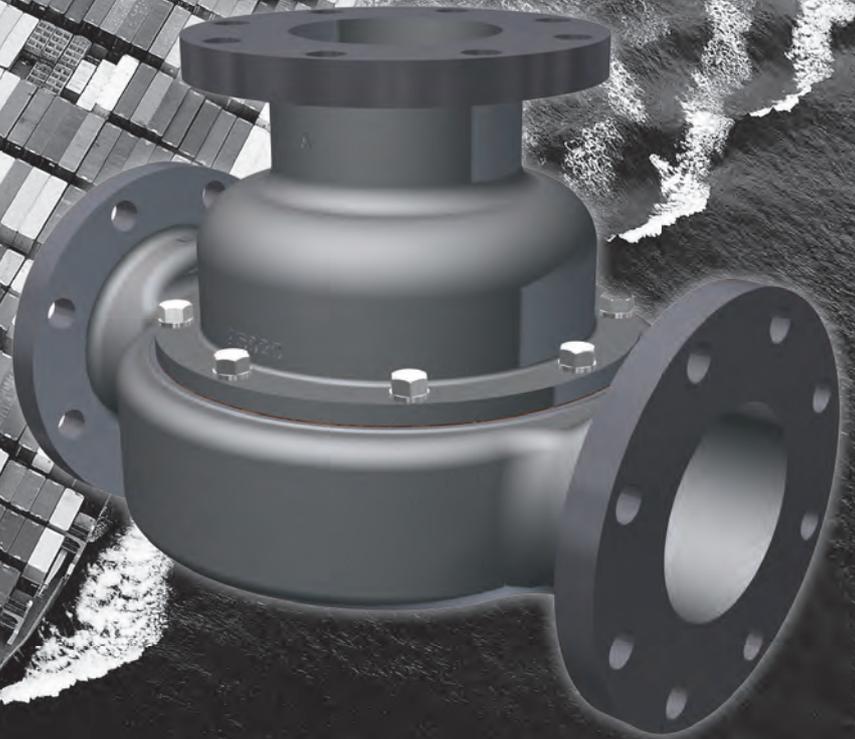
Register, engine manufacturer Wärtsilä and ship designer ScandiNaos as key partners.

Beyond traditional fire protection

In the first steps of the fire risk assessment it became clear that not only fire hazards associated with the lower flashpoint have to be regarded for alternative fuels, even if this may be the only deviation. What is addressed is the generally increased probability that flammable vapours of a low flashpoint fuel will accumulate and could ignite if there was a leak. However, it is not sufficient to minimise the probability of a leakage and ignition only. A sound fire safety design must, as any regulatory framework, address all levels of fire safety.

In the fire risk assessment, fire detection and fire extinguishment were identified as areas in need of further investigation. For example, how is detection and localisation achieved when a methanol fire does not show flames or produce smoke? And how is extinguishment performed when the fuel in addition to the low flashpoint also has wide flammability limits and bound oxygen? These questions go beyond traditional fire

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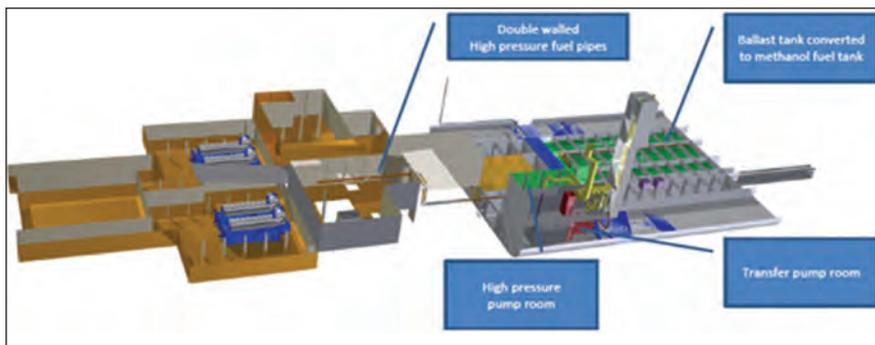
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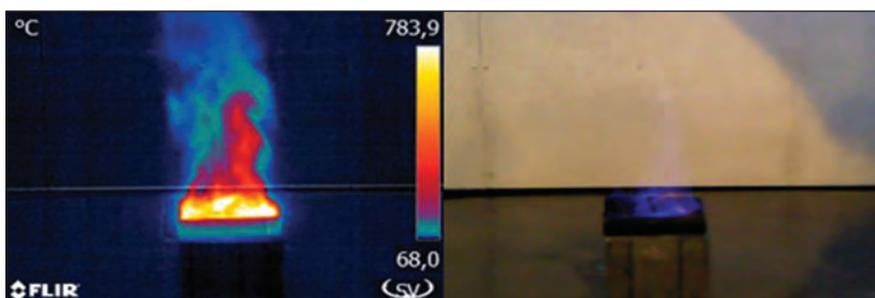
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Methanol installations including bunker tank, pump room and piping for fuel transfer



Detection and localisation becomes crucial as a methanol fire does not show smoke or flames

protection and require further analysis.

In the project it was decided that the ship should be designed to be at least as safe as a conventional ship in each affected area of fire safety. To manage this, a number of risk control measures were added. For example, all fuel piping was designed double walled and butt welded. The only space where methanol is managed in single walled pipes is the pump room.

Here a robust drainage system was designed and the equipment used is suitable for an explosive environment (ATEX). Furthermore, a smart gas detection system was designed automated with the ventilation and the pump system; if a low level of methanol is detected the ventilation is increased and if a high level of methanol is detected (still far below the flammability limit) the 700bar methanol transfer to the engines is stopped.

An automatic seamless transition is then made to run on diesel only and methanol pipes are flushed with nitrogen. The methanol storage tank will be constantly inerted with nitrogen to avoid a combustible atmosphere. Furthermore, the tank will be surrounded by water on all sides (seawater and permanent ballast water tanks), which will directly neutralise the miscible fuel in case of a leakage. Bunker tanks in the double

bottom also allow an unproblematic and efficient storage.

Detection was managed by smart installations of detectors made to distinguish the electromagnetic radiation emitted when carbon dioxide is produced at combustion. Thereby the detection system was made independent of smoke and visible flame signatures. To localise fires when performing manual firefighting, infrared cameras were provided to the fire patrols.

Effects of fixed fire-extinguishing systems

The fixed fire-extinguishing systems required particular engineering efforts. In particular two common system alternatives were evaluated: inert gas (carbon dioxide) and high-pressure water mist.

Several particularities of methanol led to the realisation that to extinguish a fire would be harder to achieve. Methanol can for example burn down to an oxygen level of 12%, which makes it relatively less sensitive to dispersion. The effectiveness of an inert gas system with CO₂ is thereby reduced and more gas is required to achieve an equivalent extinguishing effect as compared to diesel.

Requirements state that a conventional CO₂ system in machinery spaces should be designed to give a free gas volume equal to

at least 40% of space volume. A theoretical study based on the minimum extinguishing concentrations for diesel and methanol and safety margins in the FSS Code showed that this amount had to be increased by about 25% to assure an equivalent effect.

When it comes to the effectiveness of a water-based system the insensitivity to oxygen dispersion plays part of the role. Furthermore, the lack of soot in flames makes flame cooling less effective and the low flashpoint makes direct surface cooling irrelevant. For a water-based system the primary extinguishing effect is instead dilution. The fuel will no longer vaporise in sufficient amount when the surface layers have been diluted to approximately 75% water content. Hence, a water-mist system may protect surroundings and firefighters by cooling and to some extent suppress a methanol fire by dispersion of oxygen, but extinguishment will be difficult to achieve.

This was verified by full-scale fire tests. Some kind of additional system would be necessary to assure that a methanol pool fire is extinguished (by dilution or foam coverage) if not drained. In particular in case fuel is in connection with heated obstructions, which will increase vaporisation. Considering these characteristics of methanol it is possible that a traditional water-spraying (sprinkler) system would provide more effective extinguishment. More water from such a system could provide both better dilution and cooling, but at the cost of reduced visibility and potential stability problems. However, further investigations and tests are necessary before such a conclusion can be drawn.

Fire safe ship and regulations

The fire risk assessment showed that the fire safety challenges of methanol are manageable. It also stressed that it is not sufficient to only address a low flashpoint deviation when considering alternative fuels. To assure that at least the same level of safety is achieved in each affected area, safety margins were used depending on the access to reliable data.

Some conservative stands were necessary, for example with regards to fixed fire-extinguishment; it was decided to use both a CO₂ system with increased capacity and an approved water-mist system. The need for knowledge and verification in this area has now led to the initiation of a new research project called proFlash.

The project is coordinated by SP Fire Research and aims to further evaluate the effectiveness of fire-extinguishing systems for methanol and LNG by theoretical studies and full-scale testing. The results will work as direct input to the IMO correspondence group developing the IGF Code part applying to use of methanol fuel. The project may also give reason to further develop the merely two pages of fire safety requirements in the part applying to LNG, which is only formalisation away from ratification.

Approval of *Stena Germanica* fire risk assessment was given by the Swedish Flag in January 2015. At the end of the same month the shipyard started the new fire protection installations. By managing each introduced fire hazard *Stena* is now confident that fire safety has not only been maintained, but improved by the conversion to methanol. Hopes are that the findings in this project and future research will give a better understanding of alternative ship fuels and safer conversions to methanol and LNG. *NA*



Characteristics of alternative fuels need to be considered in design of fixed fire-extinguishing systems



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BWT on course for compliance

Joint development from two leading marine technology suppliers addresses impending legislation for ballast water treatment and offers a practical solution for monitoring and recording the correct discharge of ballast water, in real-time. Geoff Taylor, PSM Instrumentation and Katie Davage from Chelsea Technologies Group explain further

The IMO's 2004 Ballast Water Management Convention (BWMC) lays down strict guidelines for the treatment and discharge of ballast water. The new legislation, which will require tens of thousands of ships to be retrofitted with new systems for ballast water treatment, has caused much debate within the marine industry.

To date, discussion has largely centred around which type of treatment technology is most suited to the task. However, this has now been overshadowed by two very important

aspects of the new regulations which must form part of the overall treatment regime in order to be effective in ensuring environmental compliance: point of discharge measurement and recording and reporting of treatment activities.

The new rules are governed by strict liability laws, meaning that operators or owners can be considered guilty without a finding of fault. The authorities need only prove that the event occurred, with vessel owners being held responsible for the discharge. Consequently there is a very real need for a measurement and

recording system that quickly and reliably reports on the efficacy of the ballast water treatment plant.

A new joint development between PSM Instrumentation and Chelsea Technologies Group aims to address these important issues and to provide clear evidence of compliance when required to do so.

Point of discharge measurement

A key requirement for any treatment system installed is to provide analysis of

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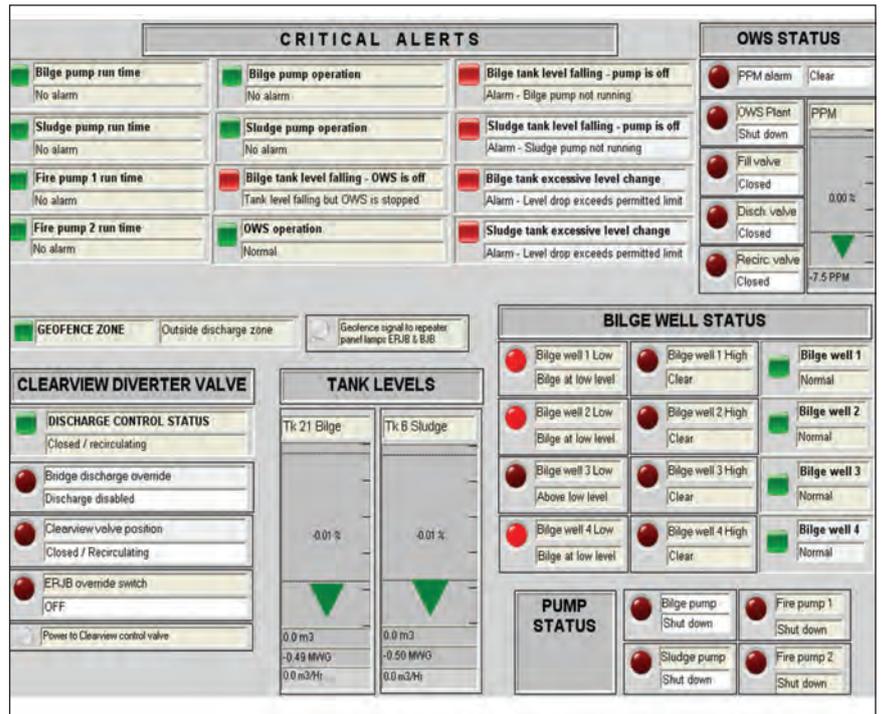
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the ballast water at the point of discharge to prove correct treatment. Using the inherent high sensitivity of the FastBallast Compliance Monitor, the variable fluorescence of live viable phytoplankton cells in moving ballast water can be monitored to the levels required by the IMO D2 standard (10 to 50µm category).

Developed by Chelsea Technologies Group and based on established marine technology, the FastBallast Compliance Monitor has been specifically developed for working with phytoplankton within the aqueous phase at low optical density, exactly the conditions encountered in ballast water. FastBallast interrogates the photosynthesis process taking place within phytoplankton to distinguish between which cells are alive or dead. Using complex algorithms, the monitor can rapidly determine if your ballast water discharge is compliant.

To ensure that all phytoplankton present within the 10 to 50µm range are detected, FastBallast uses multiple



PSM says that testing is still an important topic for owners in the BWMC debate



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LED excitation channels. A highly sensitive photon multiplier tube is used to detect the variable fluorescence of live phytoplankton. Each measurement takes only 200µs, which means that data can be collected from fast moving water (up to two metres of linear flow per second), typically encountered within ballast tanks or water treatment system piping.

FastBallast is available as a portable or integrated system. Capable of operating in flow through and static sampling mode, the portable version of the system is designed for carrying out spot check measurements, reassuring port state control and shipboard engineers that their BWTS is operating as it should. The touch screen displays a RAG (red-amber-green) system used to indicate whether the ballast water discharge is compliant with regards to current regulations. Data can be downloaded via USB or ethernet for a more detailed assessment of the treated ballast water.

The integrated variant is designed for permanent installation within a BWTS, where it will operate in flow through mode providing a continuous update on discharge compliance. This version of FastBallast can interface with PSM Instrumentation's BallastView, a system for logging compliance data onboard a vessel which can also transmit data ashore, if required.

Recording and reporting of treatment activities

An equally critical stipulation of the new regulations is Requirement B-2, which calls for vessels to hold data in a ballast water record book. This can be in an electronic format, either standalone or integrated into another system. The recorded data must include the following key information to prove correct operation:

- When ballast is taken onboard, volume, date, time and geographical location
- Movement of ballast water for onboard ballast water management purposes
- When ballast is discharged to sea, volume, date, time and geographical location
- When ballast is discharged to a reception facility, volume, date, time and location
- Accidental or other exceptional uptake or discharges of ballast water

Name of vessel		M/V Example		
Number		IMO 1234567		
Date	Function	Activity	Operation	Signature
22/11/2012	3.2	BW treated		
		3.2.1	Start 18:00 Stop 18:00	
		3.2.2	500 m3	
		3.3.3	Yes	
		3.2.4		Mark Jones

View of BallastView log book

Entries into the ballast water record book must be maintained onboard for a period of two years after the date of entry and thereafter kept in the company's control for a further three years.

The latest BallastView system from PSM Instrumentation, for example, is a modular solution comprising a suite of onboard and shoreside hardware and software elements, developed to ensure vessels are operated efficiently, safely and in an environmentally responsible manner. Integral to the system's functionality are secure data recording capabilities which more than meet the stipulations set out for the new reporting requirements.

The system's Ballast Water Treatment module allows shipping vessel operators and onshore personnel to monitor the operation of ballast water treatment equipment continuously without the need for intervention by the ship's crew. An encrypted recording capability electronically captures all key data and provides secure archive storage onboard or onshore, offering proof of correct operation and legal compliance during the three year period required.

Modern solutions such as BallastView not only provide the answer for new vessels but offer an affordable, least cost solution for retrofitting existing vessels to meet the requirements of the new regulations. Designed for compatibility, BallastView is scalable and can be integrated with existing system elements as required,

minimising the cost of upgrades. The technology has already been successfully employed across a number of fleets for similar monitoring, recording and data transmission applications in complying with MARPOL regulations for Oily Water Treatment and Oil Record Book regulations.

The automatic collection of data forming the Ballast Water Treatment Book, for example, then might also be transmitted in real-time to Port State Control prior to arrival to facilitate a swift clearance of this part of the vessel's inspection well ahead of port entry.

While earlier products were only able to monitor and log signals from primary treatment equipment, the development of the new integrated systems means other areas – for example tank levels, pump operations and valve positions – can now also be monitored. This comprehensive surveillance approach enables potential issues to be flagged as system alerts where, for example, ballast levels are falling but the treatment plant is not running.

The need to upgrade to emerging new legislative requirements presents operators with the ideal opportunity to take positive measures to improve onboard control. The installation of a modern integrated system with the latest monitoring and measurement technology can prevent incidents which might otherwise lead to violations, incurring significant fines for fleet operators and the risk of prosecution for senior officers who could also be held legally responsible. **NA**



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Tooling up for the NOx regulations

Less than a year until the first NOx emission control area (ECA) goes into effect, many in the marine industry still have questions about the status of NOx abatement technologies

Alfa Laval believes that one of those technologies, exhaust gas recirculation (EGR), is clearly on track and making rapid strides towards commercialisation, which is now being supported by further field testing. “The response [to Alfa Laval’s own PureNOx system] is positive, especially since we now have streamlined and refined the PureNOx design, a smaller and less complex system with also a significantly lower cost,” explains Kristina Effer, global business manager, exhaust gas water treatment, water treatment exhaust gas emissions, Alfa Laval.

Effer goes on to say that licensees who build MAN B&W-branded engines in South Korea, Japan and China have already started to prepare for Tier III compliant engines and adds that it will be the shipowners who decide what technology is applied, whether this is selective catalytic reduction (SCR) or EGR systems.

Søren H Jensen, vice president and head of R&D, Marine Low-Speed at MAN Diesel acknowledges the doubt in the marketplace when it comes to NOx abatement, which he says is natural – even amongst suppliers – when new technology is devised to meet legislation. “It’s when there is uncertainty surrounding the legislation that concerns arise among suppliers,” he explains, pointing to the last minute wrangling over ECA implementation and the decision to limit it initially to US waters. “Our sense is that it will gradually become law elsewhere in the world. The EU is not going to be willing to lag behind the US in this area for long.”

Since the development of the need to create a solution that will tackle the NOx regulation, MAN has turned to Alfa Laval to create a solution and for advice regarding the EGR scrubber, and for the critical development of the PureNOx water treatment system.

From the beginning, MAN and Alfa Laval were convinced of the potential of EGR’s for the marine industry. EGR’s, and their alternative, SCR’s, have their own advantages;



Alfa Laval’s PureNOx system on a MAN engine

EGR has its own particular edge when it comes to size. “EGR is much more compact than a SCR, and it is easily integrated into the engine,” says Jensen. “The engine dimensions are more or less unchanged when an EGR is integrated. In addition you have the water treatment system and the tanks, but the placement of these is more flexible, and the water treatment system is still far smaller than an SCR reactor.”

Trials have been carried out on *Maersk Cardiff* (right) and *Alexander Maersk*

These aspects were apparent when the first EGR system was installed aboard the vessel *Alexander Maersk*. Yet while the ease of integration was anticipated, the effectiveness of water treatment and the engine’s ability to withstand the EGR process came as something of a surprise. “We were especially concerned about the components around the combustion chamber, such as the cylinders, cylinder linings, pistons and piston heads.





Kristina Effer, global business manager, exhaust gas water treatment, water treatment exhaust gas emissions, Alfa Laval explains the advantages of an EGR system to meet with future NOx regulations

After all, EGR is forcing the engine to eat its own exhaust,” Jensen explains. “What we’ve found is that there is no impact. There is no negative impact whatsoever, so of course we’ve been very pleased by that.”

AP Møller-Maersk has expanded its cooperation with MAN and Alfa Laval. A more refined EGR system is now installed aboard the container vessel *Maersk Cardiff*, where it is currently undergoing fine-tuning. EGR is in use during approximately 30% of the vessel’s operation, which means the system has already logged around 2,000 hours.

“The performance of the EGR system on the *Maersk Cardiff* has been very good, because all the lessons of *Alexander*

Maersk were built into it,” says Jensen. He notes that *Maersk Cardiff* was chosen specifically, as a major step in producing a final system. “We proposed using one of the C-class vessels because they have one of our newest engine types, the S80 Mark 09 onboard. We wanted to see if there was any difference in impact due to the different cylinder pressure.”

As expected, there were some initial difficulties with the more sensitive modern cylinder linings. However, these were resolved by increasing the cylinder lining temperature and using cylinder lube oil with a higher BN number.

In the EGR system, water treatment is both a crucial aspect and the most significant cost. Alfa Laval’s PureNOx uses centrifugal separation to clean the EGR scrubber water, and its performance and reliability have proven impossible to replace. “We have worked with ideas other than the present system,” Jensen explains. “For example, we worked with filters, but this proved difficult because they quickly became blocked.”

Nonetheless, there is ample opportunity for a leaner water treatment system. Alfa Laval is currently streamlining and refining the PureNOx design, based in part on lessons from the *Alexander Maersk*

and *Maersk Cardiff*. The target is not only a smaller and less complex system, but also one with a significantly lower cost.

The difficulty for AP Møller-Maersk has been less in EGR operation than in sourcing and sludge disposal related to water treatment. “There’s not enough flexibility on the global market,” says Palle Wredström, head of engine & propulsion department, AP Møller-Maersk, referring to the sodium hydroxide (NaOH) supply. “Today, the big suppliers serve the chemical industry, while the marine suppliers normally deliver 25-litre bottles similar to those for the boiler water treatment system. No one is used to selling the quantities that we require. To increase safety, we would also prefer to have the consumable brought aboard in a closed system, for example directly from a truck.”

According to Effer, the supply chain will improve when EGR becomes more commonplace and chemical suppliers see the business potential. As for waste disposal, this too will be easily resolved. “Proper categorisation of the sludge will assist waste receivers who are currently unfamiliar with EGR,” she says. “We are also looking at sludge-reducing options that will minimise the volume for disposal.”

MAN and Alfa Laval say that the path ahead is clear: further refinement, further experience at sea and further preparation to meet the market with a competitive offering. Effer concludes that 2016 is just around the corner, but they are on the right track and now it is a case of keeping up the pace. **NA**

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LASER TECHNOLOGIES FOR SHIPBUILDING AND ENGINEERING SECTOR

Aleksandr N. Aleshkin, Valerii M. Levshakov, Natalia A. Steshenkova

The modern stage of engineering industry in the whole, and shipbuilding in particular is notable for starting implementation of technologies at major enterprises, which can substantially change the image of this previously rather conservative sector. Massive implementation of modern laser techniques is one of the ways to improve quality in shipbuilding and heavy engineering production.

JSC Shipbuilding & Shiprepair Technology Center is a leading design and technological center in the Russian shipbuilding. To support the process of equipping shipbuilding enterprises with complex lines, based on laser technologies, a Laser Shipbuilding Center was established, incorporating experimental facilities for research and mastering of technologies for laser cutting, laser and hybrid laser-arc welding, cladding, marking and labeling.

For more than 50 years, JSC SSTC (former PRC Ritm and FSUE CRIST) has been developing and supplying shipbuilding facilities with portal-type thermal cutting machines. The recent models are laser cutting machines with ytterbium fiber lasers made by RTC IRE-Polus (IPG). Portal-type laser cutting machines RITM are well known and proven in Russian market for their reliability and easy maintenance.

Portal system for laser cutting RITM-LASER (see Fig.1) is intended for cutting metal plates with size up to 2.5 x 10 m. The machine is equipped with 3.5 kW laser and gives a quality cut for plates up to 20 mm thick. The main advantages of the system are:

- precise parts cutting;
- option of automated marking and labeling;
- low operational costs and high reliability.

Apart from laser cutting machines, JSC SSTC is developing a number of program-controlled complexes for laser cutting and welding, designed for shipbuilding and marine engineering sector.



Fig. 1 – Portal complex for laser cutting RITM-LASER

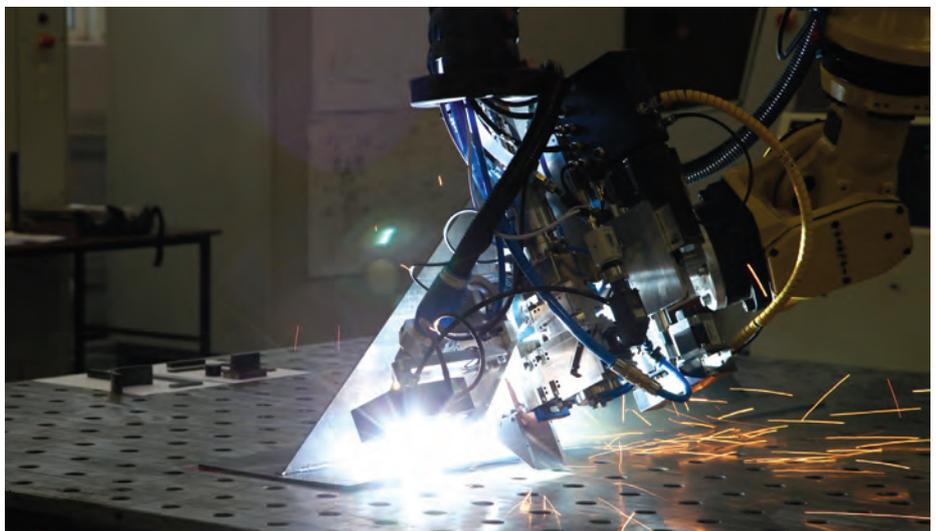


Fig. 2 – Robotized system for laser cutting and welding in various positions



Fig.3 – Laser system Labyrinth

For complex-shaped welded structures, we have designed a robotized complex for laser cutting and welding in various positions (see Fig.2). The machine is unique due to use of 25 kW laser LS-25, one of the most powerful in Russia, and optical four-channel switch, allowing to use laser optical heads in turn for welding and cutting at the same machine, thus substantially reducing manufacturing time of welded structures. With simultaneous reducing of welding deformations in 1.4 times comparing to

conventional arc welding, use of laser equipment allows to reduce overall cost of hull construction by up to 30%, and to increase productivity of hull structures manufacturing more than in 1.1 times.

For laser welding in marine engineering, a technique and robotized program-controlled complex were developed (Fig.3), intended for welding thin-walled shells to solid structures, e.g. in marine pumps or valves, and for welding thin-walled tubes into tube plate (in heat

exchangers). The system includes 8 kW fiber laser, welding robot, laser head for welding in places with limited access, and/or laser scanning head for welding of tube plates. Main advantages of laser welding comparing to conventional arc techniques are high processing speed, better weld quality, minimal heat affected zone, low requirement of welding consumables and practical absence of welding deformations. Deformations are considerably reduced due to low heat input (several times less, than with conventional arc method).

JSC SSTC has developed a manufacturing technique of flat panels production up to 20 mm thick, based on laser cutting and laser-arc hybrid welding. The procedure of hybrid laser-arc welding of plates and webs with integrated grooving by laser cutting was approved by Russian Maritime Register of Shipping (see Fig. 4). This technique is implemented in automated line for assembly and welding of flat panels up to 12 x 12 m in size, designed and constructed in cooperation with IMG, Germany. The innovation solution is combination of grooving by laser cutting with plates welding by laser-arc method at one position, as well as solution of double-side welding of stiffeners with hybrid welding.

Although hybrid laser-arc welding is a complicated multi-parameter process, and its implementation at the shopfloor leads to certain technical problems and considerable investments, its effectiveness and vitality for shipbuilding production are proved.

Development and implementation of laser technologies allow to achieve a new level of productivity and manufacturing of structures in shipbuilding and heavy engineering.

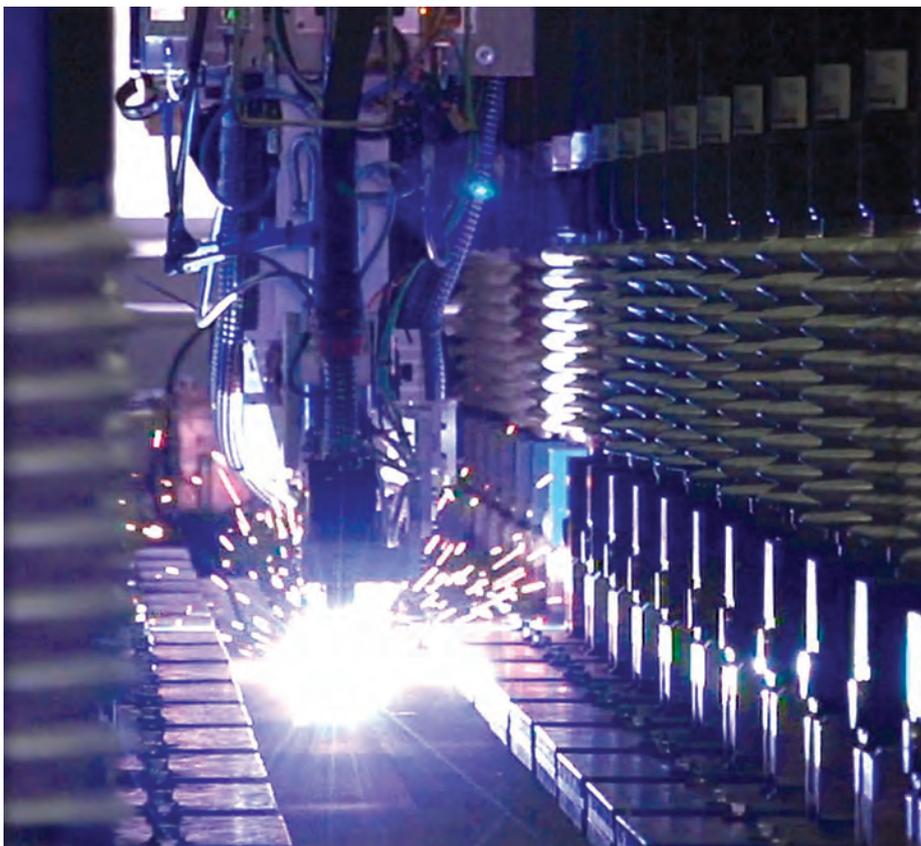


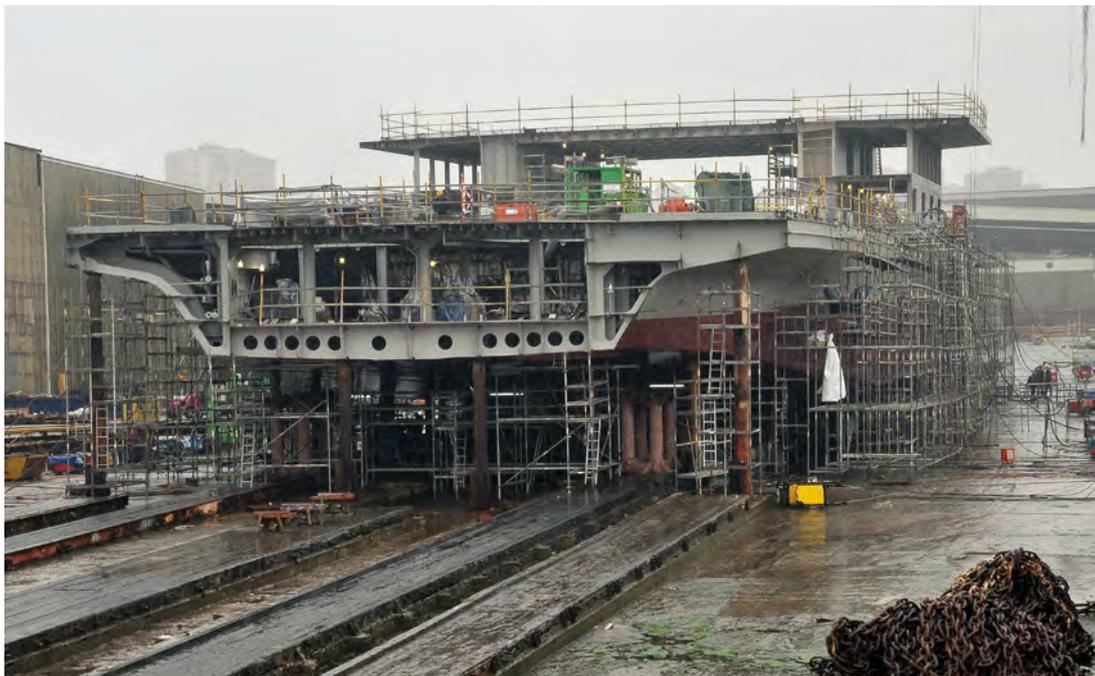
Fig.4 – Manufacturing of flat panels



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7, Promyshlennaya str., 198095,
Saint Petersburg, Russia
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Fax: +7(812)786-04-59
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European hybrid ferry set for January launch

Nowhere is the global fleet renewal with environmentally friendly vessels more evident than in the ro-ro sector. Ferries in particular operate on specific routes which allows owners to meet tough regulations with costly technological innovation that they can be confident will not be undersold



Texelstroom, TESO's latest ferry under construction at Spain's LaNaval yard will use a number of fuel saving technologies

Repositioning of its target market began towards the end of the last century for Spanish shipyard LaNaval as the group switched from tankers, both crude shuttle and chemical vessels, and bulkers to LNG ships.

More recently the company decided to switch to more specialist ships including dredgers and offshore vessels and around three years ago the company also decided to target the ferry market. That decision has led to the development of the hybrid ferry which will be launched in July 2015 and is expected to be operational by January 2016.

Ordered by the Dutch company Texels Eigen Stoomboot Onderneming (TESO) the vessel, named *Texelstroom*, offers a selection of innovations that will allow it to meet environmental regulations.

According to LaNaval sales director Javier Angulo the concept design of the

double-ended, twin bridge, vessel was carried out by Dutch naval architects C-Job and basic and detailed design work was a collaboration between C-Job and the LaNaval yard.

Powered by two dual fuel 12DZD1000 engines built by the Anglo Belgian Corporation (ABC) and two 12DZC750 conventional diesels also from ABC, with each unit producing 2,000kW power, the vessel is a double ended 135m ro-ro ferry which will operate between Den Helder on the Dutch mainland and the island of Texel.

The speed of vessel operations for this ferry is crucial and so it is designed to limit manoeuvring and for rapid loading as well as continuous operations. This means there are two navigational bridges with two engine rooms and a high redundancy.

Apart from the two dual fuel engines which will be capable of operating on

MGO and compressed natural gas (CNG) the vessel will have a battery pack and 700m² of solar panels. Mainly composed of methane, CNG is generally stored at around 20-25MPa, but unlike LNG does

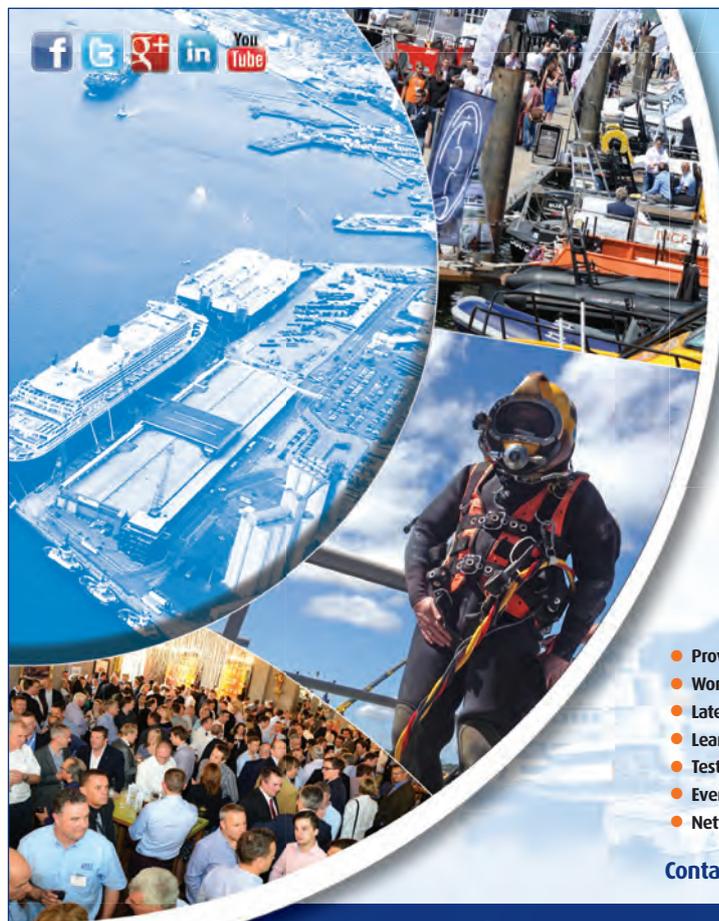
TECHNICAL PARTICULARS	
<i>Texelstroom</i>	
Length, oa.....	135.4m
Breadth.....	27.9m
Depth.....	12.37m
Draught	4.4m
Propulsion	
ABC dual fuel engines	2 x 2,081kW each
ABC Diesel engines	2 x 2,131kW each
Azimuth Trusters	4 x 1,800 kW each
2 x Car Decks	
1 x Bicycle Deck	
1 x Saloon Deck	

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not require expensive cryogenic tanks and bunkering is considered to be easier.

However, the ship owner's reasoning behind the choice of CNG as an alternative fuel was that a CNG terminal is based on Texel and as the ferry will not operate near a LNG bunkering station it was the obvious choice. Gas fuel storage tanks are situated on the main deck

Four 1,800kW azimuth thrusters will propel the ships on its 20 minute journey each way transporting up to 1,750 people and 350 vehicles. Thrusters can also be powered using lithium ion batteries and an energy storage system designed by Canadian company Corvus. The batteries will be recharged overnight from onshore power, says Angulo.

In addition the vessel will be fitted with 462 solar panels producing 150kW of power that will be available for the hotel section of the vessel reducing further the overall cost of operations and the total emissions from the ferry.

TESO estimates that the "reduction of CO₂ will be around 10% in diesel fuel, due to the solar panels, the reduction of the hotel load and the hybrid combination of diesel electric and batteries. "This is a reduction of about 780tonnes of CO₂ per



A section of *Texelstroom* being lifted into place at the LaNaval yard. The ferry is due for delivery in January next year

year. As they intend to use the dual fuel (CNG and 7-10% diesel) engine(s) most of the time we expect another reduction of about 450tonnes of CO₂ per year. "Running with the dual fuel engines also means a big reduction of SO_x (estimated at 70%) and particulates (estimated at 90%)," explains Angulo.

The owner has ordered just one vessel of this type to replace the older of two ships on this route. Angulo says the ship owner has been sensitive with the interior design of the public spaces, "aiming the shapes, colours and materials to fit with the surrounding attractive tidal area where the ferry will be operating." [NA](#)

Texelstroom is designed for rapid loading operations and offers significant savings in fuel and emissions



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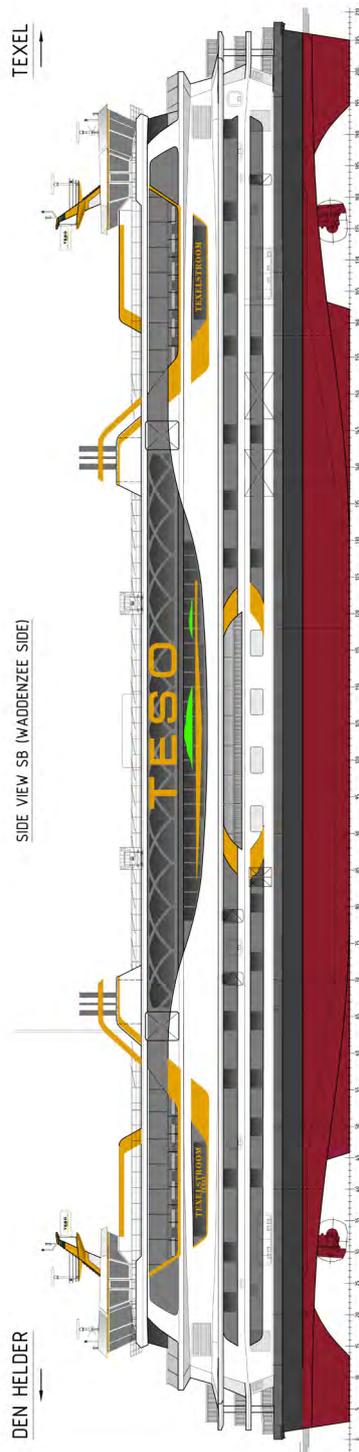
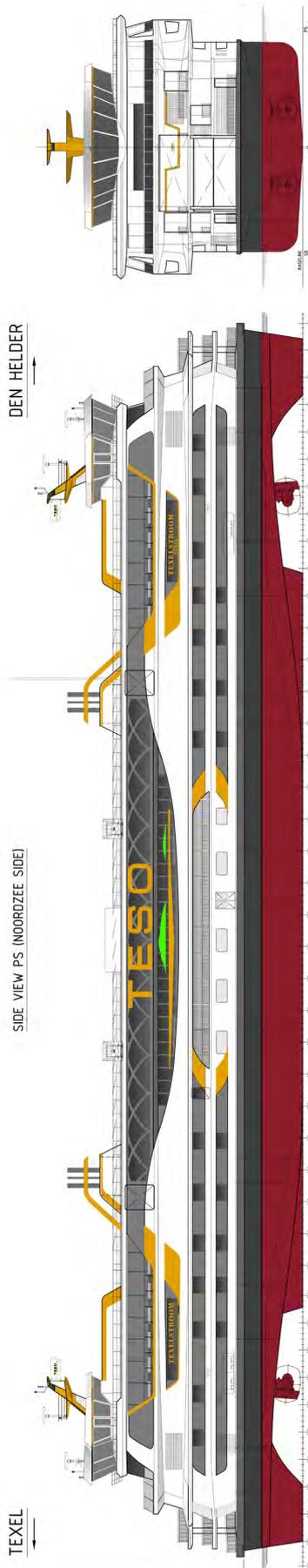
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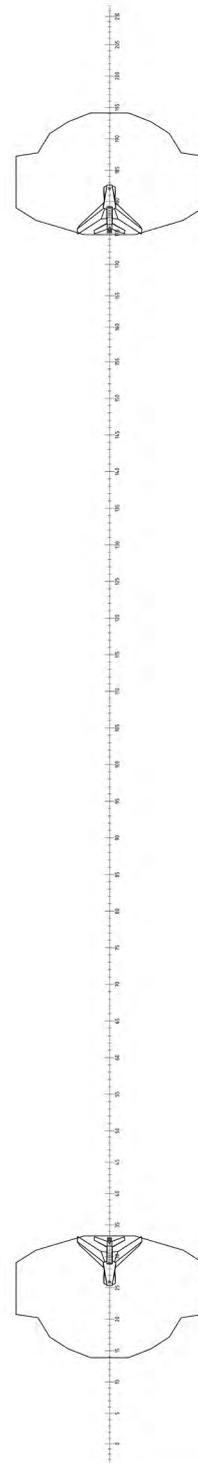
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LNG hybrid ferry for Vancouver route

Making waves on the Georgia Strait from 2016 will be Seaspan's new hybrid ferries. Two gas-powered ferries will be built in Turkey and will feature Wärtsilä dual fuel engines along with a battery power system that will also be able to power the main engines

Although the hull form of the latest Seaspan ferries is “not revolutionary” the design of the vessels, currently under construction at the Sedef yard in Turkey, are very unusual. The triple power system allows for main engine power to be provided by LNG or MGO or, if necessary, through electrical power supplied through a battery system developed by Canadian company Corvus Energy.

Designed by the Fincantieri subsidiary, Vard, the vessels, which are due for delivery in July and October 2017, will be capable of operating for 10 minutes on battery power, enough time for the vessel to return to port under its own power. “The principle”, according Bureau Veritas (BV) business development manager Martial Claudepierre, is to have electrical power always available on the vessel.”

Canadian company Corvus will supply the energy storage system (ESS) which consists of 84 Corvus Energy AT6500 lithium polymer batteries which can be re-charged either through power generation on board or through a land-based link.

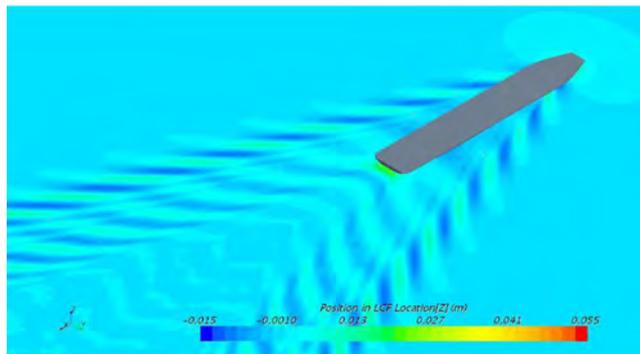
Main engine power will be provided by two Wärtsilä W9L 34DF dual fuel units each with producing 4,320kW of power. Wärtsilä will also provide its LNGPac system for LNG storage and bunkering which will supply the engines with the gas fuel. Tanks for MGO will provide a third fuel possibility for the vessels and the pilot fuel for the engines.

The vessels will operate on the Georgia Strait in Vancouver, Canada and will load LNG bunkers in two-three hours, including purging, inating and other safety operations, says Claudepierre, at the LNG storage facility on Tilbury Island via two trucks which will discharge up to 100m³/week.

“The ships will only have the two truck drivers and the master on board only



Seaspan's latest Georgia Strait ferries will be equipped with dual fuel, LNG and MGO, engines and will have a battery pack attached for back-up power (Courtesy of Seaspan)



Optimised bow and stern showing wave patterns at 14knots (Courtesy of Vard)

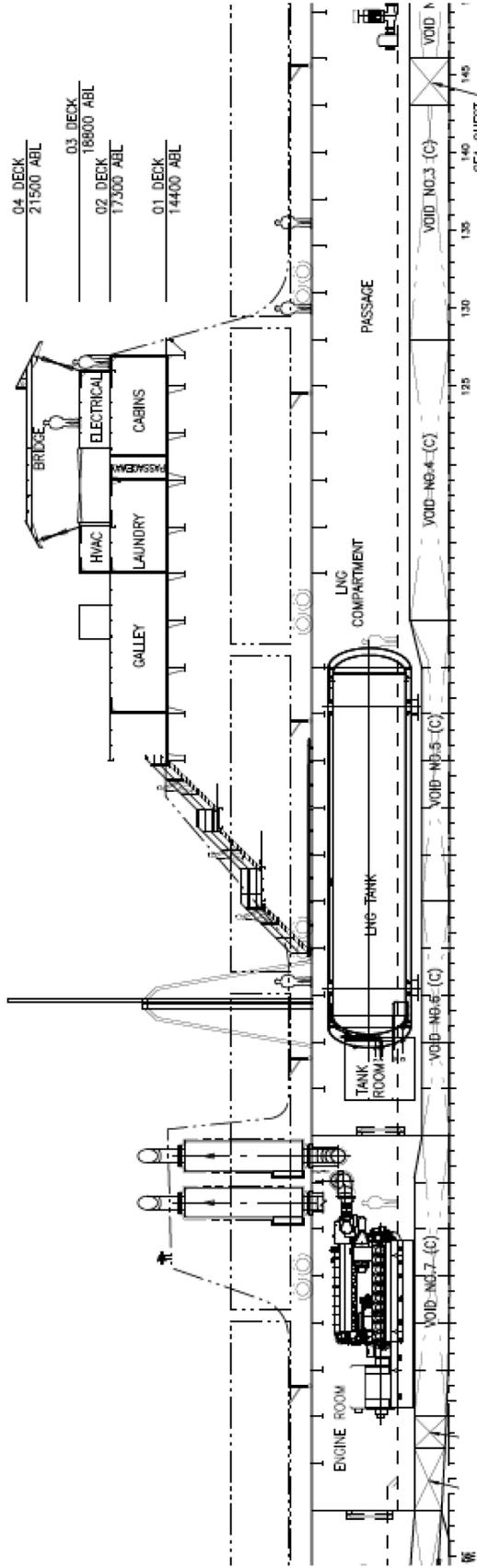
while the vessels are bunkering,” explains Claudepierre, who added that no trucks or cargo loading will take place simultaneously with the bunkering operation.

As stated earlier there has been little innovation in the hull form, however, the hull has been optimised to suit the operations on this route says BV. According to the classification society parametric optimisation of the bow and stern was the first phase of the hull improvements. Phase two saw the calm water evaluation of designs and resistance, movements and accelerations in waves.

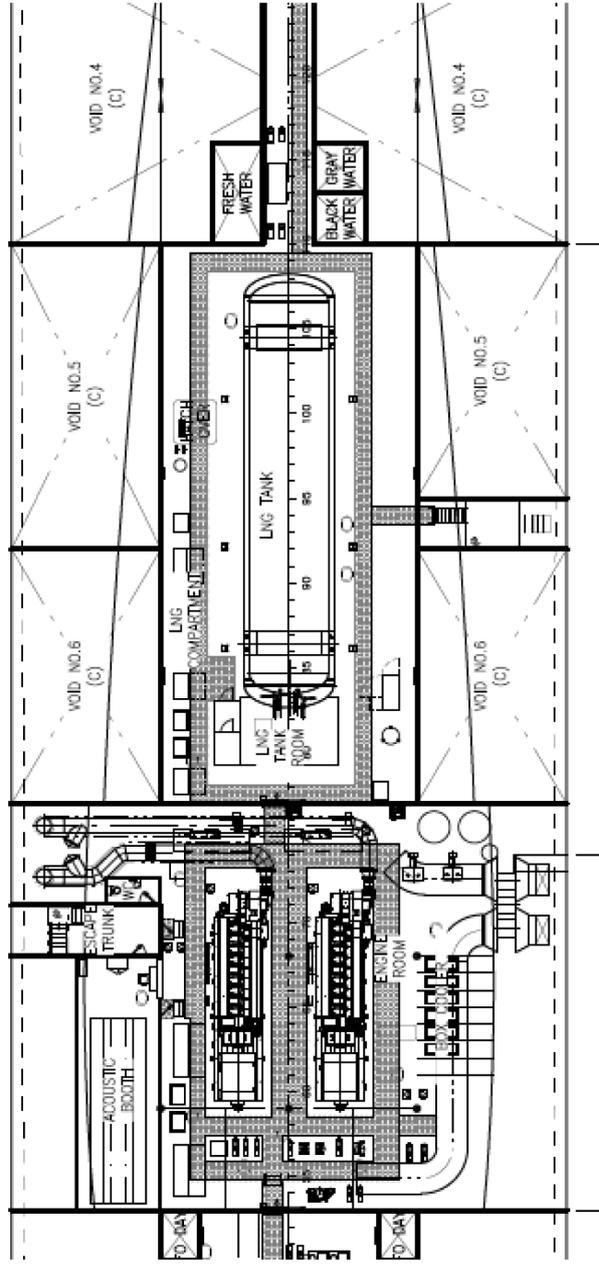
Hull appendages and propeller optimisation was then considered in the third phase of development. And in the final phase detailed trim optimisation took place. Computational fluid dynamics models were run using the Reynolds

Averaged Navier Stokes, shear-stress transport turbulence Model. **NA**

TECHNICAL PARTICULARS	
<i>Seaspan's new hybrid ferries</i>	
Length, oa.....	148.9m
Length, wl.....	145.2m
Breadth, mld.....	26.0m
Depth, main deck.....	7.0m
Design draught.....	4.25m
Propulsion	
DF Main engines.....	2 x 4,320kW
Emergency generators.....	1 x 125kW
Bow thrusters.....	2 x 550kW
Propulsion thrusters.....	2 x 2,200kW
Battery system.....	1 x 410kW



LNG Installation arrangement (Courtesy of Vard)





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- Registrations Open:
17 February 2015
- Abstract Submission Deadline
9 March 2015
- Author Acceptance Notification
6 April 2015
- Refereed Paper Submission
22 June 2015
- Full Paper Submission Deadline
13 July 2015
- Early Bird and Presenter Deadline
10 August 2015
- Conference
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Cargo magnet

In a world where reducing emissions has become crucial, new opportunities are evolving. One group of companies has taken the opportunity to design a ferry that will attract freight from the road to the sea, saving both money and fuel and, therefore, reducing emissions

Attracting business is never easy, but normally if a service can offer a more reliable and cheaper service to potential customers it would be a highly attractive offer.

Cargo from as far north as Trondheim in Norway, via Alesund and Oslo and heading through Gothenburg, Sweden to Denmark and Northern Germany and Poland often operates for hundreds of miles by truck.

According to DNV GL, the Norwegian/German class society, there is significant potential. Consider that some 2,500 trucks a day pass through Svinesund, 170km north of Gothenburg in Sweden, every day. This amounts to 15-20 million tonnes of cargo transported more than 200km in total to destinations within 25km of a port. By 2040 DNV GL estimate that with the growth in the local population there will be 50% more cargo, up to 30 million tonnes, in total.

At least 30% of this cargo is thought to be available for transportation by sea if a reliable door-to-door service can be offered to large cargo owners. This would have a significant environmental as well as economic impact.

The cargo ferry concept is aimed at meeting the potential demand offering an alternative to road transport in Scandinavia for some 3-6 million tonnes of cargo in 45ft containers and trailers at a rate that would be around 25% cheaper than by road transport.

In addition on a per unit basis Cargo Ferry will emit 34g/tonne-km compared to a Euro class 5, auto diesel oil truck on Norwegian roads which emits 112g/tonne-km.

Savings are possible and speedy delivery of goods can be effectively designed into the ship operations. DNV GL states that in coastal and shortsea shipping some 50% of vessel time is spent in port while 60-70% of costs are onshore.

Super-efficient port operations could offer significant cost reductions. For example 24 hour port access to a secure, unstaffed port area along with automated

vessel mooring and automated cargo cranes on board along with cell guides in the cargo holds along with direct loading to chassis will aid efficient loading and offer 15-20% cost savings.

A hybrid ship, the concept in this case is designed by Rolls-Royce, capable of loading around 100 containers at 12-15knots will operate on LNG between ports and will be battery powered during port operations and cold ironing will be available when a power boost is required.

On board cranes for cargo handling will be equipped with 'power recovery' reducing their energy demand by 30% compared to a conventional crane while distribution to and from the port area will be by gas/hybrid shuttle truck.

The Cargo Ferry concept on the Scandinavian routes plan to use 12 vessels operating 360 roundtrips every year the equivalent of 300,000 truck trips saving 350,000tonnes of CO₂ or the equivalent annual emissions from 135,000 private cars.

Achieving such savings requires a number of crucial steps and the first requirement is all about perception; the

customer community needs to understand that multimodal shipping has significant advantages over road.

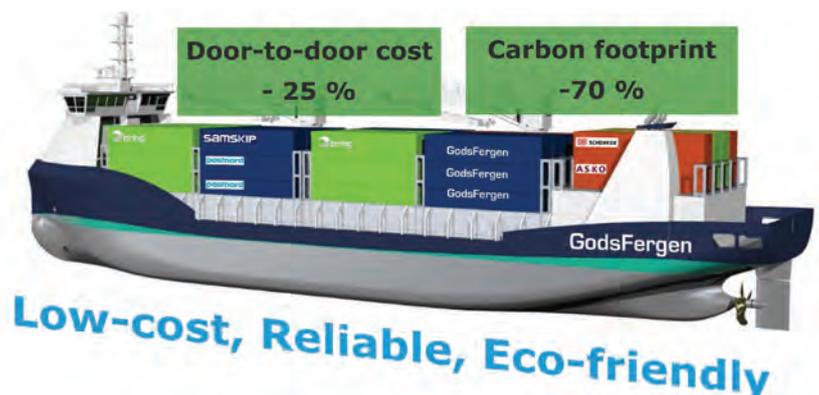
In addition there is a requirement that governments recognise the benefits of shifting cargo from road to sea and act appropriately, this would mean spending money to improve port infrastructure thereby allowing the efficiencies of operations such as the cargo ferry to attract cargo from the roads.

Incentives to promote shortsea shipping – that is to reward pioneers using such mechanisms as an ECO-bonus – and a support scheme for port cooperation and consolidation of cargo

Along with a balanced taxation system would create the conditions for an environmentally advantageous system to develop. The last piece of that puzzle would be to back research and development solutions and technology for shortsea shipping.

Attracting cargo to the sea is no longer merely about offering an alternative to road, a competitor, but is about the significant cutting off emissions. Offering a cost advantage for an environmentally friendly service would act as a magnet for cargo and would be a magnet for cargo. *NA*

Cutting emissions is not merely about the ship, but about the logistics chain in which the ship operates too



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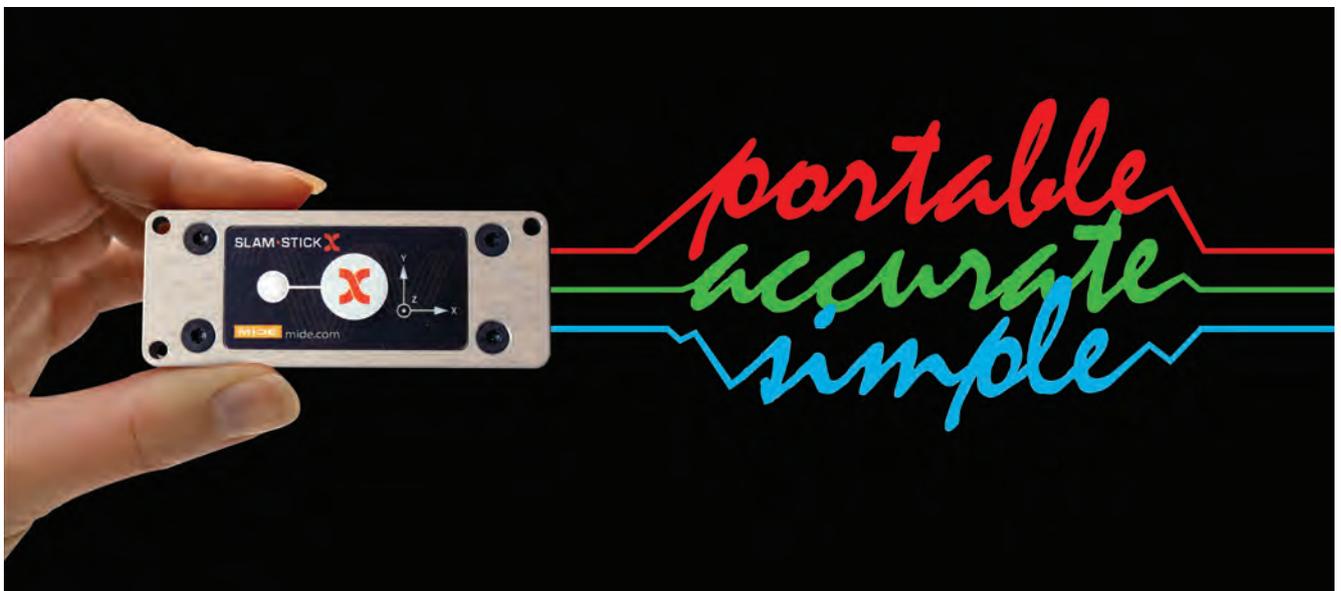
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US-based Midé Technology Corporation has released its latest product for recording shock and vibration data both more rapidly and more accurately

Due to the need for faster and more accurate data that is becoming apparent on the market, it has developed an aluminium version of its Slam Stick X shock and vibration data logger.

The Slam Stick X was originally developed for US Navy aircraft, which is a powerful data logger, but also has a small footprint. It can measure acceleration in all three axes, while also measuring temperature and pressure. Its rugged enclosure and wide temperature operating range (-40°C to 80°C) enable it to perform in many harsh environments. However, the company adds that it is the high acceleration/vibration range ($\pm 25g$, $\pm 100g$ and $\pm 500g$), sampling ranges (20kHz per channel) and triggering options that differentiate the Slam Stick X from other data loggers.

The recording device works by incorporating a microprocessor, sensors, and storage media within the device. The Slam Stick X 2GB memory records the sensors' output at the user-defined frequency. Following a recording event, laboratory software is able to read and plot the recorded data.

David Manion, director of communications, Midé Technology adds: "The Slam Stick X has been purchased by several companies in the maritime industry/environment looking to use the data logger to quantify the shock and vibration environment of various systems, and to understand how the equipment behaves when subjected to operational loads."

Midé Technology has now introduced its latest aluminium version of the Slam Stick

X, which is now being offered to better meet the robustness and accuracy needs from Midé customers. The aluminium material is over 1,000 times stiffer than the original polycarbonate enclosure material which not only results in a more rugged data logger, it also enables higher frequency and more accurate shock and vibration testing because the enclosure does not flex as much as polycarbonate under strain.

"Midé first explored an alternate enclosure material during its EMI qualification testing. An aluminium option was selected for this testing as a failsafe to ensure at least one configuration of the product qualified the stringent military requirements," explains Manion, "After building and testing this enclosure, the added benefits it offered became readily apparent." **NA**



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Waving in the next generation

CD-Adapco has launched the latest version of its simulation software tool Wave⁶ for measuring vibration

The latest tool for noise and vibration to be added to the STAR-CCM+ package looks at addressing flow-induced noise and vibration problems.

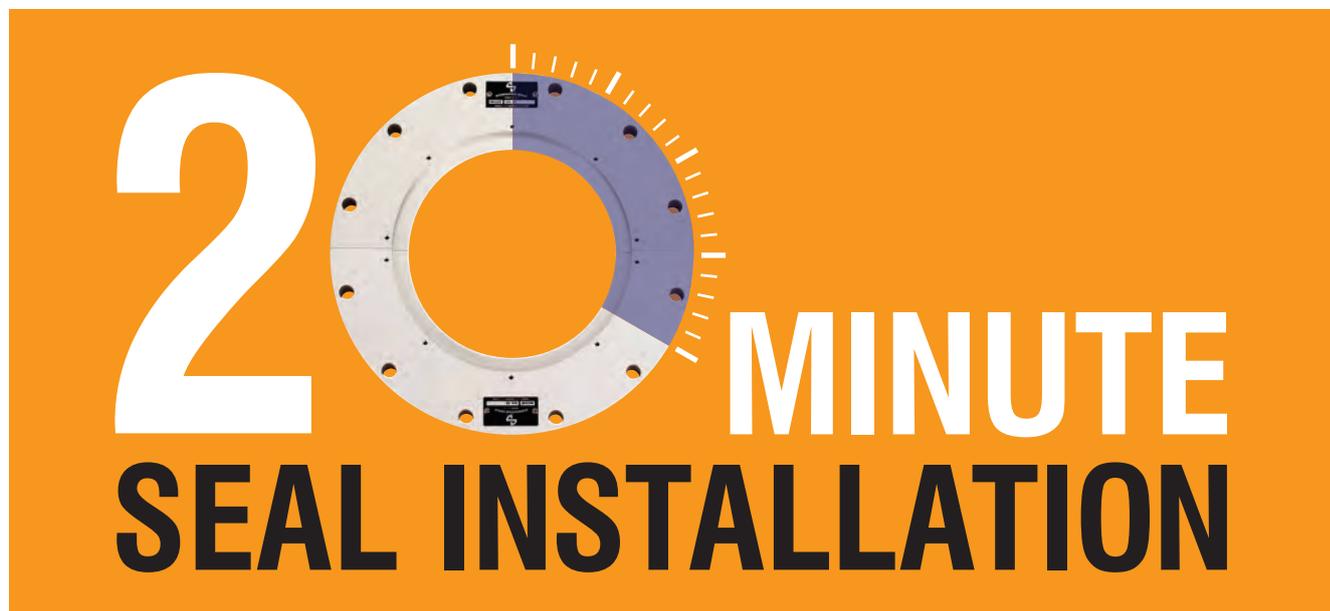
“Solving problems that involve flow-induced noise and vibration is of increasing importance to our customers. It is an application that crosses multiple disciplines and requires accurate simulation of both unsteady flow and the transmission of noise and vibration through large complex systems across a broad frequency range,” says Phil Shorter, vice president, CD-Adapco. “We developed Wave⁶ from the ground up with a group of experts who truly understand the problems engineers face trying to work with older legacy codes.”

The company says the latest methods applied in Wave⁶ are general developments that can be applied to many different problems and industries. Philip Shorter, explains the development of Wave⁶. “We started with a blank sheet of paper and so got to write the software the way we needed to write it (we weren’t constrained to have to maintain an older legacy code base and code instead start from scratch).”

Shorter adds that the uses of modern software architecture is designed for modern hardware. The result is that we have obtained significant performance improvements over legacy codes. The Wave⁶ product line also focuses on usability and introduces new automated workflows to make advanced aero-vibro-acoustic analysis methods more readily

accessible. The introduction of this release will be of benefit to existing STAR-CCM+ customers as well as a wider audience of vibro-acoustic clientele.

The new methods that have been developed are methods for accurately simulating both unsteady flow and the exterior acoustics generated by those flows, in particular, the ability to separate convective and acoustic contributions and to accurately model exterior acoustics in zones of interest; this is particularly important for low mach flows. Further methods for accurately simulating the transmission of noise and vibration across a broad frequency range have also been included, which come into play particularly when the transmission is through objects that are large. *NA*



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Shallow draught river steamers

“On American River Steamers” was the title of a paper presented at the INA meeting on 1st March 1861 by Norman S Russell. The timing is interesting, as a group of southern states had broken away to form the Confederacy, and six weeks later would come the first hostilities ushering in the long and bitter Civil War. Richard White reports

Russell’s reason for addressing the meeting was that he was convinced that lessons learned from the highly developed US Eastern and Western river boats could be applied to steamers for the growing numbers of British colonies and dependencies, many of which had extensive river networks and a pressing need for improved transport infrastructure.

He noted that “wherever this class of vessel has come into competition with English steamers the latter have always been beaten out of the field.” To make himself acquainted with these American river steamers he had “examined carefully the most remarkable vessels of each kind, I have watched them in course of construction, I have made drawings of the most remarkable points in their naval construction. The most striking peculiarities of the machinery, boilers, wheels and working gear; and I now proceed to lay before the meeting the practical results of my four month study.”

The conclusion was that there was basically one pattern of vessel plying the eastern rivers and the New York area; longer, narrower, stronger, fine lined but deeper draught than the steamers of the Mississippi and linked rivers in the west. Low pressure engines were almost universal, highly developed versions of the Watt-type beam engine directly coupled to large fixed-float side paddle wheels.

The single vertical cylinder might be 6ft bore and 12ft stroke. The Western shipbuilders seemed to like greater variety. “There are boats with two side wheels – there are boats with only one wheel at the stern – twin boats with one wheel in the middle – boats with one, two, three, and even four rudders – in fact every combination of boat and paddle wheel that the versatile talent of the Western

shipbuilder can devise.”

With many of the eastern riverboats operating on the Hudson draught was limited to about 8ft to negotiate shoals near Albany. Another important route eastward from New York on Long Island Sound also had shallow areas, but stretches were open to waves from the Atlantic.

Combined passenger and freight requirements led to spectacular paddle steamers, and Russell was impressed by the layout of these vessels and the ingenious solutions to the problem of designing wooden shallow draught vessels typically from 200ft to 350ft-long and powered by heavy machinery for 20mph. The hull lines – fine with hollow waterlines and no parallel mid body – were taken from models carved from laminated planks of alternate dark and light wood to reveal the waterlines. From the sides of the hull itself extended guards above the waterline to give a deck with a breadth of almost twice the hull beam.

“A ship on the eastern waters is a floating American hotel. You are therefore to conceive a double series of bedrooms, two or three hundred feet long, extending along the sides of a gigantic saloon; and that, to carry this, to furnish the passengers the accommodation of an hotel, and at the same time to accomplish 150 miles in the night, are the great objects to be obtained by the shipbuilder, the marine engineer, and the shipowner.”

Notable in Russell’s eye was that the space below the main deck was for passengers, one gigantic barrack, 350ft long, to accommodate 500-600 people with open berths at US\$3 a head along the sides. “We should consider this second class accommodation, especially when we find such notices as ‘gentlemen are requested not to turn in with their boots on’ are considered necessary. But the term second class is, of course, unknown in Democratic

America.”

Above this dormitory was the cargo deck, greatly extended by the guards and up to 15ft high. Russell was impressed by the roll on roll off cargo loading from the side without holds and cranes. Boilers were installed out on the guards each side. At the aft end was a ladies saloon. Above this was the long saloon with cabins each side for the more select passengers, with open promenade decks each end. Finally, on top were more deckhouses for passengers and the ship’s officers with the pilot house at the forward end.

Russell calculated weights and displacement available on such a fine lined and shallow draught hull, concluding that the designers were extremely skilled in making effective ships at such a low structural weight, at the limits of wooden construction. The hogging and sagging of the shallow hull was counteracted by the wooden hog truss, the arched element that can be seen in the sectioned drawing of Commonwealth, in conjunction with deep keelsons.

Other loads were taken by a complex array of masts and guys. He gave typical proportions for length to beam as between seven and nine to one, and hull depth one twenty-fifth of length. Bilge shape was a quarter circle with a 6ft radius. Earlier, even larger riverboats had been built, for higher speeds, but the optimum for the traffic had reduced a bit, owners competing with the expanding rail network by offering these overnight passages with sleeping accommodation.

There were similarities in passenger and cargo traffic between the western riverboats on the Mississippi, Missouri, Ohio and other connected waterways and their eastern counterparts, but design and technology had been driven in radically different directions. One driver was the

great seasonal changes in water level. Very shallow draught extended range and operating season. So the boats were generally shorter, fatter and drew anything from 18 inches to 6ft depending on size and where they ran. The great hazard was waterlogged trees carried down by the river, snags likely to tear the bottom out of a steamer.

Boats had to be built cheaply. Russell reported that the natural life of a Mississippi boat was only six to seven years, "... and there are not many that reach that advanced age. I may here mention that the number of steamers totally lost last year on western waters was 120, of which 31 were burned, 19 were burst, 44 snagged and the remainder lost by collision."

A typical boat was 250ft long, 40ft beam and 8ft deep, displacing 900 tons on a draught of 4ft. The illustration of Memphis appears to be Russell's depiction of typical construction, rather than an existing vessel, and shows the sidewheeler layout. Below the main deck the oak framed hull is strengthened by five longitudinal bulkheads, including a centreline one in the form of a series of arches. Above decks, hog chains on masts helped to support the ends of the vessel, and Russell was told these might be slacked off to let the boat flex freely if extra speed was needed. Cargo, engines and boilers are all on the main deck, the space being up to 20ft high to accommodate high volume cargo, especially bales of cotton. Above is the passenger deck, reached by a winding double staircase at the bow and forming a long saloon flanked by doors to cabins each side. The impressive saloon has white panelling, lavishly carved beams, carpets and painted glass skylights overhead. Officers' cabins and the pilot house stood above, on the hurricane deck.

With the machinery the aim was to get the maximum possible power out of the cheapest and slightest engine, and here two cylinders 27in by 96in are bedded on a built up timber foundation. Each turns a wheel by crank and a long connecting rod or pitman made up of a wooden strut and iron tie. Wheels had fixed floats, oak spokes and cast iron driving flanges. There does not appear to be any shaft connection between the two wheels.

Life on the river could be exciting, with boiler explosions not merely possible, but

frequent and devastating. Perhaps not surprising as banks of boilers each about 30ft long and 3 to 4ft diameter linked by a mud drum were fed with river water carrying a vast load of mud. Boiler plates were thin iron. Allowing the water level to drop, or mud to accumulate 'has the effect of collapsing the flues, and blowing all the water and the fires on to the deck of the ship; but in spite of their frequent occurrence, human life is reckoned too cheap and the dollar too high for the Americans to introduce a safer, but more expensive, system of boilers.'

The American Civil War disrupted the Western River traffic, and it took some time to recover. But recover it did, and the years from the 1870s to the opening of the 20th century were the golden age of river steamboating: the stuff of legends.

Norman Russell's INA paper contains much more information on the riverboats, their construction and machinery than can be included in a short article. Readers interested in the technical side of American riverboats as they had evolved at the start of the Civil War will find the paper itself well worth studying. *NA*

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SHIPBUILDING ICCAS Bremen • 2015



29th Sept - 1st Oct 2015 | BREMEN | GERMANY

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The 17th International Conference on Computer Applications in Shipbuilding (ICCAS) will review operational experience from existing computer applications in the design and build of ships and offshore structures and will cover a full range of topics including; engineering analysis, data modelling, PLM, CAD, CAM, integrated systems, knowledge management, systems engineering, simulation, visualisation, processes and standards.

It will also examine the advances in Information Technology which have contributed to increased productivity in both shipbuilding and maritime operations; including increasing co-operative working between shipyards, marine equipment and system manufacturers, engineering partners and shipping companies.

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International Conference: Energy Efficient Ships

4th November 2015, Rotterdam, Netherlands



Call for Papers

In Partnership with the Europort Exhibition, 3-6 November 2015

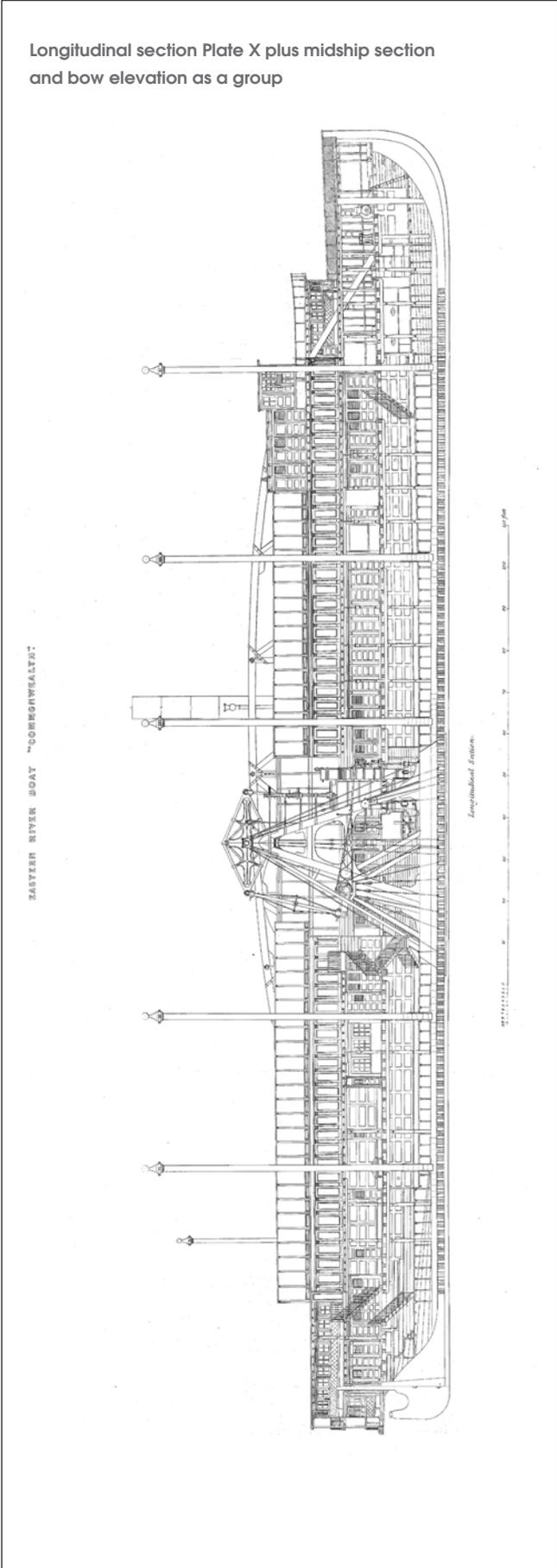
Shipping is one of the most efficient means of transportation for bulk commodities. However, as part of the global effort to reduce greenhouse gases (GHG) the industry must design and operate lower emissions-higher energy efficient ships. IMO introduced mandatory standards on the energy efficiency (EEDI) of the majority of new built vessels and further regulations are expected to be developed for ship types not already covered. The Energy Efficiency Design Index and the Ship Energy Efficiency Management Plan (SEEMP) has been adopted for existing ships in an attempt to monitor (Energy Efficiency Operational Indicators -EEOI) and improve their efficiency.

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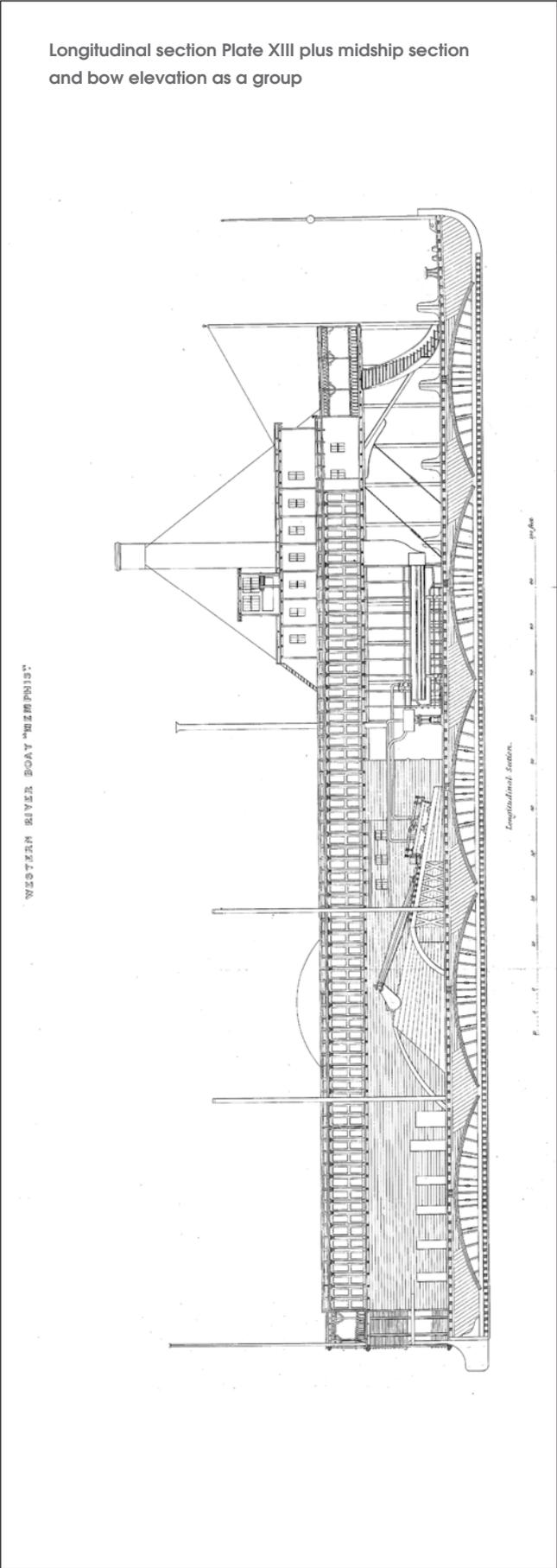


www.rina.org.uk/energy_efficient_ship

Longitudinal section Plate X plus midship section and bow elevation as a group



Longitudinal section Plate XIII plus midship section and bow elevation as a group



The Royal Institution of Naval Architects

International Conference: High Performance Sailing Yachts

28-29 October 2015, Southampton, UK



Registration Open

Innovations in hull design, materials, and sail design have contributed to the raising of the bar in speed and performance. The RINA High Performance Sailing Yacht conference will provide a forum for the presentation and discussion of the latest scientific and technologic research and its application in the complex field of high performance yachts and competitive sailing.



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www.rina.org.uk/highperformancesailingyachts

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International Conference: WARSHIP 2015: Future Surface Vessels

10-11 June 2015, Bath, UK



Registration Open

Modern navies are a trade-off between advanced technologies and cost, in both construction and operation. Versatility, flexibility, and affordability are key design criteria. The development of the Royal Navy Type 26 Frigate and the Littoral Combat Ship in the USA are examples that use modularity to address this. Modular design allows adaptability in meeting threats from smaller vessels, used by pirates and terrorists, to larger threats from enemy navies.



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www.rina.org.uk/Warship2015

May 21-23, 2015

Bari-Ship, international conference, Imabari, Japan.
www.bariship.com

May 26-29, 2015

Basic Dry Dock Training, international conference, London, UK.
www.rina.org.uk/Basic_Drydock_Training_Course_2015

June 2-5, 2015

Nor-Shipping, international conference, Oslo, Norway.
www.norshipping.com

June 3-5, 2015

UDT, international conference, Rotterdam, The Netherlands.
www.udt-global.com/Exhibitor/UDT-2015

June 9-11, 2015

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

June 10-11, 2015

Warship, international conference, Bath, UK.
www.rina.org.uk/Warship2015

June 22-23, 2015

Decommissioning of Offshore & Subsea Structures, international conference, Glasgow, UK.
www.asranet.co.uk/Courses

July 1-5, 2015

IMDS, international conference, St Petersburg, Russia.
www.navalshow.ru

September 2-4, 2015

Structural Safety under Fire & Blast, international conference, Glasgow, UK.
www.asranet.co.uk/Courses

September 3-5, 2015

Baltexpo, international conference, Gdansk, Poland.
www.baltexpo.ztw.pl/en

September 7-11, 2015

London Shipping Week, international

conference, London, UK.
www.londoninternationalshippingweek.com

September 8-11, 2015

Offshore Europe, international conference, Aberdeen, UK.
www.offshore-europe.co.uk

September 9-11, 2015

Seatrade Europe, international conference, Hamburg, Germany.
www.seatrade-europe.com

September 15-16, 2015

ICSOT Korea 2015, international conference, Busan, Korea.
www.rina.org.uk/ICSOT_Korea_2015

September 15-18, 2015

DSEI, international conference, London, UK.
www.dsei.co.uk

September 17-18, 2015

IMPA, international conference, London, UK.
www.impa.net

September 22-25, 2015

NEVA, international conference, St Petersburg, Russia.
www.transtec-neva.com

September 23-25, 2015

INMEX India, international conference, Mumbai, India.
www.inmexindia.com

September 28-30, 2015

Middle East Workboats, international conference, Abu Dhabi, UAE.
www.middleeastworkboats.com

September 30- October 1, 2015

ICCAS 2015, international conference, Bremen, Germany.
www.rina.org.uk/ICCAS-2015

October 5-7, 2015

Floating Structures & Subsea Systems for Deepwater Operations, international conference, Glasgow, UK.
www.asranet.co.uk/Courses

October 6-8, 2015

Pacific 2015, international conference, Sydney, Australia.

www.rina.org.uk/international_maritime_exposition_2015

October 9-11, 2015

Light Weight Design of Marine Structures, international conference, Glasgow, UK.
www.asranet.co.uk/Courses

October 14-16, 2015

Contract Change Management, course, London, UK.

October 20-23, 2015

Kormarine, international conference, Busan, South Korea.
www.kormarine.com

October 27-30, 2015

Gastech, international conference, Singapore.
www.gastechsingapore.com

October 28-29, 2015

High Performance Sailing Yachts, international conference, Southampton, UK.
www.rina.org.uk/highperformancesailingyachts

October 28-30, 2015

Seatrade Middle East Maritime, international conference, Dubai, UAE.
www.seatrade-middleeast.com/

November 2-6, 2015

SNAME Maritime Convention, international conference,

November 3-6, 2015

Europort, international conference, Rotterdam, The Netherlands.
www.europort.nl

November 4-5, 2015

ICSOT Indonesia 2015, international conference, Surabaya, Indonesia.
www.rina.org.uk/ICSOT_Indonesia_2015

November 17-19, 2015

METS, international conference, Amsterdam, The Netherlands.
www.metstrade.com

November 19, 2015

President's Invitation Lecture, lecture, London, UK.
www.rina.org.uk/PIL_2015.html



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The Royal Institution of Naval Architects

International Conference:
Marine Design 2015
2-3 September 2015, London, UK



Call for Papers

Marine Design 2015 will return to provide a forum for reporting and discussing Marine Design practice and technical innovation, including Human Systems Integration. Marine Design is an holistic design process with a strong focus on the end users as well as stakeholders in the design process, based on the principles of Industrial Design. Effective Marine Design requires a multidisciplinary design team of Naval Architects, Industrial Designers, Human Factors specialists, Environmental Psychologists and Interior Designers.

Although the conference will have a focus on the superyacht, cruise and offshore sectors, it is recognized that cross-sectorial innovation is critical to the development of the Design-Driven Innovation process. Therefore the conference will explore innovative approaches from across all marine design sectors including the dialectic between luxury design in the superyacht and cruise sectors, and the utilitarian design approach of the offshore sector, while reflecting upon the needs of the end user.

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www.rina.org.uk/Marine_Design_2015

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International Conference:
ICSOT Korea
15-16 September 2015, Busan, Korea



Registration Open

Safety of Offshore and Subsea Structures in
Extreme and Accidental Conditions



In deep-water operations, offshore installations may face extreme or accidental events in association with general, or site-specific, conditions. Such hazards include: leaks of gas and/ or oil, collisions, human error, structural failure, and blowouts. These emergency events sometimes result in catastrophic consequences that can lead to casualties, property damage and pollution. It is the responsibility of the designer, builder and operator to develop, and integrate, safety measures developed to mitigate the consequences from such hazards.

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By Fred Walker FRINA

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International Journal of Maritime Engineering (IJME)

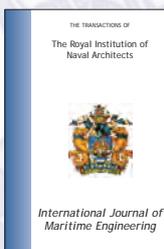
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International Journal of Small Craft Technology (IJSCT)

2015

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4 November 2015, Rotterdam

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