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E-mail subscriptions subscriptions@rina.org.uk

Printed in Wales by Stephens & George Magazines.

A 2012 subscription to *The Naval Architect* costs:

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

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

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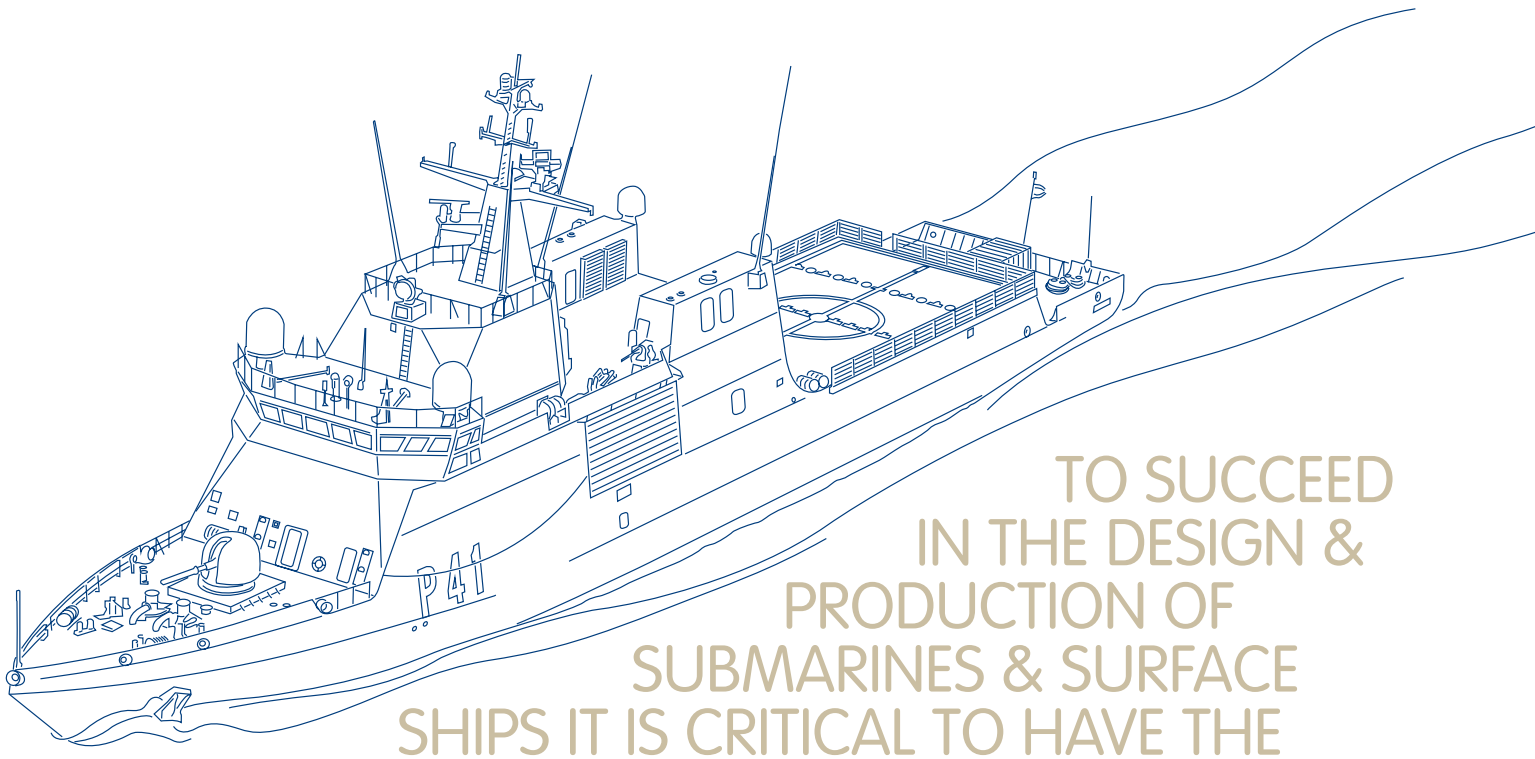
Naval, Commercial & Offshore



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LNG bandwagon gathers pace, but biofuels are catching up

LNG may be only a stopgap solution to the GHG conundrum

According to Germanischer Lloyd (GL) operating ships on "distillate fuels for a long period of time is the straightforward solution to comply with the forthcoming emissions regulations on maximum allowable sulphur content in fuel".

Even so GL points out that operating on MGO is not necessarily as straight forward as it might at first seem. "The fuel system needs to be fitted with a cooler or a chiller arrangement to meet the fuel viscosity requirements for a safe operation of the engine's fuel system," says GL, adding that "a suitable cylinder oil will also be required. For running in non-ECA areas the fuel system must also be able to cope with the new fuel low sulphur heavy fuel oil (LSHFO), with 0.5% sulphur that might be introduced in 2020."

Easy alternatives are tough to find. The industry is going to have to adapt to a new low emissions reality and this will need investment either in crew training, new technology or new fuels, or possibly, and more likely, all three.

LNG is still being touted as the short-term solution to new emissions controls that will see the industry need to reduce ship emissions of SOx, NOx and particulates as well as a significant reduction in greenhouse gas (GHG) emissions, CO_2 in the main, but LNG is essentially methane, a gas that is 21 times more potent as a GHG than CO_2 and which has the potential to make climate change far worse.

Melting glaciers near the poles are reportedly now seeping methane that has been frozen for many thousands of years and some scientists say this will have a significant effect on climate change estimates.

The maritime industry will, however, push on with its plans to operate vessels with LNG and there are a number of studies that have been commissioned that show there can be a cost benefit to shipowners as LNG is cheaper, and is expected by some to remain cheaper, than HFO and is considerably less expensive than MGO.

Owners must decide which fuel to use by weighing up the amount of time their vessel will spend in emission control areas (ECA), what they believe will be the relative cost of LNG to MGO, HFO and LSHFO in future and whether the investment, for whichever solution they opt, will have a realistic payback period.

Making a judgement with so many variables that includes at least one volatile price, that is the price of fuel, is never easy. It is further complicated by the fact that LNG, one possible solution, needs a costly up front investment, and there is no guarantee that when that investment is made that others, who have made a similar choice, will help to push up demand for the fuel, thereby pushing up its price as a result. It is not beyond the realms of possibility that a fall in demand for HFO may also see a decline in that fuel's price, maybe not by a lot, but it could affect an owner's choice.

One possible interesting alternative that is not often mentioned is the use of biofuels as an alternative. Lloyd's Register (LR) believes that the second and third generation biofuels will not suffer the same production difficulties that affected earlier feedstock based biofuels.

Second generation biofuels do not compete with food growing regions, but rather use inedible plants, biomass and crop waste. And say LR third generation biofuels can be carbon neutral and manufactured using algae. Algae, it is estimated can produce 2,000 gallons per acre, at sea, while first generation soya beans produced 50 gallons of biofuel.

In the rush to meet new regulations owners could end up investing heavily in technology that could very quickly be out of date. Costly investment such as LNG retrofits and scrubbers may be necessary for only a short period as engine builders look for alternative solutions such as algae based carbon neutral fuels or dimethylether to the GHG challenge.

It is a further complicating factor for owners that they must make decisions about investment two years before a vessel is finally delivered, or must choose costly retrofits to existing vessels, taking ships out of service to have the chosen technology fitted.

In the past owners had a comparatively simple task they needed to work out at what point the cyclical maritime market was and invest accordingly. Now owners must not only look at the economics of the particular market they are within, but also second guess changes to fuel and technology markets also.

It is probably of little comfort to owners that the regulators move with glacial speed and nimbleness. But at least this means that they can be more certain what they are facing. *NA*

Newbuildings

The Vikings start cruising

Italian cruise shipbuilder Fincantieri has signed a Memorandum of Agreement with Viking Ocean Cruises to build two 45,000gt cruise ships for delivery in 2012 and 2015. The vessels will have a passenger capacity of 998 people in 499 cabins.

The deal was made possible following the successful application by the partners to the Italian export credit programme involving SACE and SIMEST and, if eligible, the funding from Cassa Depositi e Prestiti.

Giuseppe Bono, Fincantieri CEO, says: "Considering the economic crisis, this agreement between Fincantieri and the new customer represents a strong sign of renewed confidence in the sector growth, also because Viking, the [self styled] world leader in river cruises, enters for the very first time the ocean cruises sector". This agreement demonstrates the success of Ficantieri's strategy to regain its competiveness in the market. This new Project, which, is the beginning of a new phase, will further reinforce to our employees the confidence we have for the future".

Propulsion

ABB's Azipods power ahead

Swiss power provider ABB says it has won a US$60 million order to provide complete power and Azipod propulsion systems for two new cruise ships to be built for Royal Caribbean Cruises Ltd (RCCL).

The 158,000gt ships will be delivered in 2014 and 2015 and ABB will supply complete electrical systems for the new vessels including power generation and distribution systems, thruster motors, and two 20.5MW propulsion systems that will include transformers, drives and two Azipod XO propulsion units.

RCCL's new vessels will have a passenger capacity of 4,100 and will sport redesigned spaces that will optimise passenger capacity and fuel efficiency using the latest energy saving technology while maintaining passenger comfort, says ABB.

Scrubbers

Wilhelmsen orders largest scrubber

Wärtsilä Hamworthy has announced an agreement with ro-ro operator Wilh. Wilhelmsen to retrofit its vessel *Tamesis* with a Krystallon Exhaust Gas Cleaning System (EGCS). The systems will remove sulphur and particulates from the exhaust gasses of the vessel's main and auxiliary engines.

The multi-stream scrubber system will be the world's largest in order to manage the exhaust gasses produced by the 38,486dwt Mark IV ro-ro vessel's combined engine power of 28,000kW. Its installation will prepare *Tamesis* for the upcoming sulphur emissions regulation that comes into force from January 2015, which mandates that vessels must burn fuel with a sulphur content of 0.1% when operating within Emissions Control Areas (ECAs).

The installation will be carried out during the vessel's scheduled intermediate docking in the first quarter of 2013. Following the commissioning a comprehensive third party measurement and verification programme will be carried out over two and a half years, and is partly funded by the Research Council of Norway.

The third party measurement and verification of the project, which will be carried out by Marintek and the Norwegian Marine Technology Research Institute, is a key element that could endorse the viability of scrubbing as a cost effective solution for ECA compliance. Wärtsilä Hamworthy says that it anticipates that more owners and operators will follow Wilh. Wilhelmsen's lead and adopt scrubbers in advance of the 2015 deadline.

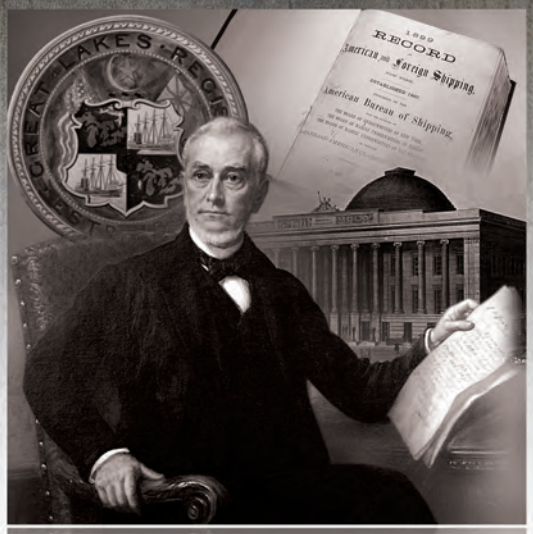
By using a scrubber to reduce sulphur and particulates from its main engine as well as its auxiliaries, *Tamesis* will be able to operate in ECAs from 2015 on a 'business as usual' basis avoiding the US$300 to US$400 price premium that standard vessels will have to pay for the distillate fuels they will need to burn to remain compliant.

Installing a scrubber unit is a significant step towards preparing the Wilh. Wilhelmsen fleet for regulatory compliance, says project manager Thamba Rajeevan. "When new, stricter emissions regulations come into force in 2015, our experience with this technology will be a valuable tool for taking the right decisions for the rest of our fleet. In the end, we want to see both a significant savings in emissions and a strong return on investment for the scrubber installation."

Newbuildings

Island Offshore opts for RR design

Aberdeen-based Island Offshore has entered into a contract with the Norwegian shipyard STX OSV Brevik to build a SubSea support vessel of the UT 737 CD design. The vessel will be 96m in length with a 21m beam and will have accommodation for around 70 people. It will be outfitted with complete handling systems for two remotely operated vehicles (ROVs) and have a 125tonne active heave compensated subsea crane. The vessel is expected to be delivered in February 2014.



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Island Offshore has selected Rolls-Royce to design and provide the power and equipment for the vessel, known as UT 737 CD which will support the demanding subsea projects, including constructing and servicing oil and gas wells on the sea bed, up to 3,000m below sea level.

UT 737 CD will include special features such as two independent systems for launching and recovering ROVs, a 125tonne offshore crane that will compensate for wave movements and an advanced offshore tower which will handle subsea equipment through a moon pool.

The Rolls-Royce-designed UT 737 CD will be delivered in two years' time

The vessel will also include a diesel electric propulsion system incorporating four Bergen engines. These will drive two Azipull thrusters and two side thrusters that will work in unison with a dynamic positioning system to enable the vessel to maintain position when undertaking subsea activities. A diesel electric propulsion system will significantly improve fuel efficiency and lower the vessel's emissions.

Classification

ABS app the first in class

US classification society ABS is the first class society to launch an app that will allow clients to access ship data through their smart phone or tablet via the myeagle.com website.

Through the ABS Bookshelf app users can access over 130 guides and rules currently available on the web. The publications are fully searchable and can be downloaded as a complete set or in the required parts as necessary and users can bookmark pages and sections if they need to.

The ABS app is free to download from the Apple store and will be supplemented shortly with a further two apps; the ABS Directory, which can be synchronised with address books and will list all of the ABS directory currently available in hard copy. ABS Directory is expected to be available within a month.

The second app currently under construction is Survey Manager, this app lists all the ships in an owner's fleet along with the status of the ship. The app will allow an owner to phone and order a survey for a vessel and will offer reminders as surveys become due.

Each time the site is accessed the system synchronises with the latest information from ABS giving the user the most up-to-date information available. Furthermore, reports, such as machinery and hull reports, can be attached to the ship's online file.

ABS says that it is concentrating on iPhone and iPad to begin with and will look at adding the technology to Android machines in future. It says that there had been a decline in hard copy demand and so this new development would see the company make printing and distribution cost savings.

Salvage

Concordia salvage set to start

An Italo-American consortium comprised of Titan Salvage of the US and Micoperi, an Italian underwater construction firm, have set out their plans to salvage *Concordia* from the rocks off the coast of Italy where it came to rest following its accident in January this year.

The salvage team plan to build a platform beneath the wreck and to attach flotation chambers attached to the port side. Two cranes attached to the undersea platform will heave the ship upright and flotation chambers will then be attached to the starboard side.

When the vessel has been stabilised it will be towed to an Italian port. The whole procedure is expected to take a year to effect and is considered the most environmentally friendly way to remove the wreck and protect the island of Giglio's coastline and thereby the local economy.

A graphic showing the Titan-Micoperi plan for salvaging *Concordia*

A joint company statement said: "The plan was selected by an evaluation team with specialist representatives from Costa Crociere, Carnival Corporation, London Offshore Consultants and Standard P&I Club, with the collaboration of RINa and Fincantieri, because it best fulfills the main objectives of the operation — removal of the wreck in one piece, minimal risk, minimal environmental impact, protection of Giglio's economy and tourism industry, and maximum safety." *NA*

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EEDI set for evolution

The Energy Efficiency Design Index (EEDI) for ships, due to enter into force for certain types of new vessels contracted after next January, is likely to evolve beyond its present form and scope as pressure on owners to build energy efficient tonnage increases, writes *Julian Macqueen*.

EEDI should not be seen in isolation, says Dimitris Argyros, an environmental specialist with Lloyd's Register, adding that the issue of efficiency is connected to other design considerations.

"You can't look at energy efficiency solely from an EEDI perspective; there are other environmental requirements which impact the ship's fuel consumption and energy balance which, are not necessarily reflected in the EEDI equation in its present form," Argyros tells *The Naval Architect*.

To illustrate the point, he says that a wet exhaust scrubber, one of the available options to comply with sulphur emissions regulations, may limit the potential for waste heat recovery, which certain types of ships use for hotel and services power.

This auxiliary power would then need to be generated by another source (possibly larger or additional auxiliary generators), but since the EEDI equation takes into account the auxiliary power demand as a function of the main engine power rather than the installed auxiliary power, this effect may not necessarily be reflected in the EEDI value.

In addition, EEDI is bound to work better for some ship types rather than others, comments the specialist. Container ships comprise one such segment.

Current tonnage overcapacity combined with design speeds of container ships built over the last decade (the period of time used to define the EEDI regulatory limits) give scope for building ships with reduced design speeds, making it easier to meet EEDI requirements compared to other ship segments, such as bulk carriers or tankers, he says.

Nevertheless, EEDI is making headway in the industry. One reason for that is the price of bunker fuel which seems stuck at historically high levels. New vessels are as likely as not to already be meeting EEDI requirements, which stipulate that a ship's efficiency should increase incrementally over time.

Critics of the concept have labelled the index convoluted. The US-based Center for Tankship Excellence has produced numerous papers attacking the validity of the EEDI concept.

"Ever since EEDI was first proposed, naval architects have been pointing out problems and strange biases associated with the regulation. This has led to a never-ending series of 'fixes' resulting in a formula which is a typesetter's nightmare , and a set of correction factors that take seven dense pages to explain," the centre said in a paper last year.

"Ever since EEDI was first proposed, naval architects have been pointing out problems and strange biases associated with the regulation. This has led to a never-ending series of 'fixes' resulting in a formula which is a typesetter's nightmare "

According to CTE, the reduction in installed power proposed by EEDI is "unsafe" as it could lead to loss of manoeuvrability while the practice of slow-steaming could hamper overall reductions in CO_2 as limiting installed power favours small bore engines. Others, however, take a more benign view of the index and what it is trying to do.

"Despite the complexities and flaws within EEDI, the formation of other indices... confirms the need for benchmarking," according to Katia Kardash, managing director of the DK Group. And benchmarking is key tool to deploy when trying to explain to the world outside shipping that the industry is serious about meeting its environmental obligations. If shipping's environmental status relative to other transport forms is to remain intact, it needs to nurture those credentials.

"It is a concern for the industry that regulation that could potentially emerge from the UN Framework Convention on Climate Change, from Europe or perhaps from other regions, could fail to adequately appreciate the irreplaceable role of shipping in world trade and actually serve to make it less efficient," International Chamber of Shipping general secretary Peter Hinchcliffe told a shipping conference in Germany late last year.

While EEDI is nowhere near 'perfect solution' status, its importance is not in doubt. Further additions can be expected as the index is likely to remain a work-in-progress for some years to come. *NA*

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Ballast water

Alfa Laval offers fuel saving device

Swedish-based Alfa Laval has recently announced the launch of its PureDry filter which can recycle lost fuel from waste fuel oil.

PureDry is a high-speed separator with the capability to recover re-usable fuel from a waste fuel oil tank, leaving only super-dry solids that can be landed as dry waste.

Alfa Laval sees "waste fuel recovery" (WFR) as a new, game-changing application that will bring the shipping industry huge savings on the fuel bills.The PureDry generation represents a paradigm shift in high speed disc stack separator solids discharge design, says the company.

With PureDry, there is no aperture in the bowl and no sensitive hydraulic system installed to actuate solids discharge. A patented, spiral-shaped device called the XCavator transports the super-dry solids to the base of the machine where they exit down into a container below the machine.

There are just two main moving/rotating parts the separator insert including the XCavator, and the outer bowl shell. They move in the same direction, but at different speeds, thus transporting the dry solids out of the machine.

"It's a kind of devolution," says Pauli Kujala. "We have utilised the simplicity of the old solid wall separator designs, except that now we don't need to open the machine and remove solids manually."

Alfa Laval's WFR concept involves installing two waste oil tanks, one each for lube oil (LO) and fuel oil (FO), respectively (some vessels already have this arrangement). Although to the observer the waste fuel oil tank appears to contain just black oil, it is actually oil polluted water containing 20% – 30% energy in the form of recoverable fuel oil. The remainder is oil polluted water 70% - 80% and, accumulating at the bottom, suspended solids approximately 1%.

www.alfalaval.com

Alfa Laval helps owners save fuel with its latest development PureDry

Environmental

LR calculates ECA's

Lloyds Register (LR) has launched a computer software tool which assists with strategic planning for Sulphur oxide (SOx) compliance with MARPOL Annex VI, Regulation 14.

To assist with making such strategic decisions (which may involve either fitting an exhaust gas cleaning system, or operating on distillate fuels), LR has developed the ECA Calculator.

Assuming a core operational scenario and using inputs which are easily available, the ECA Calculator projects the cost for the different scenarios in the future and, as the reduced fuel sulphur content requirements enter into force, allows for different fuel price scenarios to be used. Also, parameters which have increased impact on the decision making process can be easily adjusted providing an instant update of the results.

With the ECA Calculator, LR aims to provide a tool to support a company's strategic planning.

www.lr.org

Paints and Coatings

New base for BASF

BASF's coatings division has invested €1 million in the construction of a new application centre in Oldenburg, Germany.

The new centre, which includes a spray booth for large objects, several work rooms and a training and presentation room, will be used for applications in the wind energy sector, as well as for marine and aircraft coatings and further applications in diverse industrial segments.

"We are increasingly gearing our business in coatings for wind energy to a global market. At the new Application Centre, we are able to simulate the various painting conditions of our customers worldwide and optimise our products accordingly," explained Dr. Achim Gast, head of Post-Coatings at BASF. A wide range of climate conditions can be simulated. As a result of the application tests in Oldenburg, application technologies and processes are already being ideally adapted during

development in order to allow smooth and efficient use at the customer's premises. These in-depth tests carried out in advance save money and time for both the coatings division and its customers. "We also shorten the coordination process when there are product modifications," stated Lübbo Röttgers, coordinator of the Application Center. "This allows us to continuously improve our product quality."

BASF's paint experts will also train their customers at the new centre. In the future, in Oldenburg, they will practice how to apply BASF products efficiently and in a high-quality manner. The Application Centre offers ideal conditions for conducting special training courses, such as the course on using the RELEST Wind RepKit, a refinishing system specially developed by BASF for repairing rotor blades.

www.basf.com

CAD/CAM

DTE launches XFlow 2012

Desktop Engineering (DTE) has announced the UK launch of MSC's XFlow 2012; a Computational Fluid Dynamics (CFD) solution. The latest release of XFlow has been written to run on all Linux platforms as well as Windows, and also now features distributed memory processing across HPC clusters to offer near linear scalability of analysis.

XFlow is a powerful CFD technology from Next Limit Technologies that uses a proprietary, particle-based, meshless approach which can easily handle traditionally complex problems in sectors such as engineering, design, science, and architecture. XFlow provides the ability to simulate the flow of gases and liquids, heat and mass transfer, moving bodies, multiphase physics, acoustics and fluid structure interaction. The XFlow approach to CFD enables complex modeling and analysis in a straightforward way, minimising the presence of algorithmic parameters and avoiding the traditionally time consuming meshing process.

www.dte.co.uk

Cranes & deck equipment

Bergen joins forces with Koch Metalúrgica

Bergen Group Dreggen has signed an agreement with Brazilian Koch Metalúrgica for a strategic cooperation regarding the development and production of offshore cranes to the the Brazilian oil and gas market. Future products produced by the consortium will be known as Dreggen-Koch.

Bergen Group Dreggen has highlighted that through the consortium it will now be able to manufacture its cranes in Brazil and immediately comply with the local requirements.

Further, Bergen Group Dreggen has been awarded with a contract with EISA Shipyard for the delivery of a total of 12 cranes for four 72,900dwt Panamax tankers for TRANSPETRO. The contract includes delivery of various sizes Hose Handling and Provision Cranes.

www.bergengroup.no

Bergen Group Dreggen signs up with Koch Metalúrgica

Engines

MTU launch latest engines

Tognum has introduced its latest MTU-brand Series 2000 and 4000 yacht engines to the market.

The Series 2000 M94 marine engine has the highest performance values in its class and an improved power-to-weight ratio, says Tognum. An increase of up to 8% in power output has been achieved over the previous model. Available in 8, 10, 12 and 16-cylinder versions, the engine covers the 930 to 1940kW (1250 to 2600bhp) range at 2450rpm. With respect to fuel consumption at cruising speed and generation of higher charge pressures at lower rpms, the turbocharger performance has been enhanced. The unit also meets all emissions standards applying to marine engines worldwide and comes automatically equipped with a SOLAS certificate.

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COMPIT highlights hullform developments and autonomy

The conference on Computer Applications and Information Technology in the Maritime Industries – COMPIT - was held between 16 and 18 April in Liege, Belgium. Richard Bucknall, senior lecturer at University College London, reports.

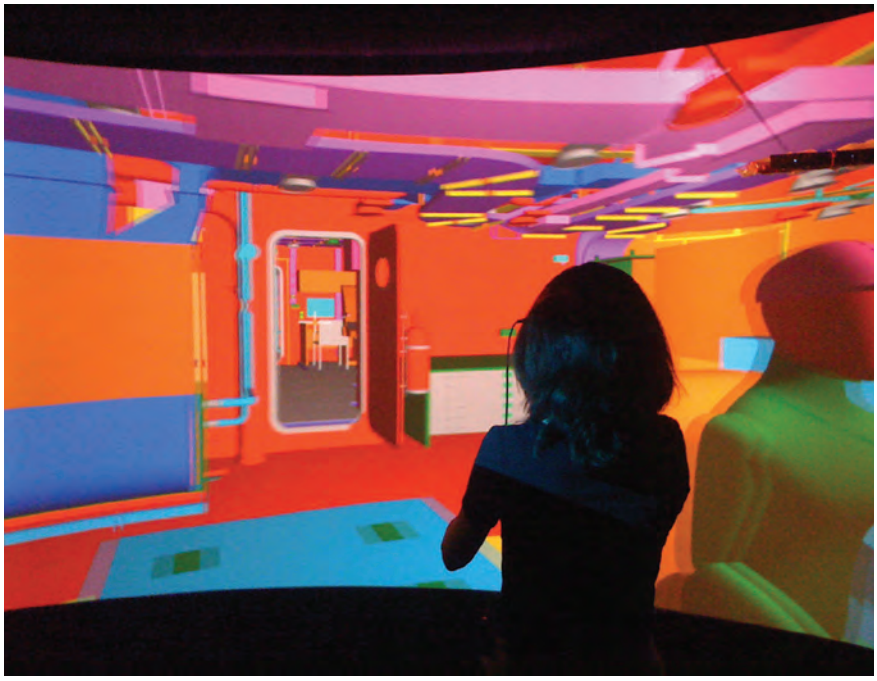
At the eleventh COMPIT Conference the main focus of the conference papers was on the latest developments in CAD, simulation, virtual reality, artificial intelligence, robotics and other topical issues relevant to the maritime sector.

Although many of the papers presented were in the fields of CAD, CFD and FEA there was also an interesting mix of papers covering other issues such as automated inspection and autonomous systems and marine wind farms.

For the ship designer there was an impressive selection of papers focused on hullform design optimisation from both a hydrodynamic and structures perspective. Karsten Hochkirch's paper *Ship Hull Optimisation – Past, Present and Future* offered a clear insight on how hullform design methods have developed from traditional model basin tests through elementary computer simulations using wave resistance codes to viscous computational methods that allow free surface effects to be simulated to a high degree of accuracy in the latest computer based tools.

This paper went on to explain how today's tools allow many thousands of candidate hullforms to be designed quickly and economically analysed thereby providing the means for hullform optimisation at a level never previously achieved. Case studies suggested substantial reductions in hullform resistance - 20% saving at design speed for some ship types.

Hochkirch, who currently works as part of GL-Group's 'FutureShip Team' went on to explain that even more sophisticated tools are under development and it can reasonably be expected that over the next decade the ship designer will be able to use computational analysis methods for combined hullform and appendage arrangements for characterising resistance and seakeeping over a full operating profile. In response to a question from the audience Hochkirch explained that such tools can now be used to identify modifications to existing ships to reduce their resistance – helpful since the worldwide fleet is relatively young and facing increased fuel prices and increasingly restrictive exhaust gas emissions regulations at a time of economic downturn.



Veronica Alonso in a Virtual Reality environment (source: SENER)

Sing-Kwan Lee's paper *Propeller Energy Loss Realisation for Full Form Ship Propulsion* was fascinating for the way she used imagery to convey the performance of hullform and propeller interaction. Lee, who is currently employed at ABS, demonstrated how CFD modelling of propeller-hull interaction allows propeller loading and propeller loss evaluation to be undertaken. Validating computer based results with actual measured performance has allowed confidence in the design simulation and optimisation methods so simulations are now able to provide detailed flow information around propellers in both the temporal and spatial domain – information that is very difficult and expensive to obtain using traditional model tests. The cost-effectiveness in obtaining comprehensive and critical flow field information for design means CFD is opening up the possibility of hull-propeller optimisation in future ships with the water-flow being optimised and the effect of any energy-saving devices quantified when minimising propulsion loss.

Ahmet Tasdemir from Zirve University in Turkey presented a paper entitled *Practical Experience with Efficient Generation of Finite-Element Models of Ships using POSEIDON* in which he argued the need

for software tools that allow ship designers to use logical, intuitive and rapid ship/hullform designs and software which has the design rules integrated into the code. Tasdemir argued for user-friendly interfaces to be provided so the designer does not have to have a deep specialised knowledge of FEA or other mathematically intensive codes. Using two case studies – a 5000gt car carrier and a multi-purpose vessel – he showed how POSEIDON allows structural and hullform models to be designed rapidly – typically 10's of hours using POSEIDON rather than months that is the case with multi-purpose FEA software codes.

CAD was the focus in a number of papers. ShipConstructor's Denis Morais presented a paper *An Effective Approach to 2D Drawings in a 3D World* in which he discussed the merits of 3D and 2D drawings in the context of ship building and approval requirements and made the interesting observation that traditional methods, where approval drawings are drawn entirely in 2D, are becoming less effective in the 3D world, and does not align well with basic and detailed design processes that are today more integrated.

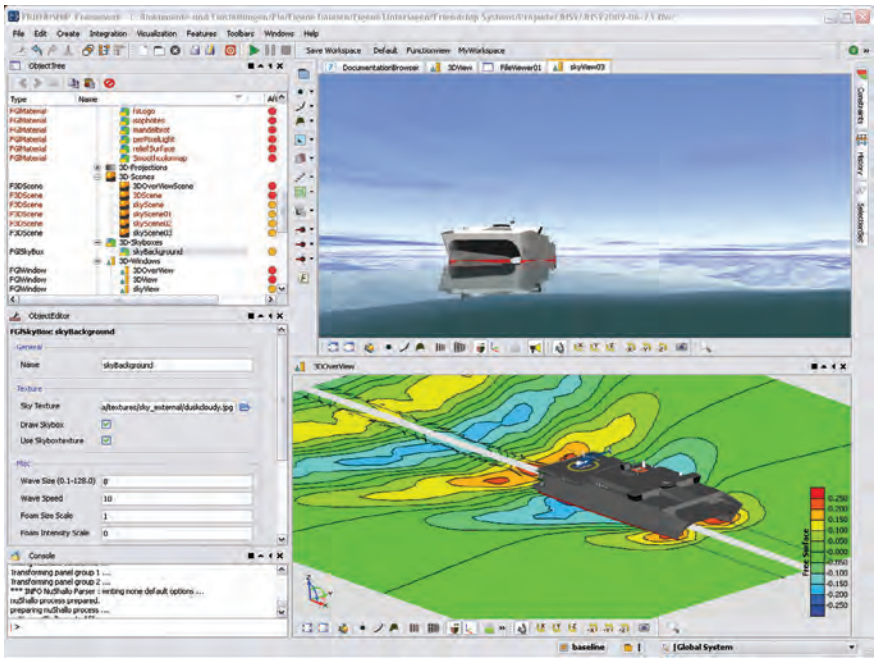
A number of papers focused on the application of virtual reality (VR) software tools for ships. Several papers discussed how VR could be exploited to provide visualisation when ship designers, shipbuilders and owners interact with each other at the various stages of the design and building process effectively enhancing communication between design, production and customer.

Engineering and systems integration company SENER, represented by Verónica Alonso, whose paper *Advantages of using a Virtual Reality Tool in Shipbuilding* described the benefits of VR from the ship builders' perspective. She explained that VR has been used for several years but, mainly in naval environments. However, the capability of VR has now been extended, for example the addition of motion tracking, so providing the opportunity to exploit VR to visualise the ship building process and to help with work planning including optimising equipment ordering/delivery scheduling, labour and workspace use when assembling subsystems during fitting out.

Another interesting application of VR is how the impact of the late delivery of a piece of equipment can be visualised within the ship assembly process so allowing rescheduling of the work to be effective through identifying what work can continue and how work spaces can be reorganised.

Richard Pawling's paper *The Development of Modelling Methods and Interface Tools Supporting a Risk Based Approach to Fire Safety in Ship Design* discussed the EC funded FIREPROOF project. Pawling from University College London explained that the FIREPROOF project is developing a probabilistic, risk-based approach to fire safety for passenger ships that will allow rational assessment of risk for both conventional and novel ship designs. Pawling's paper, which was awarded the GL COMPIT Award for best paper, described how the FIREPROOF project had developed modelling and analysis tools to address all aspects of fire from ignition, growth, to spread and ship impact i.e. consequences for the passengers and crew. To support these analyses it had been necessary to develop a new specification for a Ship Product Model (SPM), demonstrated in the Paramarine software with output data being transferred between analysis tools using bespoke interface software. In addition to the conceptual and practical issues of data types required for analysis, broader considerations were found to be important, including the availability of information during the ship design process

Indeed Pawling was one of several authors who highlighted the need for software integration. It was noted at the conference that there is significant use of computer software packages ranging from commercially available to bespoke software tools used for all aspects of ship design, shipbuilding and ship operation. To the non-expert (or perhaps even to some experts) this represents a serious challenge



This ShipConstructor image was presented by Denis Morais who argued that 2D drawings are less effective in the 3D world (source: SENER)

as software tools are increasingly used raising questions such as: what tools should be used and when? And: which tools are needed for doing the job and how will the data developed in one software package be interfaced to another software tool?

Sven Matho's paper entitled '*One Model to Run Them All*' explained how two separate software tools made for different purposes, namely GL MachineryManager and GL EmissionManager, are able to use the same data model because flexibility and extensibility are central features of the software and furthermore share the same business logic so such methodology can be applied to any software tool running in context of shiplifecycle management.

Matho argued that further applications can be integrated to use the data model and the service bus providing a base for an integrative and collaborative environment to deal with all relevant aspects concerning engineering, administration, operation and business fleet lifecycle management solution. Undoubtedly software compatibility and integration will be an issue on going for many years but one gets the sense that all those involved in the different sub-disciplines in ship design, ship building and ship operation understand the need for greater levels of data exchange compatibility and COMPIT provides an excellent opportunity to discuss such issues openly.

One of the most absorbing presentations was given by Marco Bibuli from CNR-ISSIA Italy on the development of the MINOAS heavy climbing robot. Bibuli's paper, entitled *MARC: Magnetic Autonomous Robotic Crawler Development and Exploitation in the MINOAS Project* discussed how robots could be used for inspection of ships. He showed how a robot was able to support marking and thickness measuring devices and displace them over a ship's bulkheads, tanks or holds – by climbing over the transverse bulkheads, side shell frames and upper stools. The paper explained how the system requirements for MINOAS had been identified and how computer technology had been exploited from 3D rendering through to production. Furthermore, the integration of the actuation system, magnetic tracking system, and payload which included cameras and laser range sensors was explained. Onboard computing had been achieved through using a Single Board Computer which, provided autonomous motion capabilities with power being provided by lithium-ion battery technology.

In fact robotics was clearly an emerging theme at the conference with several papers appreciating that computing power now provides the opportunity for advanced control and automation. Andrea Caiti from the University of Pisa presented a paper '*Underwater Robots: Past, Present and Future*' which, discussed lessons learnt with remotely operated vehicles (ROVs) and more recently with autonomous underwater vehicles (AUVs) and how in the future cooperative missions will be the focus of the next generation of underwater autonomy. CK Tam's paper on autonomous navigation systems focused on Autonomous Surface Vehicles where he reported work ongoing between US and UK with the ACCeSS consortium. Universities in the UK and US have partnered to develop a fully autonomous vehicle capable of achieving 15knots. The interesting development is how the navigation system is fully autonomous with built in path planning and collision avoidance algorithms that will obey COLREGS when in the vicinity of other ships. His argument that such autonomous systems could also be exploited in manned ships to provide a higher level of safety than is currently achieved with human navigators alone is intriguing when considering recent collision incidents.

One of the challenging aspects for the future is offshore renewables and the design, construction and operation of large offshore power stations. Cristian Petcu from the University of Liege presented an intriguing view of risk in his paper T*oward a Risk Based Simulation for the Erection of an Offshore Windmill Park*. This paper which highlighted the benefit of computer based tools to assess the risks associated with the assembly of wind turbine farms for the different phases of construction considered various random phenomena such as weather conditions and uncertainties of construction times. Other maritime areas requiring futuristic thinking were reported in papers examining climbing autonomous inspection machines and the role autonomous surface vessels (ASVs) offering much opportunity and challenge.

The next COMPIT will be held in Cortona Italy from 15 to 17 April. The proceedings of all the papers from COMPIT 2012 and all previous COMPIT events are available online at www.compit.info. *NA*

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SHIP ECONOMY & TRADE

Development prospects for the international shipping market

International shipping has entered a winter season; it is not the time to be optimistic about the ship market writes Zhang Bao Chen, head of China's Waterborne Transportation Institute, Ministry of Transport.

Growth in international shipping demand is destined to slow down. The increasing uncertainties over international trade recovery have brought an unfavourable impact on the world's shipping demand growth.

The outbreak of the financial crisis has hit world trade badly, and world trade has seen an unusually large fall in 2009. Governments of different countries have then tried to stimulate the economy to reverse the situation, and guide the economy back onto the road of recovery.

However, the growth model driven by over-consumption which was relied on in the past several decades is unsustainable. Governments of the developed economies such as the US, Europe and Japan are facing the double pressure of short-term unemployment and mid- to long-term deficit. World trade and the demand for shipping showed some signs of recovery in 2010 and the first three quarters of 2011 along the large-scale economic stimulation. But, the worsening of the European debt crisis in the fourth quarter of 2011 has once again slowed the world's economy.

In January, the International Monetary Fund (IMF) lowered its estimate on world economic growth in 2012 by 0.75% to 3.25%. It is expected that the recovery of the world economy in the future is full of uncertainties and the process of recovery will be long and bumpy. Affected by the worsening economic situation, global shipping demand, which is highly related to the world trade and economy, will inevitably slow.

Due to the global economic situation, the growth of China's exports has also slowed. Moreover, factors such as adjustment on the country's economic structure will limit the growth of China's demand for bulk cargo, thus weakening the boosting effect of the "China factor" over global shipping demand.

Transport mode	CO_2 emission (g/tonne-km)	Relative value
Water transport	10-15	100
Railway	19-41	240
Road	51-91	568
Air transport	673-867	6160

CO_2 emissions per tonne-kilometre by major transport modes

In the past 10 years, world shipping demand for both bulk cargoes and containerised cargo have benefitted from the "China factor". In the future, due to the weak economies and demand in the developed world, the growth in demand for container shipping, which is highly related to export, will be limited. At the same time, as China starts adjusting its economic structure through industry upgrades, energy saving and emissions reduction, the country's economic growth will also slow down.

The growth of demand for bulk cargoes, such as coal and iron ore which are closely related to the real estate and manufacturing sectors, will fall sharply in particular. In 2009, the year of the outbreak of the financial crisis, China imported 180 million tonnes of iron ore and 85 million tonnes of coal, representing volume growth of 41% and 211% respectively, becoming one of the most important bolsters to world shipping demand during the crisis.

In 2011, China imported 668 million tonnes of iron ore and 182 million tonnes of coal, up 8.3% and 10.7% year-on-year. The two growth figures were the second and third lowest since 2000. It is expected that in a relatively long period of time in the future, the "China factor" will no longer be so visible in the global shipping market and will not be able to drive the growth in demand for international shipping as it had done in previous years.

Since the outbreak of the international financial crisis, although shipping demand showed negative growth in 2009, shipping demand rebounded to 8.55 billion tonnes in 2010, and to 9.01 billion tonnes in 2011, representing year-on-year increases of 9.8% and 4.4% respectively. These growth rates are not bad compared with the average growth rates of 3.5% between 1990 and 2000 and 3.7% between 2000 and 2010.

Global shipping supply has grown at an annual rate of 5% to 6% since 2005 and has reached 1.41 billion dwt in 2011, up 9.4% from the previous year, far higher than the average yearly growth of 3.1% during 1990 to 2000 and the average yearly growth of 4.9% during 2000 to 2010.

These figures expose the excess supply in the shipping market and show the trend is of a worsening situation. At the same time, the total tonnage of new orders in hand amounts to 34% of the existing shipping fleet. New ship orders placed in 2010 and 2011 totalled 210 million dwt, amounting to 14.6% of the existing capacity. Those newly ordered vessels may be delivered in the next two years.

The growth of new orders for containerships was higher in 2011 than

in 2010. The worsening of the supply / demand imbalance in the global shipping market together with weak international trade will determine the real arrival of the winter for the shipping market and how long such an imbalance may last.

In 2011, the whole shipping sector made large-scale losses. Six of the 12 publicly-listed shipping firms in China recorded losses in the first three quarters of 2011; the net losses of these companies totalled RMB6 billion (US$947.36 million). China COSCO and China Shipping Container Lines (CSCL), the two largest among those Chinese shipping firms, saw their net losses reach RMB4.78 billion (US$ 754.7 million) and RMB1.58 billion (US$ 249.46 million) respectively.

Among foreign shipping companies, the container business of Maersk recorded a net loss of US$297 million in the third quarter of 2011; Singapore's NOL made a net loss of US$91 million; Japan's MOL, NYK and K Line made losses of US$145 million, US$110 million and US$240 million respectively in the second to third quarters in 2011. As we all know that the BDI (Baltic Dry Index) average in 2011 was 1549, 43% lower than the previous year. The BDTI average (Baltic Exchange Dirty Tanker Index) in 2011 was 782 points, down 12.2% year-on-year. On 3 February, 2012, BDI fell to 647, not only lower than the lowest dip during the financial crisis, but also broke the lowest record since 1986. I pessimistically think it will be difficult for the whole shipping market to emerge from this predicament in the next three to five years.

As there is excess supply in the shipping market and no way to reverse the situation, the whole shipping sector is making large-scale losses and shipping enterprises will strictly control their investments in newbuildings for a very long period of time. The sharp fall in newbuilding orders will reflect in the rapid contraction of new capacity.

According to estimates from consultants Drewry Shipping the growth of the world's container shipping capacity will be lower than 5% in 2016; the increase in dry bulk capacity will be less than 1%; and the increase in oil tanker capacity will be at around 2%.

These estimates are a significant contrast to the rapid capacity growth during the present delivery peak, and may strike a fatal blow to the shipbuilding sector. It is expected that as the volume of new ship orders shrinks, shipyards will downsize their production scales triggering another round of reshuffling in the shipbuilding market. From another point of view, this may pose new opportunities for the application of new technologies and especially help raise the proportion of energy-saving and environmentally-friendly vessels in ship fleets.

Green ships

According to related research and analysis, the CO_2 emissions per tonne-kilometre of cargo transported on the water, railway, road and air are 10-15g, 19-41g, 51-91g and 673-867g respectively. Water transport records the lowest emissions, amounting to around 41.7% of the emissions by road transport, 17.6% of that by railway transport; and 1.6% of the emission by air transport. Table 1 shows the CO_2 emissions per tonne-kilometre by major transport modes.

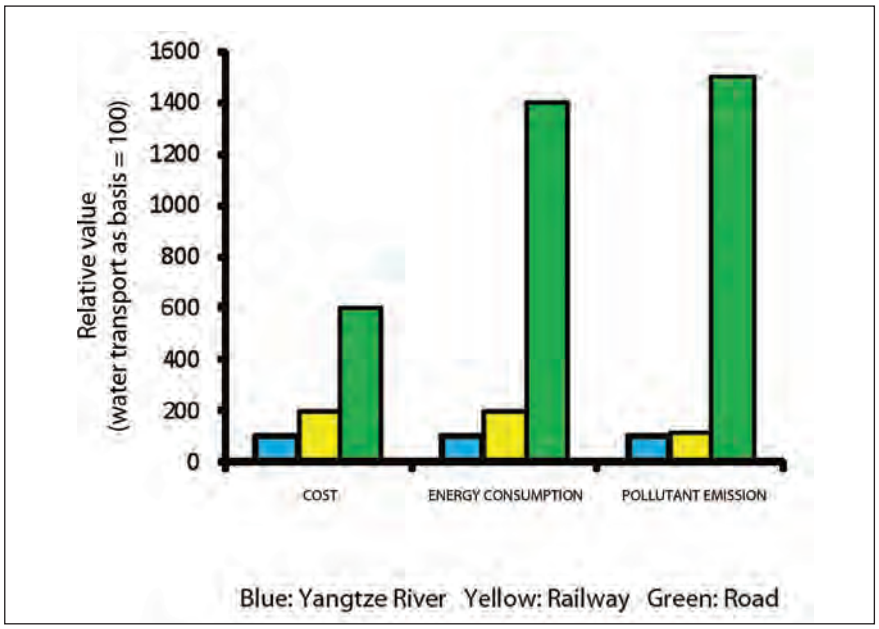
According to calculations, the ratio of costs of transporting containers from Chongqing to Shanghai by the Yangtze River, railway and road is 1:2:6; the ratio of per unit energy consumption by the above three transport means is 1:2:14; the ratio of pollutant emission volumes by the above three transport means is 1:1.2:15. The traffic volume per unit surface area of shipping containers via the Yangtze River is 13 times the traffic by railway, 167 times the traffic by road. Graph 1 shows the relations between the costs, energy consumption and pollutant emission of transport by the Yangtze River, railway and road.

Compared with other transport means, water transport has obvious advantages over energy saving, environmental friendliness and emissions reduction. Therefore, to develop water transport and to raise the position of water transport in the integrated transport system has become an important part of the adjustment of transportation structure and of the transformation of transport development mode.

According to IMO research results CO_2 emissions from global shipping amounted to 1.046 billion tonnes in 2007, 3.3% of total global CO_2 emissions. In order to ease the impact of CO_2 emission on the climate, the IMO is actively promoting the implementation of mandatory restrictions on greenhouse gases.

In order to control shipping pollutants, the world has imposed increasingly strict requirements over the quality of crude and the processing of ballast water. In future, the shipping sector will demand a large number of green vessels. Enterprises

Graph 1: Costs, energy consumption and pollutant emissions of major transport modes between Chongqing and Shanghai



with vision should set their development strategies for green ship technologies, recruit talent, pour in investment and resources, research and develop the application of green ship technology with focus, in order to adapt to the demand of the shipping market and raise their own competitiveness.

Although water transport has apparent advantages on environmental protection, energy saving and emissions reduction, the volumes of the emissions of pollutants and CO_2 from, and the energy consumed by the sector cannot be ignored due to the relatively large scale of the shipping sector.

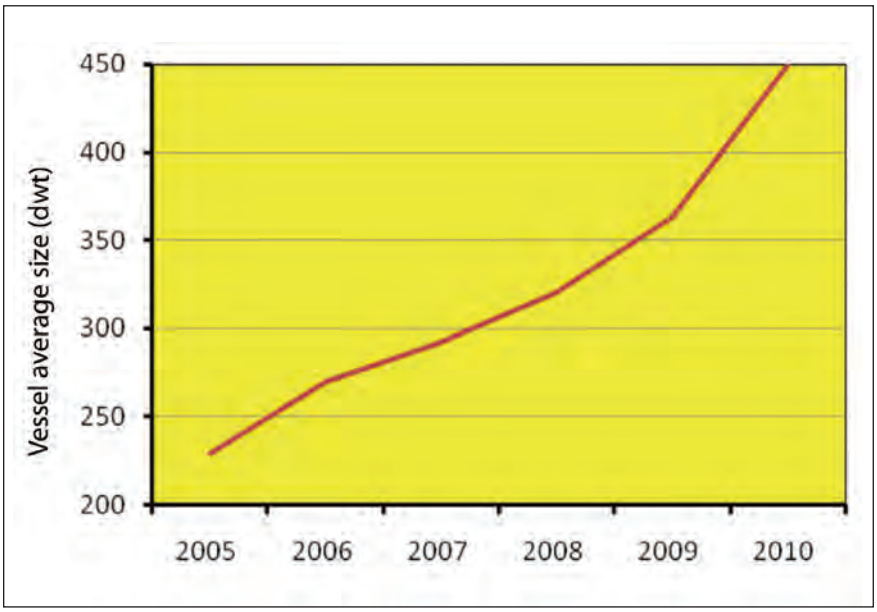
Under the current trend of building an energy-saving and environmentally-friendly society in China, to develop green water transport, lower energy consumption and greenhouse gases emissions, develop a sustainable economy, promote low-carbon technology have all become a "must" option.

The energy consumption of China's shipping transportation occupied more than 80% of the total energy consumption of the country's water transport. The annual oil consumption of China's shipping transport amounts to 7% of the total oil consumption of the country. The country's shipping sector is a major source of CO_2 and pollutant emissions from energy consumption by water transport. Therefore, the development and application of green ships has become the basis for the development of green water transport in China.

According to the transportation energy saving and emission reduction instructions provided by the ministry of transport of China, the energy consumption per tonne-kilometre has to be reduced by 15% in 2015 compared with that in 2005; the CO_2 emissions per tonne-kilometre have to be reduced by 16%.

During the 11th five-year plan period (2006-2010), the shipping sector gained satisfactory results on energy saving through the hard work of the whole industry. The energy consumption per tonne-kilometre was reduced by 7% in 2010 compared with that in 2005.

The result was mainly achieved by increasing ship sizes and raising the awareness of ship energy consumption management. Graph 2 shows the growth of average ship size of inland river vessels during the 11th five-year plan period.



Graph 2: Changes in average ship size of inland river vessels in 2005-2010

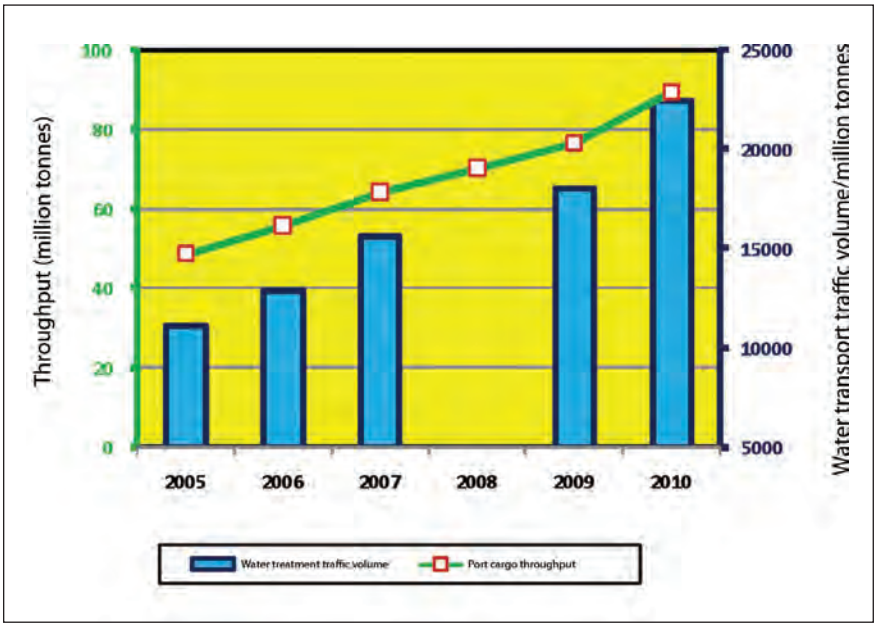
As energy-saving and emission reduction measures that are easy to implement have already been applied during the 11th five-year plan period, it will be more difficult to make progress during the 12th five-year plan and in the long run on top of the achievements of the 11th five-year plan period. It is necessary to rely on the development of green ships and the further application of energy-saving and emissions-reduction technologies to improve energy consumption structure and improve ship efficiency.

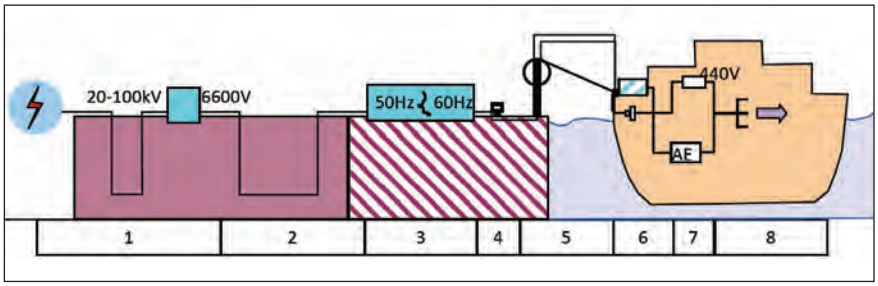
China's demand for green ship development

Water transport, as a basic service industry, plays an important role in China's economic and trade development. Since the opening up of China, especially after the country joined the WTO (World Trade Organisation), water transport has achieved significant growth in scale and bolstered the rapid economic and trade growth of the nation.

In 2010, throughput at Chinese ports reached 8.932 billion tonnes. During the

Graph 3: Changes in throughput and water transport traffic volume of China in 2005-2010





Graph 4. High voltage power supply system for vessels berthing at Lianyungang Port

11th five-year plan period, the average annual throughput growth at Chinese ports was 12.97%. China's Inland river and coastal regions processed 2,242.837 billion tonne-kilometres of cargo in 2010.

China has recorded an average annual increase of 15.06% in cargo traffic during the 11th five-year plan period. Graph 3 shows the changes in throughput and water transport traffic volume of China in 2005-2010. Against the backdrop of the building of a resource-saving and environmentally-friendly society, the scale of water transport, cargo throughput at ports and traffic at both river and coastal areas are expected to keep growing. In order to control the negative effects of the development of water transport to the environment, resources, energy and eco-system etc, the water transport sector has voiced its demands for green ship development.

As throughput grows, ships berth longer at ports and mainly use auxiliary engines to generate power for air-conditioning, heating, communications, lighting, emergency needs and other equipment. Marine auxiliary machines emit pollutants while burning diesel, destroying the environment and ecosystem of the port and neighbouring areas. Using onshore electricity provided by the city's power grid to replace the use of auxiliary engines will lower emissions while a ship is berthed.

In recent years, some local and foreign ports have commenced the trial of technologies to use onshore electricity on vessels at berth. The applications of such technologies at Shanghai port and Lianyungang port have shown that it is feasible and can achieve the expected results. Graph 4 shows the application of high-voltage power supply for vessels berthing at Lianyungang port.

The "Overall implementation plan of energy saving and emissions reduction for water transport" during the 12th Five-year Plan period (2011-2015) prepared by this institute (Notice (2011) No. 474, issued on 31 August 2011), has recommended the promotion of the technologies for vessels to use onshore electricity. Meanwhile, our institute has finished drafting the design, technical and operational standards for ports to provide onshore electricity to vessels at berth as requested by the instruction of the ministry of transport.

The institute will guide port operators on how to design and operate the onshore power supply system safely after the standards are released. The institute is drafting the construction standards and onshore power supply system to guide the design, construction and testing of onshore power supply systems at new terminals. The institute is also drafting policies to promote the application of onshore power supply.

In future, both new and existing ports will be equipped with onshore power supply systems where feasible. A major task at the moment is to encourage vessels to use onshore power. Once everything is ready, policy instructions requiring vessels to use onshore power will be released.

Ports to be equipped with onshore power supply systems and vessels to be equipped with the respective facility to use onshore power are the basic conditions for vessels to use onshore electricity. Meanwhile, Hebei Ocean Shipping Co Ltd (HOSCO)'s 180,000dwt bulk carrier *Rich China* is already equipped to use onshore power.

The China Classification Society has also launched the principles of surveying onshore power supply system. It is suggested that the technical standards for ships to use onshore power should be drafted and included as one of the design and surveying standards of vessels as soon as possible, in order to make onshore power standard for new ships.

The "Energy Conservation Law of the PRC" requires the relevant units under the State Council to set standards of fuel consumption limits for transport vehicles and vessels in operations; and those falling outside the limit cannot operate. The ministry of transport has started drafting the standards of fuel consumption limit for ships in operations. Meanwhile, the drafting of the standards of fuel consumption limit for ships in operations and the implementation plan has been done under the leadership of our institute.

The standard applies to bulk carriers, general cargo vessels, containerships, and tankers of the size of more than 400gt (gross tonne) operating in the inland river regions, coastal area, near-sea areas and sheltered water of China. Newbuildings, second-hand vessels, foreign-flagged bare-chartered vessels and other Chinese vessels that operate in those areas will be subject to the standard.

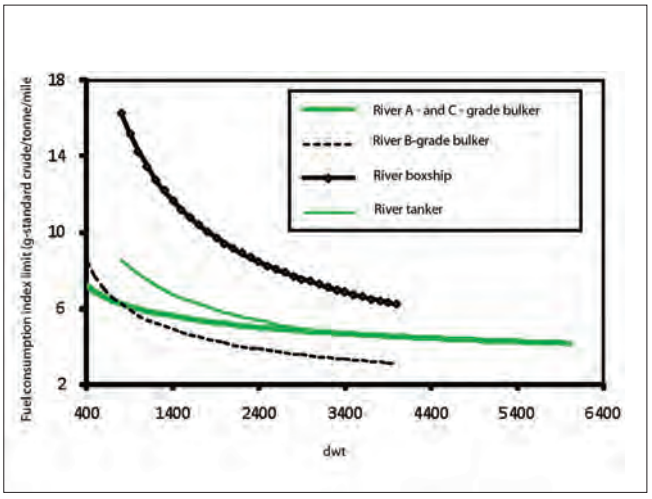
The standard defines ship fuel consumption index based on existing vessels, and fixes the base line of the ship fuel consumption index limit. A high standard and a low standard have been fixed so far.

The implementation plan being considered at the moment suggests implementing the standards gradually on different ship types. The high standard will be applied on river vessels of which the number and capacity grew rapidly in recent years. For other ship types, the low standard will be applied in the first three years, and the high standard will be implemented from the fourth year. The control over newbuildings will be done via survey of design and survey of ship launch; while control over other vessels will be done through survey of ship launch.

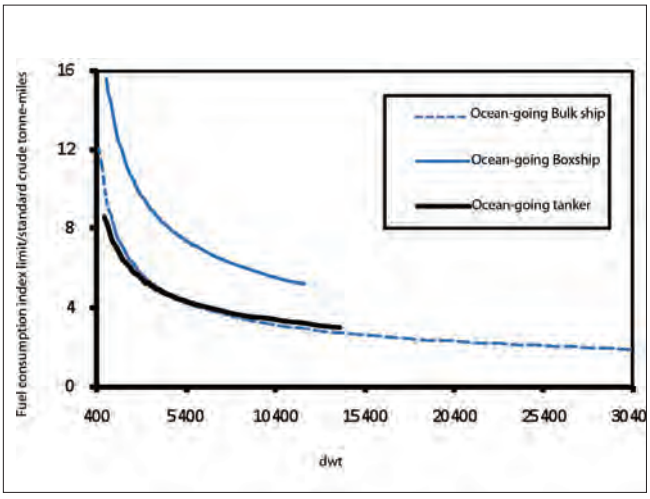
The standard and implementation plan have passed the examination of the ministry of transport, awaiting to be launched. The standard will raise the entry level for operational ships, require more applications of energy-saving technologies or improvement in fuel consumption struction in ship design and construction, and gradually improve the energy efficiency level of vessels in operations.

Green ship is the basis of the development of green water transport. We hope the shipbuilding sector can seize the present opportunity to develop, design and build green vessels to lay a solid foundation for the development of green water transport. *NA*

Graph 5: The high standards of fuel consumption limit base lines for inland river vessels

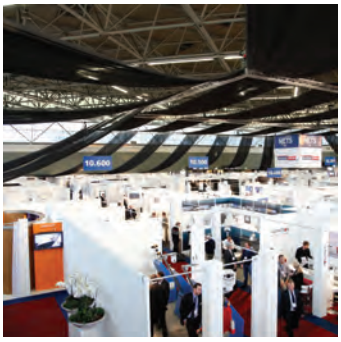


Graph 6: The standard of fuel consumption limit base lines for ocean-going vessels



THE SUPERYACHT PAVILION IN AMSTERDAM

At the heart of the 25th METS

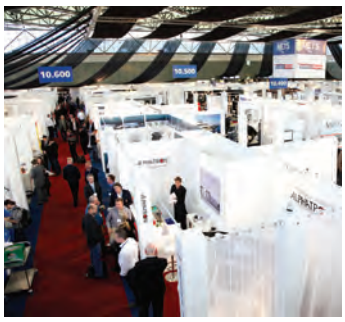


What is the SYP?

The SuperYacht Pavilion (SYP) has grown into a vibrant show-within-a-show at the heart of METS, the world's biggest and best attended leisure marine trade show. Since its launch in 2006, the SYP has expanded to comprise over 175 exhibitors and now has its own dedicated hall and independent catering and conference facilities.

Just for business

METS is a strictly trade-only event and this ensures that the genuine superyacht industry related exhibitors welcome only relevant industry professionals. The SYP is of interest to a significant part of the nearly 20,000 professionals who visit METS each year and attendance is boosted by the speakers and delegates who take part in the associated social and conference events.



Knowledge exchange

The SYP runs in association with the Global Superyacht Forum (GSF), one of the world's leading summits for superyacht captains, designers, builders, project managers, brokers and owners. The GSF programme covers up-to-the-minute topics, and interaction between speakers and delegates is excellent. The GSF is organised and presented by The Superyacht Report Group in association with METS organiser, Amsterdam RAI.

METS at 25

METS celebrates its 25th anniversary in 2012 so expect a festive atmosphere! METS started back in 1988 with just over 100 exhibitors and in 2011 it had a staggering 1,331. For the superyacht professional it's a unique combination. At no other trade-only event can you visit a thriving superyacht equipment exhibition and also have access to well over 1,000 other marine trade exhibitors, some of whom also cater to the superyacht sector.

- 19,000+ visitors from 100+ countries
- 1,300+ exhibitors (incl. 150+ in the SYP)
- 15 national pavilions
- 3 specialist pavilions including the SYP
- Strictly professional, strictly trade-only
- Meet & Greet areas for excellent networking

Where is METS?

METS/SYP is held in the Amsterdam RAI exhibition halls just 15 minutes from Amsterdam's International Airport and 10 minutes from the historic city centre. To help with your planning, Amsterdam RAI can book hotel rooms for you and assist with other travel requirements.

The Elicium, Amsterdam RAI.

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Owners' great expectations

Concordia's loss has once again pushed passenger ship survivability into view. Euan Haig, a retired naval architect who worked for the UK Ministry of Defence and BAe-Sema as Head of Marine Safety, offers his view.

Opinions on the loss of *Concordia* may vary, but these same issues are pushed into view after every maritime [passenger ship] tragedy, for example the losses of *European Gateway*, *Herald of Free Enterprise*, and *Estonia*. These four ships were all the subject of spectacular and lethal capsize, and world-wide, they are not alone.

Gateway was lost after collision. The collision killed no-one but, six died when the ship capsized. *Herald's* open bow doors scooped water into the vehicle deck. This killed no-one; the fatalities occurred when the ship capsized. *Estonia's* bow doors admitted water to the vehicle deck. Once again this killed no-one, but capsize caused huge loss of life. *Concordia* struck a reef and suffered extensive flooding. There have been no reports of fatalities when the compartments flooded; her capsize caused fatalities. It seems a reasonable conclusion that it is not enough to prevent accidents; ships must be prevented from capsizing so easily.

Statutory and international safety regulations rely on avoiding collisions rather than safe behaviour of the ship after the collision; indeed claims of a good safety record are based on the rarity of accidents. Accidents always happen and always will. They consistently reveal that ships respond badly to damage. *Gateway, Herald*, and *Concordia's* capsizes were arrested by the seabed of the North Sea, the English Channel, and the Mediterranean. It would be instructive to estimate how many fatalities would have occurred in each had capsize been complete, for that is the true measure of the hazard to passengers and crew in capsize.

Statutory and international safety regulations cannot guarantee that accidents will not happen. The response of modern passenger ships to damage has been shown to be disappointing, for they are likely to capsize while still possessing a great deal of residual buoyancy. Dreadful experiences show that the response of ships to damage is a matter of life or death on a huge scale, for a ship that capsizes is a very dangerous place indeed.

Modern passenger ships are wide and high. When intact, high CG is offset by large beam at the waterline, giving high BM. However, this high BM is drastically reduced by each compartment that is flooded. When a passenger ship just meets the statutory and international safety standards for the number of compartments that may be flooded (often two compartments) then the ship no longer has enough BM to maintain positive GM if flooding continues. Modern passenger ships are wall-sided, without the flare that might recover BM as the ship settles in the water. Denied the ability to recover BM after partial flooding, they are likely to capsize once the statutory extent of flooding for survival is exceeded.

It seems that *Concordia's* passengers started to board lifeboats before the crew had called abandon ship, as observed in April's edition of *The Naval Architect* (The Mourning After; Editorial Comment pp 7 April 2012). This must prompt consideration of what can be expected of the paying passenger. Self-discipline as shown by those on *Birkenhead* in 1852 is unlikely. When trust is lost, when chaos exists, and when great danger is present *sauve qui peut* (every man for himself) is inevitable. It is fortunate that *Concordia's* capsize was arrested by the seabed otherwise there would have been huge fatalities among those still onboard once heel exceeded about 20degs.

The crew of *Concordia* seem to have been unable to provide sufficient assurance that there was time for the safe and orderly evacuation. It was impossible for them to speak with confidence for little of the ship's likely response to damage had been explained to them, and they knew nothing of the extent of damage. Indeed knowledge of the extent of damage coupled with knowledge of *Concordia's* likely response is unlikely to satisfy anyone that their prospects for survival were good. *Concordia's* captain might have known enough about the ship's prospects given the extent of flooding, which he knew, and this might explain his haste to get off.

The harsh truth is that it is against human nature to believe assurances that are contrary to what we see about us. If passengers cannot be given clear and understandable information about their survivability they will form their own judgements and act accordingly. Given the publicity surrounding *Concordia*, it seems likely that passengers will believe their deaths are imminent in any future instance of flooding. There is some justice in that belief; for passengers have been given no reason to think otherwise. A rush for the boats can be expected.

A way to prevent panic might lie in publicising the survivability standard of each ship. This might not be as difficult to summarise in ordinary language as it seems. It might, however, be difficult to present as positive a statement like 'This ship will survive with any two compartments flooded but will probably capsize if flooding is much more than that.' It might be therapeutic for proposed standards to be exposed to the general public to obtain their common-sense views on survivability, for example on the amount of extra flooding beyond the survival standard before downflooding begins, or the amount of flooding beyond that before capsize occurs. Shipping companies might need to consider the level of trust their ships have earned.

Statutory and international safety regulations for survivability should be seen as a floor, not a ceiling. They are the lowest standards that shipping companies can be persuaded to agree in an international competition. They amount to the lowest internationally acceptable common denominator. The passenger is very much in the dark and is expected to trust the ship and its owner on matters concerning safety.

The responsibility for ship and passenger safety lies firmly in the hands of those who profit by selling the tickets. It is well-known and commonly accepted that no ship is 'unsinkable'. The 'uncapsizable' ship is just as unlikely, but it should be unacceptable for ships to capsize so readily when they are still a long way from sinking in accordance with Archimedes Law. The remedy lies in the hands of shipowners, and it is readily available given the ease of designing ships with flare. *NA*

SEAHORSE 35 demonstrates 2025 EEDI compliance

With the first tier of the EEDI fast approaching Grontmij's SEAHORSE 35 bulk carrier design exceeds expectations with the potential to meet 2025 EEDI compliance. Michael H Schmidt, naval architect, at consultants Schmidt Maritime explains.

In 2008 Danish bulk carrier designer Grontmij (formerly known as Carl Bro/Dwinger Marine Consult) introduced a new generation of 35,000dwt handysize bulk carrier design, named SEAHORSE 35.

The SEAHORSE 35 was developed in close cooperation with handysize bulk carrier charterers and operators, with the focus on economical and efficient cargo handling, loading flexibility, safety, environmental and maintenance friendliness and low operational costs.

The SEAHORSE 35 has been very well received by owners and yards and since the first vessel was contracted by Danish owner Falcon Rederi back in 2008 at Daoda Heavy Industry, in China, a further 37 SEAHORSE 35's have been contracted at eight different Chinese yards, says Schmidt.

The SEAHORSE 35 vessels have been ordered by a wide range of shipping companies from Belgium, Denmark, Dubai, Germany, Greece, Hong Kong, Russia, The Netherlands and United Kingdom. By May 2012, six vessels had been successfully delivered from three Chinese yards.

Michael H Schmidt, naval architect, Schmidt Maritime states SEAHORSE 35 can meet EEDI requirements

Since the SEAHORSE 35 design was developed by the Grontmij design team, headed by Schmidt in 2007-08, the market situation for bulk carriers has changed dramatically:

- earning potential for bulk carrier owners has decreased significantly, due to low freight rates combined with high fuel oil costs
- over-supply of bulk carriers and over-capacity at yards
- environmental awareness and introduction of the Energy Efficiency Design Index (EEDI).

All the above factors have led to strong competition with a focus on fuel oil efficiency as:

- owners are looking for ships with lower fuel oil consumption in order to ensure a healthy business
- yards promote fuel efficient vessels to get a competitive edge in a market suffereing from capacity over-supply owners, yards and designers are trying to comply with future EEDI regulations.

To meet the request for more fuel efficient vessels, designers, machinery and equipment manufacturers have optimised their design and products and also new fuel saving devices have been invented and introduced to the market.

As the designer of the SEAHORSE 35, Grontmij / Schmidt Maritime have been working on optimising the SEAHORSE 35 design and making further reductions of fuel oil consumption and EEDI have been achieved.

Figure 1: SEAHORSE 35 (Source: Grontmij)

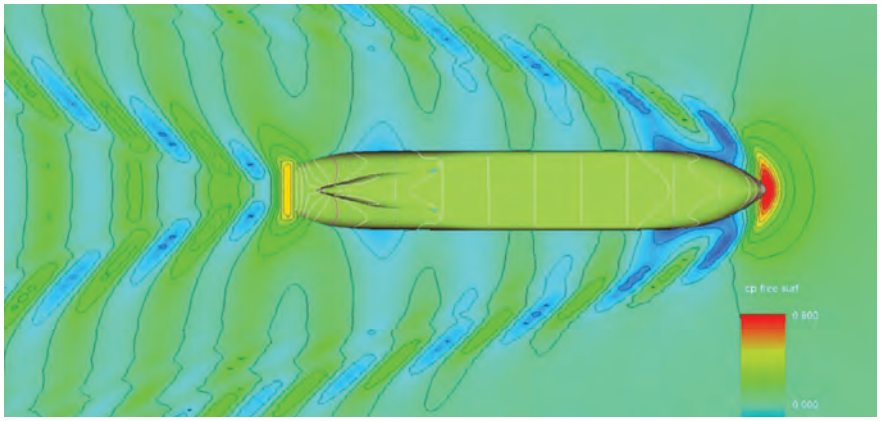


Figure 2: CFD analysis of SEAHORSE 35 hullform (Source: MARIN)

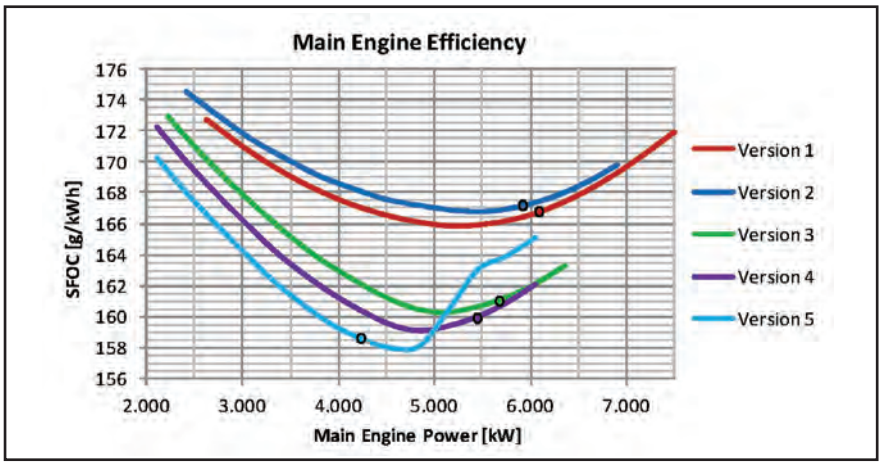


Figure 3: Main engine SFOC and NCR (Source: MAN D&T – CEAS)

The optimisation of fuel oil consumption and EEDI has been achieved by the introduction of highly efficient main engines, highly efficient propeller design and a newly invented fuel saving device.

Hullform

The original SEAHORSE 35 hullform was developed in close cooperation with FORCE Technology, Denmark. The hullform was developed on the basis of extensive CFD analysis and tank tests. In 2011 the Dutch testing tank MARIN was hired to perform a further hullform optimisation; utilising the latest CFD techniques. The MARIN analysis concluded that the original SEAHORSE 35 hullform was good and the potential for further optimisation of the hullform was a maximum of 1.5%.

Considering the results and the general tolerances of the MARIN study, it was decided to maintain the original hullform and to proceed the optimisation process with focus on main engine and propeller layout.

Main Engine

A significant development on 2-stroke diesel main engines has taken place within the past five years. The thermal efficiency of the main engines has been improved, ie the specific fuel oil consumption (SFOC), representing the amount of fuel oil required to develop one kilowatt-hour, has gone down.

The first SEAHORSE 35 was ordered with a full mechanical MAN B&W 5S50MC-C7.1 TI (NOX Tier I compliant) engine. The later SEAHORSE 35 vessels have been ordered with several different versions of the MAN B&W 5S50 and also Wärtsilä 5RT50-flex-D.

All the different main engines have been optimised with the propeller chosen. For the purpose of this overview of the optimisation process, three main engines were presented.

The thermal efficiency for the five versions included in this optimisation study is shown in figure 3. The SFOC curves for each main engine type and setup are plotted together with the normal continuous rating (NCR).

From Figure 3, it is clear that the electronically controlled ME-B9.2 TII engine used for version 3, 4 and 5, is significantly more efficient than the ME-B8.1 TII (version 2) and MC-C7.1

Thermal efficiency for five MAN Diesel & Turbo engines in an optimisation study

Version	Main Engine Type	M/E Layout Point	M/E Tuning	Comment
1	MAN B&W 5S50MC-C7.1 TI	SMCR 7.500kW @ 121 RPM	High Load	Ice class
2	MAN B&W 5S50ME-B8.1 TII	SMCR 6.900kW @ 110 RPM	High Load	
3	MAN B&W 5S50ME-B9.2 TII	SMCR 6.350kW @ 99 RPM	High Load	
4	MAN B&W 5S50ME-B9.2 TII	SMCR 6.050kW @ 99 RPM	High Load	
5	MAN B&W 5S50ME-B9.2 TII	SMCR 6.050kW @ 99 RPM	Part Load	Shaft Limitation 4.700kW

SEAHORSE 35 Version			1	2	3	4	5
1.	Main Engine Maker	[-]	MAN D&T	MAN D&T	MAN D&T	MAN D&T	MAN D&T
2.	Main Egine Type	[-]	5S50	5S50	5S50	5S50	5S50
3.	Main Engine Mark	[-]	MC-C7.1 TI	ME-B8.1 TII	ME-B9.2 TII	ME-B9.2 TII	ME-B9.2 TII
4.	Main Engine Tuning	[-]	High Load	High Load	High Load	High Load	Part Load
5.	Propeller	[-]	5,54m NPT	5,80m Wärts.	5,90m NPT	5,90m NPT	5,90m NPT
6.	Becker MEWIS Duct®	[-]	No	No	No	Yes	Yes
7.	Design Speed 1)	[knots]	14.0	14.0	14.0	14.0	13.0
8.	SMCR2)	[kW]	7,500	6,900	6,350	6,050	4,700
9.	NCR3)	[kW]	6,082	5,913	5,670	5,440	4,230
10.	NCR verified by:	[-]	Sea trial	Sea trial	Tanktest	Tanktest	Tanktest
11.	% of SMCR	[%]	81%	86%	89%	90%	90%
12.	NCR Index	[-]	100%	97%	93%	89%	70%
13.	SFOCNCR	[g/kWh]	166.8	167.2	161.0	159.9	158.6
14.	SFOC Index	[%]	100%	100%	97%	96%	95%
15.	M/E FOC-MDO4)	[mt/day]	24.3	23.7	21.9	20.9	16.1
16.	FOC Index	[%]	100%	97%	90%	86%	66%

Table 1: Summary of main engine fuel oil consumption

Notes:

1) Design speed at scantling draft of 10.1m (35.000dwt)
2) SMCR for Version 1 is increased due to ice class.
3) Main engine power to reach design speed at scantling draft including 15% sea margin and 1% shaft loss
4) Main engine fuel oil consumption at NCR based on MDO with LCV 42.700 kJ kg. Main engine SFOC tolerance of +5% is not included.

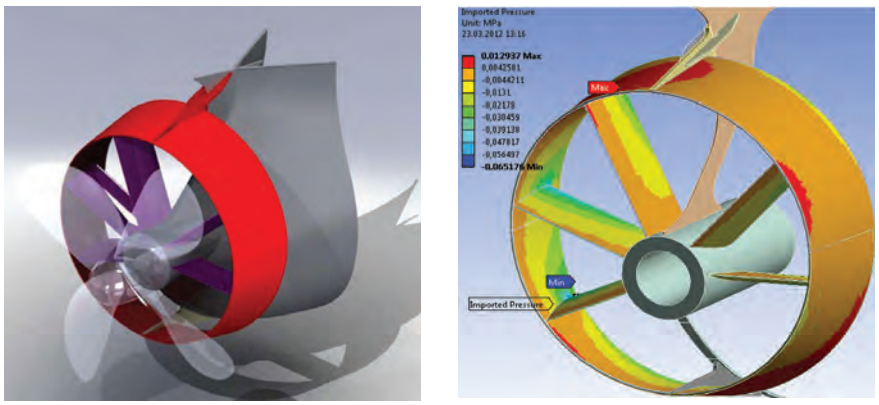


Figure 4: Becker Mewis Duct (R) (Source: Becker Marine Systems)

TI engines (version 1). The main engine efficiency has been improved 4% between version 1 and version 4. See Table 1, Row 14.

The reason that the main engine used for version 2 is less efficient than the main engine used for version 1, is the result of the version 2 engine being NOx Tier II compliant and the version 1 engine being NOx Tier I compliant.

Propeller

Not only has the thermal efficiency of the main engines been improved, but the revolutions (RPM) of the main engines have been reduced as well. The reduced RPM for the main engines has enabled larger diameter propellers to be used significantly improving efficiency.

Tank tests have been conducted with a variety of propellers but the NPT propeller design made by Stone Marine, of the UK proved the most efficient for the SEAHORSE 35. The reduced RPM for the main engines has enabled the propeller designer to improve the propeller efficiency by 7%, when comparing version 1 and 3. See Table 1, Row 12.

Becker Mewis Duct (R)

After the main engine and propeller layout had been fully optimised, various fuel saving devices have been evaluated. The Becker Mewis Duct (R) marketed by Becker Marin Systems (BMS), Germany was found most suitable for the SEAHORSE 35.

Tank tests with the Becker Mewis Duct (R) have been conducted in conjunction with Becker Marine Systems at SVA, Potsdam, Germany. The SEAHORSE 35 tank tests with the Becker Mewis Duct (R) documented a main engine power saving of 4% at scantling draft at 14knots and a 5% power saving at light ballast draft at 14knots.

The power savings for the Becker Mewis Duct (R) are on the lower side compared to the power savings BMS normally achieve for bulk carriers. The relatively lower saving is a consequence of the Becker Mewis duct being combined with a highly optimised hullform and propeller.

Fuel Oil Consumption

The main engine fuel oil consumption has been calculated for five different versions of the SEAHORSE 35.

Version 1 : First version of the SEAHORSE 35 delivered

Version 2 : Latest version of the SEAHORSE 35 delivered

Version 3 : Optimised standard SEAHORSE 35 without Mewis Duct (R)

Version 4 : Optimised SEAHORSE 35 with Mewis Duct (R)

Version 5 : Optimised SEAHORSE 35 with Mewis Duct (R) and design speed reduced to 13knots.

With the most efficient main engine, propeller and Becker Mewis Duct (R) the result of the optimisation process has been:

A. The main engine power (NCR) has been reduced by 7% by larger and thereby more efficient propellers (Table 1, Row 12, Version 1 –> 3)

B. The main engine power (NCR) has been reduced further by 4% by installing the Mewis Duct (R) (Table 1, Row 9, Version 3 –> 4)

SEAHORSE 35 Version			1	2	3	4	5
17.	EEDI1)	[g/DWTxnm]	6.53	6.23	5.60	5.32	4.50
18.	EEDI Index	[%]	100%	95%	86%	81%	69%
19.	EEDI Base Line	[g/DWTxnm]	6.54	6.54	6.54	6.54	6.54
20.	EEDI blw. Base Line	[%]	0%	5%	14%	19%	31%

Table 2: Summary of EEDI calculations

Main engine SFOC tolerance of +5% is included in the calculation of EEDI.

C. The SFOC has been reduced by 3-4% by introducing new more efficient main engines (Table 1, Row 14, Version 1 –> 3/4)
D. The main engine fuel oil consumption has been reduced by 10% by introducing more efficient main engines and propellers (Table 1, Row 16, Version 1 –> 3)
E. The main engine fuel oil consumption has been reduced by 14% by introducing more efficient main engines and propellers and the Mewis Duct (R) (Table 1, Row 16, Version 1 –> 4).

With the most efficient main engine, propeller and MEWIS Duct and a design speed reduced from 14knots to 13knots, the:
F. Main engine power can be reduced by 30% (Table 1, Row 12, Version 1 –> 5)
G. SFOC can be reduced by 5% (Table 1, Row 14, Version 1 –> 5)
H. The main engine fuel oil consumption can be reduced by 33% (Table 1, Row 16, Version 1 –> 5).

EEDI

The EEDI has been calculated for the five versions of the SEAHORSE 35 and the results are summarised in Table 2 and Figure 4.

The present IMO regulations dictate a scheme for reduction of EEDI for new vessels, ie new bulk carriers built after a certain date are to demonstrate an EEDI a certain percentage below the EEDI base line for bulk carriers.

The EEDI results listed in Table 2 have been presented together with the IMO EEDI threshold values in Figure 4 below.

With the most efficient main engine and propeller (version 3) the result of the optimisation process has led to:
I. the EEDI being reduced by 14%, being 14% below the EEDI base line for bulk carriers (Table 2, Row 18/20, Version 1 –> 3).

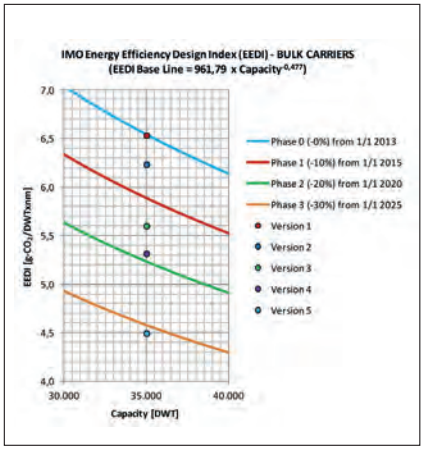


Figure 4: EEDI for Version 1 – 5

With the most efficient main engine and propeller and the Mewis Duct (R) (version 4) the result of the optimisation process has led to:
J. the EEDI being reduced by 19%, being 19% below the EEDI base line for bulk carriers with the Mewis Duct (R) installed (Table 2, Row 18/20, Version 1 –> 4).

With the most efficient main engine / propeller / the Mewis Duct (R) (version 5) and the design speed reduced from 14knots to 13knots, the result of the optimisation process has led to:
K. the EEDI being reduced by 31%, being 31% below the EEDI base line for bulk carriers with the Mewis Duct (R) installed (Table 2, Row 18/20, Version 1 –> 5).

Conclusion

The fuel oil optimisation process carried out for the SEAHORSE 35 has proved that even for a highly optimised hullform, it is possible to reduce the main engine fuel oil consumption by 10% to 15% by adopting the latest developments with main engine and propeller designs in combination with a Becker Mewis Duct (R).

The reduction in main engine fuel oil consumption results in a 14% to 19% reduction in EEDI. The reduction in EEDI is relatively higher than the reduction in fuel oil consumption, as the engine margin (NCR/SMCR) has been reduced from 19% for version 1 to 10% for version 3, 4 and 5.

The fully optimised SEAHORSE 35 with a Becker Mewis Duct (R) almost meets the EEDI requirement of 2020 of new vessels having an EEDI 20% below the base line. Considering the EEDI calculations include a SFOC margin of 5%, it is likely that the fully optimised SEAHORSE 35 will actually meet the 2020 EEDI requirement.

The fully optimised SEAHORSE 35 with a Mewis Duct (R) and a max power limitation on the main engine of 4,700kW meets the EEDI requirement of 2025 of new vessels having an EEDI 30% below the base line.

The max main engine power limitation of 4,700kW equals a reduction in scantling draft design speed from 14knots to 13knots.

It has been shown it is possible for a modern optimised handysize bulk carrier to meet the 2020 EEDI requirements of an EEDI 20% below base line and to maintain the design speed. To meet the 2025 requirement of an EEDI 30% below base line, the maximum installed main engine power (SMCR) has to be reduced by ~25% leading to a reduction of design speed from 14knots to 13knots.

Considering the significant reduction in fuel oil consumption, owners and charters might find a 1knot reduction in design speed acceptable, but how low can we go in maximum installed main engine power and still have a safe ship with sufficient manoeuvring speed in heavy weather? *NA*

The need for 'green' bulk carriers

Jochen Marzi, Scott Gatchell, Hannes Renzsch from Hamburgische Schiffbau Versuchsanstalt GmbH (HSVA) explain how optimisation can help bulkers become more environmentally friendly.

Today's world cargo fleet is comprised of about 6,400 bulk carriers of which more than 5,700 are seagoing vessels [(1)]. According to IMO's 2009 Green House Gas study [(2)] these vessels use about 55 million tonnes of fuel per year and are responsible for about 18% of the overall maritime CO_2 emissions. These figures indicate that bulk shipping has a large potential for emission reductions and, related to that, energy savings. With ship emissions being strongly coupled to energy consumption, any reduction of the latter will have a twofold benefit, firstly reduced energy consumption will inherently lead to reduced emissions, and secondly, operational costs will be reduced. Energy consumption of any cargo vessel is largely determined by its hydrodynamic performance; typically more than 85% of the useful energy available onboard a cargo ship, i.e. after heat and exhaust losses have been accounted for, is used to overcome resistance and propeller losses. This calls for a thorough hydrodynamic analysis as a first step to improve energy efficiency of such vessels during operation and puts hydrodynamic analysis and optimisation using both CFD and model testing at the centre of efficiency related design activities.

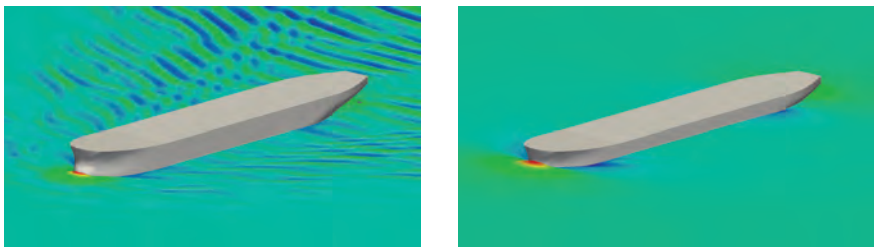


Figure 1: *FreSCo+* free surface predictions for a capesize bulk carrier

Bulk carrier operational conditions

Unlike a large variety of other vessels, bulk carriers operate over a large envelope of different sailing conditions, ranging from ballast to partially laden to design draft conditions. Due to this broad range, the hullform design of a bulk carrier poses special problems as there is no single point of design for which to optimise. The complexity of the design process is increased significantly with the number of conditions which need to be taken into account. This in turn calls for more elaborate design, analysis and optimisation approaches for bulk carriers compared with those for vessels which predominately operate at a single design point. In the European TARGETS project [(3)] a complete Dynamic Energy Model for ship operation is currently being developed. The aim of this model is to provide a basis for both, design and operational decisions to sail a vessel with the least possible energy consumption while considering safety standards. To do so, energy requirements for a full range of operational conditions must be predicted which requires a large number of CFD computations to cover the full envelope of drafts and speed. In addition, different trim conditions should be considered as the ship will sail with a trim angle in most of the partially laden conditions. Although this would be possible in principle when using a panel code, experience shows that potential flow results for blunt ships such as bulk carriers are less reliable and absolute values for resistance cannot be expected from such tools. Alternatively, the new RANS code *FreSCo+* jointly developed by HSVA and Hamburg University of Technology (TUHH) [(4)] has been applied to perform such computations. Figure 1 shows free surface predictions for a Capesize bulk carrier for two different conditions: a ballast case and at design draft for a speed of 14.25knots.

Although large progress has been achieved during the last year to improve the speed of free surface predictions, the necessary effort to predict more than 100 different cases alone is prohibitive. HSVA has hence applied an artificial neural network – ANN to populate a complete multi-dimensional response surface for the resistance under different conditions. This ANN is fed with a tangible number of exact evaluations of total resistance from *FreSCo*$^+$ predictions and evaluates the results for a large set of discrete points as indicated in figure 5.

Another aspect relevant for the dynamic energy model is the deterioration of the hull surface due to fouling during the time between docking periods. Practically this leads to higher surface roughness. The TARGETS project addresses the role of surface roughness on the resistance which for slow, blunt ships like bulk carriers or tankers where the friction part plays a dominant role in overall resistance will be significant. Modelling roughness effects on the basis of sand grain roughness in the RANS code has been accomplished in one of the development tasks of the project and is now applied to evaluate the effect on the frictional resistance and hence the total power requirements for the vessel. The following figure 2 shows a comparison of the friction coefficient cF for a smooth surface (top) and for

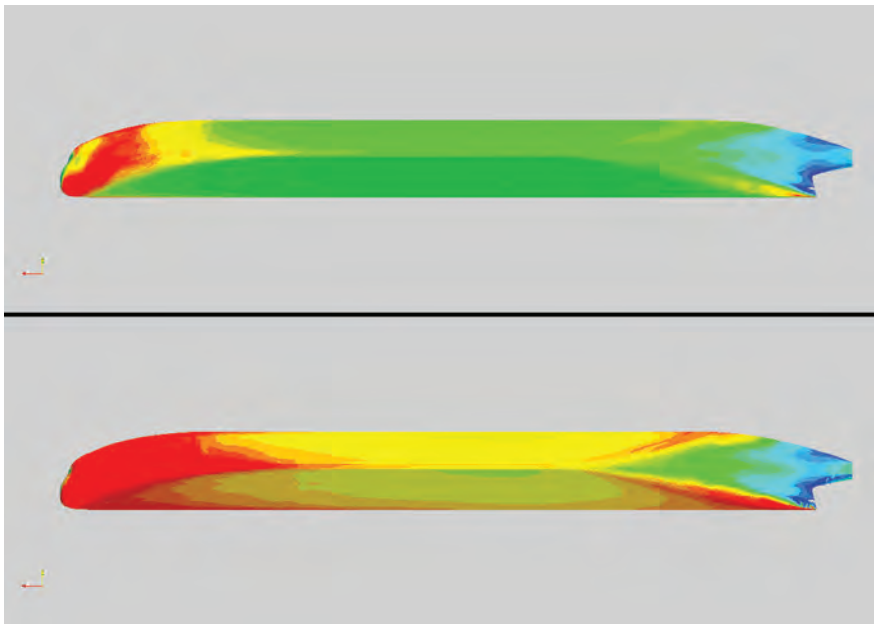


Figure 2: Distribution of friction coefficient c_F on the hull surface, smooth surface (top) and rough surface (bottom)

an assumed sand grain roughness of h_R = 500μm (bottom). The contour plots clearly indicate the different level of friction forces to be expected.

It is interesting to note that in the results presented the increased friction force goes along with an increase in pressure drag (c_P). The following figure depicts velocity iso-lines for u = 0.5 x u∞ and section shapes amidships and at two locations on the aft-body. Green lines are iso-lines corresponding to smooth surface, red to hR = 500μm, black are sectional shapes. It can clearly be seen that, while boundary layer thickness amidships is very similar, a significant difference occurs at the aft-body. This difference correlates well with the predicted pressure coefficient (cP) shown in figure 4. These plots indicate significantly better pressure recovery on the aft-body of the smooth-hulled vessel.

Figure 3: Velocity iso-lines at 50% u_∞ and hull section at three longitudinal positions, green: smooth, red: h_R = 500μm

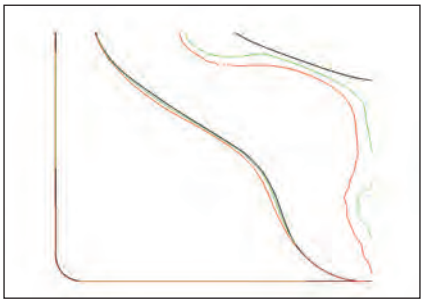
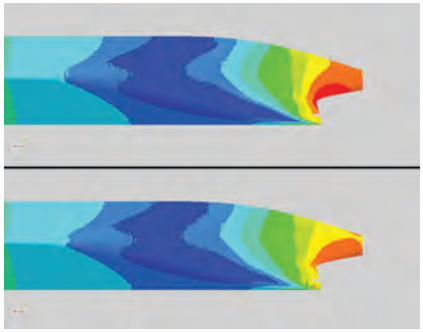


Figure 4: Pressure coefficient on smooth (upper) and rough (lower) aft-body (scaled to same range)



The following figure 5 shows a complete resistance response surface which has been assembled from computations for a range of conditions: draft, trim, speed and surface condition. For all these cases a relevant set of explicit RANS predictions have been performed and interim values have been predicted using the ANN. This data set allows for a complete interpolation of resistance data for arbitrary conditions during the operation of the vessel which can then be fed into the dynamic energy model to find optimal conditions for a given set of constraints, e.g. loading conditions, required speed etc.

Form optimisation – the issue of propulsion

Hullform optimisation is a key element of ship design. Today, traditional experience-based approaches have been supplemented and partially substituted by automated panel-code-based methods. As much as these methods benefit modern ship design, they suffer from the absence of viscosity in the simulation and, hence, do not offer the full potential CFD can provide. In contrast, RANS methods allow capturing all relevant flow phenomena at a largely increased accuracy, but due to much larger computational times they do not lend themselves to fully automatic optimisations easily. A promising way forward is a novel technique using

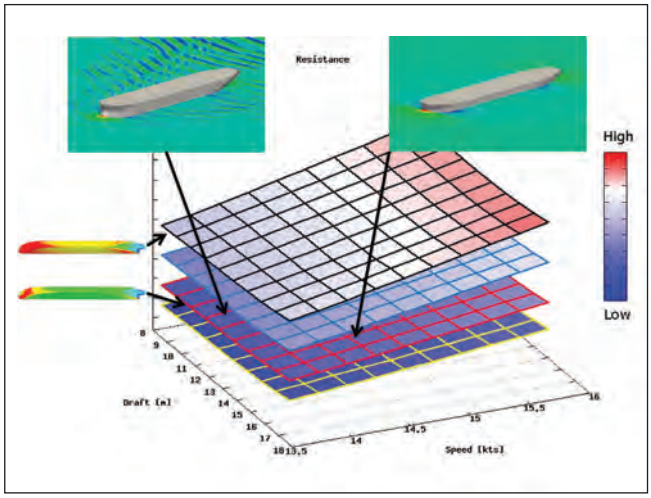


Figure 5: Complete response surface (resistance) for a Capesize bulk carrier with different operating conditions (draft, trim, speed, surface conditions.

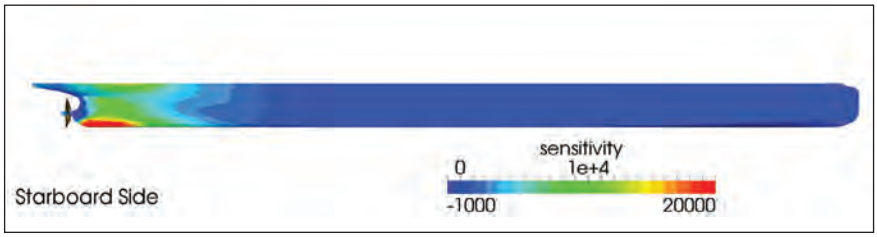


Figure 6: Computed sensitivities on a bulk carrier hull - complete ship

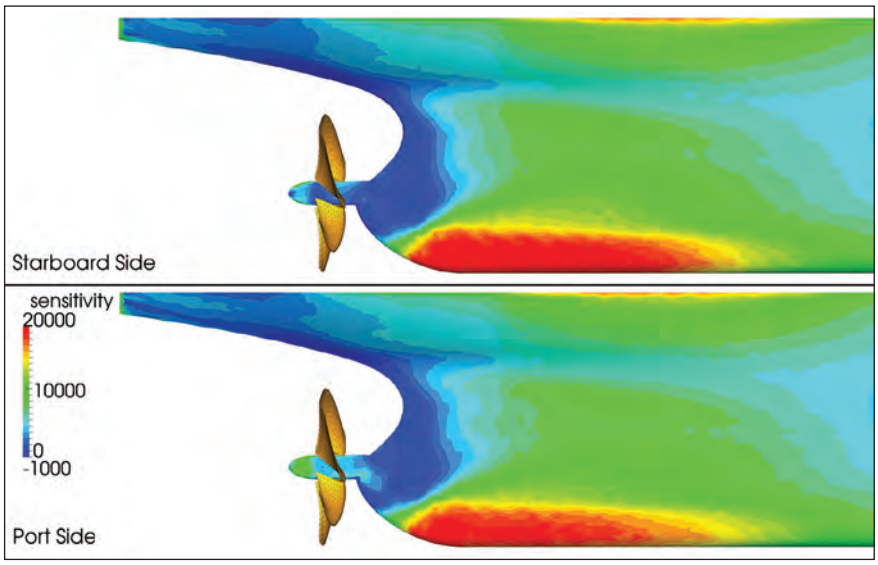


Figure 7: Computed sensitivities on both sides in front of the propeller

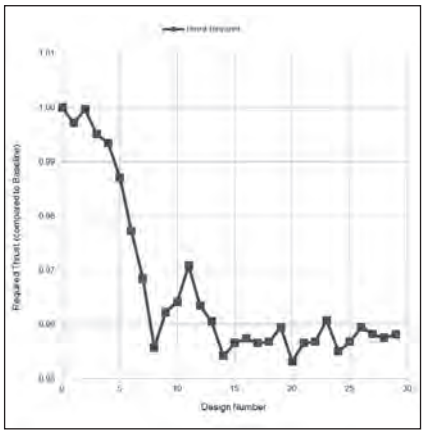


Figure 8: Form optimisation results using the adjoint solver

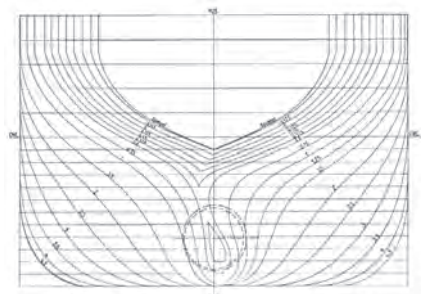


Figure 9: Asymmetric aftbody according to Nönnecke /GL 1990/

adjoint equations which compute the sensitivity to disturbances of a target variable or cost function inside the RANS code *FreSCo*$^+$ parallel to the solution of the momentum equations, [5]. This approach which is being developed in the German Form-Pro project [6] is used now for the optimisation of bulk carrier designs. In contrast to earlier, panel or potential flow based CFD tools, the entire ship-propeller system is analysed at the same time.

Rather than rating different designs after they have been produced and analysed, which is the common practice of a traditional optimisation procedure, the adjoint solver allows to answer a "what if" type of question in that it indicates the sensitivity of the shape to a pre-specified cost function, which includes not only the resistance of the hull but also criteria for the wake and propeller efficiency.

The following figures show computed sensitivities for the hullform of a medium sized bulk carrier with respect to the cost function, dark blue colours indicating a positive effect when the shape is moved outwards along the local surface normal, red colours indicating the need to move the shape inwards. Note that the highly non-linear colour map is "0" in the blue area. For the complete hull shown in figure x this means that for the majority of the forebody and the parallel midship section no variation is suggested, the major changes only occur in the aftbody of the vessel.

The following figures show a detail of the sensitivities obtained at the ship's stern, both the port (mirrored) as well as the starboard side are plotted to indicate the slight asymmetry between the two sides which is obvious from the red patch in the bottom and the form of the blue patch in front of the propeller. This is of course caused by the effect of the – operating – propeller introducing a significant rotational component into the flow.

This vessel is currently being optimised in the context of the Form-Pro project; first results of the optimisation with respect to propeller thrust are indicated in figure 8. The final version of the hull will sport an asymmetric aft body. This is in fact not a new result. In the 1970s and 80s asymmetric aftbodies were developed by Nönnecke [7] and tested in comparison with standard symmetrical shapes. This concept proved very efficient and over a period of 10 years after the first oil crisis in the 1970s more than 70 ships have been built using an asymmetric aftbody.

At the time, the design was based entirely on model scale measurements. Sadly, the idea was not pursued further in the following decades, apparently affected by too high complexity of the design and construction process on one side and comparatively low fuel prices on the other. The need for further improved hydrodynamic performance together with the superior new analysis and design opportunities offered by advanced CFD tools, we expect to see a renaissance of this technology soon.

A practical application the CROWN 63 bulker

During the last years HSVA has been involved in the development and hydrodynamic design of the 63,500dwt

Figure 10: Model test - CROWN 63 bulk carrier

Figure 11: Semi-balanced rudder model with energy saving devices

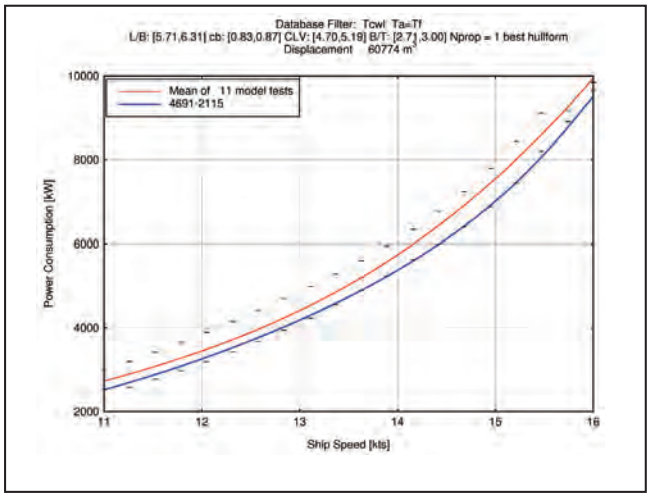


Figure 12: Comparison of CROWN 63 design with similar vessels in HSVA's database

CROWN 63 bulk carrier for GreenSeas Marine Technology (GSMT) and the French shipping company Setaf Saget [8].

Starting with the initial hullform, first CFD predictions and a first model test suggested further improvements to be made. Several hullform optimisations were performed on the basis of CFD predictions, reflecting changes made to the general arrangement of the vessel and model tests confirmed savings in the order of 11% compared to the initial hullform. After a further refinement of the hull lines the next step was the optimisation of the rudder/propeller arrangement. An actual design propeller (developed by Nakashima) was manufactured and combined with a conventional semi-balanced rudder designed by HSVA. The new rudder reduced the power consumption further by 2.7% and was fitted with a rudder-bulb and rudder-fins in the next steps. Both energy saving devices, rudder-bulb and rudder-fins, have been designed by HSVA and reduce the power consumption in total by 3%. As a result, the present vessel serves as the benchmark vessel for this ship type and size in HSVA's database.

The following figure 10 shows a photograph of the bow and the stern of the ship model during testing at design speed, while figure 11 shows the stern-propeller-rudder configuration on the model, sporting the newly design bulb-fin rudder.

Finally, figure 12 shows a comparison of the new benchmark design with other, similar vessels in HSVA's database. This clearly indicates the superior properties of the design which has recently proven also during the sea trials of the first vessel delivered by the Chinese shipyard Sinopacific.

CFD and Model testing save energy

With Bulk carriers forming a significant part of the world's merchant fleet, they offer a significant potential for overall energy savings and associated emission reductions of seaborne transportation. Hydrodynamic performance is the key to an improved energy consumption of cargo vessels and advanced analysis and optimisation tools show the way forward

to achieving unprecedented performance. For the special case of bulk carriers, hydrodynamic analysis and optimisation becomes more complex due to the large number of operational conditions which need to be considered for more global, life-cycle oriented optimisation targets. Advanced CFD methods including the adjoint solver as the latest addition to the RANS code *FreSCo*$^{+}$ offer a significant potential for further perfection in the future. The comprehensive numerical analysis of different conditions described above provides a sound basis for the dynamic energy model of a ship which is currently developed in the European research project TARGETS and will allow optimising vessel design as well as finding optimal conditions during operation.

Together with advanced model tests, the numerical simulations performed at HSVA form an outstanding opportunity to render today's and tomorrow's ship operation greener and more efficient.

Acknowledgments

Parts of the developments presented here were performed in the TARGETS project which is partly funded by the European Commission under Grant Agreement 266008 as part of the 7th Framework Surface Transport programme. Further parts are funded in the context of the German project "Adjungierte Formoptimierung von Schiffen bei aktiver Propulsion – Form-Pro" which is funded by the German Ministry of Trade and Industry, Grant 03 SX 280. The authors wish to express their thanks to the funding authorities as well as to all project partners who have contributed to the work.

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Deltamarin on a roll

Finnish naval architects Deltamarin have seen further contracts for its B.Delta37 bulk carriers placed at Chengxi Shipyard for The China Navigation Company.

The new contracts which are for 4+4+2 of the B.Delta designs are the first B.Delta37 bulk carriers to be built at Chengxi shipyard, which have been specifically amended to take into account specific requirements of China Navigation.

The B.Delta design has an extremely low fuel consumption, which has sparked the interest of many ship owners and shipbuilders. Deltamarin says that it will take care of the basic and detailed design of the vessels as well as technical procurement handling and will also have a site team to take the design to production.

Deltamarin has focused on fuel efficiency in the designs of the vessel. The service speed at design draught of the vessel will be 14knots and the model tested daily fuel oil consumption at design draft shall be 18tonnes including a 15% seamargin, ISO conditions. The EEDI shall be 15.4 % less than the requirements to come into force.

A laker bulk carrier utilising the featured Deltamarin B.Delta design is already sailing and has proved that the extensively tested design features work in full scale as well, say Deltamarin. The solutions that enable such improvements to existing designs are a combination of hull form, propeller, rudder and main engine solutions applied in a novel way.

TECHNICAL PARTICULARS

The vessels to be built for China Navigation Company shall have the following main particulars:

Length, oa:	180m
Beam:	30m
Scantling draft:	10.50m
Deadweight:	39,500dwt
Cargo area:	48,500m^3

Further, Tianjin Xingang Shipbuilding Heavy Industries Co. is currently building other B.Delta37 handysize bulk carriers for Louis Dreyfus Armateurs (LDA) and M.T.M. Ship Management Pte Ltd. / Strategic Shipping Inc. and additional shipbuilding contracts are expected to be signed within a few months.

There are currently ongoing discussions to build B.Delta series vessels in other sizes, such as the B.Delta25, B.Delta64, B.Delta82, B.Delta95, B.Delta210 and B.Delta250. The B.Delta37 series has also been further developed with several alternative arrangements or specifications including box shape holds, open hatch arrangements, ice class, timber deck cargo and others. ***NA***

Cargotec develops set industry standards

Cargotec's continuous development of bulk carrier cargo handling technology includes its latest electric-drive system for opening and closing side-rolling hatch covers, improvements to its gravity self-unloading systems, and a 3D CAD product cutting design lead times for hatch covers.

Cargotec is constantly seeking and developing dry bulk cargo handling solutions with improved environmental and economic characteristics, says Esko Karvonen, vice president of the company's marine dry cargo business line.

The development process for a new system or piece of equipment, however, continues even after it reaches the market.

"We work with our customers, building on our combined knowledge and experience to drive a process of continuous product development for our mutual benefit," Says Karvonen.

As well as new solutions, the company's R&D strategy addresses the effectiveness of equipment throughout its lifetime. Finding the best balance between innovation and product development is an interesting challenge, according to Matti Sommarberg, Cargotec's Chief Technology Officer.

"In today's world of widely distributed knowledge, companies cannot rely entirely on their own research, but should acquire inventions or intellectual property from elsewhere when it advances their business model," he says. This concept is called 'open innovation', in contrast to the established approach to R&D, now known as 'closed innovation', which concentrates on generating and developing ideas privately in-house and guarding the resulting intellectual property.

For example, Cargotec is a shareholder in FIMECC, the Finnish Metals and Engineering Competence Cluster, which aims to increase research cooperation between companies, universities and institutes. A two-year FIMECC programme has recently produced a 3D CAD product that has enabled design lead times for MacGregor side-rolling covers to be cut to a fraction of the eight weeks it generally took previously.

"Hatch covers are weight-sensitive products and their designs are determined by various requirements from shipyards and shipowners," explains Henri Paukku, dry cargo project manager. "Variations in the particulars of each delivery require individual specifications despite products that look similar. The 150 to 200 drawings and documents required can create a huge amount of work that is nevertheless uniform from project to project."

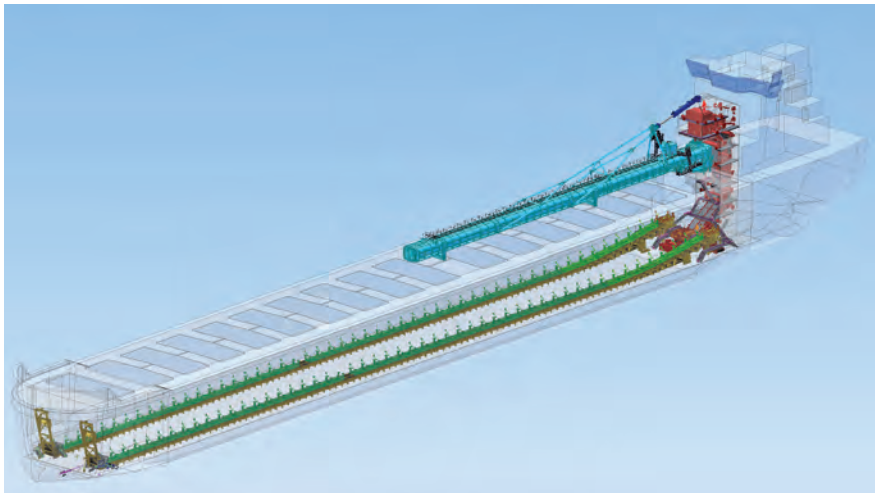
Standardising essential structural elements led to the development of a modular product architecture. "In hindsight, quite a few of the solutions seem almost self-evident. But none of them would have been developed alongside the customer projects that are the predominant way of conducting R&D in most companies".

Other bulk carrier developments that Cargotec is introducing include the first delivery of its MacRack electrically-operated opening and closing system for side-rolling hatch covers, and new cargo gates and enclosed booms incorporated in its gravity self-unloading systems being installed on four new Great Lakes bulk carriers.

"We anticipate that the MacRack system will become the industry standard for side-rolling hatch covers," Karvonen says. MacRack hardware has recently been delivered to the Zhejiang Zhenghe Shipbuilding Co Ltd in China, where Cargotec will install the system on a 47,500dwt bulk carrier scheduled for delivery to a Chinese owner this autumn.

"Development of MacRack has been driven by demand from shipyards and ship owners, along with a mutual commitment to the environment and the overall improvement of cargo system performance.

"For a long time, hatch cover wheels have been lifted hydraulically, even when an electric drive has been used, because electric piston movement is not easy to achieve. We solved this problem with electrically powered screws and now we have taken the process a stage further by combining the lift and drive operations,



A MacGregor gravity self-unloading system will be fitted on four new 30,000dwt Great Lakes vessels

MacRack gets order for its latest solution in hatch covers

rendering separate hatch cover lifters obsolete. This reduces maintenance requirements and streamlines installation work in the shipyard.

Each hatch cover panel has just one drive unit actuated by one electric motor. The drive unit is located close to the middle of the longitudinal coaming and both lifts and rolls the panel open. MacRack uses variable frequency drive technology, which allows for the optimised use of electric power. The operating speed is slow at the start of the opening process, when power is needed to lift the panel. Rolling takes place at full speed and slows down again when the panel is close to the end stops.

"MacRack is intended to deliver exceptional reliability, but we have naturally designed in comprehensive emergency operation arrangements to minimise downtime and inconvenience in the unlikely event of a failure in any part of the system."

Ilkka Kukko-Liedes, MacRack R&D project manager, says: "Whatever the solution, an integral part of all our product development work is product verification. The verification process is decisive when developing an idea into a working product."

Computer simulation can be used in the initial stages for defining rough parameters, and in the latter stages for fine-tuning details, he says. "In the case of MacRack, it is essential that all dimensions and kinematics are precise. Using computer simulation, we were able to detect the locations where fine-tuning was needed, change these components accordingly and carry out new test cycles until all issues were resolved.

"However, while computer simulation significantly accelerates the development process, we cannot rely on computers alone. To support our focus on ease-of-use, redundancy and reliability, we have built a full size test bench for verifying the final product. This can simulate different panel weights using a hydraulic pressure system. Every MacRack unit is tested by a similar device for 80tonne loads before delivery to the customer. This provides a good safety margin as the recommended maximum hatch cover weight is 70tonnes."

MacGregor full flow gates and fully enclosed booms for gravity self-unloading systems are two more product developments from Cargotec finding their first commercial application. Four 30,000dwt Great Lakes bulk carriers on order at Nantong Mingde Heavy Industry Stock Co Ltd in China for a Canadian owner will be the first vessels to benefit from the new products as part of their complete MacGregor gravity self-unloading systems.

Commercial ports on North America's Great Lakes handle around 150 million tonnes of dry bulk cargo a year, mostly carried by self-unloaders. The new components have been designed to offer enhanced standards in environmental protection, safety and operational efficiency. Cargoes to be handled include coal, aggregates, iron ore pellets, coarse and fine salt, grain, potash, clinker, ilmenite, bentonite, gypsum and coke.

"The Canadian customer already has one of the biggest fleets of gravity self-unloaders in the world, and they are convinced that the MacGregor self-unloading system is both cost and time effective, ensuring high capacities and high standards of environmental protection," says Pankaj Thakker, sales manager for Cargotec's self-unloading systems.

Modern requirements for dust-free operations are for the benefit of crew, stevedores and the local environment. However, the enclosed boom offers other benefits such as an optimal support structure with a smooth upper surface to prevent ice formation, and a smooth inner bottom surface for easy cleaning.

"Service and inspection is much easier and safer than previously; walkways alongside the belt allow safe and easy access, eliminating the problems of handling heavy, unwieldy access cover plates," Thakker says.

"The new full flow gate maximises a vessel's cargo carrying capacity as well as enhancing its discharge rates. It also has a better capability to deal with hard-to-handle materials."

MacGregor equipment for the four lakers is scheduled for delivery between May this year and July 2013. Each gravity self-unloading system's rated capacity will be 4360t/h for coal and 5450t/h for aggregates. *NA*

MacRack key facts

MacRack saves energy because there is no continuous running as there is with a hydraulic pump unit. The need to warm hydraulic oil in advance is removed, so MacRack is not as sensitive to a cold climate as are hydraulic systems.

Variable frequency drives deliver high torque with low speed, so vessel list and trim are not significant factors in MacRack operation.

Between 2kW and 6kW is required to operate the system, depending on the weight of the panels.

MacRack technology is still relatively new and production volumes reflect this. Consequently, the cost of the new equipment is higher than conventional hydraulic systems, but the situation should change as production increases.

The mechanical components are designed to last for a ship's lifetime, but this naturally depends on how well the MacRack unit is maintained. The various electrical components have differing lifetime expectations, but very few replacements are anticipated.

Overall dimensions are approximately 1700mm x 3000mm x 1300mm.

Floating on air

Japan's Mitsubishi Heavy Industries Ltd (MHI) claims it latest bulk carrier design, MALS ODESSAMAX, will enable reductions in CO_2 emissions by about 25% compared with conventional bulk carriers.

As the first commercial application of the design, MHI will apply its conceptual design and green technologies to three grain carriers to be built for Archer Daniels Midland Company (ADM) of the US.

MHI's bulk carrier design adopts the Mitsubishi Air Lubrication System (MALS), which reduces frictional resistance between the vessel's hull and seawater using air bubbles produced at the vessel bottom, along with a high-efficiency hull form and enhanced propulsion system. Sumitomo Corporation of Japan has received the order for the ship construction from ADM, and Oshima Shipbuilding Co., Ltd. of Nagasaki was selected to build the ships.

The MALS-ODESSAMAX is a 95,000dwt post-Panamax bulk carrier design that is combined with MALS and a high-efficiency ship hull design and propulsion system. The vessel will produce 25% less carbon dioxide (CO_2) emissions compared with a conventional bulk carrier, states MHI. The MALS-ODESSAMAX is designed for a 7% reduction in CO_2 emissions through the MALS system, along with the design of the vessel having a high-performance hull form and relatively wider and shallow draught will also enhance the MALS efficiency, further reducing CO_2 emissions by 14%. Combined with another 5% reduction by propulsion devices such as the Mitsubishi reaction fin and Mitsubishi hub vortex free cap MALS-ODESSAMAX will achieve an overall 25% cut in CO_2 emissions, says MHI.

The MALS system consists of a high efficiency blower/motor, inverter, and control systems. Air is taken in from the blower room directly to the blower, which is then distributed to the air discharging chamber at the bottom of the vessel where it is changed into air bubbles that cover the bottom of the vessel once forced through openings at the bottom of the ship.

There is no recess, and/or no obstructions underwater on the hull, such as fins, therefore the vessel can operate without any trouble or any resistance increase with MALS-off condition. The air-flow rate can be controlled by the MALS control system automatically to get a target flow rate.

It has been confirmed by MHI through CFD analysis that only one air-discharging chamber is needed to cover a sufficient flat bottom area for the bulk carrier. In speed-power testing of the vessel during sea trails where the MALS was tested both switched on and off, it showed that when the MALS was switched on there is 20% energy saving when applied at a specific speed. MHI says that the net energy savings taking in to consideration the air blower power consumption was 13%.

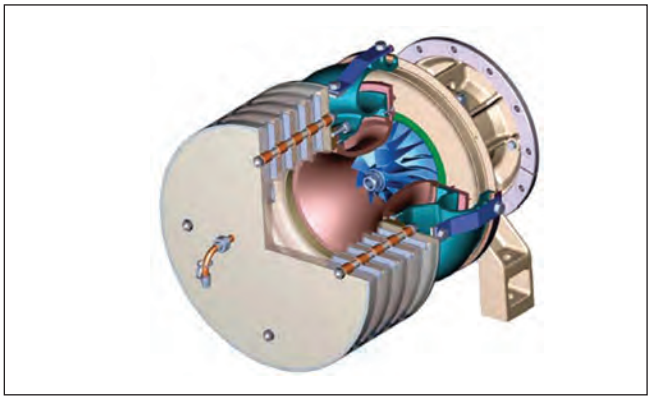
Besides the MALS the three grain carriers will also feature a specially designed bow shape that will reduce wave resistance. The vessels have also been fitted with a Mitsubishi Reaction Fin to recover energy losses from the propeller and creating a pre-swirl flow. Adding to this is a Mitsubishi Hub Vortex Cap that will control hub vortices, these two adaptations to the propeller will give the vessels an extra 5% energy saving, says MHI.

Oshima Shipbuilding will perform the basic design work through to construction based on the conceptual design, with delivery of the equipment related to the MALS system from MHI slated for 2014. *NA*

TECHNICAL PARTICULARS

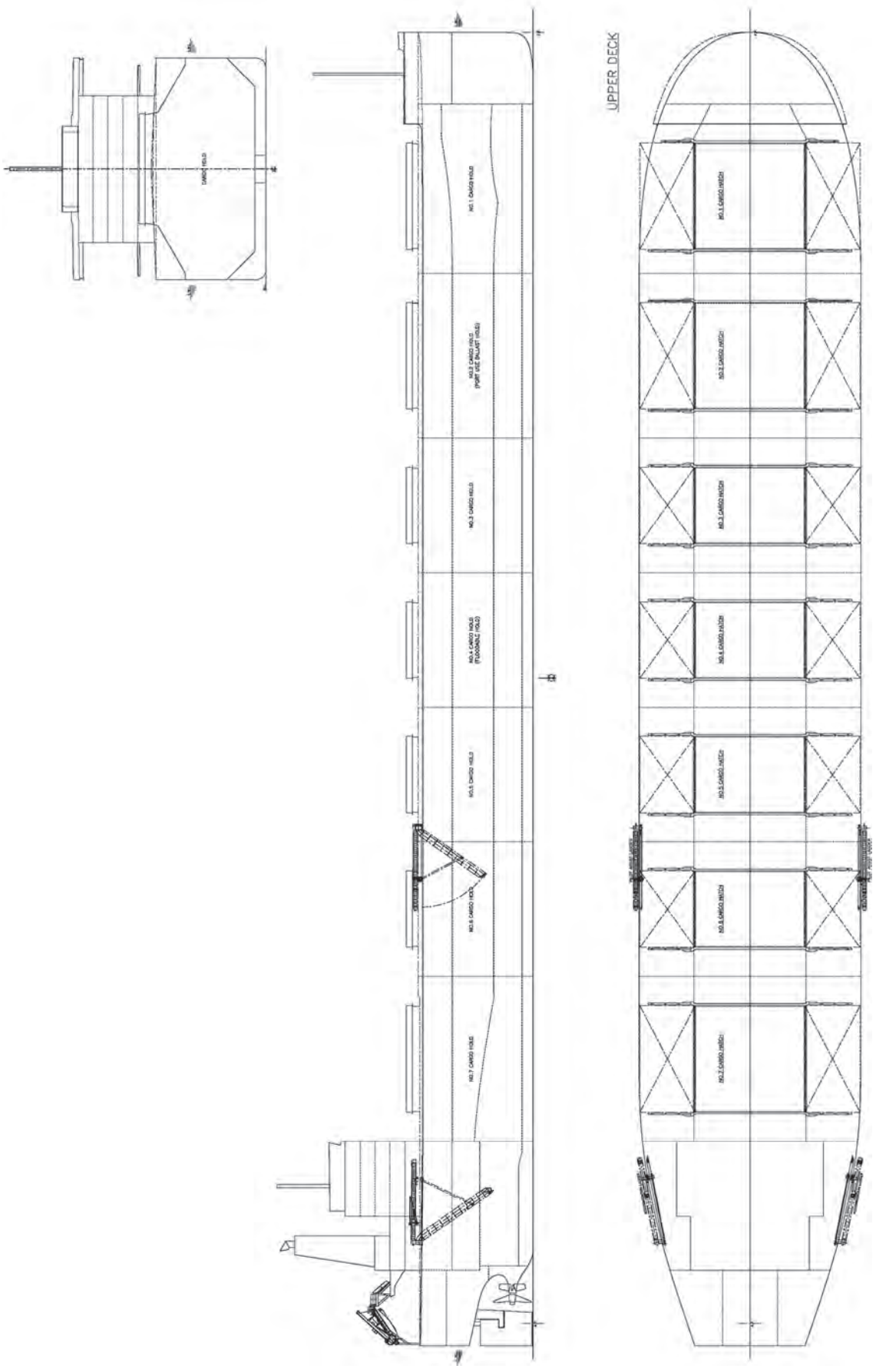
MALS-ODESSAMAX

Length oa:	abt. 237.00m
Length bp:	233.00m
Breadth moulded:	40.00m
Depth moulded:	19.80m
Draught	
Scantling:	13.6m
Design:	12.5m
Gross:	abt. 55000gt
Deadweight	
Design:	abt. 85,000dwt.
Scantling:	abt. 95,000dwt.
Speed, service:	abt. 14.5knots
Classification society and notations:	Nippon Kaiji Kyokai NS* (CSR, Bulk Carrier-Type A, BC-XII, GRAB 20), (ESP), (EA), (IWS), MNS*, (M0), Strengthened for Heavy cargo loading where holds Nos.2, 4 and 6 may be empty
Cargo capacity	
Hold capacity:	abt. 115,500m^3
Main engines	
Design:	Mitsubishi Heavy Industries, Ltd.
Model:	6UEC60LSE-Eco-A2
Manufacturer:	Mitsubishi Heavy Industries, Ltd.



A MALS blower.

GA plan of MALS-ODESSAMAX.



Meeting tomorrow's needs

The bulk carrier market has been hit hard by the recession, with charter rates down and fuel prices up. Michael Aasland, business director bulk carriers, DNV gives his view on how bulk carriers are developing through the crisis.

The type of vessels that were built at shipyards in the past saw vessels being constructed with a maximised deadweight, but at the expense of fuel efficiency, which was the demand at the time. Now due to the change in the market shipowners are looking to more fuel efficient designs and ways to save money.

Shipowners and yards are looking to energy saving devices as well as savings through enhanced hydrodynamic design. "We are seeing questions round energy saving devices, such as propeller adaptations", says Aasland. He adds further that the savings that can be made through these devices can significantly outweigh the costs especially for a refit of a vessel, as there are more savings to be achieved than that of a newbuild vessel that has been designed already with energy efficiency in mind. Aasland highlights that in the long term vessels that have been retrofitted with adaptions will also have a significant environmental benefit.

Currently, DNV has been researching into how shipowners can operate vessels more efficiently, both by changes to vessel designs and adaptations. DNV also produced its Guidelines for fuel efficiency (for bulk carriers) last year, giving owners a guide of different ways of making their vessels more fuel efficient. Further guidelines for other vessel types have also been produced.

Michael Aasland, business director bulk carriers, DNV

Will bulk carriers be able to meet the green challenges of tomorrow?

DNV has been carrying out studies on bulk carriers to see where gains can be found, Aasland says that with the design process you need to start with an operational profile, and then optimise the forward part and the aft part of the vessel. Also, you need to look at the wake and the type of energy saving device (if you are looking at a propeller adaptation) that can be installed. "We are seeing double digit gains through hydrodynamics and adaptions, which are very significant savings both for the owner and the environment", he says.

Concern has been raised that even with adaptations, older bulk carriers will not be able to meet with the IMO's stringent EEDI standards. "Existing designs and new designs will meet with the first and second standard, however the third will be a challenge", says Aasland. He further highlights that "we don't see or expect any single device that will significantly reduce fuel consumption, however we need to look at a number of changes, which all add up to significant savings. The market has a variety of fuels and energy saving devices working together to give vessels better efficiency, but it is a challenge."

Aasland highlights that the main factor for bulk carriers is the growth in China, because of its impact on iron and ore production. The forecast has reduced to 7.5% and "is an important number to watch". With China being a large consumer, growth in the rest of the world has created more trade with China. "However, what we saw with the impact of the recession was reversed, when iron ore in Europe declined in price on the market, China then started to import more instead of using its own, which resulted a sharp increase in trade to China. But, the market will develop, it is clear that fuel efficiency will be an important competitive factor going forward", he says. *NA*

Safety first for bulk carriers

Geoff Taylor, managing director of PSM looks at the potential hazards posed by liquefaction for bulk carriers and considers how modern technology can help not only to ensure regulatory compliance, but also deliver operational benefits.

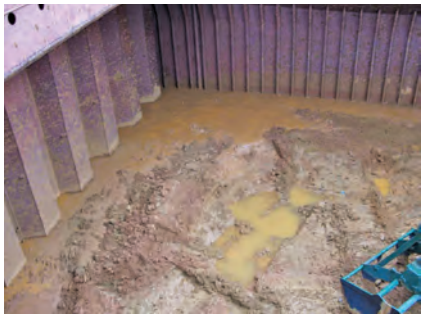
This year sees the 100th anniversary of the loss of *Titanic*, an event which changed maritime history forever. Beyond the staggering loss of human lives and implications for ship design, the disaster pointed out sharply the necessity of proper safety procedures and their potential to avert a crisis. Out of this recognition was born the Safety of Life at Sea (SOLAS) Treaty.

Almost 100 years on, the treaty remains largely unchanged in respect of regulations governing passenger ships. In 1974 however, a major amendment was implemented introducing new regulations aimed at providing added protection for bulk carriers constructed to carry dry cargo - for example, metal and mineral ore - against the risk of liquefaction.

The new legislation was developed in response to the many lost ships and fatalities found to be attributable to this newly discovered cargo phenomenon. While the number of losses has since declined, liquefaction continues to be an issue, with seven bulk carriers lost in 2010 alone and the Supramax bulk carrier *Vinalines Queen* reported missing as recently as December 2011.

Liquefaction refers to the process by which saturated, unconsolidated metal ores are transformed into a substance that acts like a liquid. Left undetected, the presence of liquid may lead to disastrous consequences. The SOLAS X11 Regulation 12 required all bulk carriers to be fitted with Water Ingress and Detection (WIAS) systems to provide advance warning of water layer formation in the bottom of cargo holds, a state widely acknowledged as being an early stage of liquefaction.

Subsequently in 1999, the regulations were extended (SOLAS Chapter 11-1) to include single hold cargo ships and void spaces to ensure the protection of smaller cargo vessels. In addition to the requirement to install WIAS systems in new ships, vessels currently in service are required to undergo periodic port inspections to ensure their WIAS systems are functioning adequately.



Liquifaction is a danger still present for today's bulk carriers

Tip of the iceberg

There are estimated to be as many as 500 bulk carriers in service today, with new vessels coming into service all the time. The earliest detection systems developed to meet the new WIAS requirements were poorly conceived, due to a lack of knowledge at that time about the severe service demands likely to be placed upon them in use. This has led to an emerging problem with performance issues and even system failures. Many vessel owners now also face legacy issues relating to service and spares, with some manufacturers since having left the market altogether.

The requirement for a more robust and reliable system has been the key driver for PSM in developing its Bulksafe water ingress detection and alarm system. Bulksafe has been proven to detect the presence of water in bulk carriers and has been designed to ensure full compliance with the latest SOLAS regulations for bulk carriers.

This new technology has found wide acceptance amongst shipyards and designers as a low-cost solution which is easy to install. As a retrofit solution, there are also considerable financial advantages. With many bulkers approaching the age where a major refit and overhaul becomes a consideration, the latest systems offer an easy way to update obsolete or malfunctioning WIAS systems, often at a lower cost than repairing the existing configuration.

Having the correct equipment onboard that alerts seafarers quickly, give's more time to react

How does the technology work?

The latest systems offer maximum flexibility and ease of fitting for both new and retrofit applications, with a full range of mechanical and electrical installation options facilitating integration with other systems and allowing existing components e.g. clamps and conduits to be re-used. With no moving parts that will wear or foul with damp cargo, today's solutions offer proven reliability in use with fewer maintenance requirements.

Unlike systems based on mechanical switches and floats, PSM's modern Water Ingress Detection and Alarm systems use self-checking, active sensors to monitor cargo holds, triggering an alarm if water is detected. PSM's Bulksafe System additionally features a 'check from deck' facility which allows mandatory Inspections to be completed with the cargo holds full or empty.

Reducing the time spent in port clearance procedures can help improve

fleet efficiency while maximising available cargo capacity. A high safety integrity level is assured through the use of hydrostatic level transmitters with a 'live zero' function. Both features are designed to enable comprehensive testing of the ship's systems by the ship's Cargo Master prior to loading to ensure everything is in order.

Another important requisite for today's ship operators is a means to establish a safety audit trail, both to protect staff in the event of an incident and to provide documented evidence. PSM's Bulksafe application provides a solution in the form of an RS485 serial communications output which connects to the ship's Voyage Data Recorder to provide a permanent and secure record that can be analysed offline.

What does the future hold?

At the present time WIAS regulations do not require systems to provide any remote alerting facility, however PSM believes that by providing faster transmission of critical alarms potentially dangerous incidents can be more easily avoided, meeting the true objectives that lie behind the SOLAS WIAS regulations. The latest Bulksafe systems use Polestar and Skywave IDP technology to provide near-instantaneous alerts.

Integration of Bulksafe with PSM's Clearview system provides further functionality. With the Clearview system, a real-time message is delivered to the operator's desk or via a text message should a critical alarm or pre-warning be activated onboard the vessel. Additionally, operators benefit from secure storage of operating activity records and can perform onboard system condition health checks. This allows the ship's staff to ensure the vessel's readiness for WIAS port inspections ahead of arrival and to monitor safety systems at all times.

Manufacturers continue to make further advances – PSM for example seeks to cut installation costs further by the introduction of the latest MODBUS sensors, which reduce pipework and cabling requirements. The move to digital technology provides improved reliability and self-checking, further enhancing safety in transit.

Affordable and Practical

Whilst the primary function of Bulksafe and similar systems is safety, the benefits of adopting the latest technology are clear. Installing modern systems of this type offer rapid payback in terms of cost savings and operational efficiency through the entire vessel. Advances in technology combined with the specialist instrumentation experience of suppliers has brought such systems within reach of shipowners and operators, making them a practical alternative to repair. With the help of digital technology, the cargo industry can at last look forward to a safer future. *NA*

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Smooth operator passes the baton

Pavel Shikhov the current council chairman of the International Association of Classification Societies (IACS) will complete his term in July, handing the reins to Lloyd's Register's marine director Tom Boardley. In a frank interview with *The Naval Architect* he reflects on his year in office.

Absolutism is not for class societies. There are no harsh contrasts that can be considered black and white, there is merely the "smooth and efficient" running of the organisation says outgoing IACS Council chairman Pavel Shikhov.

Success and failure then are not words that lend themselves to the development of the IACS mission over Shikhov's stewardship, but rather he prefers to talk about "milestones" that have been achieved.

"In light of the fact that the majority of IACS' tasks are long-standing, sometimes spanning a number of years and hence falling within the purview of several chairmen, I would rather talk about important milestones during the year of my chairmanship," explains Shikhov.

And a number of milestones have been reached over the past year. Including the expansion of the IACS membership to include the Polish and Croatian registers last year; Shikhov visited both companies this spring to learn more about the organisations and to understand their achievements.

"Another event in 2011 that is worth mentioning was the re-establishment of IACS' presence in Brussels by employing its own Permanent Representative to the EU with the task to promulgate to the EU the aims of IACS regarding safe and environmentally friendly shipping" says Shikhov.

In addition to welcoming the twelfth and thirteenth members to IACS and re-establishing a presence within the EU IACS has been heavily involved with developing new regulations at the IMO. In particular it has been involved with the Flag State Implementation (FSI) 20 sub-committee meetings.

"In the last session of FSI20, the Sub-Committee finalised the Code for Recognised Organisations (RO Code), taking onboard most of the points raised by IACS in its submission. Clear and unambiguous text of the RO Code is vital for IACS Members, acting in their capacity as ROs, to properly implement the provisions of the IMO instrument when it comes into force (assumed to be 1 January 2015 if approved at MEPC 64 and MSC 91), says Shikhov."

Pavel Shikhov outgoing chairman of IACS reviews the milestones reached over the past year

The next step for the RO Code is to reduce the number flag state audits of RO's undertaken: "The arrangements for audits by flag States should aim at improving their effectiveness while reducing the duplication of efforts by flag States and their ROs," he explained.

In modern shipping the thorny question of greenhouse gas (GHG) emissions is never far away and IACS has used its expertise to assist IMO in developing the Energy Efficiency Design Index (EEDI) including the guidelines on minimum installed power for the safe manoeuvring of vessels in adverse conditions.

"IACS continued to support new energy efficiency regulations for ships by participating in the JWG/EEDI, the body that is developing EEDI Industry Guidelines on the way to collect, correlate, verify and use the technical data needed to compute the EEDI. The agreement to produce sound and comprehensive guidelines and methodologies is a big step forward and a major contribution to the IMO's efforts to tackle GHG emissions from shipping," claimed Shikhov.

Classification societies provide a link to the maritime safety and environmental protection chain and as a result any problems currently faced by the maritime community are closely connected with the IACS short-term and long-term objectives. Many of these objectives are environmental, but that is not exclusively the case.

For example one of the major challenges for class over the coming years will be preparation of the harmonised common structural rules (CSR-H) for future goal-based standards (GBS) compliance verification by IMO experts to comply with the IMO's GBS implementation schedule.

The entry into force of the Ballast water management (BWM) convention is another issue that requires IACS' attention. Class will be deeply involved in both the development of standards for the installation of ballast water treatment systems (BWTS) and the certification of ships to comply with the BWM Convention. "Therefore, IACS is prepared to work closely with the IMO, Industry and Member States in order to contribute to the smooth and consistent implementation of the Convention."

In addition Shikhov says IACS will continue to develop technical requirements for Polar ships and their equipment, refine the ship survey system and "in the future it may embark on the development of common structural rules for ship types other than tankers and bulk carriers".

For Shikhov his tenure as IACS council chairman, while not in his words, a "black and white" issue has seen the organisation reach a number of milestones that has prepared the way for Tom Boardley who will continue the smooth operation that is classification. *NA*

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Counting the cost of fuel, a retrofit review

A Lloyd's Register (LR) study of three fuel options finds reassuringly few future problems, reports Jesper Aagessenior, design support senior surveyor at the classification society.

The way in which shipowners and operators comply with the new emissions regulations is one of the themes of a retrofit technology study by a group of Green Ship of the Future (GSF) partners.

The project, named the *ECA Retrofit Technology Study*, compares technologies that meet the IMO's emission levels for ships sailing in Emission Control Areas (ECAs). Jointly funded by the Danish Maritime Fund and participating partner companies – LR, Alfa Laval Aalborg, D/S Norden, Danish Shipowners' Association, Elland Engineering, Maersk Maritime Technology, Maersk Tankers, MAN Diesel & Turbo and Schmidt Maritime – the study looks at three fuel options: low sulphur fuel oil/marine gas oil (referred to as MGO and the reference case), heavy fuel oil (HFO) and liquefied natural gas (LNG).

The reference ship used for the project was a newly built medium range (MR) tanker from D/S Norden, *Nord Butterfly*. The project's aim was to carry out a desktop study based on a real ship and on real operational data and to set up practical solutions as well as uncovering the financial aspects of installation, operation and maintenance of the options.

D/S Norden-owned *Nord Butterfly*, the tanker converted to LNG as fuel with two LNG storage tanks in front of the accommodation area

However, Katharine Palmer, LR's environmental manager, cautions: "There is a vast difference between the perspective of a small coastal ferry operator in Norway and that of an owner of large deep sea ships. For example, with the exception of LNG carriers I don't think that many rational, dispassionate observers see LNG as fuel being adopted by many deep sea operators in the immediate future."

LR has reviewed the proposed solutions for scrubber technology and LNG as a fuel. The reference case for operation on MGO has not been a subject of further investigation. The LR reviews are conceptual design reviews, i.e. overall regulative and safety assessments to identify the challenges and outstanding matters which need further consideration.

The scrubber solution

In the scrubber solution, the aim was to extend the vessel's funnel casing and install a hybrid wet scrubber system that can operate on both freshwater and sea water, serving both the main and auxiliary engines.

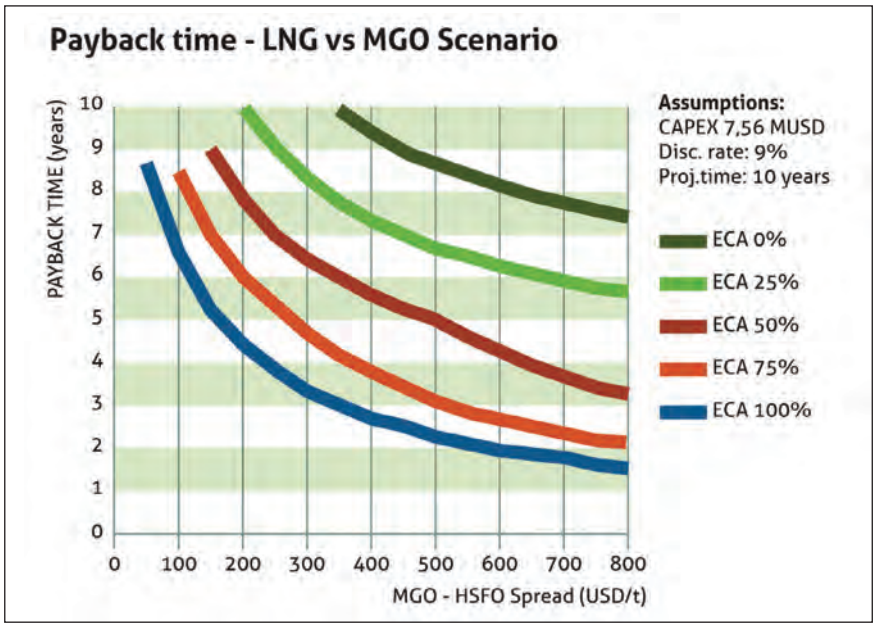
During the conversion the funnel would need to be rebuilt and about 300tonnes of steel work carried out. The vessel's freefall lifeboat would also have to be re-located.

This solution has to some extent been based on experiences gained by Alfa Laval-Aalborg, the equipment supplier onboard the ro-ro vessel *Ficaria Seaways*.

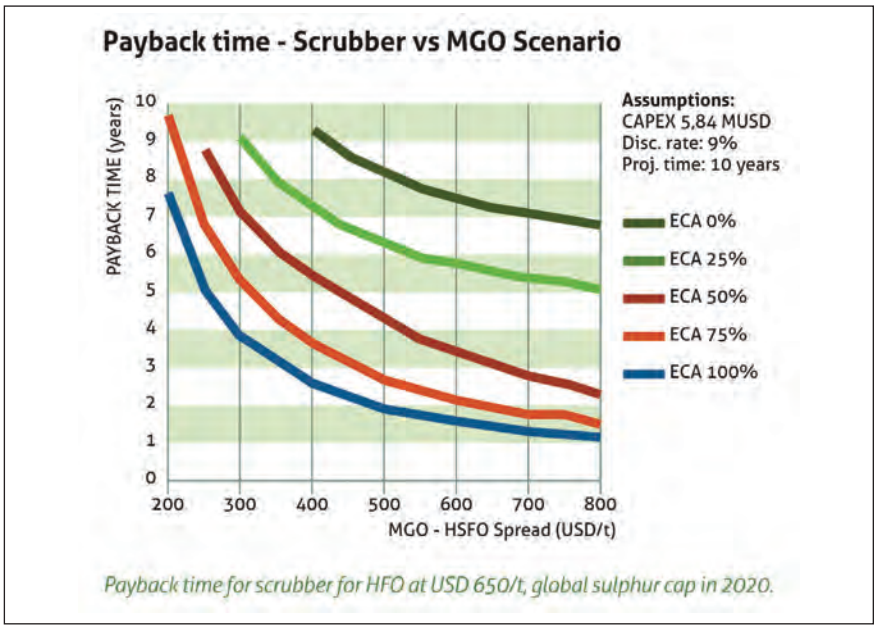
Lloyd's Register's conclusion is that the scrubber retrofit solution would be both feasible and technically sound. Payback times are dependent on the scale of the initial outlay for the scrubber and its installation, capital expenditure and the price differential between MGO to HFO. However, the study concluded that an outlay of around US$6.5 million would be repaid within a little over six years if the price differential between MGO and HFO was around US$350/tonne and the vessel operated within an ECA zone 50% of the time. This decreased to four to five years if the vessel operated within an ECA 75% of the time. A three year payback time would require an MGO / HFO spread of US$650/tonne.

Nord Butterfly operates within an ECA zone some 13% of the time resulting in a

LR's Jesper Aagessenior says the scrubber solution relies on the relative price between MGO and HFO while LNG also has a high capital cost attached to a retrofit



Payback time for LNG alternative, operation on LNG inside ECA and outside ECA after 2020. HFO cast USD 650/t, global sulphur cap in 2020



Payback time for scrubber for HFO at USD650/t global sulphur cap in 2020

nine year payback period if the MGO / HFO spread is US$350/tonne.

LNG as fuel solution

Any owner wishing to convert an existing vessel to a dual-fuel concept, operating on both diesel oil and LNG, will need to convert the main engine to a dual-fuel one and the vessel will need separate LNG storage tanks and a fuel gas supply system.

In this project, two 350m^3 tanks were located transversely on the ship's upper deck forward of the accommodation house. Deck houses for LNG equipment were also placed on the upper deck. One of the challenges in the retrofit project was the location of tanks, deck houses and foundations due to the huge amount of piping on the upper deck.

As LR's conceptual design review did not identify any major or unsolvable problems at this stage, it concluded that the project is feasible from a regulatory point of view. New rules and regulations from LR for gas-fuelled ships will come into force on 1 July, 2012. LR-classed ships that comply with these rules will be eligible for assignment of the class notation GF.

One of the main drivers for converting to LNG, according to the study will be the price of the gas itself. If the LNG price remains US$100-200/tonne below HFO then the gas option is "financially attractive" for a vessel operating 50% of the time within an ECA and assuming a payback time of five years or less.

If the price of LNG is comparable or greater than HFO then ECA operations must take place at least 75% of the time for the LNG option to remain attractive.

Nord Butterfly's repayment period would exceed 10 years as it operates within an ECA only 13% of the time and assuming a US$350/tonne spread between MGO and HFO with LNG set at US$100/tonne below this level.

LR's bunkering study

Availability of LNG is an important issue when considering LNG as fuel for a deep-sea vessel. Independent of the GSF ECA Retrofit Project, LR recently carried out a study on the LNG bunkering infrastructure for deep-sea ships. The study provided an overview of the main global trade routes, vessels' fuel consumption and bunkering hubs. It includes two stakeholder surveys – one on shipowners, the other on ports.

The information gathered in the study has been turned into an interactive model that LR can use to assist clients considering LNG as fuel for deep-sea ships.

It will also provide an estimate of the newbuilding demand for LNG-fuelled deep-sea vessels up to 2025. The full findings of the bunkering study will be published in LR's own *Horizons* magazine.

"Some short sea operators may be able to meet emissions targets and their financial imperatives by using LNG as a fuel: they can control the distribution of relatively small quantities and the proximity of their operations to centres of population, and government policy and incentives may help them easily support such a decision. Others, with significant elements of their route outside ECAs may want to retro-fit scrubbers or continue to switch between high and low Sulphur fuels or go for scrubbers at newbuild.

"This is the challenge for owners: deciding what levels of investment and flexibility to choose. We can help them with understanding the technology but we can't predict what the future price of fuel will be," says Palmer.

The financial solution

The study included a financial analysis of the solutions covering the investment costs (CAPEX) and the operational costs (OPEX). Information on investment costs was gleaned from equipment suppliers and shipyards.

On the operational side, estimates of OPEX were done for each of the solutions under different scenarios based on fuel oil/LNG costs as well as the percentage of time vessels spend trading in ECAs.

The conclusion on the scrubber solution was that the main factor was the price spread between marine gas oil/distillates (MGO) and heavy fuel oil (HFO) while the investment costs had less significance.

For the LNG as fuel retrofit solution the spread between the fuel prices (LNG versus HFO and MGO) are of course also important and the final LNG price plays a role as well. In this case, the investment cost was found to be slightly higher than that of the scrubber solution and, therefore, its impact on the pay-back time is higher, but not the main factor. It is important to note that these factors may change when looking into other ship and engine types and sizes.

Commenting more broadly on the challenges facing shipowners, Palmer says: "Where new fuels are concerned decisions will be different for different operators and be based around the nature and range of their activities: trade, routing, engine configurations, geography and time spent in ECAs will all be relevant. The view looks pretty different from the perspective of a VLCC operator than that of a Baltic ferry owner. And there is the small matter of fuel costs – operators will have to take a view on the likely development of energy prices and differences between HFO, distillates and LNG as well as the relevant machinery costs. That's true for abatement systems as well.

"It's all about having an energy management strategy and understanding the technology that could support such a strategy."

For more information about the study, please visit www.greenship.org where the report and associated presentations will be available. *NA*

The great fuel debate

How does a shipowner achieve the delicate balance between energy-efficiency, sustainability and environmental imprint when choosing the fuel of the future? Lloyd's Register's (LR) head of marine engineering systems Ed Fort argues the pros and cons.

Sustainable power generation is arguably the greatest challenge facing the shipping industry today. Ever-increasing fuel costs and rising environmental demands during a period of global economic uncertainty threaten the very existence of all but the most efficient options within the industry.

While conventional residual and distillate fuel oils can be expected to continue as the dominant fuels for the world's merchant fleet for the foreseeable future, the rising cost of bunkering and, more recently combustion, makes the consideration of alternative fuels for marine power generation crucial. Lloyd's Register is actively engaged with industry in evaluating a range of potential or alternative marine fuels so that industry may rise to and succeed in achieving a sustainable future, not least in marine power generation.

Natural gas

There has been widespread recent interest in the use of natural gas as a marine fuel, particularly when stored cryogenically as liquefied natural gas (LNG). In terms of emissions, the relative advantages associated with the clean combustion of natural gas compared to conventional marine fuel oils are by now well known, including the total elimination of SOx emissions, the almost total reduction of particulate matter and between 80-90% less NOx emissions. Reductions of around 20% in CO_2 emissions are also realised onboard. However, although such reductions may well represent a saving for the marine industry, it may not be evident when considering the impact of LNG production, storage, delivery and combustion as a whole.

While the use of natural gas is well established as a fuel for highly reliable multi-megawatt shore power generating stations, its use as a marine fuel is not without challenges.

The comparatively low volumetric energy density when liquefied at temperatures of -162°C compared to conventional marine fuel oils means that the storage volume required for the cryogenic tanks, typically 'Type C' tanks, will be somewhere between 2.5 to 3 times greater than the volume required for storage of marine diesel oil and even greater for compressed natural gas (CNG). The introduction of prismatic cryogenic storage tanks should see that

storage volume fall to approximately twice the volume required for marine diesel oil.

A further challenge for the industry is the worldwide availability of LNG at the dockside. If LNG is to offer an alternative to conventional marine fuel oils, for ships trading internationally, world wide availability of LNG of appropriate and consistent quality will be required.

Although the future of LNG as an alternative fuel for ships trading internationally remains to be seen, its suitability for ships operating frequently in Emission Control Areas (ECAs) such as shortsea shipping, inshore and inland shipping with frequent bunkering opportunities at one, or a limited number, of established bunkering facilities, is in no doubt. LR is currently engaged in a number of LNG-related projects including *Viking Grace* ro-pax ferry and the inland waterway chemical tanker *Argonon*.

While clearly not a sustainable fuel in the truest sense of the word, with global oil reserves in decline, the prospect of natural gas meeting ever-increasing power demands ashore and at sea while bridging the gap between conventional fuel oils and the renewable or carbon-neutral fuels required for a truly sustainable future is clearly an option.

To facilitate the safe use of natural gas onboard ships class societies are currently working alongside the marine industry in the development of the International Code for Gas-fuelled Ships (IGF Code) and in several related national and international initiatives aimed at ensuring the safety of gas-fuelled ships.

Biofuels

Unlike their first generation counterparts, second and third generation biodiesel offers the potential for a realistic and sustainable alternative, or at least a supplement, to conventional marine fuel oils. Although of lower volumetric energy density than conventional marine diesel oils, biodiesel compares favourably with LNG and is significantly greater than CNG. However, unlike LNG or CNG, storage tanks for biodiesel are likely to be comparable in size and in structure to conventional marine fuel oil storage tanks.

While first generation biofuels are produced using feedstocks, water or land resources traditionally associated with food production, second and particularly third generation biofuels do not compete with either. Second generation biofuels make use of non-edible plants, crop waste or biomass. While third generation biofuels offer the prospect of large-scale production of carbon neutral fuels using land and water totally unsuitable for crop plant or food production.

Natural algae growing on the sea-shore

One of the most promising developments is the use of algae (see image) to produce oils with molecular structures similar to the petroleum and refined hydrocarbon products in use today, offering the potential for manufacturing a range of fuels including gasoline, diesel fuels and jet fuels with the same specifications. Such algae is theoretically capable of producing over 2,000 gallons of oil per acre per year – compared to first generation feedstocks such as soybeans, which yield approximately 50 gallons per acre per year – and in doing so consumes atmospheric carbon dioxide.

In addition to the sea trials of algae-derived biodiesel, LR is also evaluating the use of other alternative fuels currently manufactured from hydrocarbon feedstocks but potentially capable of carbon neutral production using biofeedstocks including methanol and dimethylether (DME).

Hydrogen

In the longer term hydrogen would appear to be the ultimate clean fuel or more accurately 'energy carrier'. If used to supply fuel cell generators the prospect of true zero emission power generation (no SOx, NOx, CO_2 or particulate matter [PM]) and extremely high electrical efficiency (60-70%) could be realised. However, before it may be considered as a practical alternative to conventional marine fuel oils a number of challenges have yet to be overcome.

The volumetric energy density of hydrogen, even when compressed or liquefied, is extremely low. Compressed to 250bar the energy density is less than a tenth of that of conventional marine diesel oils and when liquefied, at a temperature of approximately –250°C, still only a quarter suggesting the need for prohibitively large storage tanks. A further challenge is that the energy necessary for compression may represent as much as 5-20% of energy content of the hydrogen, depending on the storage pressure, and as much as 30-40% for liquefaction.

Such inefficiencies currently make the use of hydrogen as an alternative to conventional marine fuel oils unlikely in the short term for all but niche applications such as vessels with very low power demands, and/or very short trading routes or operating in very environmentally sensitive areas such as harbours or inland waterways.

For hydrogen to replace conventional marine fuel oils as a truly zero emission fuel, it will need to be produced using established or sustainable production processes that are currently the focus of worldwide R&D including electrolysis, photo-electrolysis, high temperature decomposition, photo-biological production and thermo-chemical splitting. In addition to 'green' production hydrogen storage technology will need to improve. R&D worldwide is currently focused on the development of hydrogen storage technologies such as organic hydrides and carbon nanostructures which, if realised, will almost certainly revolutionise our industry and all other transportation sectors too."

The challenges facing the marine industry in striving for sustainable marine power are significant. For its part, LR aims to support the industry by facilitating, without promoting, the use of alternative fuels through the provision of timely and appropriate rules, regulations, guidance and advice. *NA*

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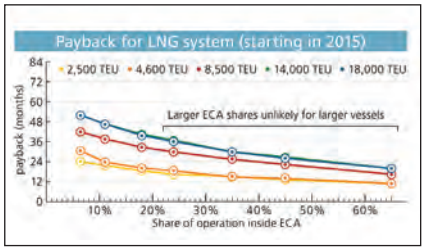
LNG in the box seat

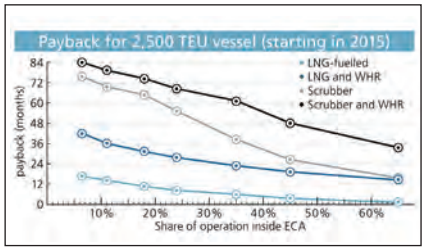
A rash of comparative studies looking at the merits of using MGO compared to scrubbers or converting to LNG when operating in emission control areas (ECA's) are helping owners navigate a path through the regulatory maze. In May Germanischer Lloyd (GL) and MAN Diesel & Turbo offered a similar service to container ship operators.

Container ships operate on a number of routes and trades and vary in size and speed to such a great extent that a single solution would never be appropriate.

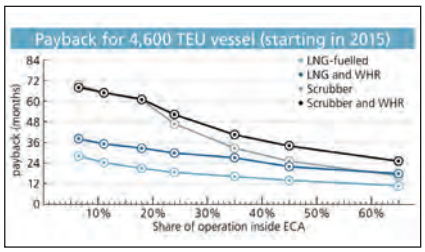
Smaller, feeder vessels would spend a greater proportion of their time within ECA regions thereby changing the economic calculations that will decide whether an operator prefers to use the comparatively expensive MGO, invest in cheaper cleaner LNG or make the smaller investment in scrubber technology that would allow operators to continue operating on HFO. Graph 1 shows the payback times for container ships converting to LNG while graphs 2-4 compares payback times for LNG with scrubber technology.



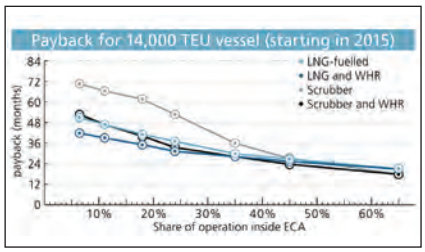
Graph 1



Graph 2



Graph 3



Graph 4

According to the GL report, *Costs and Benefits of LNG as Ship Fuel for Container Vessels*, owners are interested in discovering whether exhaust gas treatment systems could be a better solution to emissions regulations and whether the increased efficiency offered through waste heat recovery would be feasible.

In reviewing the options GL and MAN Diesel & Turbo specified the use of the MAN ME GI duel fuel engine which allows for three different fuel modes; fuel oil only, minimum fuel mode, where the system controls the amount of gas used and is combined with 5% pilot oil, and finally the specific fuel mode where a mix of oil and gas are used.

According to the MAN Diesel & Turbo / GL study: "Cost advantages are the sum of fuel cost savings, additional operating costs and lost [negative] earnings". However, the benefits of LNG or scrubber technology will be dependent on the time spent within an ECA. "Payback time is shorter for the smaller container vessels (2,500TEU and 4,600TEU). This is caused by their relatively smaller investment for the LNG system compared to the large vessels. With 65% ECA exposure, LNG system payback time below two years can be achieved for smaller vessels," says the report.

Variations on the payback times can be seen in graphs 2-4 and some of the results are surprising. For example as ECA operations fall below 20% the scrubber payback time extends beyond 60 months, "which indicates that payback is achieved only after the introduction of the LSHFO quality standard in 2020".

Results also show that the larger vessels will see a shorter payback time for LNG fuels rather than using scrubber technology "using the standard fuel price

Table 1

TEU	Speed (knots)	Main engine power (kW)	Round trip (nm)	default ECA share
2,500	20	14,500	5,300	65.1%
4,600	21	25,000	13,300	11.0%
8,500	23	47,500	23,000	6.3%
14,000	23	53,500	23,000	6.3%
18,000	23	65,000	23,000	6.3%

scenario". According to the report scrubber technology only becomes a viable option when the vessel operates in an ECA for longer periods, which is unlikely for the larger vessels.

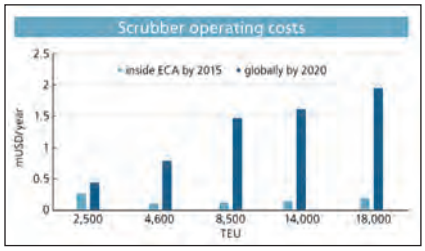
The MAN Diesel & Turbo / GL study assumed the use of wet scrubber systems that reduce SOx emissions by filtering engine exhaust gas using seawater. The scrubber system is place in the exhaust stack of the ship after the turbocharger and "downstream from the exhaust gas boiler".

Water droplets filter sulphur from the exhaust and washwater is then purified and then discharged into the sea.

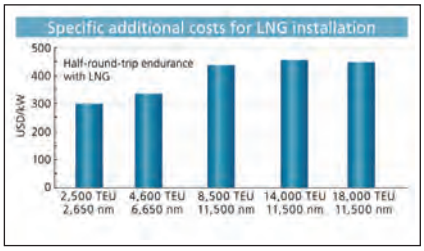
It was assumed that scrubbers were only used to meet emissions regulations. "Their operating costs (see graph 5) depend on operation time and engine loads. An average cost for open and closed loop scrubbers of US$5/MWh was used. Lost TEU slots depend on the space required for the scrubber installation. Up to 0.3% of the total available TEU slots are assumed to be lost. This is assumed to apply only every second voyage. Other operation costs such as crew spare parts and maintenance are assumed to be 20% higher than the reference vessels."

Waste heat recovery (WHR) systems were also studied used in conjunction with the scrubber or LNG. The system heats water in a boiler driving a steam turbine that boosts electrical output.

"The system can be extended with a gas turbine utilising the energy in the exhaust gas not used by the turbocharger. To obtain the highest electrical production the optimal solution is to use a dual-steam-pressure system or even a triple-steam-pressure system if the engine is equipped with a system for exhaust gas recirculation."



Graph 5



Graph 6

The MAN Diesel & Turbo / GL study assumed a maximum benefit of 13% for WHR systems on the largest vessels at 75% MCR. WHR systems would also incur a cost through the loss of cargo space, of 0.4% for the smaller sizes, up to 4,600TEU, while other costs such as maintenance, crew and spare parts are assumed to be 15% higher than the reference vessel.

LNG assumptions were for a "half round-trip" which the report says "controls investment costs", but exposes the owner to "volatile fuel prices". Costs of the LNG system (see graph 6) included tanks, bunker station, gas preparation, gas line, main engine and generator sets.

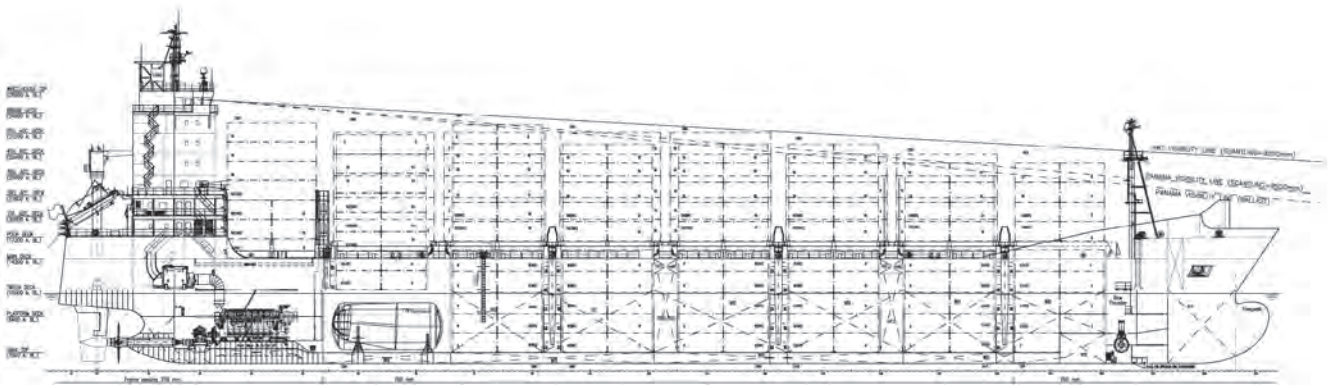
"LNG tanks are assumed to consume TEU slots, resulting in lost earnings, assumed only for every second voyage. The medium-sized container vessels (4,600TEU and 8,500TEU) have the largest losses with a maximum of about 3% of the total available TEU slots. Other operation costs such as crew, spare parts and maintenance are assumed to be 10% higher than the reference vessels."

In conclusion GL and MAN Diesel & Turbo say: "Comparing LNG and scrubber system's payback for the 2,500TEU vessel shows that even at high specific LNG tank costs payback time is shorter for the LNG system [when the standard fuel price scenario is used] than for the scrubber."

However, the report acknowledged that the LNG payback times for the larger vessels would depend heavily on the cost of LNG delivered to the ship. "At price parity of HFO and LNG, based on energy content, payback time for the larger vessels is longer than 60 months [indicating a breakeven is possible only when the 2020 fuel standard is in force.]"

Comparing the energy equivalent units shows that for "the 2,500TEU vessel, a comparison of payback times for the scrubber and for the LNG system, and varying LNG prices, shows that the LNG system is attractive as long as LNG [delivered to the ship] is as expensive as or cheaper than HFO, when the fuels are compared on their energy contents. [In January 2012, LNG wholesale price in Zeebrugge was at US$10.6mm BTU and HFO in Rotterdam was at US$15.7/mmBTU, indicating that LNG as ship fuel appears commercially attractive vs. HFO in Europe.]" *NA*

LNG container ship design



IMO push for WMU renaissance

IMO secretary general Koji Sekimizu said that stabilising the funding of the World Maritime University (WMU) would be a priority. Last month he took the first step to achieving that goal as Dr Oh, Kong-gyun, Chairman and CEO of the Korean Register (KR) was appointed governor of the college.

Koji Sekimizu's choice as governor of the WMU, Dr Oh, Kong-gyun, Chairman and CEO of the Korean Register (KR), has been appointed by the IMO and the new governor has already set his stall out for his tenure.

Identified as one of Sekimizu's four major "opportunities" reviving the flagging interest in education was cited by the IMO secretary general as key to improving the outlook for the maritime industry. Beset by funding problems the appointment of Dr Oh is seen as a first step in finding the financial backing for the WMU necessary to help it survive the economic crisis.

Dr Oh told *The Naval Architect*: "In principle, the IMO secretary general considers various issues when nominating a governor. Finance and fund-raising abilities are one of the most important attributes that a nominee should have. Other skills include understanding of the needs of developing countries, and a rich knowledge and experience of the maritime industry and the workings of government. I am honoured to have been appointed as a Governor and hope to contribute to achieving the IMO Secretary-General's aims to revive the funding for the WMU."

Dr Oh will be the first chairman and CEO of KR to serve as governor of the WMU. "As a member of Board of Governors, it is our obligation to maintain and develop measures to fund the university and its students. The Korean Register of Shipping, even before my appointment, has always been a strong supporter of the WMU through the provision of various technical and financial support."

In accepting the position Dr Oh emphasised that the support necessary for the university was not merely financial, but included providing lecturers who discussed the IMO's Goal Based Standards and KR donated KR-CON, the class society's IMO document database software which allows students and lecturers to access IMO conventions.

Furthermore, Dr Oh says that KR recognises that, "there is a need to strengthen the social network of the WMU alumni. This is important for the university itself as well as its 3000 or so graduates. A strong alumnus will lead to better job prospects for students. It will also maintain the good reputation of the WMU and build a lifelong affiliation to the university. This, in turn, could help with funding as a committed alumnus can often be a useful source of income."

Dr Oh believes that by following the lead of universities such as US King's Point and the Korean Maritime University he can build a strong and successful alumni network. "Fortunately, we have an excellent President of the WMU and the Chancellor of the Board of Governors, both of whom, I believe, are committed to strengthening the WMU alumni in various ways.

I think that to make this practical, regional alumnus networks could be combined into a global network. And this could fit into the programme of the WMU's regional conferences. *NA*

Russian Polarisation under way

The Russian Maritime Register of Shipping (RS) develops Polar expertise.

Services for the offshore industry are identified as one of the major sectors for the development of RS development says CEO Mikhail Ayvazov.

Due to its geographical position most of Russia's seas are freezing. This fact, together with the growing interest towards development of the Arctic shelf oil fields determined RS's focus on ice-resistant offshore development facilities as well as an ice class fleet for supply, transportation and icebreaking, explains Ayvazov.

Currently, the largest Arctic offshore project is the development of the Shtokman gas field which is in an area that has year-round ice cover and will require underwater (under-ice) technologies, including systems of production and offloading of hydrocarbons.

To prepare for the Shtokman project RS developed classification rules for Construction of Subsea Production Systems and for Planning and Execution of Marine Operations back in 2010. The Rules refer to the design, manufacture, operation, risk assessment and verification of compliance with regards to environmental pollution from subsea production systems.

Two drilling units initially intended for the field, *Polyarnaya Zvezda* (Polar Star) and *Severnoye Siyaniye* (Northern Lights) are self-propelled floating catamaran structures with two pontoons and six stabilising columns supporting the hull and topside. They are designed to work in Arctic conditions in broken ice of up to 70cm, at an ambient temperature of -30°C, at depths of up to 500m and they can drill wells of up to 7,500m.

The Shtokman development project foresees the construction of a FPU for gas treatment and transition from the underwater production facility to underwater gas pipes. RS has approved the concept of this vessel jointly with BV.

RS is reviewing the project documentation for a 320m ice resistant FPSO with gas tank capacity of 79,500m^3, intended for gas-condensate mixture extraction by an underwater production unit, gas treatment, storage and offloading to tankers and into a pipeline. *NA*

Different strokes for different folks

Jacques Desdouits of Bureau Veritas (BV) deciphers the meaning of ship efficiency as owners are faced with a wealth of fuel saving devices. BV also introduces its latest software, SEECAT, that models savings.

Shipowners and charterers are always ready to say they want a fuel-efficient ship, and yards are quick to claim they can build fuel-efficient ships. There is also a plethora of fuel-saving equipment and schemes on the market. But, fuel efficiency means very different things for different ship types and trades.

Passenger ships must focus on hotel load in order to reduce costs, while bulkers and tankers must look to reduce fuel use in long haul propulsion, both in ballast and loaded. There is no one answer to all the fuel saving questions.

"There are many devices which save fuel, and ways to design ships which make them more efficient," says Jacques Desdouits, machinery development manager at BV. "But how much they contribute separately or together depends on the ship type and trade. Saving fuel is down to a combination of the original hull design, the equipment fitted, the trade the ship is used on and operational practices. How the ship is operated has a massive influence, so before decisions on capital items are made the yard and owner should know how the ship will be operated, including how the ship is loaded, ballasted and trimmed and how the crew manages energy."

According to Desdouits the complex way in which fuel saving parameters interact has never been fully investigated and evaluated on a specific ship and trade basis. "There is no easily available or agreed benchmark of energy consumption against which to judge changes made to increase fuel efficiency," he explains. "So here at BV we set out to develop a suite of tools to help owners and yards make the most cost-effective decisions on how to save fuel, starting with simple items and working up to a full ship energy model."

BV's new software tools include EMIT, which helps owners build a useful Ship Energy Efficiency Management Plan, and E2, which helps shippers and charterers benchmark emissions for trades. But, the key new tool is Ship Energy Efficiency Calculation & Analysis Tool (SEECAT).

SEECAT was developed with shipyards and owners to provide a ship energy modelling platform for designers and owners to use for energy optimisation of new and existing ships. The model is intended to take into account all energy usage on specific ships and routes so that designers can build and equip and owners can operate ships in the most economical way.

SEECAT represents the ship as a chain of various physical components where the energy is flowing from one to the other. During this energy transportation and transformation, energy losses can be traced and minimised. Based on a user-defined navigational profile, the instantaneous fuel consumption and consequent CO_2, NOx and SOx emissions are calculated.

SEECAT has been validated with real measurements onboard sample vessels to deliver an accurate description of the energy operations of ships. Armed with that analysis, yards and owners can make choices on equipment, speed, trim and operation to deliver the optimum result.

Models for cruise ships, container ships and bulk carriers have been developed for SEECAT and other ship type models now being built. Each model is a basic reference and can be tweaked to represent the actual ship being investigated.

"This is not a quick-fix tool aimed at compliance," says Desdouits. "It is a much more serious and technical tool, complete, complex and detailed. It will enable owners and yards to make initial big decisions based on real information. Using SEECAT, all the variables can be changed and the outputs monitored. That way, changes to hull type and design, decisions on power, speed, propeller and equipment can all be evaluated for a specific ship type and trade."

SEECAT is based on SimulationX software developed by ITI (Germany) and uses the Modelica language, which is a language for component-oriented modelling of complex systems. The ship energy model includes all the systems involving energy transformation or exchange, including all mechanical and electrical consumers such as the propulsion plant, steam plant, generators and other machinery auxiliaries, air-conditioning, lighting, and hotel services.

"Using this model we can compute differences between given sailing conditions, such as normal sailing and slow steaming," says Desdouits. "We can identify and calculate waste energy that can be recovered and we have already seen results from that working with a major shipyard on low-temperature heat recovery systems which yield real results in the form of energy savings."

SEECAT will yield results for ships already in service but will produce the most energy savings if used as part of the design process of a new vessel for a specific trade. Says Desdouits: "SEECAT will improve investment decisions on new equipment, or decisions on changes in operational practice, as now they can be made based on real evidence. We can also use the model to monitor the effects of changes in service, providing real decision-making information and helping owners to deliver the least cost tonne-miles on their trades." *NA*

A transparent approach

Han Wensink, managing director of BMT ARGOSS, a subsidiary of BMT Group and Trevor Solomon, project manager at International Paint, discuss the significance of their companies' partnership and explain why they are confident the new, independent coatings monitoring system will silence the critics.

In October 2011, BMT ARGOSS and International Paint announced the formation of a partnership which can deliver demonstrable and transparent improvements in performance, efficiency and environmental emissions for the global shipping fleet. By deploying International Paint's fouling control coatings in conjunction with the BMT SMART^{SERVICES} system, shipowners and operators will be able to benefit from a measurable reduction in energy use and CO_2 emissions. The system developed by BMT ARGOSS will independently monitor and report to stakeholders the performance of their vessels.

Understanding hull roughness is an important factor in understanding ship performance. Any increase in hull roughness will increase the hull frictional resistance which will either require additional power and fuel to maintain vessel speed or, if maintaining constant power, will result in speed loss and longer voyage times.

Based on evidence gathered from over 5,000 vessel drydocking and inspections for fouling rating, combined with Average Hull Roughness (AHR) measurements, International Paint claims fuel and emissions savings for its Intersmooth SPC coating. Behind this evidence, the International Paint 'Dataplan' system has coating details of over 1.7 billion dwt, representing almost 200,000 drydockings that allow antifouling performance to be predicted and assessed. Results are derived from analysing the in-docking condition of a vessel, its coating performance and assessing the type, severity and extent of any fouling, if present. In conjunction with the vessel's trading pattern, operational profile and drydocking interval, an antifouling performance rating can be calculated. Dataplan also records the vessel's coating condition, including the type, severity and extent of any corrosion, cracking, blistering, detachment and mechanical damage, all of which contribute to, and are included in hull roughness measurement.

BMT ARGOSS managing director Han Wensink says that an analysis of a number of ships showed fuel efficiencies of between 5-22%.

International Paint also cites the 2010 report, '*Energy and GHG Emissions Savings Analysis of Fluoropolymer Foul Release Hull Coating*' by Professor James Corbett's Energy & Environmental Research Associates. The report analysed the latest fuel consumption data of three vessel types coated with Intersleek 900; *Prem Divya*, a single engine 15,500kW tanker, *Ikuna*, a twin engine 2500kW bulker and five identical post-Panamax container vessels, three of which were coated with SPC antifoulings and two with Intersleek 900. The results presented a reduction in fuel consumption of 10% on *Prem Divya*, 22% on *Ikuna* and 5% in five container vessels (based on all five ships carrying a comparable load). The report further stated that if similar fuel efficiency results were realised by all tanker and bulk cargo vessels within the commercial fleet that: "annual fuel oil consumption could be reduced by roughly 16 million metric tonnes [MMT] per year, fuel expenditures could be reduced by US$4.4 to US$8.8 billion per year and nearly 49 million tonnes of CO_2 emissions could be avoided annually".

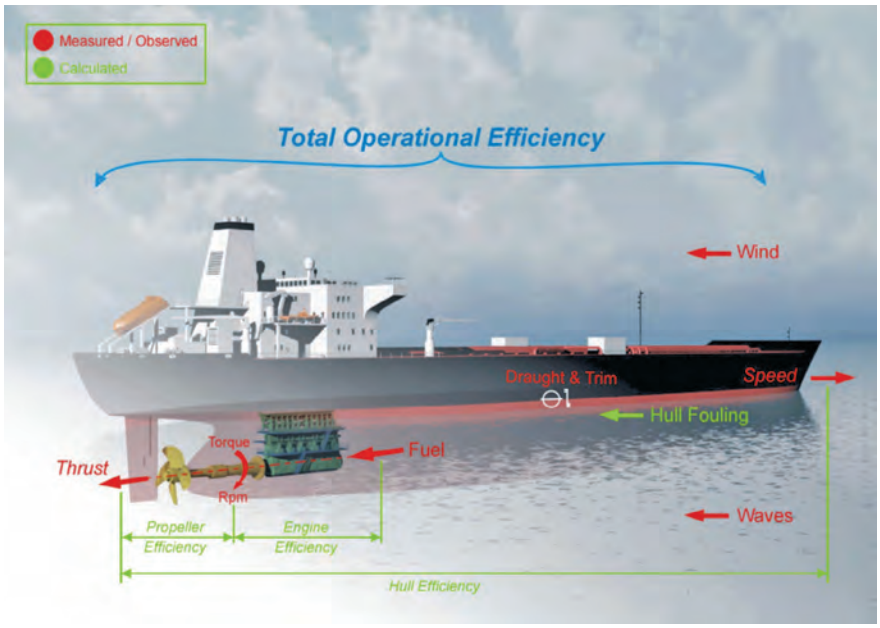
For some these claims are always open to debate. Critics argue that, no matter which coating is applied, a ship will naturally move through the water more smoothly if it has been blast cleaned during dry-docking. Furthermore, they argue the linkage between hull smoothness and reduced emissions is tenuous in that, traditionally, extra smoothness was more likely to lead to some ships being driven faster, rather than save fuel.

On the surface, such seemingly persuasive arguments could be readily countered by observing the growing propensity for owners to operate slow steaming policies specifically in pursuit of fuel (and consequently, emissions) savings. Again while no one would dispute that, depending upon the fouling control system employed, a newly grit-blasted or hydroblasted, freshly coated hull will perform better than a hull at the end of its docking cycle. The point is surely to measure how quickly hull performance deteriorates over time in the context of the coating systems applied.

For this reason, International Paint has been explicit in detailing the alternative methods that have been used as the means of establishing a linkage between the fouling control system selected and potential fuel savings which include:

- Directly comparing the in-service vessel performance when using one fouling control system over its full lifetime to that of another
- Comparing a period of time in-service

Vessel efficiency diagram.



prior to drydocking with one fouling control system to the same period after the dry-docking and application of a new fouling control system

- Directly measuring the same fouling control system over a given time period. This method uses an 'industry view' that a vessel, on average, will lose 5% speed over a 60 month period. This 5% speed loss would translate to roughly a maximum average of 15% increase in fuel in order to maintain speed.

Despite these various methods, International Paint has recognised the importance of providing owners with as much information as possible, on the performance of its products. The collaboration with BMT ARGOSS, a subsidiary of BMT Group aims to do just that – providing independent monitoring which will make both the evidence and methodology cited above incontrovertible.

The BMT SMART^{SERVICES} system, developed by BMT ARGOSS, will capture and compile real vessel data and independently monitor and report on vessel performance. It will record data automatically from ships' sensors to monitor engine torque, the speed log, navigational signals (heading and speed over ground) and provide performance information to the crew and to shore-based management for analysis. The system, which can be installed at the newbuilding stage or as a retro-fit, automatically records thousands of readings per day, providing unparalleled, accurate analysis of vessel performance.

Clearly and transparently measuring the in-service performance of International Paint's hull coatings, the system will draw on BMT's 24/7 in-house and validated MetOcean data which plays a critical role. Whilst it is clearly essential to monitor information onboard, such as the relationship between hull roughness and fuel consumption, the same information must be integrated with the environmental conditions being experienced by the ship. This MetOcean data includes factors such as wind speed and direction, currents (speed and direction), as well as wave height and direction.

The system has been modelled using weighted coefficients to provide the basis for measurement of vessel performance against the condition of the propeller, hull, engine and fuel consumption. In-depth analysis can be used to monitor the propulsive performance of a ship and to indicate how much additional power, or fuel would be required as a consequence of the combined effects of weather and fouling, or of the isolated effects of fouling on the hull or propeller. This analysis enables data trending which can then be used to optimise any scheduling of hull and propeller cleaning events and can be subsequently used to quantify the effectiveness of any such events.

To ensure complete data integrity, all the information that is collected will be sent straight to BMT. The client and International Paint will be able to view vessel data in a graphical or tabular format to develop trend analysis via a secure web interface, but cannot change or manipulate the data. Accurate monitoring of this nature provides the ship operator with a number of benefits including:

- Proof of compliance in line with charter agreements
- Ability to determine the energy efficiency of the vessel within the EEOI (Energy Efficiency Operational Index) encompassed in the Ship Energy Efficiency Management Plan [SEEMP] guidelines
- Provides the ability to act immediately on anything adversely affecting the optimum running of the vessel. For instance hull or propeller fouling and hull damage.

It is the consortium's mission to provide shipowners and operators with robust information in a completely open and transparent way to provide clarity to those using the information. We want owners to secure fuel saving benefits based on fact, whilst ensuring that there is a complete understanding of the actual savings possible, rather than just accepting unfounded claims. It is from many years of proven in-service performance with data from owners/operators, from Dataplan and from independent testimony that we know exactly what benefits each of these technology types can deliver. We strongly believe that this partnership will allow that knowledge to be completely transparent. *NA*

The full 'Energy and GHG Emissions Savings Analysis of Fluoropolymer Foul Release Hull Coating' report can be seen at the following web address: http://www.dft.gov.uk/mca/prof._james_corbett_fluropolymer_as_ecoefficiency_tech_report-2.pdf

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Cathelco launches C-Max ICCP anodes

Cathelco, manufacturers of impressed current cathodic protection (ICCP) hull corrosion protection systems for ships and FPSOs, has launched its latest generation of anodes which combine higher performance with a number of features to simplify installation.

The new C-Max anodes are available in a range from 50amps to 300amps covering the requirements of all types of vessels from small ferries and workboats to the largest VLCCs and container ships.

The anodes are available in linear or disc designs. In the case of the linear anodes, current is emitted from one or more tubular elements (tubes) produced from titanium with a coating of mixed metal oxide. These are mounted on an integral backing shield made from strong, but lightweight ABS plastic.

One important feature is that they are diver changeable, allowing them to be installed or replaced when the vessel is in drydock or at sea. They are also lighter and easier to handle than existing anodes with the largest 300amp anode weighing only 14kg, says Cathelco.

C-Max ICCP anode from Cathelco

The company says that more accurate tightening is achieved through the use of self-snapping torque nuts. When the correct torque is achieved using an ordinary wrench, the top section of the nut snaps off leaving the lower section in intact for future use, so that no torque wrenches are required, greatly reducing the time and effort taken by divers when anodes are changed at sea. The electrical connection is made through a single connecting rod which simplifies the task for the diver at installation and when the anode needs to be changed.

One of the first vessels to be fitted with C-Max anodes will be a bulk carrier (Hull GH405C), which is currently under construction at the Fujian Crown Ocean Shipbuilding yard in China. As the vessel has a length of 190m, it will be equipped with forward and aft ICCP systems. The forward system will consist of two 50amp disc anodes mounted port and starboard, whilst the more powerful aft system will have two 150amp linear anodes with power supplied from modular control panels. *NA*

Joint project for Advanced Polymer Coatings

Advanced Polymer Coatings and Reactive Surfaces Ltd have signed a Letter of Intent to combine their technologies in a joint venture to develop exterior marine coatings with bio-based additives for submersed hull surfaces and stationary structures.

Advanced Polymer Coatings produces a polymer-based tank coating/lining system, MarineLine, used to protect maritime chemical and product tankers. Reactive Surfaces, a manufacturer of bioengineered coating additives, employs an enzyme and peptide technology for its coatings solutions.

Together the companies intend to develop environmentally-benign, bio-based, functional marine coatings for the maritime industry. These new coatings will utilise surface-modifying additives designed to meet or exceed efficacy of current marine coatings.

Donald J. Keehan, chairman, Advanced Polymer Coatings says: "This new generation of exterior underwater coatings we will develop will expand our offering to the marine industry. We plan in the years ahead to take advantage of the growing 'green' trend for non-toxic, low drag underwater vessel surfaces by introducing Reactive Sciences' bio-based functionality into new coatings using natural biomaterials, such as proteins and peptides."

Reactive Surfaces focuses on using its bio-based additives to bring stability and added functionality to coated surfaces, including its self-degreasing additive DeGreez, self-decontaminating additive OPDtox, and antimicrobial additive ProteCoat.

Coatings tests will be conducted by the joint venture partners using a number of these different bio-based additives, in a variety of polymer systems, and in a range of marine environments, simulating both stationary structures and underway surfaces, and culminating with on-ship testing.

Dr. C. Steven McDaniel, managing partner and chief innovation officer of surface technologies explains: "Bio-based functionality employs natural biomaterials, such as proteins and peptides, to provide an enormous resource of functional additives that are non-persistent in the environment, non-toxic and renewable. By focusing on the unique and specific binding properties of these biomolecules, our bio-based additives create an innovative function to coatings systems called 'recharge-ability.' By being able to change or renew functionality without recoating, a new effective dimension is added to the coated marine surface." *NA*

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Longer life for Enviromarine

Gibraltar-based Brunel Marine Coatings has announced that it has received approval for its Enviromarine application, which is able to extend vessel drydocking periods by up to 10 years.

The coating is a complex resin and catalyst system that has around 100% solids, zero solvents, biocides or volatile organic compounds (VOC's). The company has highlighted that operationally, the benefits of a coating with virtually zero microtexture, absolute zero porosity, extreme hardness and a coefficient of friction less than that of glass have proved themselves in improved hull performance (speed/consumption with the added benefit of the inherent reduction in omission such as NOx and CO_2), durability and resistance to mechanical wear.

"Enviromarine is a 100% solids Complex Resin System, in two parts, which naturally cures exothermically, regardless of humidity, to become completely inert and smoother than glass, requiring no further conditioning or polishing. It contains no solvents, biocides, metals or VOC's. All of these characteristics are certified and guaranteed", says Richard Hussey, PR, Brunel Coatings.

Brunel highlights that maintenance is negligible with Enviromarine. Fouling, which may occur in certain trades or lay-up situations, is unable to penetrate the surface, or to use the pores present in other coating systems to gain a foothold, and can be removed by simple cleaning. The coating is completely inert, so there is no environmental concern related to this process as it will not damage the surface or reduce the life of the coating.

"Enviromarine has been observed at sea and in drydock by Class [such as DNV] still in good condition on vessels coated with it over 10 years ago. Indeed, it is the only coating DNV have approved for the 10-year docking interval programme. So, there is in-operation evidence as well as accelerated testing in laboratories up to 25+ years. It also comes with a 10-year guarantee. Unlike other coatings, it does not rely on biocides [which deplete the coating], or on self-polishing to kill or shed marine growth, respectively. Both of these methods mean that these coatings have, by definition, a finite lifespan", comments Hussey.

Enviromarine gets type approved

Reports from owners and class alike have told of vessels returning to drydocks with the coating "fully intact and smooth", and with a paint thickness "exactly the same" as when it had been applied, anything from five to 10 years previously highlights the company. The inert nature of the coating also means that it has no risk of being required to be removed in future under any environmental initiative of legislation, .

It is a combination of these factors that has seen Brunel's latest Enviromarine system selected and approved by flag and class for an unprecedented 10-year dry docking interval programme, which is proving of particular value to owners of vessels wishing to remain at sea for 10 years without drydocking.

Brunel Enviromarine can extend drydocking to 10 yearsj

The fact that Enviromarine is so hard (several times harder than concrete) completely non-porous and smooth means that there is very little friction in operation, and that it is very hard for marine growth to attach to by penetration (or using micropores as anchor points) and the product has very high resistance to mechanical damage. Due to it also being fully inert it has no reaction with either salt or fresh water, and is completely insoluble. Hence the extremely, virtually indefinite, lifespan, he adds.

Hussey highlights that a drydocking means loss of trade/hire, diversion (fuel and pollution), hire of dock, cost of operation/labour, removal of existing coatings each time, and recoating.

Environmentally, there is the removed coating (normally toxic - and designed to be), the grit and the several tonnes of solvents dispersed together with VOC's in the application of another coating. Prolonging this from sometimes as little as 30 months to 10 years saves a fortune, whichever way you look at it.

With 12 newbuildings currently in progress, and an order book with significant options in addition, together with a growing demand for drydock applications and extended docking intervals, Brunel is greatly encouraged by the market at present. *NA*

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International Conference on Ship and Offshore Technology

"Developments in Ship Design & Construction"

Ambon, Indonesia, 7-8 November 2012

Organised by the
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Second Notice

Today, the international maritime industry faces new challenges as it emerges from the global financial crisis. It is therefore understandable that the industry's priority and attention is on consolidation and continued survival. However, at such a time it is all the more important for the industry to look ahead in order to respond to the continuing challenges it will face from the increasing demands of operators, regulators and society for greater efficiency, safety and the protection of the environment, as it emerges from the current crisis. This response will require innovative thinking from all sectors of the maritime industry, and particularly those involved in ship design and construction.

The International Conference on Ship & Offshore Technology – Indonesia 2012 will take "Developments in Ship Design & Construction" as its theme, and will bring together members of the international maritime industry to present and discuss the latest developments in the ship design and construction process which will provide the improvements in productivity and cost-competitiveness necessary to respond to the demand for lower cost of ownership and greater environmental sensitivity. Whilst covering developments in all ship types, it will look particularly at developments in those vessels which are essential to the economies of countries in the region, e.g. fishing vessels.

The conference will cover a wide range of topics with papers such as:

-**On The Seakeeping of Survey Vessels**, B. Abeil, MARIN
-Stability Of Ship With Large Breadth-Draft Ratio In Following Quartering Seas, D. Paroka, Hasanuddin University
-**Design Aspects of Offshore Platform for Combining of Marine Current and Offshore Wind Energy Conversion Plant in Indonesia**, A. Suroso, ITS
-Numerical Simulation Into Drag Characteristic of Symmetrical and Asymmetrical Catamarans With Various Demihull Separations, A. Jamaluddin, Indonesian Hydrodynamics Laboratory
-**Preliminary Study Into The Selection Of Passenger And Cargo Vesses For Eastern Indonesia,** K. Utama, ITS

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Director of Naval Construction/ Naval Architect

Are you interested in the development of future requirements for the New Zealand Defence Force? Does delivering the next generation of Defence Force capability excite you? Our Capability Branch provides management of Defence Force capability development and delivery. The Capability Branch provides a single point of accountability and delivers outputs that enable the provision of joint military effects. The Capability Branch fosters contemporary military specialist knowledge and future thinking, operates using project and financial management disciplines and provides programme and project quality assurance oversight.

Director of Naval Construction

We are seeking a successful candidate that will take responsibility for naval architectural, stability and construction aspects for the Royal New Zealand Navy and in doing so support NZDF medium and longer-term ship acquisition projects.

Key to the success within this role will be exceptional relationship management experience and the ability to manage a wide range of stakeholders across the Defence Force and externally. If you can demonstrate previous experience with warship related design, build or repair environment, a relevant graduate qualification in Naval Architecture, or related field, preferably including to Master's level, and full or fellow membership of the Royal Institution of Naval Architects (or an equivalent engineering institution) / Chartered Engineer we welcome your application.

Please quote NZDF-12-4947 in all correspondence.

For further information, contact John Butcher on +64 4 496 0327 quoting NZDF-12-4947.

Naval Architect

We are seeking a driven individual that will take responsibility for architectural, stability and construction aspects on behalf of HQ NZDF Capability Branch in support of ship acquisition and major upgrade projects. In particular, this role will take responsibility for the naval architecture requirements supporting the Maritime Projection and Sustainment Capability Project which is seeking to replace the current fleet replenishment ship HMNZS ENDEAVOUR. The project, currently in the pre-acquisition phase, is looking to identify and justify a platform (ship) solution to maintain the NZDF's maritime sustainment capability, and if possible use this replacement opportunity to increase the versatility of that platform to undertake other key operations such as sealift or amphibious support.

Our ideal candidate will have demonstrated previous experience with naval architecture and ship construction in a complex acquisition environment and hold a relevant graduate qualification preferably to Master's level.

To be successful in this role, you will possess exceptional relationship management and communication skills and a demonstrated ability to work under pressure in high-consequence and/or hostile interactions involving major acquisition contracts. Your experience in the management of technical regulation in an engineering environment, combined with project engineering skills (preferably including PRINCE 2) will put you in good stead for this position.

If you have these skills and attributes we look forward to hearing from you.

Please quote NZDF-12-51030 in all correspondence.

For further information, contact Anthony Hayes on +64 4 529 6756, quoting NZDF-12-51030.

To view the Position Descriptions and to Apply Online please visit the NZDF website, www.defecencareers.mil.nz/civilian

Applications close 4:30pm Sunday, 24 June 2012, NZ standard time (GMT + 12).

Please note: Applicants must be legally entitled to work in New Zealand (NZ) and be able to obtain and maintain the required level of NZ Government security clearance for the position applied for. The minimum citizenship and residency criteria for security clearances to be granted by the NZ Defence Force are as follows:

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- most preferably a NZ citizen who has resided continuously in this country for the last 10 years, OR
- is a citizen of, and has resided continuously in one or more of the following countries for the last 10 years: either Australia, Canada, NZ, UK or the USA; and has a background history that is verifiable and can be assessed as appropriate by the NZSIS towards a recommendation of suitability for a security clearance at a higher level.

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The Royal Institution of Naval Architects is pleased to announce another opportunity to attend Dr Kenneth Fisher's highly successful three day training programme. The course is primarily designed for project managers who handle day-to-day relations with other parties, people who form contracts and senior managers who monitor contract-related cash flow for marine related projects. Those attending the course will be better able to identify the pitfalls and traps experienced within the industry, and be more prepared to identify all the costs,schedule changes and to properly assign responsibilty for those changes and effects. This will save companies considerable sums in each major contract.

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11- 14 September 2012, London, UK

DM Consulting's Basic Dry Dock Training is a 4-day course that covers the fundamentals and calculations of dry docking.

The course begins with the basics and safety concerns, and progresses through all phases of dry docking: preparation, docking, lay period, and undocking. The course ends with a discussion of Accidents and Incidents.

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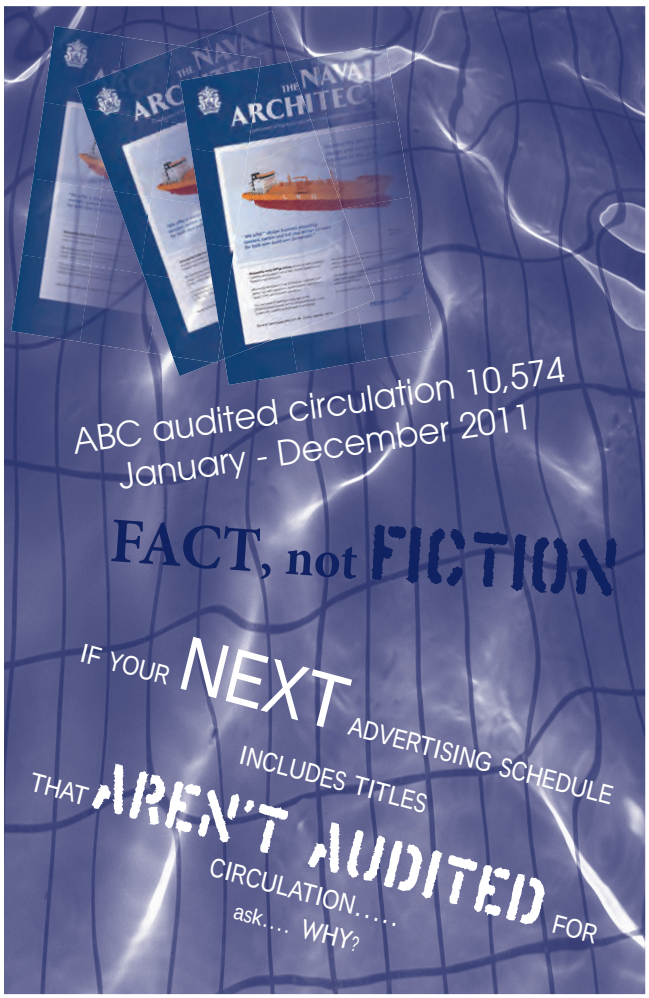
www.rina.org.uk/basic-drydock-2012.html



MARINE COATINGS RISK MANAGEMENT COURSE

2nd October 2012, London

The failure of marine coatings can lead to significant in-service costs for owners and operators of marine vehicles (ships and offshore structures). A good understanding of the problems that can result in coating failure is essential if the risks associated with marine coatings are to be avoided or mitigated and coating in service performance improved hence reducing operating costs through life and the potential for claims.

Marine Coatings – Risk Management is a one-day course for all maritime professionals in who are involved in managing risk associated with marine coatings - legal advisors, insurance claim managers, P&I Club claim advisors, ship superintendents and coating professionals and of course naval architects, marine engineers. No previous knowledge of coatings and the processes involved is required.

On completion of the course, the maritime professional will be familiar with basic coating terminology and risks, understand how these risks can be assessed and/or mitigated, and in the event of a coating failure understand the basic procedures required to assess the cause of the failure and the validity of any claim for compensation.

www.rina.org.uk/marine-coatings-course

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

IMPROVING SHIP OPERATIONAL DESIGN
Compiled By The Nautical Institute Ref: ISOD
This book has been prepared to assist with the feedback from the user and is based upon a survey of the Institute's membership and the solutions advocated by experienced practitioners. The book is essential reading for all those involved in the design process whether in a shipping company, independent design office or shipbuilder. Also sea staff will understand more fully their essential role in communicating with design staff, particularly
when standing by a new building.
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By Fred Walker FRINA
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THE ROYAL INSTITUTION OF NAVAL ARCHITECTS

SAFEGUARD
Passenger Evacuation Seminar

One Day Seminar
30 November 2012, London, UK

- Do we really know that cruiseships and ferries can safely evacuate passengers in an emergency?
- Can we be certain the current passenger evacuation simulation software is realistic?
- How do "real" passengers actually react in an evacuation?

The EU-funded SAFEGUARD research project brings together nine international companies and research institutes based in the UK, France, Canada, Norway and Greece to perform a series of full-scale ship passenger evacuation trials to gather data for calibration and validation of ship based evacuation simulation models.

Data collected from real sea trials on three passenger ships and five semi-unannounced evacuation assemblies will be used by the SAFEGUARD partners to create a large data base of passenger response times and assembly times of a sufficient depth and detail to permit simulation model calibration, verification and validation. It is also hoped that this data will serve as the basis for improved evacuation analysis protocols beyond the International Maritime Organisations (IMO) MSC circular 1238.

- Background on ship evacuation, presenting the partners
- Introduction to the SAFEGUARD project, methodology, description of the three shipping companies and the ships.
- Enhanced Benchmark Scenarios and model performance and the recommendations to IMO MSC.
- Response time data set: data collection, the data sets, implications for IMO MSC.
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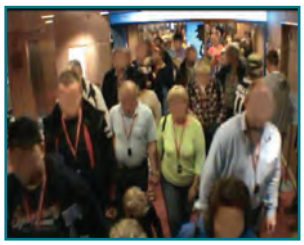
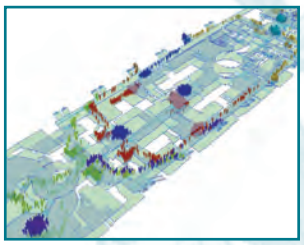

www.rina.org.uk/passenger-evacuation-seminar

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