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Editorial Assistant Robert Grisbrook
Design/Production Manager Sandy Defraine
Group Sales Director John Payten
Assistant Advertising Manager Valder Gates
Advertisement Production Manager Stephen Bell
Subscriptions & Publications Manager Josie Smith
Publisher Mark J Staunton-Lambert

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Editorial & Advertisement Office:
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Tel:+886-7-801-0111 Fax:+886-7-801-8830 Email:sales@csbcnet.com.tw

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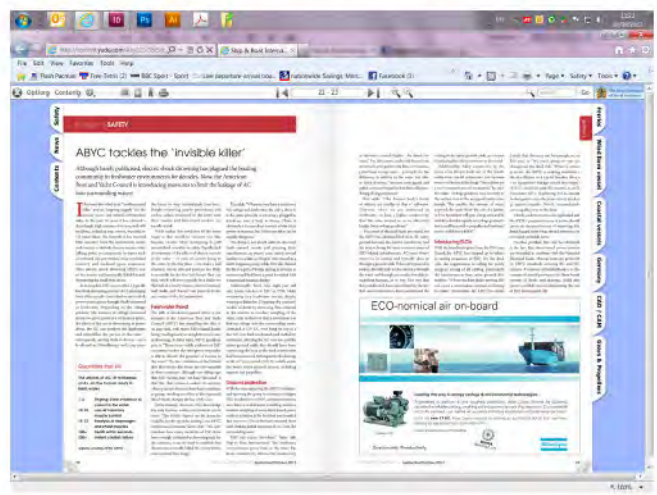

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The darkest hour

Rongsheng yard once a bustling yard now the subject of a takeover bid following its cash-flow difficulties

In folklore it is often said that the darkest hour is just before the dawn, with the view that things can get no worse and so will have to improve.

Shipbuilders and the shipping industry in general may finally have reached that moment with freight rates persistently low in the major trades, scrapping on the rise, but failing to make the kind of impact on the over-capacity conundrum necessary to lift rates.

China's shipbuilders appear to be in a particularly desperate situation with the economy failing, a stock market slide that has wiped millions of dollars off the value of shares, and the kind of collapse in orders that would suggest many yards would be on the critical list if they were left to their own devices.

Even two years ago there were upwards of 1,400 yards active in China, today there are reportedly only half that number still able to build ships and barely 70 of those have actually taken orders for new vessels.

Many yards in China and South Korea, the world's two largest shipbuilding nations by some distance, sought refuge from the gathering storm in the commercial shipbuilding market in the burgeoning offshore industry. Political developments in the Middle East and the evolution of a new form of energy, namely shale gas and the demand for LNG from offshore sites, has developed into a battle of wills between the oil producers and the gas lobby.

Demand for oil has tailed off as the global economic difficulties persist and the oil cartel that is OPEC, the Organisation of Petroleum Exporting Countries, has decided to maintain production at close to pre-economic crash levels. This decision alone pushed the price of oil through the floor and well beyond the offshore industry's breakeven point of around US$80 per barrel.

In addition, a historic deal on nuclear weapons development between the US and Iran has led to the lifting of sanctions imposed on the Middle Eastern country, which will see yet more oil stored in Iran for many years released onto the market, imposing yet more downward pressure on the price of oil and consequently altering the economics of the offshore industry.

At the time of writing Brent Crude had deteriorated to US$48.61/barrel and West Texas Intermediate (WTI) had fallen to US$43.87/barrel. Offshore industry experts say that even if the oil price rose to US$80/barrel tomorrow investors in the offshore market would wait a year to see if this price was sustainable before returning to the industry.

The battle between the oil and shale gas producers has been a major contributing factor to the fall in crude oil prices and for a time it looked like the oil lobby was winning with the number of North Dakota fracking wells falling from 197 to just 80, according to industry reports. However, those same industry reports say that the frackers are winning the oil war.

According to Oil-Price.net: "The [fracking] sector is maturing from one dominated by risk takers to one run by innovators. Rather than repeating the same old formula at every new site, oil producers examined new methods and rapidly evolved the technology in order to survive. Analysts now estimate that the breakeven point of new shale oil wells is $27.50 per barrel, not counting financing costs."

The influential Canadian newspaper the Globe and Mail reported that some 7 billion litres of water were used in the course of fracking in 2013 and that this figure was set to rise by 500%.

Regulation could cause the cost of fracking to increase substantially as already hard pressed water resources are diverted to hydraulic fracturing techniques. This would impact the complex commercial relationship between oil and onshore gas, and increase the demand for oil.

Regulation in shipping would also have an impact as owners are required to upgrade their vessels to meet new environmental targets. Such upgrading will have increased costs that will be passed on by shipowners. But it is precisely because all owners will need to meet these regulations that it will be possible to improve the commercial as well as environmental efficiency of shipping, as no one owner will be able to gain a competitive advantage.

The demand for new ships will not stimulate demand for oil, but the place of refuge that many yards took when the recession hit in 2008 and newbuild orders fell was in the offshore sector. The fall in the price of oil has hit that sector and is therefore no longer a realistic option for yards. In this scenario regulation may be the only salvation for the yards in the immediate future, since the global economy will have to significantly recover for the demand for shipping services to increase substantially and lead to renewed ordering on a greater scale.

If the economic drive is not there to fuel maritime demand and consequently the demand for more ships, and if the price of oil is to remain low, making the offshore sector uneconomic, the only hope for the shipbuilder will be that the shipowner replaces his existing fleet with more efficient tonnage. If so, regulation should, for once, be welcomed as a new dawn rather than feared or resisted as a force that will impose greater costs on owners. *NA*

Market

Clarksons figures show extent of building decline

Latest newbuilding figures from Clarksons reveal the depth of the shipbuilding recession and the rapidity with which orders have declined.

Projections for 2015 deliveries made earlier this year and published in February's *The Naval Architect* showed that vessel deliveries for this year were expected to be 2,150 ships while deliveries for 2016 stood at 1,520 ships.

Second half statistics reveal that this year's deliveries have declined to just 800 vessels, while next year some 2,058 ships are expected to be delivered. This suggests that owners are pushing back deliveries and refusing options.

Vessel deliveries had increased from 1,952 in 2008 to a recent high of 2,375 ships in 2011. Since that year there has been a slow decline in vessel deliveries to 1,300 in 2014. This year will be the first time in the last 10 years that the number of delivered vessels has fallen below the 1,000 mark and that figure will pose a substantial challenge to engine manufacturers and other equipment suppliers who depend, in large part, on the newbuilding market for business.

Consolidation in the equipment manufacturers is a likely outcome with Kobelt already having announced in August that it has acquired Accu-Steer Inc, a US-based manufacturer of hydraulic steering actuators. Meanwhile, the Korean manufacturers' association expects some consolidation and closures as market slides.

Ship power

Wärtsilä restructures business

Fifty seven-year old Jaakko Eskola, currently the President of Wärtsilä Marine Solutions, Senior Executive Vice President and Deputy to the CEO, will take over the role of President and CEO of Wärtsilä Corporation as of 1 November this year.

Eskola will take over as CEO as the Finnish engine supplier continues its restructuring of its Ship Power business, which it has renamed as Marine Solutions in response to the sluggish global marine market.

Restructuring of the business will see a loss of 600 jobs from the 7,217 currently employed globally with some 160 of those jobs being cut in Finland.

Eskola, said: "The marine industry has been slow in recovering from the global economic crisis and new shipbuilding contracting is weak. At the same time, the offshore oil & gas industry has been adversely affected by lower oil prices. In addition, there are risks related to vessel owners negotiating extensions to existing delivery contracts. The combined impact of these developments has created a challenging market situation for the entire marine sector.

Jakko Eskola has been appointed the new President and CEO of Wärtsilä Corporation and will take up his new office in November

These unfortunate capacity adjustments have to be made in this current environment of low demand in order for us to maintain our competitive position in the global market. Despite streamlining the organisation, our commitment to our customers remains absolutely solid."

Meanwhile, WinGD, Wärtsilä's joint venture company with China State Shipbuilding Corporation, which took over 70% of Wärtsilä's two-stroke engine business in January this year, has won an order to supply the power plant for French container line CMA CGM's 20,000 plus TEU container vessel, currently under construction at Hyundai Heavy Industries' Subic Bay yard in the Philippines. The ship will be fitted with a Wärtsilä X92 engine, the largest of Wärtsilä's Generation X series. The unit has a power range from 24,420 to 73,560kW at 70 to 80 rpm.

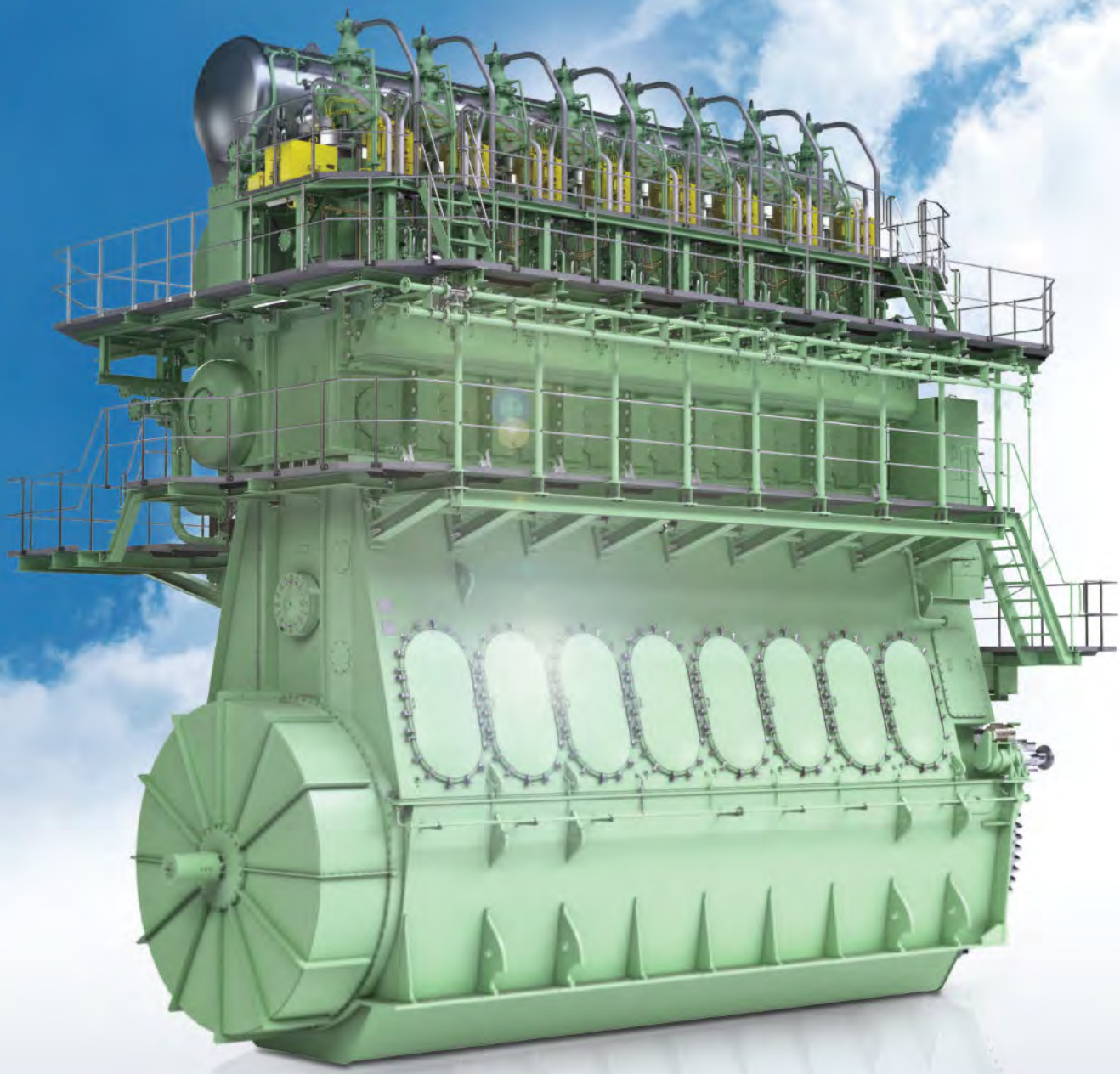
Newbuildings

MES Q1 results expose bulk market decline

Delivery of the 60,000dwt *Elbabe* bulk carrier from Mitsui Engineering and Shipbuilding (MES) could not mask the difficulties being experienced by Japanese shipbuilders as shown by the company's first quarter results released on the same day as the ship delivery.

The Future is Clear

ME-GI dual fuel done right



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Elbabe is the third MES neo60BC Eco-ships to be delivered from its Chiba works and is one of two ordered by owners Niovis Shipping of Greece.

However, on the day *Elbabe* was delivered MES released its first quarter results which reveal the difficulties that the bulk shipbuilding market is in as profits and new orders fell substantially.

New ship orders fell by ¥7.59 billion (US$61.15 million), 13.7%, to ¥47.73 billion (US$384.27 million) in the first quarter and machinery orders fell 25.7%, a ¥10.9 billion (US$87.73 million).

Analysts believe that the Japanese shipbuilding industry will struggle due to its bias towards building bulk carriers and the first quarter results from MES will do nothing to quell those fears with operating income falling nearly 94% from ¥1.94 billion (US$15.62 million) on 30 June 2014 to just ¥120 million (US$966,000) in the same period this year. Total losses in the same period amounted to ¥1.54 billion (US$12.4 million).

Energy

DNV GL publishes energy survey

A survey by class society DNV GL has found that just a third of shipping companies achieved its energy related targets in 2014.

The survey of 80 companies across the all the major shipping sectors included a 35 question poll that sought to identify attitudes to new environmental regulations and the actual uptake of new technology that will help operators to meet new rules.

"This is a call for action to take the single biggest cost position and its effect on each shipping company's bottom line more seriously. For an operator 5% savings in a 40% cost position equate to two percentage points EBITA (Earnings Before Interest, Taxes and Amortisation)," said DNV GL.

The company added: "Based on increased regulatory pressure and charter markets taking energy efficiency into account more and more, the topic is on every shipping company's plate. But it is obviously treated in very different ways as our daily advisory practice shows. We wanted to know, what did successful players do differently? What worked well? Where does the industry struggle? What are the success factors? What are the plans going forward? Or in short: What matters really?"

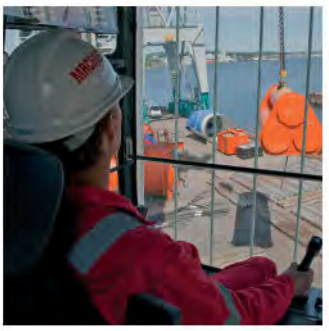
According to the survey results cost is the key driver for energy efficiency and the need to disclose environmental footprint while energy efficiency is named as a key topic of high importance by 76% of the participants.

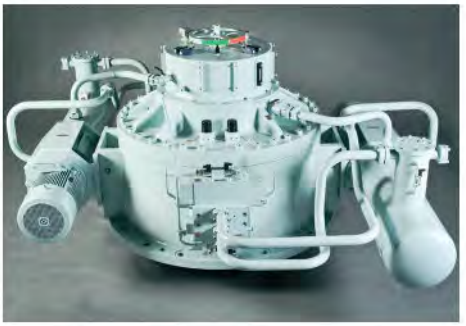
However, respondents to the survey displayed what DNV GL call low ambition levels with energy saving targets remaining low. Some 28% of participants did not quantify a savings target; however, of those that did the average target was just 2.8%.

DNV GL says that IMO initiatives such as the Ship Energy Efficiency Management Plan (SEEMP) and energy management "seem to be purely compliance driven initiatives for about at least 40% of participants. The others have at least made some efforts towards more energy efficiency since 2013."

Survey results showed that nine energy saving measures have been addressed by more than 50% of the respondents. And of these nine eight were operational or managerial changes and one technical.

"Since last year's energy management survey in 2014 the industry has made some progress. Awareness of the problems has increased across the board. The respondents have understood that they struggle and why they struggle. Some shipping companies – but still only a minority – have started effective actions; others still need to take that step," DNV GL concludes. *NA*





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Burning issues

Bunkering and fuel management are just two of the issues that that have been driving owners and operators' vessels performance and has led to increased interest in engine monitoring systems with new innovation on the as far as scrubber technology. The jury is still out as to whether scrubbers will win out over low sulphur as the best solution to the environmental challenge, *writes Sandra Speares.*

Marine scrubber technology company Ionada has won a contract to supply its Membrane Scrubber for MG Management's ro-ro the *Nolhanava*. Ionada will deliver the 6MW Membrane Scrubber in the 4th quarter of 2015.

Yvon Dufour of MG Management stated; "As a company operating in Atlantic Canada we understand the importance of protecting our ocean resources. We chose Ionada and their Membrane Scrubber for their environmental solution".

With the introduction of Ionada's Membrane Scrubber, shipowners can achieve the benefits of fuel cost savings while meeting ECA requirements, with the added assurance of no environmental challenges to overboard discharge as well as simplified retrofit installation.

Meanwhile a new generation Antigoon class dredger, called Scheldt River, being built by Royal IHC (IHC) in the Netherlands on behalf of the Belgium based DEME Group, is to be powered by Wärtsilä dual-fuel engines. This will be the first ever dredger to operate on engines capable of utilising either LNG or conventional marine fuels.

The 104m vessel will have a hopper volume capacity of approximately 8,000m^3. The scope of supply includes one 12-cylinder and one 9-cylinder Wärtsilä 34DF engines, two Wärtsilä controllable pitch propellers and two transverse thrusters as well as the company's patented LNGPac gas supply and storage system.

"Wärtsilä's unmatched experience and extensive reference list in dual-fuel engine applications, plus our complete solutions portfolio, were key considerations in the award of this contract. We congratulate the shipyard and owners for taking the decision to have this new dredger become the first to be capable of using LNG or diesel fuel," says Lars Anderson, vice president of engine sales, at Wärtsilä Marine Solutions.

"Environmental considerations are extremely important for every new vessel built today. Operating on LNG allows DEME to set new standards in minimising harmful emissions. Wärtsilä's dual-fuel know-how and in particular the 34DF engine series made our concept feasible," says Jan Gabriël, head of the newbuilding and conversion department at DEME.

According to diesel power specialist Royston its Enginei fuel management system has been particularly successful in Nigeria, with the fuel monitoring system now being installed in 25 vessels with more installations due over the next few months and the system has helped overcome security and pilfering issues , the company says.

Damian McCann, product manager for fuel management systems at Royston, explains: "Access to reliable fuel consumption data is taking on even greater importance for a wide range of fleet management and fuel security issues.

"We take direct OEM responsibility for the installation and performance of the system - giving ship owners and operators the reassurance that specialist support will be provided for the entirety of a vessel's working life or operational time in Nigeria.

"In addition, our electrical engineers work closely with local fabricators to keep system installation rates competitive.

"We have installation coverage throughout Africa and are now working with many oil sector majors and fleet operators – with initial customer feedback already confirming that significant reductions in fuel consumption are being achieved."

At the heart of the Enginei system is an expanded on board flowmeter and sensor system. This gives the upgraded system the ability to acquire real time engine and vessel performance measurements beyond the usual RPM, GPS and fuel inputs to take in a wide range of other engine control unit outputs.

Installation of the system on board vessels also includes tamper proof armoured cable and a unique tamper prevention tape for flanges and electrical cabinets – which are also locked and robustly secured.

Enginei records the fuel consumption data which is presented on board via touchscreen monitors installed on the bridge and in engine control rooms. In addition, the system remotely sends the information from ship to shore where it can be accessed through a simple web dashboard with computer generated graphs and Google mapping to show an operational profile of a vessel.

Importantly, the new data options include the measurement of fuel consumption by individual engines to enable operators to more accurately determine actual engine load for the scheduling of service and overhaul requirements.

In addition, specific fuel burn data can be provided for different vessel operational modes, as well as consumption measurements per passage and by different captains. *NA*

BWTS

Brackish testing complete

Evoqua's ballast water management system, SeaCURE, has become the first system to complete low salinity testing for ballast water management solutions (BWMS) in an independent laboratory. BWMS are designed to safely protect the environment and world economies from invasive aquatic species damage, and are part of United States Coast Guard (USCG) protocols.

SeaCure completed the brackish water testing phase on 30 July 2015, and is scheduled for fresh water testing and sea trials later this year.

"We're very excited about moving on to the next stages of the process. It is our goal to be the first to complete all three phases of the USCG protocols," says Ian Stentiford, vice president and general manager of Evoqua's electro-catalytic business.

Evoqua decided to test their BWMS at the Marine Environmental Resource Centre (MERC) in Baltimore, US, because they are working to comply with US regulations and believed that US testing would provide the "most realistic and stringent testing conditions for USCG approval."

Gaining approval and providing a long-term solution are crucial in this period of transition for ballast water management regulation. "Approvals such as those we have already achieved will give our customers the confidence that they will not only be investing in a system that has passed the relevant compliance tests on a particular day, but also a solution that will comply with regulations for the lifetime of their vessel," said Stentiford.

The SeaCure system is suitable for gas carriers, tankers, bulk carriers and container vessels, and can be used for vessels with ballast water flow rates ranging from 500 to 4,000m3/hour. According to Evoqua, higher flow rates can be accommodated with multiple units.

www.evoqua.com

BWTS

BWT for Hapag-Lloyd

Hapag-Lloyd is voluntarily installing GEA's chemical-free UV ballast water treatment on its container fleet in anticipation of enforced worldwide standards.

GEA's BallastMaster ultraV 500 has been accepted onboard Panamax container ship *London Express*, so the 294m freighter can "be used worldwide in accordance with the IMO-D-2 standards and [so the vessel] actively contributes to the protection of the maritime ecosystem."

"With a throughput of 500m3/hour, our DNV-GL-Certified system performs the required ballast water cleaning processes by mechanical pre-filtration with subsequent disinfection of the ballast water using UV-C and ultrasound application," says Tilo Pfützke, ballast water project manager, GEA."

The Ballast Master ultraV 500 treatment system

London Express, which entered operation in 1998, posed connectivity challenges, but the treatment system was successfully connected with the ship's software systems bespoke modular integration. The company used an intelligent IO control which Lars Voss, senior superintendent and project manager, Hapag-Lloyd AG, says: "guarantee[s] easy, reliable and efficient system operation from the control room."

Hamburg-based classification company DNV GL has supported and evaluated the joint project. For more information on ballast water developments see pages 52-58.

www.gea.com

Welding

Weld update

Huntingdon Fusion Techniques (HFT) has developed MultiStrike Tungsten Electrodes in response to growing concerns over the radio toxic thoria that is present in standard red tipped tungsten electrodes.

The company discovered that other, non-radio toxic earth elements could replace thoria in the activation of tungsten, and that a mixture of these elements could produce a superior tungsten electrode when added during the manufacturing process. Exchanging these elements also prevents TIG welders from inhaling hazardous dust.

According to a spokesperson for the company, the Multistrike will strike an arc 10 times more than a red tipped thoriated tungsten electrode when tested under identical conditions, making it a cost-efficient option as the Multistrike provides more strikes per electrode. In addition, the electrode carries a traceable identity that may be beneficial for companies operating to ISO 9000 or other standards.

HFT has also developed Weld Purge Film for pipe purging in order to overcome difficulties associated with tandem purge systems, such as PurgElite, QuickPurge and HotPurge. "These systems require an open end to enable the system to be retrieved after the weld is finished, meaning it is impossible to use one of these tandem systems for closing welds," says a spokesperson for HFT.

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"Weld Purge Film kits…can be used for open assemblies and closing welds. The film produces an impenetrable purge barrier, but which can easily be washed away when hydrostatically testing the pipe or just by normal wash out."

Huntingdon Fusion Techniques, developer of the first weld purge monitor, has 40 years of experience in the research, development and manufacturing of gas weld purging techniques.

www.huntingdonfusion.com

Propulsion

MAN Diesel & Turbo packages for Van Oord

Dutch dredging and marine contractor, Van Oord, has placed an order for two trailing-suction hopper dredgers with complete MAN Diesel & Turbo propulsion packages.

Each propulsion package will feature MAN 6L48/60CR engines, which are equipped with high-efficiency, TCA-type, exhaust-gas turbochargers; an advanced electronic fuel-injection system; and electronic hardware and software for engine control, monitoring and diagnosis: SaCoS-ONE and CoCoS-EDS. According to MAN Diesel & Turbo, these technologies will optimise the engines' economic and ecological performance; "Special attention was paid to the energy-efficiency of the vessels… [and] both [will] obtain a Green Passport and Clean Ship Notation."

The propulsion package also supplies RENK gearboxes with PTO, and a MAN Alpha propeller and aft-ship package.

The new vessels will use a complete twin-screw propeller, nozzle and shaft system, including Alphatronic 3000 propulsion controls. Significantly, the propeller blades can be replaced underwater, which means the need for docking is avoided if replacement is necessary.

Propulsion will be controlled by a twin-screw Alphatronic 3000 system from the main-bridge control stations, engine-room control stations, and with an interface to joystick control for dynamic-positioning.

The vessels will be constructed at CNN LaNAval Shipyard in Sestao, Spain, and are scheduled for delivery in 2017.

www.mandieselturbo.com

Couplings

Compression coupling mitigates bad vibrations

Renold Hi-Tec Couplings, based in Halifax, UK, has designed a rubber-in-compression coupling for use in demanding applications including mass transit, marine and power generation that increases component lifetimes and decreases the level of necessary maintenance and operating costs.

This type of flexible coupling aims to protect gas and diesel-driven generator sets from torsional vibration and the effects of resonance by dampening any vibration and distancing the natural frequency of the system from the operating speeds of the engine.

According to Renold, it offers added longevity and value when compared with rubber-in-shear couplings, which they say are prone to early failure because of rapid fatigue from torque fluctuations and reversals associated with diesel and gas-driven systems. A spokesperson for Renold Hi-Tec claims that: "This type of flexible coupling is maintenance free, intrinsically failsafe, and a better option than rubber-in-shear type flexible couplings."

Unlike rubber-in-shear couplings, Renold Hi-Tec's rubber-in-compression coupling provides a drive-through compressed rubber block without metal hubs. This means that the stresses associated with hub twisting are avoided and the level of coupling fatigue is reduced.

According to the company, the compression coupling is able to operate at temperatures of up to 200°C and can offer misalignment capabilities and blind assembly options.

www.renold.com

Bearings

COMPAC solution for MSC newbuild

MSC Cruises has ordered a COMPAC water-lubricated propeller shaft from Thordon Bearings for the first of two Seaside-class cruise ships which have been specifically designed for the US cruise market.

The order from Thorndon will feature six COMPAC bearings in bronze carriers with tapered keysets to fit 664mm shaft diameters, and looks to enhance MSC's environmental credentials.

According to Andy Edwards, Thorndon's commercial director: "[The ship's] structure, shape and systems suggest a cruising future that goes way beyond current environmental regulations and our water-lubricated propeller shaft bearing will help MSC towards achieving that goal. There will be zero oil leaking from the vessel's shaft line."

"Seawater-lubricated propeller systems offer considerable advantages, not only in bearing wear life, predictability, and reliability, but they are also considerably cheaper to maintain, easier to install and there is absolutely zero risk of pollution."

This vision of a "cruising future" will also see that the ship is fully compliant with the Safe Return to Port requirement laid out in the International Safety of Life at Sea treaty 2009.

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MSC's 154,000grt twin-screw new vessel will be the largest cruise ship ever to be built at Fincantieri's Monfalcone yard. It is scheduled for delivery in November 2017.

www.thordonbearings.com

Paints and coatings

New toxin-free fouling release

Duplex, a silicone coating delivered by Smart Surfaces, will feature at Marine Maintenance in Antwerp this year. Its aim is to keep hulls free of marine growth while boosting the vessel's performance and fuel economy.

The coating prevents marine flora and fauna from sticking to a ship's hull and can reduce drag on a ship's hull because of its low friction attributes. This results in measurable improvements in hull speed and can reduce fuel consumption by 7-10%, according to Robert Carr, managing director, Smart Surfaces.

Organisms can colonise a Duplex coated hull when it is stationary. However, as soon as the vessel reaches 8knots, the organisms become unable to grip the hull and are washed away.

Duplex's eco-credentials also contribute to its durability according to Smart Surfaces. "Because its performance does not involve the release of heavy metals or toxins to eliminate marine growth its effectiveness does not diminish with time."

A single coating of Duplex has a life of at least five years, which will "maintain the same level performance as on the first day [it is used]." This offers substantial saving for users as maintenance costs are cut.

The fouling release system was originally developed by the US Navy as an alternative to antifouling products, which have long been polluting US ports; the Fujifilm Corporation now manufactures it. For more information on paints and coatings, see page 78.

www.smartsurfaces.co.uk

Controls

Lilaas enables new bridge design

VARD has collaborated with Lilaas, a manufacturer of maritime control levers, joysticks and wheels, to realise its new bridge concept, SeaQ Bridge.

The joint project has aimed to deliver "controls that report high-level data instantly, reducing the user's cognitive load to enhance performance in high-pressure situations," according to VARD. The SeaQ Propulsion Control, which is part of SeaQ Bridge, has pad-like levers that have been designed to provide customizable touch-based feedback. These levers are also digitally represented on the console screens when in use, visually reinforcing any action taken.

Lilaas has enabled this symbiotic man-machine interface by adapting its LO1 control technology to offer increased touch sensitivity. The LO1 can offer the user "resistance emulating changes in force" because of its compact motors and tailored software, which uses an electronic brake and detent settings.

Vice president R&D technology, VARD Electro AS, Ove Bjørneseth says: "The entire SeaQ Bridge has been designed with the operator in mind, while functionality is built around a new framework for flexible integration of maritime software applications."

SeaQ Control is part an umbrella project from VARD, 'A Step Forward'. This larger project integrates VARD Accommodation, VARD Electro and VARD Design.

www.lilaas.no

Engines

First dredger to operate dual-fuel engine

Wärtsilä's dual-fuel engine is to power a new generation 'Antigoon' class dredger, called *Scheldt River*, being built by Royal IHC in the Netherlands on behalf of the Belgium based DEME group.

This will be the first dredger to operate with engines capable of processing LNG or conventional marine fuels.

Wärtsilä will supply one 12-cylinder and one 9-cylinder 34DF engine, two controllable pitch propellers and two transverse thrusters, as well as a LNGPac gas supply and storage system.

DEME elected to use Wärtsilä's dual-fuel engine because of concern for the environment and the need to meet the tight regulation of inland waterways. "Environmental considerations are extremely important for every new vessel built today," says Jan Gabriël, head of new building and conversion department at DEME. "Operating on LNG allows DEME to set new standards in minimising harmful emissions. *Scheldt River* will easily comply with all local and international environmental regulations."

Wärtsilä has also been contracted to supply the Tianjin Dredging Company, part of the China Communication Construction Company (CCCC) and the recently founded Dredging Group, with engines and all essential ancillaries for a new self-propelled cutter dredger.

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Revolutions can be slow

Martin Stopford says that in his article in the January edition of *The Naval Architect* he explained why "smart shipping" offers the prospect of a major technological revolution in the shipping industry on a scale with the steam engine in the 19th century or containerisation in the 20th century. Here he looks at the pace of change

Shipping revolutions generally take their time, creeping up on unsuspecting shipowners who just want to get on with managing ships and moving cargo.

This was certainly true of the steam shipping revolution – there was a gap of 63 years between the first steam powered voyage on a Scottish canal by *Charlotte Dundas* and Alfred Holt's ability to piece together a ship, the *Agamemnon*, capable of making the voyage to Asia with only a single bunkering stop in Mauritius and 75% of the deadweight available for cargo. Then the sailing ships fought back, incorporating the latest technology (steel hulls, steam winches, wire cables etc) and were still trading in the 1920s, by which time a completely new industry organisation had emerged.

Containerisation presented different problems. The first tentative container voyages were in 1956 and it was not until 1966 that the first transatlantic container service was introduced. Liner companies of the day were reluctant converts, to put it mildly. Not because they did not appreciate the benefits, but because they were appalled by the scope of the change and the difficulties it presented.

As Blue Funnel found: "the fundamental point was that, unlike most marine technological innovations, containerisation of a trade could not be adopted in a slow, gradual fashion. It needed…nothing less than a radical reorganisation of the whole shipping industry." In 1965 they were looking down the barrel of a gun which was threatening to end a type of operation which the company had been pursuing for a century.[1] Arguably it is only now, 50 years later, that containerisation is a mature concept.

The real question today is "what sort of revolution will smart-shipping" turn out to be?

Revolutions are based on hard work

The lesson from history is that each shipping revolution is different, but the common theme is that they all involve decades of painful development, risk-taking and evolution. There will always be doubts. Maersk, the biggest container operator today, did not really get serious about containerisation until the mid-1970s and even then many liner businesses remained dubious about the prospects and were still investing in multipurpose tonnage and ro-ros. But the simple robust system won the day and far more cargo was containerisable than anyone thought possible at the outset.

Shiploads of standard boxes, easily movable on land or sea were the answer and newcomers like Sealand, Evergreen and of course Maersk built them into the dominant general cargo business.

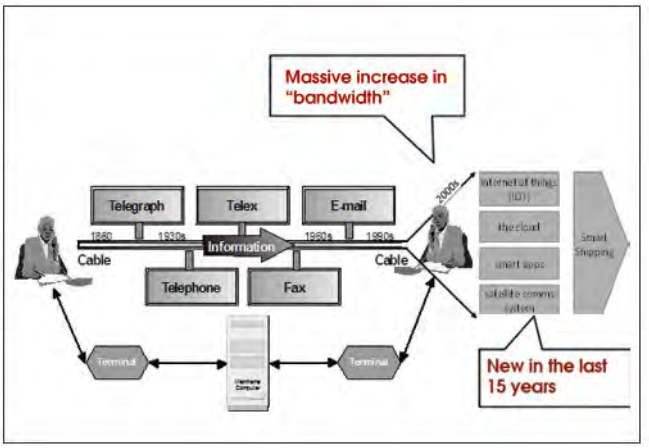

Figure 1: The evolution of information, Communictaion & Technology in shipping 1860-2015

Software engineering

As we move into the smart shipping era, we are building on old foundations. Although technicians focus on hulls and engines, history shows that communications have played an equally big part in the development of the modern shipping business. The diagram in figure 1, which I have taken from my Grout Lecture to the Institute of Logistics in March 2000, discussed the way that the shipping business has evolved around information.[2]

The cable network was a true revolution, creating a real-time global market for ships and cargoes. It took 50 years to build up the cable network. This also allowed the cargo manifests to be shipped ahead of the cargo, leading to a much more efficient system for distributing cargo when the ship arrived.

Telephone, telex, fax and email all speeded up this process, extending the market place and improving efficiency in the use of assets. But the system shown in figure 1 is essentially static. It is communication between points on land. Although we had radio communication with ships for some time, it was limited, expensive and patchy. Each ship continued to operate as a stand-alone business unit. Indeed this concept pervaded the whole business, including finance, corporate structuring and maintenance.

Communicating Change

In the 15 years since I gave this paper we have seen four dramatic changes in the global communications system which, in my January paper, I argued would transform shipping businesses from ships trading as self-contained business units to an integrated management unit; a fleet of ships

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becomes a production unit manufacturing transport. The four developments are: –

- Satellite communications systems: we are moving into an era of when continuous communication with ships is likely to be global (or near global), cheap and reliable. That means data, voice communications can be close to real time.
- The cloud: provides the opportunity to store information in very large quantities globally with cheap and easy access. That means that any information generated by the ship can be stored for operational, management and research purposes.
- The Internet of things: the rise of the ubiquitous "sensor" offers the opportunity to generate digital information about equipment on board ship without the need for human intervention. This means you can monitor just about anything, and it's exactly what is happening in many other transport segments. It is the basis for the "Internet of things" and the feedback loops which enable automation.
- Smart phone technology has provided both the example and the capability to develop "apps" designed to do specific jobs extremely well and efficiently, without the need for massive computer systems. The iPhone technology is light-years ahead of anything in business. But as such it provides a model, an example and a potential inspiration.

New Voyage of discovery

To naval architects used to designing ships, or marine engineers developing engines, all this may sound fuzzy and insubstantial. Where is the pattern? But when Alfred Holt approached the design of the *Agamemnon*, he was dealing with the equally fuzzy technology of the many embryo parts of the steam ship. He put the best design features together in a commercial package that worked.[3] And to the liner companies of the 1960s abandoning the cargo liner system they had grown up with seemed surreal. Adapting to today's digital technology revolution is equally surreal, requiring discipline, protocols and a lot of hard work; the big issue is how to do it.

If the principal of a shipping company with 10 vessels can cope with an iPhone, why not a cluster of smart shipping apps? As Steve Jobs famously said: "design is how it works." The real revolution we need here is not in hardware, it's in how we think about the business and the people who work in it, to turn a portfolio of "stand alone" ships into an integrated business manufacturing sea transport. *NA*

[1] Falcus M (1990) The Blue Funne/ Legend, Macmillan, London pages 360 and 365

[2] Stopford, Martin (2000) " E-Commerce-Implications, Opportunities and Threats for the Shipping Business" Institute of Transport and Logistics 11th April 2000.

[3] Holt's rivals were convinced that Asia was not a viable market for steamers and Holt obviously had his doubts, which the first few difficult years reinforced. Then they opened the Suez Canal and the steam economics became decisive.

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Embrace change – secure employment

Technological change is coming and the maritime industry needs to embrace that change. You will find no argument to that sentiment amongst trade unionists writes Allan Graveson, Senior National Secretary, Nautilus International

It is not that this generation, or any generation, forgets the challenges the last generation faced - that is either a fond memory or a nightmare best forgotten - it is the experience of the generation before the last generation that is forgotten. Whilst the repetition of events such as wars, financial crashes and the mass movement of peoples are not predictable in themselves, once occurred the outcome is all-too familiar.

Technological change can take place at such a slow rate that it may not be readily apparent. Alternatively, it can be so fast that identification and appreciation of its future implications is difficult. New technology brings both threats and opportunities. Unions that recognise this and prepare accordingly are better able not only to survive, but to serve their membership better.

There is a perception that unions resist technological change. In some cases this is so, but equally there is evidence amongst those representing professionals that technological change is not only accepted, but is advocated. Resistance usually arises when change is sudden and with potential immediate loss - notably of employment.

As in other industries, notable events or 'milestones' in shipping are recorded by historians and where analysis has taken place, there is little evidence to suggest that lessons from an earlier time are acknowledged and applied today. The political, economic, fiscal, and legal environment may be considerably different – and so is the technology - but the common factor is change. The evidence of history shows that resistance to new technology, once it is proven and established, is futile.

Human error is frequently cited as a cause of marine incidents - in fact, the most common cause of certain types of accidents. Notwithstanding the imperatives of the parties to obtain a favourable financial outcome by focusing on proximate cause, humans do make mistakes. This is particularly evident where working a 91 to 98 hour week, with incidents concentrated in the 'watch of death' – the night hours of 00.00 to 06.00 when the human body resists thousands of years of development and suffers 'sleepiness'.

We must all face the challenges of new technology says Allen Graveson of the Sailors Union Nautilus

By taking humans out of the workplace it would not be unreasonable to conclude that incidents attributed to 'human error' would reduce. The issue of remote working and unmanned ships certainly has its possibilities, if only to remove the risk of drowning and exposure to long-term health effects of excessive working hours and dangerous cargoes. This is the extreme of such possibilities. Similarly, a convoy of ships with a mother vessel and unmanned vessels like a tug with barges is a possible option. While this and other ideas are good in theory, they will require the 'permission of the sea'.

More realistically, a monitoring and on-board maintenance crew - with a work pattern, dare one suggest, not dissimilar to aviation – could pick up a vessel and take it from A to B, with specialist pilotage available and mooring teams at the ready. It would reconcile the 91/98 hour week to the dustbin. This would receive little resistance from a generation tied to shore by, albeit limited, communication. De-skilling? It is doubtful, these individuals will have to be very highly skilled - and there is also the potential increase in shore-based maintenance, as in aviation. Initially, such vessels may be smaller, but more numerous so creating employment.

Realistically, the next generation and certainly the one after will need skills to meet the requirements of new technology, some of which is currently on the lab table. However, current skills will need to be imparted to those that continue to work with current technology. The saving grace is that the shipping industry moves slowly and resists change - usually on immediate cost grounds, thus affording time to think and adapt to survive.

In the 19th century technological change was coupled with expansion in world trade on a massive scale, while the 20th century was more incremental. There are great hopes and expectations for what technology can bring to a workforce in the 21st century, especially a workforce that works continually more hours than any other on earth. Looking to the past and making a best guess it will be incremental, not devoid of humans, and will co-exist with existing technology for at least two generations.

Shipping is a contradiction, in that risk exists in every sea voyage, yet when it comes to the adoption of new technology it has shown not only a lack of willingness to accept, but often outright hostility to


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change. Decades pass before universal adoption of new technology - even when the economic benefits are apparent, let alone improvements in safety. An industry largely concerned with profit today waits for the eleventh hour to approach before making changes to construction and/or to fit mandatory equipment for safety of the vessel, crew and the environment.

The industrial revolution saw the growth of unions and associations as a consequence of de-skilling of 'trades' and exploitation of the work force. The nature of those organisations and their readiness to resist or embrace change was dependent upon potential threat or opportunity. For Nautilus International - with roots dating back to the formation of the Mercantile Marine Service Association (MMSA) in 1857 - it was to exert influence over the professional qualification and protect members in what was a rapidly changing and hostile world.

Looking back to the period of European expansionism, shipping made it possible and technology made shipping possible. The 19th century was a period of considerable technological advance. Engineers and naval architects took civilisation into a new age of trade and commerce.

In navigation a breakthrough came with a functional solution to the 'Longitude' question by John Harrison in 1761/64, with trials of Chronometer H4. The high cost delayed routine carriage by the Royal Navy until 1825. Such was the cost and distrust of reliance on the Chronometer by commercial shipping, the use of the Lunar Distance Method remained an option until 1907 when the production of tables ceased.

In engineering, steam ships were developed in the early 1800s and the first voyage of an iron ship in 1822 (Aaron Manby). But it was not until the first iron hull screw-driven ship (*SS Great Britain*) in 1847, that steam ships became commercially viable. Unreliability and "free wind" meant masts remained a feature until the opening of the Suez Canal in 1869. Clipper ships co-existed with steam ships, albeit on different routes from the 1850s to approximately 1900.

The 20th century witnessed a change from coal to oil, the development of engine control systems and navigation equipment including the gyro compass, radar/ARPA and terrestrial navigation systems. These developments, while hastened by two world wars, took decades to be universally adopted in commercial shipping - again on cost grounds.

"Shipping is a contradiction, in that risk exists in every sea voyage, yet when it comes to the adoption of new technology it has shown not only a lack of willingness to accept, but often outright hostility to change"

In communications a breakthrough came in the early 1900s with wireless telegraphy, but it was not until the 1980s with satellite communications that navigation changed after 200 years. This fundamental change was not resisted, despite the obvious de-skilling. The worry was taken out of navigation – self-interest, one's life!

Since 1959 IMO has set regulation for shipping via conventions, codes and other instruments - and, increasingly, in recent years by the use of 'non-mandatory guidance'. Invariably, there is a last-minute rush to 'lay a keel' or purchase equipment by implementation date; with 'extensions granted by a circular issued by the Maritime Safety Committee of the IMO. This is as if it is 'a burden' - simply another financial cost that has to be grudgingly accepted. There is no clamour by the industry to make new equipment mandatory, much to the annoyance of those representing equipment manufacturers; the preference is to exercise commercial freedom. This extends to life-saving and fire-fighting equipment.

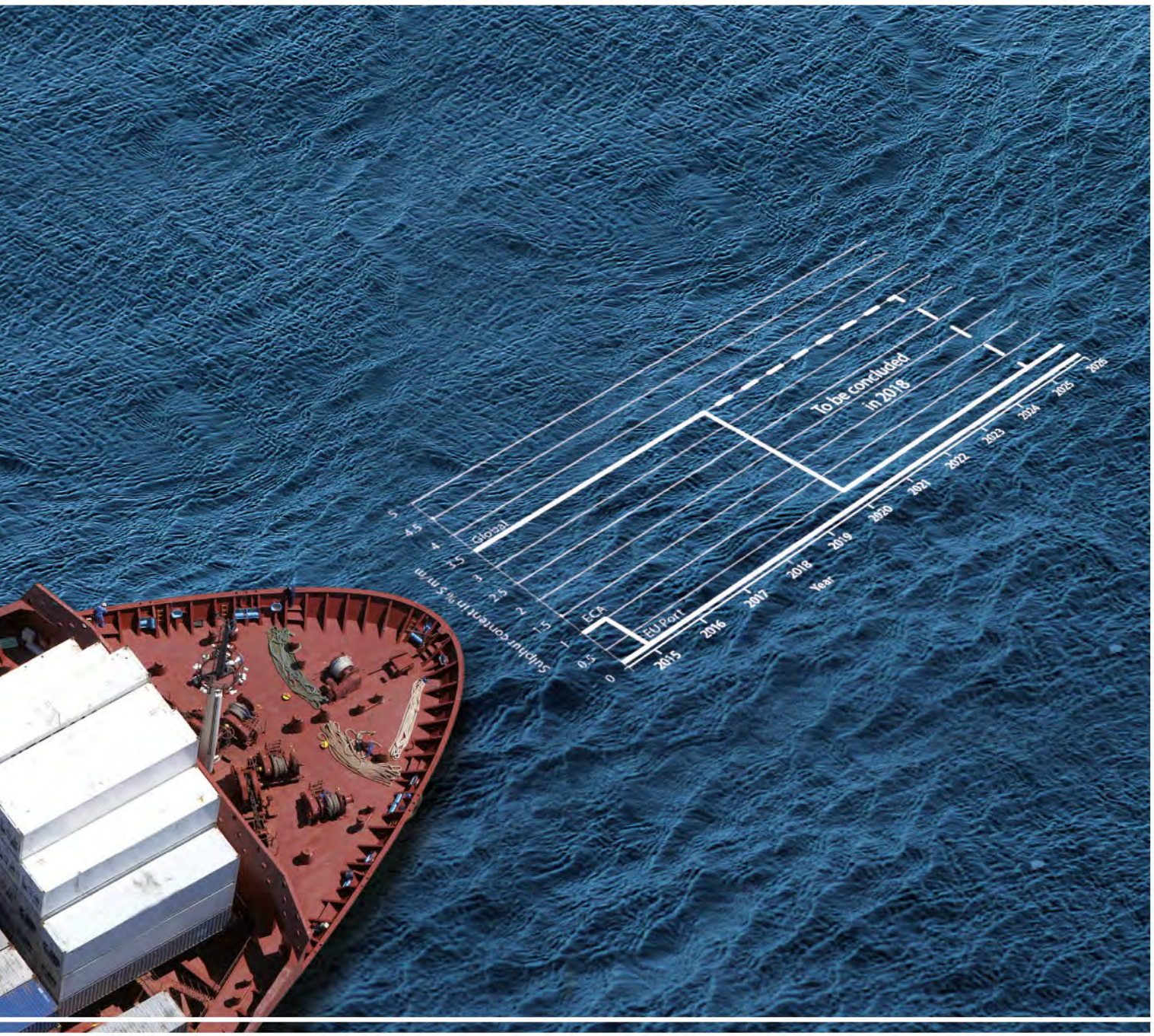
However, the nature of shipping, and the increasing potential to cause significant loss of life, catastrophic economic loss and environmental damage, has resulted in inevitable political pressures for the mandatory carriage of new technology, including radar, ARPA, GMDSS, VDR and AIS and a complex set of requirements for power and control systems. Whilst the industry resists mandatory carriage of new navigation technology, seafarers' representatives press for carriage - after all, they have a more direct interest: their lives!

Similarly, with the move to cleaner, but more expensive fuels - away from HFO that is relatively cheap to the operator - but costly to society given the adverse effects SOx NOx and particulate matter have on health - resistance has come not from this union [Nautilus], but from industry. Not all unions and individuals shared the view that a change to cleaner fuels was necessary. We repeatedly heard the argument that shipping is the cleanest form of transport – correct in CO_2 terms, but not the issue – which, again, is about life.

The only notable resistance to new technology from a UK maritime union came from the Radio and Electronic Officers Union (REOU) with the development of GMDSS and changing communication systems in the 1970s and 80s. As radio officers were increasingly consigned to the dustbin of history, the REOU amalgamated with the MMSA and the MNAOA in 1985 to become the National Union of Marine Aviation and Shipping Transport Officers (NUMAST), now Nautilus International.

Ironically, in response to changes, the REOU had twice renamed itself - firstly, in 1938 from the Association of Wireless & Cable Telegraphists, established in 1912, to the Radio Officers Union and in 1967 to the REOU. A well fought rear-guard action and the persistence of electronic officers in NUMAST, now Nautilus, kept the case for an electronic specialist very much alive. This was realised in 2010 in Manila, with the certification requirements for an Electronic Technical Officer (ETO) included in the Standards of Training, Certification and Watchkeeping Convention 1978 as amended.

The path to Manila was a long journey, the detail of which is still to be



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properly told. What was significant was the certification requirement without a carriage requirement; this satisfied the disparate parties, with union agreement. Absence of certification for a Senior ETO was recognised in the discussions, but was a step too far and difficult for former Chief Engineers present to accept – this is for another day. The workforce was proved to be correct, but it took almost two generations.

The development and eventual obsolescence of long-rage radio equipment initially de-skilled the workforce, with tasks redistributed amongst deck and engine officers. The technological advances that made radio officers obsolete developed to such an extent that they are now an essential part of modern ship operation; new skills for new technology. This is the start, not the end, of this journey.

ECDIS and ENS illustrate the resistance to change by individuals not unions. The cry goes up: "What if the system breaks down" - so what! "You have another back-up". The same argument was made for the retention of masts on ships in the 19th century, where the potential consequence of an engine failure was greater.

As with the industrial revolution, there is an opportunity to create and develop new specialist skills. Integrating the human into communications systems –'augmented reality' - has the potential to up-skill to a degree not yet realised. This has been illustrated recently by Wärtsilä, where engineers can interact with remote service centres ashore.

Similarly, for bridge personnel to enhance interaction between ships and ships and shore with the possibility of removing the vexed question, "What are they doing?" But, please, let's get bridge design sorted – talked about for decades, yet a pair of trainers remains the most suitable footwear. This could be seen as another step in de-skilling, but the complexity of such technology makes this a remote possibility.

Currently communications to ships remains limited, and remains the greatest barrier to future progress. Simply, the hardware over the oceans is not there – it is a capacity issue. Improved communication for commercial purposes affords the opportunity for improved safety and social communication. People joining the industry expect to have the same access to social media and communicate with friends and family as they do ashore. The removal of isolation brought about by reduced crew numbers - and sure to reduce further as technology follows a projected path - will surely be an inducement to accept new technology.

Unions have the ability to bring both a brain and heart to the process of change - to ensure that those working in the industry now and in future have healthy and secure employment. For a union born out of technological change and mindful of the lessons of history, there is no doubt of the continuing need to embrace change – and, in doing so, to set the education and training agenda for the future generations of marine professionals. *NA*

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MILC builds a regulatory framework for smart ships

Development of rules within which smart ships can operate is becoming essential as the use of small scale surface vessels is becoming more prevalent and the debate around the use of much larger smart ships gathers pace. James Fanshawe CBE, Chairman of the MASRWG describes the latest developments

The use of Maritime Autonomous Systems (MAS) is developing at a fast pace and this will continue to grow as technology and research opens up new opportunities.

Current MAS operations have highlighted important opportunities in the maritime world, specifically for Marine Scientific Research, Hydrography and Oceanography. There are significant benefits for Unmanned Surface Vessels (USVs) in the Oil and Gas Industry, who are already deploying large numbers of Unmanned Underwater Vehicles (UUVs).

In addition, they present important new capabilities for Defence and other National Security agencies as Admiral Sir George Zambellas, the First Sea Lord, has made clear. Most importantly, the development of MAS offers significant economic opportunities for the international maritime industry, specifically in the UK.

But this new type of vessel raises some important questions which need to be addressed. MAS are understood to include any type of unmanned vessel or craft, but their range is increasing all the time. Some may be relatively small and slow, but the future tells a different story as demonstrated by the EU MUNIN (Maritime Unmanned Navigation through Intelligence in Networks) project.

As things stand, MAS are operated under existing Conventions, Regulations and Legislation, using agreed and recognised procedures to ensure safety at sea. In the UK, these include Notices to Mariners, Kingfisher Fortnightly Bulletins and MMO Exempt Activity Forms, amongst others.

NOC have already invested heavily in unmanned craft, as can be seen in this picture

Background

The UK Marine Industries Alliance Steering Group has recognised the opportunity to capitalise on the potential growth of MAS. One of the key challenges to this growth is the development of a regulatory framework to support the safe operation of Maritime Autonomous Systems in all of the global designated maritime zones, from the high seas through to internal waters.

In May 2014, the UK Marine Industries Leadership Council (MILC) endorsed the formation of a regulatory working group (MASRWG) to focus on the regulation of USVs and UUVs (when at or near the surface) and the MASRWG was established in August 2014. The inaugural MASRWG meeting was held on 16 September 2014.

The intention of this group is to formulate a regulatory framework and a code of practice, with associated recommendations which will include risk assessments. The aim is to provide documents which can be adopted by the UK and other States, as well as the International bodies charged with the responsibility to regulate the marine and maritime world – specifically the IMO.

The UK MASRWG currently has over 30 members from a broad cross-section of organisations and companies encompassing Government, NGOs, Industry and Academia.

There are three sub-groups working within the UK MASRWG. These are looking at the legal aspects, the opportunities for 'equivalence', and the requirements for training, standards and accreditation.

Whilst the foci of the first and last sub-groups are fairly self-evident, the concept of 'equivalence' may be less well understood. This group is considering how MAS can integrate within the following areas:

- The IMO COLREGS (International Regulations for Preventing Collisions at Sea 1972)
- Issues of ownership, registration and insurance

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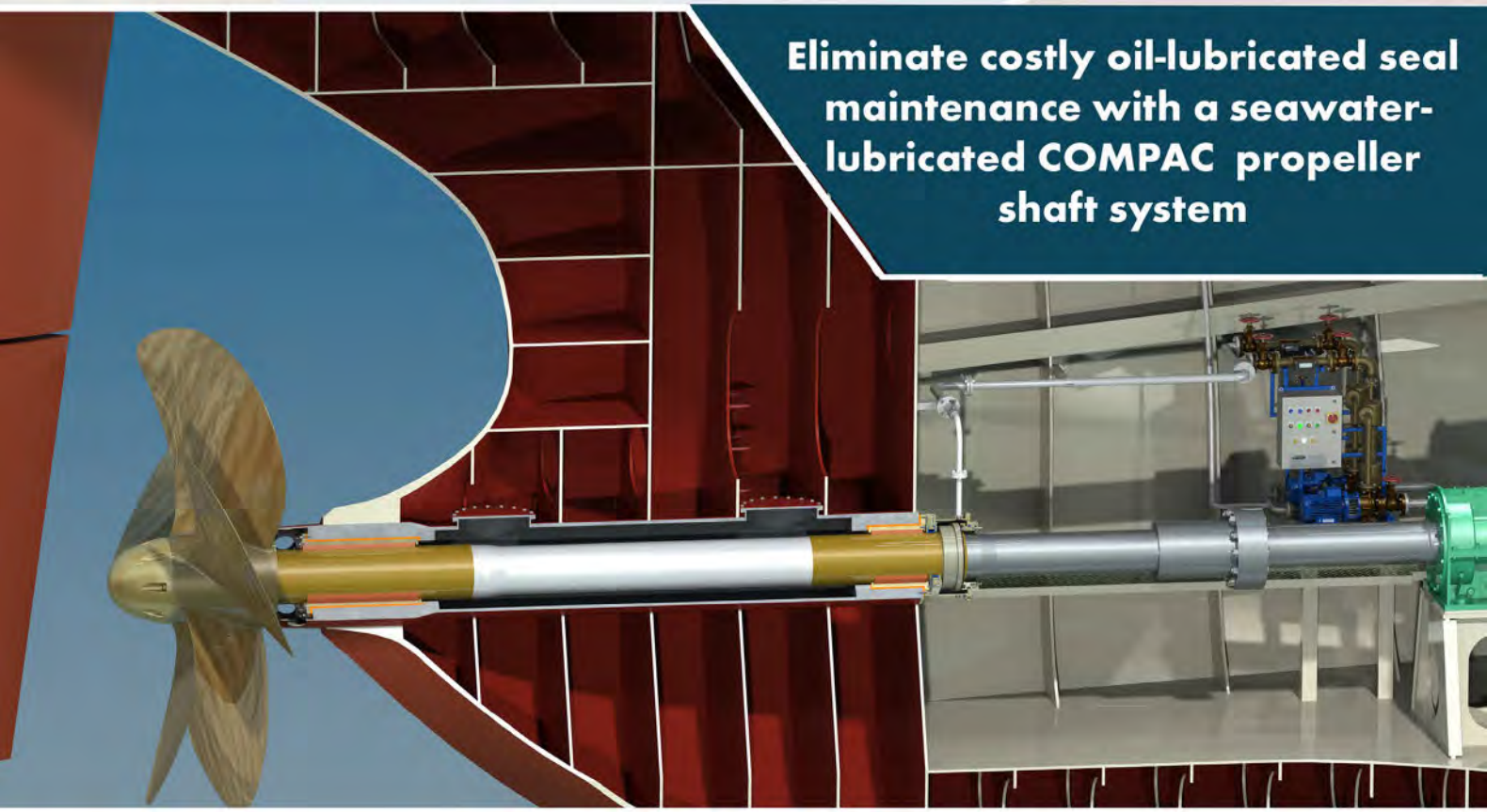

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- Structural integrity with a view to developing a set of classification rules
- Requirements for additional training, accreditation and certification.

Output from the UK MASRWG

The working group's main output will be in the form of a draft best practice regulatory framework which will be submitted to the MCA as part of the Open Policy Approach. This regulatory framework will cover the following key aspects:

- Safety
- Environmental compliance
- Compliance with UNCLOS (UN Convention on the Law of the Sea 1982)
- Compliance with other key maritime and marine conventions where identified.

The following outputs have already been produced by the UK MASRWG:

- Submission of an Information (INF) paper to the IMO Maritime Safety Committee 95th Session (MSC 95) 10-11 June 2015, to raise awareness of MAS and the UK's work on a regulatory framework. The paper was submitted to the IMO via the MCA as the appointed UK Maritime Organisation
- MIA's Maritime Autonomous Systems (Surface) MAS(S) Code of Practice Issue 1, to be developed and regularly updated to provide best practice to a responsible industry
- A further more detailed paper will be submitted to the IMO Safety Committee 96th Session (MSC 96) in June 2016.

James Fanshawe CBE, Chairman of the MASRWG

Further details of the UK MAS Regulatory Working Group can be found at: http://www.maritimeindustries.org/MAS-Regulatory-Working-Group

International Regulatory Conference – October 2015

The MSRWG is arranging an International MAS Regulatory Conference at the National Oceanography Centre (NOC) in Southampton on 14-15 October 2015. Although this event is by invitation only, expressions of interest can be made by registering at the conference website: http://conference.noc.ac.uk/uk-international-marine-autonomous-systems-regulatory-conference-2015. *NA*

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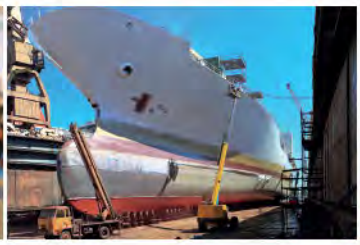


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The right to time

Contractual rights to an extension of time for the delivery of a ship from a yard due to permissible delays and a buyer's right to rescind are complex legal issues for naval architects to grasp. David Price of Hill International explains some of the legal detail in the first in a series of three articles focusing on the commercial aspects of shipbuilding

The award of an extension of time will have the effect of deferring the date of delivery of the vessel. Under English law if the builder is late delivering the vessel due to buyer delays which are beyond the control of the builder and there is no extension of time provision in the contract to cover such a delay by the buyer, this could leave the builder liable for damages unless he argued that the contract was legally frustrated by the actions or non-actions of the buyer.

It is for this reason that it is very common for shipbuilding contracts to sensibly incorporate an extension of time clause. A question often posed is whether an extension of time clause is actually for the benefit of the buyer or the builder? From a legal point of view the extension of time provisions in a contract allow the buyer to vary the scope of work and still keep their right to deduct liquidated damages alive by being able to move back the date of delivery for variations to scope which are causing delay.

Without such an extension of the time provisions in the contract, if the buyer varied the work he would lose his right to deduct liquidated damages and time would said to become 'at large'; this means the builder then only has to complete the vessel in a reasonable time, but he could still potentially become liable for unliquidated damages (actual damages that the buyer can prove).

It is thought that if the original liquidated damages clause was to be set aside then the sum recoverable by the buyer could not exceed the original liquidated damages sums in the original contract. There are many reasons why builders are delayed in constructing vessels, but the following reasons often feature high on the list of delays: force majeure events; failure by the buyer to approve the design within the period allowed in the contract; late instructions and changes; failure to provide free issue materials in time; preferential engineering by the buyer and 'scope creep'.

David Price describes the legal detail of shipbuilding contracts

Force Majeure is not a doctrine that is defined under English law whereas certain civil law jurisdictions do provide certainty over the meaning given to force majeure, consequently in contracts subject to English law the parties will generally set out in detail the scope of matters to be dealt with as a force majeure event. Article VIII of the Shipbuilders' Association of Japan (SAJ) Form of Contract for instance, sets out over thirty matters which would entitle a builder to a valid postponement of the delivery date such as: Acts of God; War or other hostilities; Plague; Flood, typhoons, hurricanes, storms or other weather conditions not included in normal planning; strikes, lockouts or other labour disturbances; labour shortage; import restrictions; explosions; shortages of materials, machinery or equipment; delays in the builder's other commitments and other causes or accidents beyond the control of the builder, its subcontractors or suppliers.

The SAJ Form of Contract has tight time limits within which the builder has to notify the buyer of a force majeure event or risk the very real possibility of his claim for an extension of time failing due to lack of notice within the prescribed limit which occurs 10 days after the date of occurrence of any cause of delay.

This is a challenging 'hurdle' for builders and one which causes many problems in practice. It is very frustrating for builders to have their claims set aside due to lack of notice and buyers will often make the service of such a notice a condition precedent of the contract and expressly state that if notice is not served in the requisite period of time that the builder loses all his rights to an extension of time.

Liquidated damages are included within contracts to recompense the buyer for the late delivery of the vessel and are usually expressed in a fixed amount per calendar day. Historically the amount per day was to be a genuine pre-estimate of the likely losses that would be suffered by the buyer in the event of delay.

If the builder could demonstrate that the damages were not a genuine pre-estimate then the damages could potentially be set aside. However, in recent years we have seen a movement away from this relatively simple approach, whereby the courts now examine if the liquidated damages provision is unconscionable and there is additionally a general reluctance by the courts to find a provision to be unlawful if there is a commercial justification for the provision.

This approach was followed in *Azimut-Benetti SpA v Healey (2011)* where the Court held that a yacht builder's claim for an amount equal to 20% of the contract by way of liquidated damages on its termination of the contract due to the buyer's late payment did not constitute a penalty as it was held to be commercially viable.

The interpretation of liquidated damages clauses in contracts varies across various jurisdictions and buyers and builders should be aware when entering contracts as to whether the sums in the contract can be increased or indeed reduced depending upon the actual damages suffered by the buyer.

A buyer's right to rescind due to excessive delay in delivery is for instance covered in Article VIII of the SAJ form of contract wherein it states:

"If the total accumulated time of all delays on account of the causes specified in Paragraph 1 of this Article, excluding delays of a nature which under the terms of this Contract permit postponement of the Delivery Date, amounts to Two Hundred and Ten (210) days or more, then, in such event, the buyer may rescind the Contract in accordance with the provisions of Article X hereof."

The buyer may additionally have the possibility to rescind the contract under Article X of the SAJ Form of Contract due to; delay in delivery; failure of the vessel to meet the technical requirements of the contract; financial defaults; total loss of the vessel before delivery and other defaults. It is worth noting that in addition to the buyer's potential rights to rescind the contract they also have the potential to bring the contract with the builder to an end if the builder seriously defaults in the performance of his obligations under the contract and in such situations the buyer has the common law remedy of accepting the builder's repudiatory breach and to pursue the builder for a damages claim.

The prevention principle is a doctrine whereby the buyer cannot insist upon completion by the delivery date if he the buyer has prevented the builder from completing on time. This would be relevant if there was a delay to completion caused by the buyer which was not a permissible delay under the contract, as permissible delays give the builder an entitlement to an extension of time.

Clearly persons drafting contracts attempt to cover all potential situations whereby the buyer could delay the builder for fear that by missing such a classification of delay would mean the buyer would lose his right to deduct liquidated damages for any unjustified delays in completion.

The builder would then only be required to complete construction of the vessel within a reasonable time and if the builder unreasonably delays completion of the vessel, the buyer could respond by submitting a claim for recovery of his unliquidated damages (actual damages suffered) in the normal course of events.

Concurrent delay was defined by John Marrin QC in (2002) 18 Const LJ No 6 436, as "a period of project overrun which is caused by two or more effective causes of delay which are of approximately equal causative potency."

The broad consensus in the technical and legal commentaries and cases of first instance seems to be that where the project delay flows from simultaneous concurrent causes of equal causative potency leading to delays felt at the same time, the resulting losses should lie where they fall.

In dealing with the issue of concurrent delay, the legal position has remained static for some years following a flurry of cases. The case of *Adyard Abu Dhabi v S. D. Marine Services (2011)* confirmed the position in the earlier construction case of *Henry Boot Construction (UK) Ltd v Malmaison Hotel (Manchester) Ltd (1999)* that in the case of concurrent delay, where there is an extension of time clause and there has been a delay due to two or more effective causes then the shipbuilder will be entitled to an extension of time if he is delayed by a permissible delay.

However, if there are other competing parallel delays which would not be classed as permissible delays then the builder would not be able to recover losses for that period of delay because it is said that he would have suffered exactly the same loss as a result of his own default. Franco Mastrandrea, a Hill International colleague recently wrote an article in International Construction Law Review [2014] 83, which suggested that this approach may not be entirely satisfactory due to, amongst other reasons:

- Such a definition of concurrent delay is too narrowly drawn;
- An "all-or-nothing" rationale for the resolution of responsibility for concurrent delay is increasingly regarded as unsatisfactory and demand for proportionate, contribution-based, solutions is in the ascendency as for example in an Australian standard form of construction contract (AS4000 – 1997 Form).
- this demand for a more proportionate approach is reinforced rather than diminished by the ability to segregate delays through techniques such as critical path analysis;
- severance should be used where it is possible satisfactorily to separate out the causes of distinctive parts of delay, but where this is not possible apportionment should be used to determine the extent of attribution to concurrent causes;
- apportionment may be appropriate in cases where the relevant events in a construction project are either not amenable to satisfactory segregation, or where such segregation does not materially improve resolution of responsibility for concurrent delay;
- many contract terms in common use do not address these shortcomings, or do so ineptly (if not perversely).

The above is an introduction to time related contractual provisions commonly found within contracts. Delay to completion provokes high emotion at times and it is important for the parties to avoid a 'blame culture' developing.

Good communication between the parties together with the implementation of the appropriate project management software can help to focus the project on the responsibility for delay at an early stage and hopefully engender a collaborative method of working to overcome delays between the parties for the good of the project. *NA*

David Price BSc(Hons), LLB, DipArb, FRICS, FCIArb, Barrister Senior Vice President of Hill International
davidprice@hillintl.com

NUPAS CADMATIC

Desolation row

Shipbuilding is in the doldrums. Not only have owners ordered too much capacity in previous years, but the global economic outlook remains uncertain. In addition the collapse in the price of oil has given owners' further cause for concern. In China this means that many yards, and jobs, are under threat

Maintaining the balance between supply and demand is tricky at the best of times. In shipping the difficulty rating is multiplied due to the long lead times between ordering and delivery.

In the few years before 2008 the boom in shipbuilding was fuelled by cheap loans and a global economy found sustenance in the notional price of property in Europe and the US, with consumers borrowing money against the rising value of their homes.

That boom could never have lasted and when the collapse of the banking system occurred the vessel capacity continued to grow for a couple of years longer as contracts signed months or years earlier were fulfilled.

Today the inheritance of the earlier excess is the tragic failure of many yards and the loss of income for many families. In human terms this is a catastrophe, in economic terms the downturn is an opportunity to get rid of the dead wood, those yards that are inefficient and lack the technological knowhow of some of their competitors.

Ships built in China in the first seven months of this year compared to the same period last year

Source: Clarksons Research

DATES	Deliveries > Builder Country > Asia/Pacific > China P.R. (No)	Deliveries > Builder Country > Asia/Pacific > China P.R. (GT)
Jan 2014	74	3,213,165
Feb 2014	23	976,625
March 2014	52	2,284,005
April 2014	43	1,914,689
May 2014	39	1,842,322
June 2014	54	2,516,652
July 2014	41	1,899,713
	TOTAL 326 SHIPS	14,287,171GT
Jan 2015	86	3,765,102
Feb 2015	39	1,664,592
March 2015	37	1,512,653
April 2015	44	2,342,753
May 2015	42	1,559,954
June 2015	52	2,346,052
July 2015	34	1,880,583
	TOTAL 334 SHIPS	15,071,689 GT

One of the most high profile of closures is the Jiangsu Rongsheng yard, once China's biggest yard with some 30,000 plus employees. The yard has laid idle since February when the last of the 16 Vale orders of vessels, the 400,000dwt *Ore Ningbo*, was delivered. Only a few hundred staff remain at the yard and they have not been paid since November according to local news reports. The same report says that yard negotiations regarding the RMB20.4 billion (US$3.14 billion) debts to a number of Chinese banks, including the Bank of China, China Development Bank and the China Minsheng Bank.

Many other yards are under threat in the three major shipbuilding nations, China, Japan and South Korea. There is a feel that a sea-change is taking place in the industry with a restructuring of the shipyards in all the major shipbuilding countries, Japan, South Korea and China. In China alone some 900 yards have closed, since last year when CANSI, the China Association of National Shipbuilders, reported that there were 1,600 yards operating in the country.

Closure may be a result of the enforcement of the Issue 55 directive on working practices which Beijing enacted at the end of 2011 to improve efficiency in the sector, reduce pollution and increase quality. Or it may simply be a result of the harsh economic conditions forcing closures and consolidation, or a combination of the two elements.

Whatever, the reason Captain Thomas Wissmann, President of consultants Maritime Solutions, argues: "Even assuming no major shocks to the global economy, the eventual recovery from current economic weakness plus and ensuing future growth in seaborne trade and tonnage demand, worldwide shipyard capacity requirements in the next 15 years look set to be well below the levels seen in their peak year of production, 2010. It is estimated that, rather than the 51.6 million tonnes of capacity that was active in 2010, some 39.8 million tonnes could be required in 15 years, or a reduction of 22.9% from 2010. Even if assuming that more regulations come into force during that period and reducing the retirement age of vessels to 25 instead of 30 years still a deficit of around 10.5% would remain."

According to Wissmann: "Chinese shipyards are seeing a general consolidation process that deals with a market rebound and not yet a recovery due to the fact that prices were too low in the two years before 2013. It is projected that the industry is to bottom out in 2015 and slowly start to recover in 2016. In 2015 the industry still has to live with low margin orders from 2012. The

recession of China's shipbuilding sector has seen the closing of many unproductive and speculative yards as the sector undergoes consolidation that is likely to carry on for the next few years."

According to sources in China the country now has only around 700 active yards with only around 85 having received new orders this year.

"One prediction (from sources that cannot be independently verified) included the statement 'that after the consolidation period we will see only 10 Chinese shipyards accounting for 75% of the country's shipbuilding market share'," says Wissmann.

In the first half of this year CANSI says that shipyards in China completed ships totalling 18.53 million tonnes and took new orders for 11.19 million tonnes. CANSI focused a survey on 88 companies and of these their total output amounted to RMB205,600 billion (US$32.19 billion) with export orders totalling US$12.77 billion.

According to Wissmann executives from the leading shipbuilding companies in Japan, Europe, China, South Korea and the United States meet annually at what is known as the "JECKU" shipbuilding summit.

It represents one of the most important shipbuilding summits as all the major shipyards in the world are represented.

Paris was the venue for the last JECKU meeting in November last year and here is an abstract of the most important points in the chairman, Dave Iwamoto's, note at the end of the meeting: "Supply is still outstripping demand in the conventional shipbuilding markets creating imbalances in the day-to-day business. Measures have been taken to address this overcapacity with the yards focusing on the quality of shipbuilding versus quantity and specialisation into new high-tech business fields such as the offshore market. However, these measures alone will not be enough to restore a healthy supply and demand balance in the sector. Further ideas and opinions were put forward and discussed by the regional shipbuilding delegations.

> "Focusing on the environmental footprint of shipping offers real opportunities for the shipbuilding sector to support the removal of underperforming ships from the market "

"Focusing on the environmental footprint of shipping offers real opportunities for the shipbuilding sector to support the removal of underperforming ships from the market and offer energy efficient, technologically advanced vessel solutions to the regulatory demands, which are placed upon the sector. Regulation, hence innovation, is seen as a key driver to promote the fleet renewal into energy efficient vessel types and for the development of technologies to be retrofitted to ships to allow them to meet the energy efficient design profiles required today. Regulation needs to have implementation certainty in order not to impede technology development."

Focusing on technological developments is a shift for the industry and the recent currency devaluations could benefit vessel exports from China, but historically, according to the Organisation of Economic Co-Operation and Development (OECD) the focus for China's shipbuilding industry is as a strategic industry. "The economic strategy in China has initially been to develop shipyard capacity to sustain domestic economic development," said an OECD report into China shipbuilding in 2010.

Last year China produced 326 ships with an LOA of more than 100m totalling 14.28m GT in the period between 1 January and 31 July, according to Clarksons Research. In that same period this year some 334 ships were delivered totalling 15.07m GT, an increase of 5.5%.

Compared to the global outlook these are positive figures; Clarksons forecast deliveries of 1903 ships for 2015 in mid-2014, by January that had increased to 2150, but the revised figure this month of just 800 ships for 2015 reveals just how great a decline and how rapid that decline has been.

These figures shine a light on just how far the supply/demand balance has fallen out of kilter, with pressure on the shipyards to restructure now becoming irresistible and the pressure on the ship operators also increasing, the outlook for the next few years is indeed bleak. *NA*

Lighting China's cruise fuse

Cruise shipping in China is taking off and the shipyards are hoping to get a piece of the action. However, penetrating the cruise ship building market is significantly more difficult than it first appears; ask any Korean yard. Chinese shipbuilders, hope to succeed where others have failed

Passenger numbers on Chinese cruises and the number of cruises originating in China is growing at a fantastic rate, albeit from a comparatively low base. A 14.6% year-on-year growth in cruise ships calling at Chinese ports, 466 calls in all, masks the 43.4% increase in passenger numbers, 860,000 in all, 740,000 of which were Chinese.

That was last year, this year the China Cruise and Yacht Industry Association (CCYIA) expects the numbers to pass the one million mark as ship operators increase the number of vessels in the Chinese cruise market by 50%, from eight to 12. According to the Executive Vice President of the CCYIA Zheng Weihang, the Beijing government has demanded that Chinese industry start to build new cruise vessels and a number of yards have said they are keen to enter the trade.

Helge Hermundsgård, Area Manager & Director Global Cruise Centre at DNV GL – Maritime, told *The Naval Architect* that although no cruise ships are currently on order, plans to enter the market are evolving.

Late last year the Chinese shipyard group, China State Shipbuilding Corporation (CSSC), signed a three-party Memorandum of Understanding (MoU) with cruise operator Carnival Corporation and Italian shipbuilder Fincantieri to explore the possibility of a joint venture in cruise design and shipbuilding for the Chinese market.

More recently, another MoU was signed between Carnival Corporation and China Merchants Group to explore the potential for two joint ventures aimed at accelerating the development and growth of the cruise industry in China.

"These cases show that China is stepping up its preparations for cruise ship construction. In my opinion, we don't need to start from scratch in the construction of cruise liners. We're open to all options, including joint construction with foreign shipyards and cooperation with foreign designers," says Zheng.

Helge Hermundsgård, Area Manager & Director Global Cruise Centre at DNV GL says that cruise operators must tailor their services to cater for Chinese tastes

Perhaps Shanghai Huarun Dadong Dockyard, which was the first Chinese yard to provide dry dock and renovation services for Carnival's *Costa Atlantica* is showing the way forward to other local yards.

Even though there are no cruise ships on order in China, that will surely change as the industry in the region evolves. The advantage of a Chinese yard building a vessel for the Chinese market is clear, those yards will be better able to tailor the designs of cruise ships for the local cruise market as established European and US cruise lines are struggling to meet the needs of their Chinese clients; according to Hermundsgård that means tailoring the service concept to the Chinese market as well.

Complaints from Chinese cruise passengers ranged from the failure of lines to sufficiently recognise those who had paid more for their tickets and treat them accordingly. While others complained that there was not enough Chinese food on offer aboard the vessel.

These complaints are merely about cultural taste, just as Chinese travellers tend to drink less and are less likely to spend an evening in a club, but for Hermundsgård the real challenge for China is to "partner with a European yard, however, none of them are really willing to do so because this will create a future competitor."

He also argues that "two big challenges are competence/capabilities and a good network of suppliers – it will take a long time to develop these," he says.

Cruise industry potential in China is big, explains Hermundsgård, he says "the industry feels optimistic in their future predictions for China. I think we will see China's true potential when brand new tonnage has been operating in the market for a while."

The expectations are that ships such as *Quantum of the Seas* and *Genting World* will be deployed into the market and Hermundsgård says if these ships are a success we will see an acceleration of tonnage deployed to China.

DNV GL adds: "In terms of cruise ship building, China welcomes more foreign shipyards, designers and suppliers to cooperate with Chinese companies and form joint ventures. There is a huge potential in the sourcing of cruise materials and facilities. China might become the Asian sourcing centre for cruise construction in the near future."

However, for the moment it is important for the fledgling industry that more international operators deploy tonnage and develop the cruise experience that will suit the Chinese taste.

If that happens then there is a chance that China will become a sourcing market for international cruises, and this might be equally important to the future evolution of the cruise industry in China.

"One other thing with China is that the distribution system and sales channels are a bit different than for example in the US and Europe. This might be an enabler for faster growth than what we have seen before. A challenge on the other side is that the people's opportunity to plan a vacation is slightly different compared to Europe and US, this might affect the development of the market," says Hermundsgård. *NA*

Quantum of the Seas one of the world's biggest cruise ships will call at ports in China, boosting the regional market

Something old, something new. Deltamarin's technological marriage

As owners and operators seek to come up with innovative environmental solutions for the ferry industry, there have been a number of new designs presented in recent months. Sandra Speares investigates

Deltamarin launched its new showcase ro-pax vessel *DeltaChallenger* during the Nor-Shipping 2015 exhibition in Oslo. Based on Deltamarin's extensive experience, an energy efficient and environmentally friendly vessel has been developed. The design incorporates in unforeseen ways the latest technologies available, and some not so new technologies, many of which are not yet used on any other ro-pax vessels.

To reduce fuel consumption the vessel has six rotor sails developed by Norsepower, giving ca. 10% of the total propulsion power (1.3 MW). Impressive fuel economy and manoeuvrability is gained through the combination of dual-fuel electric machinery, four power plants (2 x 6 MW and 2 x 3 MW) and the new compact Azipod D pod propulsion system from ABB. The steering unit of the pod can be fitted in one deck so that it does not hamper the loading of cars.

The vessel will have GTT Mark III membrane LNG tanks totalling 1,200m^3. The tanks give superior layout advantages making new efficient loading and unloading configurations possible without decreasing passenger and cargo capacity.

The vessel utilises heat recovery and demand controlled ventilation to ensure maximum comfort while at the same time minimising the energy consumed.

Very effective loading and unloading is guaranteed by the possibility to simultaneously load and unload on two levels of the lower hold. The ship will have a total of 2,720m of trailer lanes on the main and upper deck. There are 480m car lanes / 104 cars in two levels in the lower hold which can be loaded with maximum number of trailers. Alternatively by means of hoistable car decks in use, the ship could be loaded with maximum of 950 cars.

"Challenging the existing methods and utilising the latest technologies have always been part of Deltamarin's philosophy. With the new *DeltaChallenger* we aim to show what the future's combined passenger and cargo ship could be. By combining the top-level existing technology, you can create something unique but functional. The right product for the customer may not be the *DeltaChallenger* as such, but the idea is that together with the customer and our partners we can develop exactly the exceptional ship that best serves the customer's s future needs," explains Deltamarin's Manager, R&D Päivi Haikkola.

The Bore ferry *Estraden* with the Norsepower Rotor sail which it tested giving confirmed fuel savings of 2.6% for a single small rotor

Bore contract

Norsepower Oy and Bore announced in June the successful sea trials of Norsepower's Rotor Sail Solution, a new wind propulsion technology for ships. The Rotor Sail Solution was installed on the Bore-owned 9,700dwt ro-ro carrier *Estraden*. The sea trials, verified by NAPA and supported by VTT Technical Research Centre of Finland, confirm fuel savings of 2.6% using a single small Rotor Sail on a route in the North Sea. With these fuel savings, the technology has a payback period of four years. Based on the trials, Norsepower and Bore believe that a full system on *Estraden* with two rotors has the potential to deliver 5% efficiency savings on an ongoing basis.

"The successful trials of our wind technology are a ground-breaking moment not only for Norsepower, and also the wider development of wind propulsion technology for shipping. The results suggest that when Norsepower's technology is implemented at scale, it can produce up to 20% net savings in fuel costs with a payback period of less than four years at current fuel prices, confirming that wind technologies are commercially-viable solutions that reduce fuel and carbon emissions in the industry," said Tuomas Riski, CEO, Norsepower.

The trials were measured and analysed with continuous monitoring systems from maritime data analysis, software and services provider, NAPA and VTT Technical Research Centre of Finland. VTT Technical Research Centre of Finland collected data over a six-month period, during which both the Rotor Sail technology and automation system was operational 99% of the time.

The results confirmed that Norsepower's rotor is able to produce large amounts of thrust force, which enables considerable fuel savings. Reinforcing VTT's findings, NAPA conducted a randomised trial that found clear and significant savings, despite largely calm weather conditions throughout the study. After establishing a baseline profile of the vessel in normal operation, the Rotor Sail was activated and de-activated at random intervals to verify that any measured effect was solely due to the sail, and that any benefit was measurable across the vessel's operating profile.

The average verified fuel savings during the trial in NAPA's analysis was 2.6%. The trial was conducted using ClassNK-NAPA GREEN. "As impartial data analysis and verification is vital for charterers and shipowners looking to retrofit efficiency technology onto vessels, we used both randomised trialling and advanced statistical modelling to ensure objective results. The Rotor Sail offered clear savings against this criteria and adds to a growing list of innovative eco-efficiency technologies that have proved themselves through robust data collection and advanced analytics," said Esa Henttinen, Executive Vice President, NAPA.

"We are proud to be the first shipowner to install the Norsepower Rotor Sail, and demonstrate that wind propulsion technology has verifiable 5% fuel savings on a yearly basis, can be retrofitted without any off-hire costs, and is extremely easy to use in practice. It's our goal to find ways to establish sustainable shipping with minimal impact on our environment," said Jörgen Mansnerus, Vice President, Bore.

The Norsepower Rotor Sail Solution is a modernised version of the Flettner rotor – a spinning cylinder that uses the Magnus effect to harness wind power to propel a ship. When the wind conditions are favourable, Norsepower Rotor Sails allow the main engines to be throttled back, saving fuel and reducing emissions while providing the power needed to maintain speed and voyage time.

Commenting on the Bore contract, Riski said the company had had very encouraging results from the seatrials: "so we can definitely see that our technology is working". The system has a big savings potential and it looks really promising he says. The company is in the process of delivering a second unit to the vessel by the end of the year.

The performance is being measured on a continuous basis with Napa, Riski says. Then they will have a look to see if they can double the savings potential with two rotors. Riski says the company is hoping to have an overall saving of more than 5%.

So is it easy to install? The company is currently using a standard product from Napa. "It is a simple add-on interface to the basic monitoring and research system by NAPA implemented in cooperation with Norsepower," says Riski. It is easy to fit and monitoring systems can be installed to verify the performance of the technology. It should also be possible to sell the technology as a service in the long term, he says.

There is interest in the technology on the market as well as selling it as a service where the customer would be invoiced on the basis of the actual verified savings, explains Riski. There is no other provider on the market, with a product as developed, he says. How the equipment is acquired obviously depends on the balance sheet of the owner as to whether they want to purchase the equipment with maintenance or whether they prefer the service model.

So how much does it cost? In the case of the Bore delivery, the cost for two rotors is approximately €700,000 (US$765,000) with turnkey delivery and an energy saving of approximately 5%. These are fairly small rotors in a big ship and Riski says that the company is fairly confident that slower steaming vessels with bigger rotors could make savings of up to 20%.

The company's portfolio includes two bigger rotor models, the one running on Bore's vessel is 18m by 3m, with the next models up being 20m by 4m and 30m by 5m. The company has the ability to start manufacturing these, Riski says, but the company is looking for either a customer or a partner to move to this stage. There is a lot of interest among bigger operators, he says. There is interest in the market "but we would very much like to close one of the next agreements."

The equipment should pay for itself within four years on the current pricing level provided the wind conditions are good enough. "When you are using wind propulsion, you have to have as good wind conditions as possible. I'm not saying this would be the solution for all the consumption problems of the entire global fleet, but in areas with enough wind, you can make a very good business case."

The product is therefore more appropriate for certain markets than others. "The most important factor is that you have a high enough average wind speed." The second point is for the wind to be from a favourable direction compared to your typical route, he says. The favourable direction is "through wind from the beam," he says. Three interesting market areas include the North Sea and Baltic Sea as well as the North Atlantic and North Pacific.

The prototype has been run with a through wind speed of 25m per second at full speed, without any trouble, he says. You can operate the rotor in any kind of weather and it is also safe to use in any weather conditions but in a huge storm the interest is not really in saving fuel. In entirely calm conditions, the technology is not going to work properly. "When you have no wind you are saving nothing. To understand the potential you have to combine the weather statistics with your route area."

In terms of the fuel price, if this was at the same levels as last year, there would be half the payback with the new technology with a double fuel price, says Riski. "The substitute for our technology is actually heavy fuel oil. The more expensive the heavy fuel oil is, the more likely you are to see our technology on the oceans. The more expensive it becomes, the wider the market area for wind propulsion."

The DeltaMarin project was a fascinating project he said and "I think it is a good showcase example of what can be done with technologies that are already available on the market. *NA*

Rederi

Rederi AB Gotland has signed a contract with GSI Shipyard in China for one more passenger and cargo ship with capacity for 1,650 passengers. The order means that Rederi AB Gotland has exercised its option to order a sister vessel to the first vessel whose contracts were published in autumn 2014. Both vessels will be operated with chilled natural gas, LNG, with significant environmental improvement.

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Third hybrid ferry for CalMac

Ferguson Marine Engineering Ltd (FMEL) is building a third hybrid ferry which is due to be delivered next year. Sandra Speares reports

The £12.3 million (US$19.02 million) contract to build the new vessel, known as Hull 727, was awarded last September and is the first major deal for the company since it was taken over by Clyde Blowers Capital.

The new vessel is expected to be launched in spring 2016, before entering service in the autumn of 2016. It will use a low carbon hybrid system that combines traditional diesel power with electric battery power. The system will lead to a reduction in fossil fuel consumption and carbon emissions. It will be built to accommodate 150 passengers, 23 cars or two HGVs, with a service speed of nine knots.

Ferguson Shipbuilders, Port Glasgow, Scotland, worked alongside Glasgow based ship design specialists Seatec and electrical specialists Tec-Source to fit out the two hybrid ferries. The ferries will be operated by the current operator, CalMac and will use some of the most innovative new 'green' technology, including battery banks supplying a minimum of 20% of the energy consumed on board. The ferry is powered by small diesel generator sets, feeding power to a 400 volt switchboard, which supplies power to electric propulsion motors that turn the propulsion units.

In addition, two lithium-ion battery banks with a total of 700kWh also supply power to the units reducing fuel and CO_2 consumption by at least 20%. The battery banks are charged overnight from the mains.

The vessel design and power configuration additionally realise 19-24% savings of power input to the propulsion units over a conventional diesel mechanical solution reducing CO_2, SOx and NOx emissions.

Meanwhile, Italy-based classification society RINa has launched a major ferry safety initiative. The Asset Integrity Management scheme for ro-pax ferries covers fire risk mitigation, single-failure risk assessment, enhanced planned maintenance and condition-based monitoring and also food and bacteriological risk management. The initiative also covers specific training for ro-pax crews, including behavioural training to avoid and manage crises,

Paolo Moretti, General Manager Marine, RINa Services, says: "With over 300 ferries in our class we are the world leaders in ro-pax ferry safety. That gives us two things. One is a lot of experience and feedback from vessels in service, the other is a sense of responsibility. We feel that as the class of choice for these types of vessel we should show a lead in safety standards which go beyond regulatory basics."

RINa's package of initiatives builds on its recent work with major cruise and ferry operators to extend tailored risk management services to the marine industry.

Moretti says: "Our experience shows that operation and maintenance of these vessels merit particular attention. Extending targeted risk-management to ro-pax operation will bring benefits for operators and in overall safety."

Specific parts of the ro-pax package are a fire risk identification and mitigation service, a series of training courses for crews and shore staff which focus on teamwork and behaviour in a crisis, and a service to identify and mitigate the risk of any single failure impacting the ship and its operations severely. There is also a focus on condition-based monitoring and enhanced and targeted planned maintenance and a bacteriological risk assessment and mitigation service. The first company to use the new package is Grimaldi Lines, which will implement the measures on the 22.5 knot 954-passenger ro-pax vessel *Florencia*.

"What we are doing is bringing the disciplines used in offshore industry into passenger ship operations," explains Moretti. "It began with a hot spot analysis service and we have extended that to a Single Point of Failure standard approach. The scope of this analysis is to assess the risk associated with a single failure of particular equipment or systems which may have severe consequences on the ship's service and operation and to identify the most appropriate mitigating measures to be implemented. The analysis evaluates the ship's system availability in the case of any single failure."

The systems to be analysed, which can include propulsion and safety systems, navigation systems, sanitation and hotel services, the consequences to be considered for the people on board and the definition of likelihood are all decided in cooperation with the customers depending on their objectives.

"We think of this as a Marine Asset Integrity System, and that was the platform for developing a specific package for ro-pax ferries," says Moretti. "As it goes beyond prescriptive requirements it can be tailored to the individual circumstances, ships and routes of each operator. Our experience helps them to focus on the things that might go wrong and the consequences if they do, and then our risk management services help to find ways to limit the likelihood of those critical issues going wrong. It means taking a long hard look at how big complex systems like ro-pax and other passenger ships work. It covers not just machinery and systems and operations but issues such as bacteriological risk, which is a big concern for passenger ships. It is simple in principle, very complex in practice, and requires both experience and specific skills."

Ferry agenda

Some of the latest innovations in ferry technology will be featured at trade association Interferry's 40th anniversary annual conference in Copenhagen in October.

Presentations will include one from Oskar Levander, VP Innovation, Engineering & Technology, Rolls-Royce Marine, Finland, which will cover a variety of topics, such as increased automation, smart controls, robotics, optimisation and decision support tools, equipment and system health management and predictive maintenance schemes. Ship intelligence will also drive the development of remote control and autonomous solutions. The first unmanned commercial ships will likely be locally operated vessels, since single flag states can permit their operation before international regulations are in place.

One prime candidate for early adoption is the road ferry. They operate within a confined area and there is a clear desire to address the crew cost. Studies have indicated that most essential technology building blocks are already in place, but practical marine solutions will still require some development efforts. The planned roadmaps indicate that the first remote controlled ferry demonstrator could hit the water within 4-5 years.

Tuomas Riski, CEO, Norsepower will be introducing the company's Rotor Sail solution while Bruno Bouckaert commercial director, of Hull Vane will be looking at the fuel saving device in the form of a hydrofoil-type appendage, fixed to the stern of a ship. The underwater wing generates a beneficial lift force - angled forward and therefore providing forward thrust - and reduces the wave-making resistance of a ship by reducing the stern wave produced. When sailing in waves, the Hull Vane reduces pitching, rolling and yawing and therefore also the added resistance caused by these motions.

Eliza Gagatsi, Senior Project Manager and head of the Freight Transport and Logistics Unit, Hellenic Institute of Transport, will consider E-ferry, a new project supported by the European H2020 initiative involving the design, building and demonstration of a fully electric powered 'green' ferry which can operate with low environmental impact, while Ulf Tudem of Effect Ships International will present BB GREEN, a 30 Knot Electric Commuter Ferry.

The BB GREEN vessels will be built from a vacuum-infused carbon sandwich, Devinycell. A new, high efficiency battery electric and contra rotating pod propulsion driveline for the prototype vessel has been developed by Echandia of Sweden. Powering comes from a new Lithium Ion Titanate battery, developed by Emrol from Belgium. BJB from Latvia has been responsible for the construction of the vessel. Ulf Tudem is project coordinator.

Fire on board ferries has been of increasing concern and Javier Herbon, managing director, CBG Systems, Australia will be considering the issue.

The inherent difficulty of assisting vessels while operating at sea compounds the consequences of onboard fires to potentially catastrophic results. Given the high risk involved, minimising the possibility of a fire starting, and limiting its capacity to spread, becomes paramount. This presentation will concentrate on the latter - controlling the spread of fire. The function of passive fire protection is to contain a fire within a limited area and maintain separation between the fire origin and adjacent areas in the vessel. Traditionally, passive fire protection has been in the form of a fibrous blanket wrapped across the profile of every beam and stiffener on the bulkheads and deckheads. Lightweight panelised structural fire protection provides conveniences and efficiencies not possible with traditional insulation.

The lightweight systems have revolutionised structural fire protection in high speed craft over the last 30 years, and more recently the benefits are also beginning to be applied more broadly to the other types of vessels – CBG Systems has developed several innovative lightweight panelised structure fire protection systems for installation in more than 70 commercial and navy vessels.

Tommy Hertzberg, fire research section manager, SP Technical Research Institute of Sweden will look at research and development related to fire safety when using FRP (fibre reinforced polymer) composites in ships. In 2010, research supported the realisation of the world's first fully certified HSC in FRP composite.

Ampere, the world's first large fully electric vessel operated by Norled and designed and constructed by Fjellstrand, the DNV GL classed car ferry is a fully battery driven catamaran made of aluminium.

Compared to a standard diesel ferry serving the same route, *Ampere* saves about one million litres of fuel annually, as well as preventing 2,640tonnes of carbon dioxide from entering the atmosphere. Emissions of particulate matter, NOx and SOx are also eliminated. In economic terms, battery hybridisation of ferries can provide potential fuel cost savings of 10% to 30%, with a payback time of three to five years, while all-electric ferries can produce fuel cost savings of 50% to 80%.

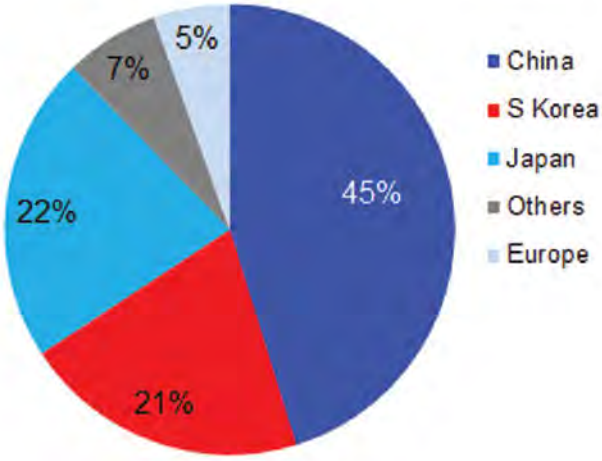
The combination of the slim aluminium catamaran hull and propulsion system of 2 x 450kW Azimuth thrusters and 2 x 450kW electric motors means the Ampere is optimised for energy efficiency, while at the same time giving the vessel very good low speed and manoeuvring characteristics. Ampere has the DNV GL class notation 1A1 LC R4 (nor) Car Ferry C Battery Power. *NA*

Clarkson Research: Historic and Scheduled Delivery

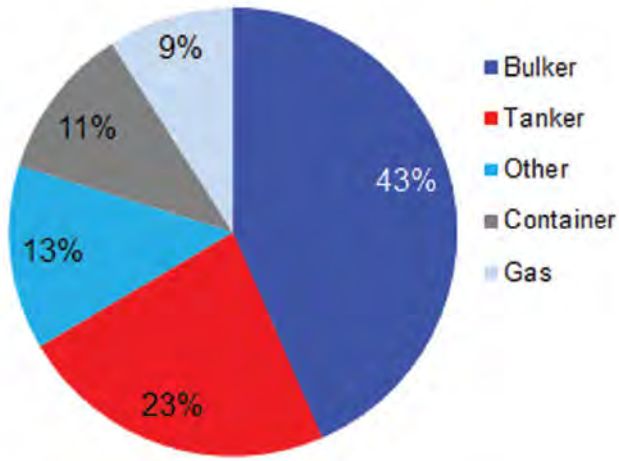
Data extract from World Fleet Register available at www.clarksons.net/wfr

Vessel Type	2004		2005		2006		2007		2008		2009		2010	
	1st Half	2nd Half	1st Half	2nd Half	1st Half	2nd Half	1st Half	2nd Half	1st Half	2nd Half	1st Half	2nd Half	1st Half	2nd Half
VLCC >= 200,000	15	14	15	16	5	13	15	14	18	23	32	21	30	24
Suezmax 120-200,000	17	10	16	9	14	12	15	10	9	5	22	23	28	13
Aframax 80-120,000	31	21	35	30	29	21	28	28	24	44	62	34	37	31
Panamax Tankers 60-80,000	26	11	24	21	25	20	26	15	16	27	26	12	15	16
Products 30-60,000	58	60	51	48	59	56	68	66	73	92	91	67	63	43
Products 10-30,000	3	4	3	5	2	9	8	10	7	6	5	5	6	7
Chem & Spec. 10-60,000	27	34	35	41	56	45	62	62	81	104	107	71	79	63
Tankers < 10,000	25	17	27	27	20	26	31	43	59	88	68	69	60	43
Capesize > 100,000	21	20	22	25	32	28	29	27	20	24	34	77	101	112
Panamax 80-100,000	3	3	6	11	22	23	22	16	15	17	27	21	60	60
Panamax 65-80,000	35	39	41	35	36	26	22	22	23	20	18	15	18	33
Handymax 40-65,000	37	43	52	48	53	40	50	50	66	59	86	100	168	168
Handysize 10-40,000	30	35	32	38	33	33	43	54	65	60	89	117	142	156
Combos > 10,000	0	0	0	0	0	0	0	0	0	0	0	0	3	2
LNG Carriers	11	9	7	11	12	16	16	16	25	26	22	17	15	12
LPG Carriers	6	5	4	3	9	15	15	20	27	33	25	18	18	19
Containers > 8,000 teu	5	10	14	18	34	28	20	17	25	25	22	13	30	33
Containers 3-8,000 teu	40	35	38	54	45	56	60	70	72	61	62	57	79	41
Containers < 3,000 teu	40	50	63	79	87	115	105	121	140	109	69	51	56	25
Offshore	7	4	5	6	4	5	3	18	14	14	13	14	24	26
Cruise Vessels	7	3	2	2	5	1	7	3	6	3	3	6	9	4
Ro-Ro Ferries	9	6	13	6	8	6	5	8	16	5	9	7	10	8
Other	70	61	74	77	102	123	148	133	150	148	143	151	163	177
TOTAL	**527**	**493**	**583**	**608**	**698**	**715**	**805**	**829**	**962**	**995**	**1,045**	**976**	**1,221**	**1,129**

Orderbook by builder region (number of vessels)



Orderbook by sector (number of vessels)



2011		2012		2013		2014		2015	Scheduled Orderbook		
1st Half	2nd Half	1st Half	2nd Half	1st Half	2nd Half	1st Half	2nd Half	1st Half	2015	2016	2017
35	27	27	22	21	9	14	10	9	12	63	33
25	18	31	16	25	6	4	4	8	1	42	43
28	31	29	14	13	5	4	13	21	18	60	47
18	8	8	6	6	4	3	1	2	3	27	20
45	23	25	30	49	27	48	49	57	53	117	29
9	8	12	2	6	2	2	7	3	3	1	0
52	45	41	11	12	16	13	13	38	40	127	48
51	48	65	34	29	25	22	19	7	27	18	1
128	123	148	65	63	40	56	38	46	57	177	32
82	97	140	95	100	68	62	35	57	69	181	45
39	46	54	39	34	43	44	23	22	25	21	4
195	198	226	146	147	118	96	98	139	162	398	89
160	170	211	113	111	73	89	68	101	92	225	63
2	0	0	0	0	0	0	0	0	0	0	0
5	10	1	2	4	13	14	18	17	16	51	46
16	14	13	7	23	16	14	14	24	30	115	39
46	25	50	28	51	33	59	41	59	40	101	62
33	26	40	19	46	29	26	24	19	6	7	20
32	29	33	38	29	16	22	27	26	28	97	30
30	26	34	17	15	19	31	30	28	26	79	39
4	2	6	1	6	0	3	2	5	2	10	9
11	8	11	8	5	6	12	5	11	8	17	8
176	172	190	90	98	86	71	52	60	82	124	55
1,222	**1,154**	**1,395**	**803**	**893**	**654**	**709**	**591**	**759**	**800**	**2058**	**762**

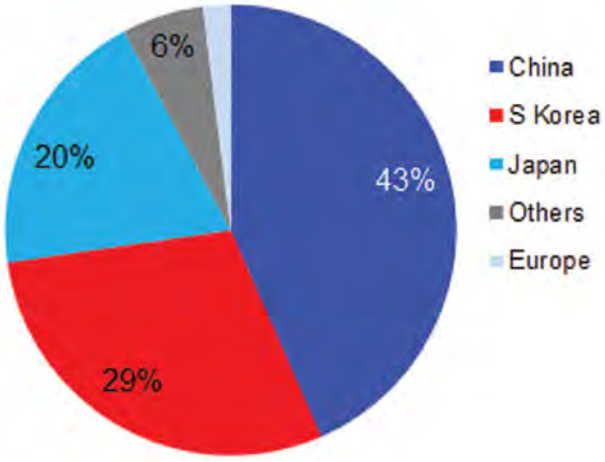
Data includes all vessels with LOA estimated at >100m

Where scheduled month of delivery is unknown an arbitary month of build has been applied for orderbook data

The orderbook by year of delivery on this page is based on reported orders and scheduled delivery dates and do not necessarily represent the expected pattern of future deliveries

All data taken as of 1st August 2014

Orderbook (DWT) by builder region



Source: Clarkson Research

Uncertainty over ballast water regulations draws ICS ire

There have been a number of legislative developments on the international front in recent months, whether in the IMO or Europe, with a good deal of uncertainty as to how legislation already in place in the US will impact owners and operators trading there. Sandra Speares reports

The ballast water issue continues to be a hot topic as, although it has yet to come into force, there is a good deal of uncertainty about the position when it does.

According to Jonathan Spremulli technical director, the International Chamber of Shipping (ICS) did a lot of work at and prior to MEPC 67 in terms of lobbying to get the G8 ballast water management system (BWMS) approval guidelines re-opened and that was agreed. The ICS presented, with the co-sponsors, a draft resolution to facilitate the entry into force of the convention and highlighted a number of issues of concern to shipowners including the need to make the BWMS approval process more robust in order to ensure the efficacy of approved systems.

ICS raised six major issues in relation to type approval guidelines that it considered to be inadequate and which were not robust enough to ensure that approved systems would, with confidence, be effective in treating ballast water in conditions normally encountered when operating worldwide.

The ballast water management system might reasonably be expected, when fitted on a ship tramping on worldwide service, to have to treat ballast water from any one of the three salinity groups, i.e. fresh water, brackish water or marine water and therefore needs to be tested and approved accordingly. The current approval guidelines, now being revised, only require testing with two test waters with a differential of at least 10PSU and therefore testing in all three salinity groups can be avoided.

As Spremulli points out, the nature of international shipping is such that a tramp ship might operate in one area at a certain time and then move to another where water conditions are different. It is not just a question of salinity, but also water temperature, he said. Levels of suspended solids in the water also have to be taken into account as these would vary according to the location.

Jonathan Spremulli, technical director, the International Chamber of Shipping (ICS)

"We need to make sure that the testing is robust enough so that we can have confidence that systems will work within the different environments normally encountered by ships during worldwide service". Another issue the ICS highlighted was with testing the systems at the actual flow rate at which they would be expected to operate. "It is not just the maximum flow rate the system has to work at, but also reduced flow rates such as those at the time you are topping off your tanks; the control systems need to adjust dosing rates etc."

ICS also highlighted the need for standard test organisms. "It had been highlighted to us that if you left some of the organisms used in testing long enough in the test water, due to their high natural mortality rates, they would have died without any application of the treatment systems and obviously these organisms could not be considered suitably robust to challenge the systems being tested. In these circumstances, one would not actually be testing the efficacy of a ballast water treatment system", he explained.

"You have to have adequate controls in place to make sure that the water you are using to test the system is setting an adequate challenge to the system". The last point the ICS raised was discounting test runs that did not comply. All six items are now being addressed. Since the ICS together with the other industry groups supported by many IMO member States opened up G8 Guidelines for review and revision, other delegations have added an additional 30 plus issues for discussion, he said.

One of the other areas of concern is about the ballast water systems that are already being fitted. MEPC 67 adopted resolution MEPC.253(67) agreeing that shipowners should not be penalised if they had fitted ballast water treatment systems approved in accordance with the current G8 Guidelines prior to the application of the revised G8 Guidelines.

The meaning of "shall not be penalised" was clarified at MEPC 68 within an agreed road map. It was agreed that when the revised G8 guidelines were adopted that systems approved in accordance with the current guidelines and installed prior to the application of the revised guidelines would not be required to be replaced by systems approved in accordance with the revised guidelines and that the same systems would not be required to be replaced due to occasional lack of efficacy outside of the control of the ship owner and crew.

According to Spremulli, there might unfortunately be occasions, due to the lack of robustness of the current approval Guidelines, where an owner has fitted a type approved system, approved in accordance with the current G8 Guidelines, which despite being operated and maintained correctly may occasionally lack the necessary efficacy to meet the discharge standard.

In such instances it was agreed at MEPC 68 that there should be no requirement to have the system replaced, he said. Should this happen it was agreed that flag states, port states and the owner should work together to address the problem on a case by case basis.

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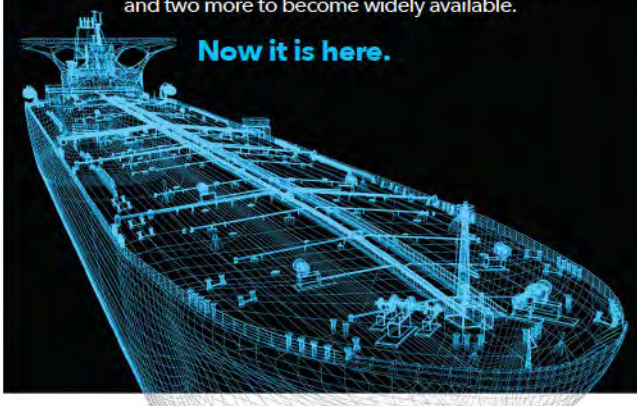

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"Going forward IMO has agreed that we will be looking at guidance on contingency measures for use by stakeholders to mitigate for any such occurrences."

Also discussed at MEPC 68 and referred to in the agreed road map was the extension of the previously agreed trial period into a longer renamed experience building phase once the convention had come into force. IMO had already agreed a two year trial period during which the level of enforcement should not be as draconian. It was agreed at MEPC 68 to extend the trial period in order to assess how the systems were performing and in the light of that experience, go back to the convention and see what needed to be adjusted.

The whole issue is complex, just the testing to ensure things work is complex, as systems have to work in all different types of water conditions. "From a shipowner's perspective the only thing that is important is that the systems work" so a system needs to be tested adequately. Another issue is whether owners will absorb the additional costs of testing. "The owners want systems that work, that is the priority."

The biggest problem at the moment is the US position, Spremulli says, and how to comply with the US ballast water regulations going forward and the ballast water management convention when it comes into force.

At the moment owners operating in US waters, depending on the ballast water capacity of the ship, are expected to fit ballast water management systems that have been approved by the US Coast Guard. However, no system has been approved so far. The last tranche of existing ships, those with ballast capacities less than 1,500m^3 or greater than 5,000m^3, will be required to fit USCG approved systems by the first dry dock after 1 January 2016.

Existing ships with ballast water capacities from 1,500 to 5,000m^3 have been required to fit such systems since 1 January 2014. In the absence of USCG approved systems owners are being given the option to fit a system that the USCG recognises as an alternate management system (AMS), but there is no guarantee that a system that has been accepted as an AMS will subsequently be given full approval by the US Coast Guard. In consequence, it may be necessary either to stop trading with the US, rip the system out, or fit another that does comply after five years.

Most owners are not particularly happy going down the AMS route, Spremulli says, so they are applying for extensions to their compliance date, whether that is from 1 January 2014 or 1 January 2016, based on the fact that there are no USCG approved systems.

A submission to MEPC 68 from Canada highlights a regional concern of theirs. This relates to ships operating in the Great Lakes, as these vessels operate in both Canadian and US territorial waters.

As Canada pointed out in its paper, if the ballast water ratification criteria are met now, a year later Canada would expect ships to be fitted with ballast water management systems approved by the IMO. There would then be a situation where the extensions currently sought from the USCG for US BW regulation compliance would no longer be an option because Canada would require Canadian flagged ships and ships operating in their waters to comply with IMO requirements and fit an approved BWMS.

If at the same time the USCG has still not approved any systems then this would leave owners no option but to fit an AMS, risking having to replace it after five years if the system did not gain full USCG approval. There are 24 companies that have now issued letters of intent that they are going to seek USCG approval for their product. To date it is understood that three companies have submitted documentation to the USCG seeking full USCG approval for three BWMSs all of which are UV systems.

There is a major issue, Spremulli said, with what is deemed to be a "viable organism," which is seen to be blocking US approval of UV systems already approved by other IMO member States. The way UV systems have been approved by IMO member States (excluding the US) is by considering that an organism is deemed non-viable if it is either dead or cannot reproduce. The US takes the view that viable organisms are at any life stages that are living. At the moment the US is working on the viability issue to see if the approaches for acceptance can be resolved.

Other issues that have been receiving attention from the EU include the monitoring, reporting and verification process related to CO_2 emissions. A system for data collection is being developed at IMO. The EU has gone ahead with a regulation which will require owners, regardless of flag, to report on an annual basis to the EU. Concerns have been raised about confidentiality of information as the EU is talking of publishing the information which ICS says may be commercially sensitive.

ICS has been adamant that any regulation has to be global to avoid problems like those being experienced in the ballast water arena. The EU has said that it is willing to look at what the IMO finally develops and will consider adapting its system, but the concern is if the EU is not happy with any IMO system it will continue with its own rules. "The issue with the MRV [monitoring reporting and verification system] is 'what comes next'," he says. Is there going to be some form of taxation applied?

Those who do not understand shipping think you can simply compare two sister ships in terms of efficiency and fuel used– it seems they do not or are unwilling to understand simple examples such as: 1.You can have two identical ferries one on a route carrying light cargoes and another on a trade carrying heavy cargoes and the fuel consumption could be completely different, or, 2. You can have a tramping tanker which could one year be carrying caustic soda so it is always down to its marks fully loaded and considered efficient in terms of transport work, but in another year it might be carrying a much less dense cargo and is full (in terms of volume) but not down to its marks and possibly considered less efficient. Also, if you start indexing ships there is a danger of distorting the market.

Another issue at IMO that ICS is involved in relates to fuel quality in terms of not only sulphur content, but importantly safety requirements contained in MARPOL Annex VI. Specifically fuel supplied to ships needs to comply with the regulations and parties to MARPOL Annex VI need to do more to ensure that fuel suppliers within their jurisdictions supply only compliant fuel.

It is not and should not just be a commercial issue between the fuel supplier and the ship. Other issues include a push by the US to simply reduce the minimum flashpoint of marine fuels as regulated in SOLAS to 52°C rather than 60°C. ICS has argued that to simply reduce the SOLAS requirement would not be safe. As many sea going engineers know engine room temperatures in parts of the world can exceed 52°C. To use fuels with flashpoints less than 60°C, ICS believes the fuels need to be individually considered under the IGF Code and appropriate mitigation identified to ensure the fuels' safe carriage and use. *NA*

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BWTC - are you on course for compliance?

Joined up thinking from two leading marine technology suppliers addresses impending legislation for ballast water treatment and offers a practical solution for monitoring and recording the correct discharge of ballast water, in real-time

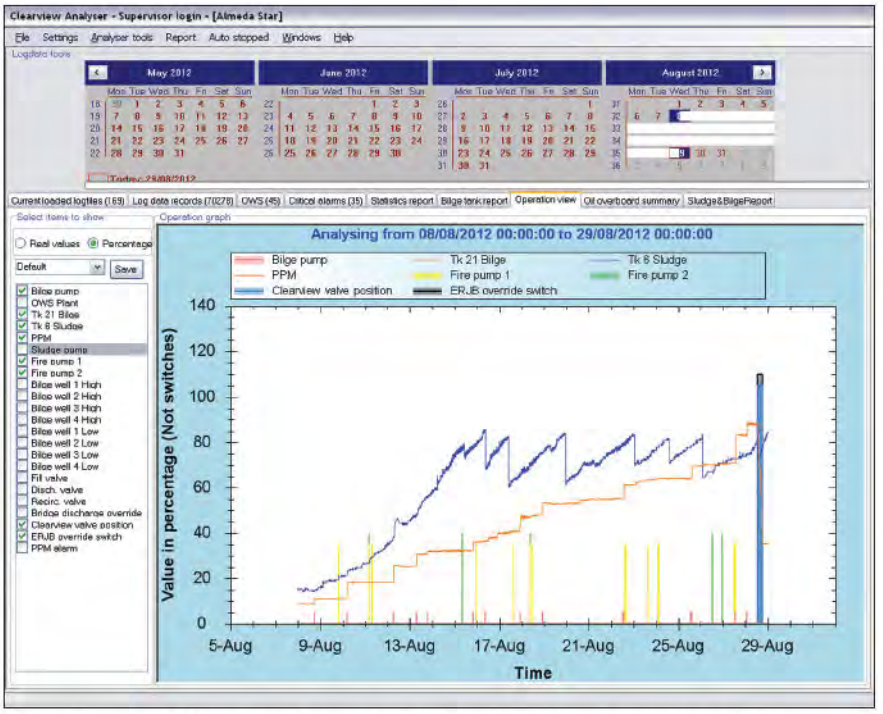
The IMO's 2004 Ballast Water Management Convention lays down strict guidelines for the treatment and discharge of ballast water. Already in force as of 1 January 2015 in US waters and universal ratification is expected to occur during the next six months.

The new legislation, which will require tens of thousands of ships to be retrofitted with new systems for Ballast Water Treatment, has caused much debate within the marine industry.

To date, discussion has largely centred around which type of treatment technology is most suited to the task. However, this has overshadowed two very important aspects of the new regulations which must form part of the overall treatment regime in order to be effective in ensuring environmental compliance: point of discharge measurement and recording and reporting of treatment activities.

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

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



Shoreside report of recorded & reported onboard OWS plant activity over the complete voyage

Point of discharge measurement

A key requirement for any treatment system installed is to provide analysis of the ballast water at the point of discharge to prove correct treatment. Using the inherent high sensitivity of the FastBallast Compliance Monitor, the variable fluorescence of live viable phytoplankton cells in moving ballast water can be monitored to the levels required by the IMO D2 standard (10 to 50um category).

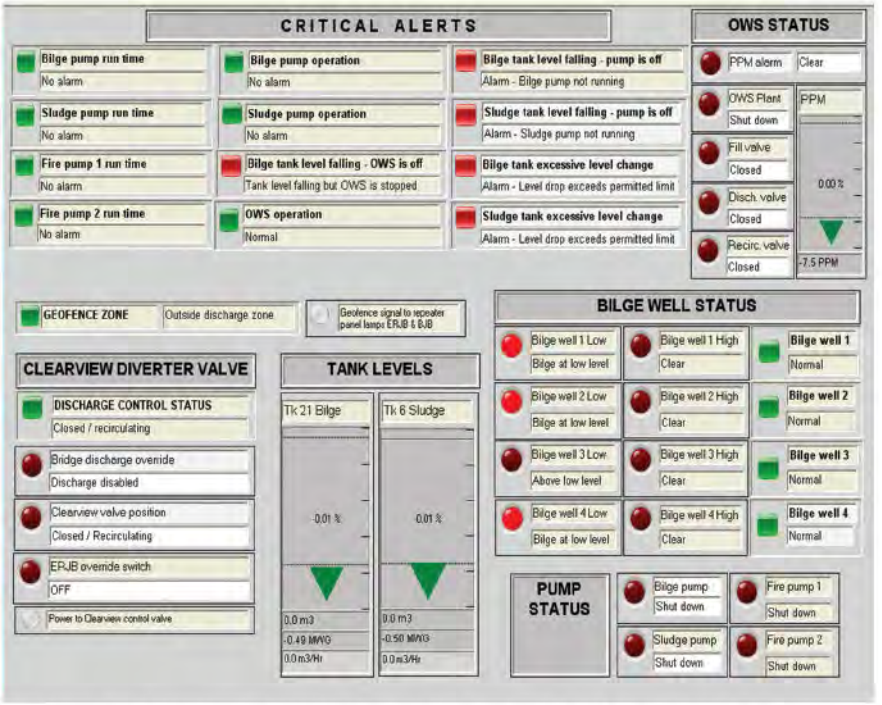
Developed by Chelsea Technologies Group and based on established marine technology, the FastBallast Compliance Monitor has been specifically developed for working with phytoplankton within the aqueous phase at low optical density, exactly the conditions encountered in ballast water. FastBallast interrogates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

To ensure that all phytoplankton present within the 10 to 50um range are detected, the system uses multiple LED excitation channels. A highly sensitive photon multiplier tube is used to detect the variable fluorescence of live phytoplankton. Each measurement takes only 200µs, which means that data can be collected from fast moving water (up to two metres of linear flow per second), typically encountered within ballast tanks or water treatment system piping.

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

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

Using FastBallast will improve the ballast water management regime of vessels in time for ratification and will assure the end user whether that be a ship operator, BWTS manufacturer or port state control officer that a given Ballast Water Treatment System is discharging ballast water in environmentally responsible manner. Integral to the system's functionality are secure data recording capabilities which more than meet the stipulations set out for the new reporting requirements.



Onboard HMI screen for the crew showing real time OWS plant operational status

Recording and reporting of treatment activities

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

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

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

Marine systems specialists PSM Instrumentation undertake continuous research and development aimed at providing operators with improved control and visibility onboard vessels. The latest BallastView system from PSM Instrumentation, for example, is a modular solution comprising a suite of onboard and shoreside hardware and software elements, developed to ensure vessels are operated efficiently, safely and in an

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

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

The technology has already been successfully employed across a number of fleets for similar monitoring, recording and data transmission applications in complying with MARPOL regulations for Oily Water Treatment and Oil Record Book regulations. The automatic collection of data forming the Ballast Water Treatment Book, for example, then might also be transmitted in real-time to Port State Control prior to arrival to facilitate a swift clearance of this part of the vessel's inspection well ahead of port entry.

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

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

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IMO adopts IGF Code

The Maritime Safety Committee has adopted the new IGF Code on the safe use of low flashpoint fuels. Sandra Speares looks at the latest regulations keeping seafarers and others safe

The IMO's Maritime Safety Committee (MSC) adopted the International Code of Safety for Ships using Gases or other low flashpoint Fuels (IGF Code), along with amendments to make the Code mandatory under the International Convention for the Safety of Life at Sea (SOLAS).

The use of gas as a fuel, particularly liquefied natural gas (LNG), has increased in recent years due to lower sulphur and particulate emissions than fuel oil or marine diesel oil. But gas and other low-flashpoint fuels pose their own set of safety challenges, which need to be properly managed. The IGF Code aims to minimise the risk to the ship, its crew and the environment, in regard to the nature of the fuels involved.

The amendments to SOLAS chapter II-1 (Construction – structure, subdivision and stability, machinery and electrical installations) include amendments to Part F Alternative design and arrangements, to provide a methodology for alternative design and arrangements for machinery, electrical installations and low-flashpoint fuel storage and distribution systems, and a new Part G Ships using low-flashpoint fuels, to add new regulations to require ships constructed after the expected date of entry into force of 1 January 2017 to comply with the requirements of the IGF Code, together with related amendments to chapter II-2 and Appendix (Certificates).

The IGF Code contains mandatory provisions for the arrangement, installation, control and monitoring of machinery, equipment and systems using low-flashpoint fuels, focusing initially on LNG.

The Code addresses all areas that need special consideration for the usage of low-flashpoint fuels, taking a goal-based approach, with goals and functional requirements specified for each section forming the basis for the design, construction and operation of ships using this type of fuel.

The MSC also adopted related amendments to the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW), and STCW Code, to include new mandatory minimum requirements for the training and qualifications of masters, officers, ratings and other personnel on ships subject to the IGF Code. The amendments also have an entry into force date of 1 January 2017, in line with the SOLAS amendments related to the IGF Code.

Venting amendments adopted

The MSC adopted amendments to SOLAS regulations II-2/4.5 and II-2/11.6, clarifying the provisions related to the secondary means of venting cargo tanks in order to ensure adequate safety against over- and under-pressure in the event of a cargo tank isolation valve being damaged or inadvertently closed, and SOLAS regulation II-2/20 relating to performance of ventilation systems. The expected entry into force date is 1 January 2017. *NA*

GloMEEP project offers shipping a low carbon future

GloMEEP, the Global Maritime Energy Efficiency Partnership, is set to transform the future of the maritime industry through support for technology and operating systems use, writes Sandra Speares

The IMO's Global Environment Facility (GEF) and the United Nations Development Programme (UNDP) have signed an agreement to allocate US$2 million to a two-year global maritime energy efficiency partnership project, which aims to support increased uptake and implementation of energy-efficiency measures for shipping.

The so-called GloMEEP project, formally designated "Transforming the Global Maritime Transport Industry towards a Low Carbon Future through Improved Energy Efficiency," will focus in particular on building capacity to implement technical and operational measures in developing countries, where shipping is increasingly concentrated. The aim is to promote a low-carbon maritime sector, in order to minimise the adverse impacts of shipping emissions on climate change, ocean acidification and local air quality.

A particularly interesting aspect of the project is its expected role in catalysing an innovative public-private sector partnership within the project framework through a new Global Industry Alliance (GIA) for maritime energy efficiency. Participation is anticipated from leading private sector

companies, including classification societies, ship builders, ship owners, ship operators, marine equipment suppliers, port operators, and marine consultancy and management system providers.

IMO will execute this GEF-funded GloMEEP project in partnership with UNDP. Ten IMO Member States have signed up to the GloMEEP project as lead pilot countries: Argentina, China, Georgia, India, Jamaica, Malaysia, Morocco, Panama, Philippines and South Africa. The lead pilot countries will be supported in taking a fast-track approach to pursuing relevant legal, policy and institutional reforms, driving national and regional government action and industry innovation to support the effective implementation of IMO's energy efficiency requirements.

Besides the GEF financing for GloMEEP, other funds will be mobilised in the form of in-kind and financial donations, to a projected total of some US$13.8 million.

A number of events related to the implementation of the GloMEEP project are expected to be held alongside the two-day inaugural Future-Ready Shipping 2015 Conference, the joint IMO-Singapore International Conference on Maritime Technology Transfer and Capacity Building, to be held in Singapore on 28-29 September 2015. The conference will gather maritime leaders to discuss ways forward in encouraging the uptake of energy-efficient ship technologies. It is envisaged that the official launch and commissioning of the GloMEEP project and associated global project task force and inception meetings will be held during and after the conference.

Mandatory technical and operational energy-efficiency measures were adopted by parties to Annex VI of the International Convention for the Prevention of Pollution from Ships (MARPOL) in July 2011 and they entered into force on 1 January 2013. These regulations make mandatory the Energy Efficiency Design Index (EEDI) for certain types of new ships, and the Ship Energy Efficiency Management Plan (SEEMP) for all ships.

Since the entry into force of the regulations on energy efficiency for ships in 2013, further work has been undertaken to extend the scope of application of the EEDI to include several additional ship types, to further develop guidelines to support uniform implementation and to promote technology transfer.

The IMO's third study on greenhouse gas emissions from ships (2014) estimates that international shipping emitted 796 million tonnes of carbon dioxide in 2012, down from 885 million tonnes in 2007. This represented 2.2% of the global emissions of CO_2 in 2012, down from 2.8% in 2007. However, the study's "business as usual" scenarios forecast a growth in CO_2 emissions for international maritime transport of between 50% to 250% in the period to 2050, depending on future economic and energy developments. *NA*

German bulls buck bear market

Continued growth in the German marine equipment sector is bucking the trend in the industry. However, the equipment manufacturers in Hamburg are bracing themselves for tougher times as they expect a further dip in the newbuilding market

Global ship orders for 2015 are already showing significant signs of slippage, but the outlook for the next three to five years is "tough" according to the VDMA, the German equipment manufacturers association.

VDMA executive board member Martin Johannsmann says the association expects the market to become more difficult for equipment manufacturers the world over as the demand for new ships has slumped, even though yard prices have also fallen.

"According to Clarksons there will be 1,300 ships ordered this year, but we believe that it will be less 1,000 and that it will be three to five years before the [shipbuilding] market starts to rise again," explained Johannsmann.

A decline in the value of the Euro has undoubtedly aided German manufacturers to maintain export volumes even though the largest export sector remains the countries within the EU at 29.9% of exports, some 70.1% is to countries outside of the EU, including China at 26.6% and Korea at 11.3%, currently the world's two biggest shipbuilding nations.

Johannsmann does not believe that Greece's economic struggles has played a significant role, "the Euro was already devalued," he said and he added, "I doubt there will be a further devaluation because the future of Greece has been in doubt for some years."

He believes that the major markets for German manufacturers are in the cruise sector and that the economic situations of both the US and Europe remain "stable and strong".

"We believe the Euro will harden anyway, but Germany is doing well because it is structured, even though there will be a period of up to five years with the Euro strengthening, independent from Greece," he says.

According to the VDMA German equipment manufacturers are well versed in coping with the cyclical nature of the shipping industry. "All [German manufacturers] are flexible, they don't hire many staff in the good times to lay them off in the bad times," says Johannsmann.

With the fact that employers have learnt to manage the ups and downs experienced in the maritime sector in mind the equipment manufacturers have ridden the wave caused by the spike in oil prices: However, the offshore bubble burst when the Saudi Arabians refused to cut production and shipbuilders, and consequently equipment manufacturers, have now come under threat with the subsequent decline in the price of oil.

The break-even point for the offshore business is around the US$80/barrel mark with the Brent Crude wallowing at around US$50/barrel and West Texas Intermediate at some US$3/barrel below that at the time of writing, the consequences for the shipbuilding and related sectors could be considerable.

"Even if the oil price recovered to US$100/barrel investors would wait for a year to see if the price would remain stable," Johannsmann explained.

According to the VDMA technology is the solution to the economic downturn, with environmental protection pushing the development of innovative technology and the manufacturers' products can drive that process.

One technological solution that Johannsmann used as an example was the emissions monitoring system developed by SKF, a subsidiary of Blohm+Voss, and the company which he heads as its CEO.

The US Coast Guard is currently "trying to understand the system" says Johannsmann and may eventually take the lead in introducing this type of monitoring system. The SKF unit has a data system installed and can map the region in which the ship is in giving the operator a run-down of all the emission regulations currently in force in the region in which the ship is positioned.

Sensors, strategically placed, will monitor emissions and record levels including times and position of the vessel when readings were taken and will store the information.

"We introduced the system at SMM in Hamburg last year and have sold 50 units so far, with 15 units currently installed," said Johannsmann. Sensors for the system need to be bought from an outside source

German Marine Equipment Industry - Annual Survey 2014 / 2015. Turnover (bn. Euro)

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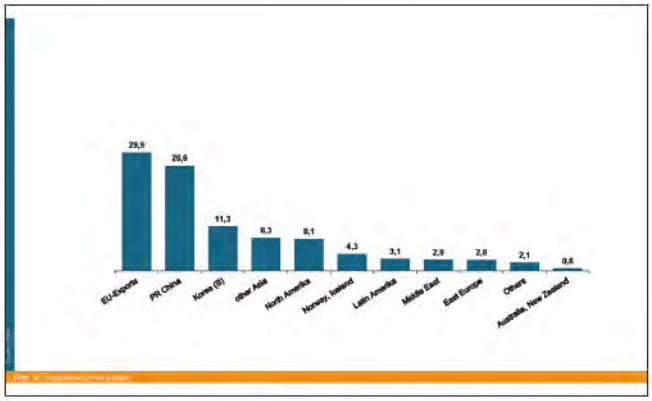
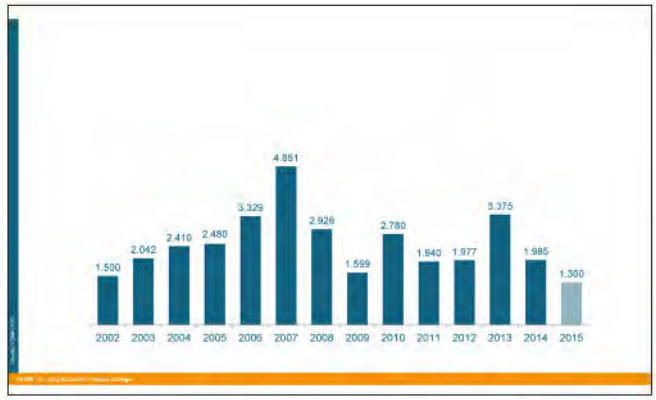


Orders intake from export regions for year 2014, in per cent



Market development world shipbuilding. New orders 2002-2015 (by number)

and need to be calibrated, but otherwise the system, including the software, is manufactured by SKF and can be bought and installed on a ship for US€40,000 (US$43,480).

The company is now looking at a developing a cloud-based system that will store operational information, however, that data belongs to the ship owners and they are unlikely to want to share such sensitive information.

SKF says it is in negotiations with owners and authorities to develop a "mutual understanding" that will allow the company to fully develop its monitoring system into a real operating information database. *NA*

Liquefaction, reaction

New guidelines to increase industry awareness of cargo liquefaction caused by vessel motion onboard bulk carriers

Norwegian and German classification society DNV GL has responded to the frequency and seriousness of related disasters with a new guideline: "Design and operation of vessels with bulk cargo that may liquefy." In it, they explain the physics behind the phenomena, susceptible materials including bauxite (IMSBC Code Group C), and provide ways to mitigate such dangers for conventional bulk carriers and ore carriers.

Cargo sliding and liquefaction has resulted in the listing, capsize, and structural damage of old and recent bulk carriers. Since 2009, at least six ships of more than 40,000dwt have been lost to suspected liquefaction of cargo. This period includes a six week stretch in which three bulk carriers, *Jian Fu Star, Nasco Diamond* and *Hong Wei*, were capsized while transporting nickel ore from Indonesia during the rainy season of 2010, killing 44 seafarers. Recently, the 55,652dwt *Alam Manis*, owned by Malaysian Bulk Carriers, ran aground after the nickel ore it was carrying shifted in the hull and created a severe list of 20degrees.

Measures are already in place to prevent further vessel losses, but the new DNV GL guideline suggests more should be done; cargo liquefaction is still the "single most significant factor for life lost at sea for bulk carriers," says DNV GL's Morten Løvstad, business director of bulk carriers and Håvard Helling, bulk carrier ship type expert. ClassNK has also responded to the ongoing loss of life, putting its weight behind research and change to further safe-guard vessels and personnel in a joint industry R&D project for bulk carrier safety: LiquefAction. The major ore exporting countries Australia and Brazil have also been pro-active in responding to this issue.

Trans Summer after capsizing as a result of suspected liquefaction

DNV GL's two-tiered strategy identifies the different hazards impacting conventional bulk carriers and ore carriers, and offers individuated responses. Conventional

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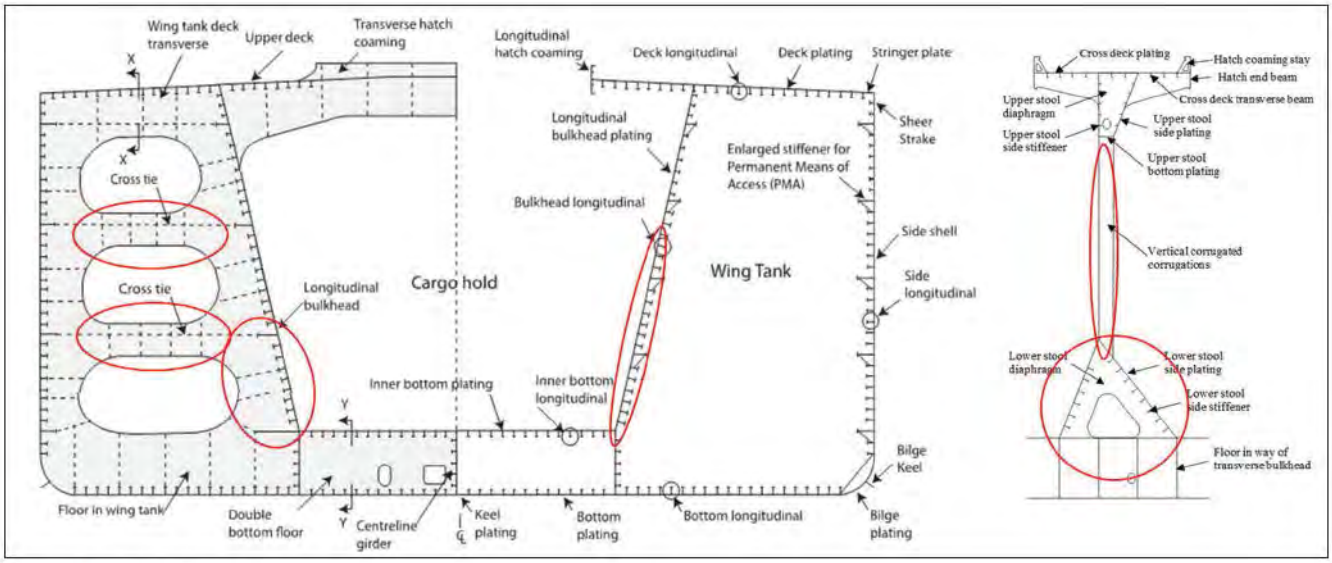

Areas of special attention for ore carriers

bulk carriers (which have no longitudinal bulkhead) are shown to be more susceptible to stability issues when carrying cargo at risk of liquefaction. This is for two reasons: the transported material is generally quite dense, occupying a small part of the cargo hold volume, and conventional bulk carriers are quite wide, leaving a significant volume of space for the liquefied cargo to move around in.

While it is difficult to design a vessel for general duties that can also transport ore materials, it can be done, according to DNV GL experts. The drawback lies with lost capacity and cost; "According to DNV GL experience, arranging longitudinal bulkheads to narrow the holds is the only feasible way of obtaining sufficient stability to withstand cargo liquefaction for a conventional bulk carrier," making the vessel less commercially attractive for general trades. Ore carriers are less affected by stability issues when under the free surface effect because their longitudinal bulkheads limit the width of the cargo hold. However, they face increased strength issues when compared with conventional bulk carriers. This is due to the higher filling level of their cargo hold and the fact the cargo hold boundaries are not designed to withstand flooding. The guideline states that the lateral pressure load is significantly increased on the longitudinal bulkheads' plates and stiffeners in this situation, and normally means the scantlings should be increased.

Similarly, scantlings should need to be increased for the plates and stiffeners on the lower stool in way of the transverse bulkhead. The strengthening of the transverse corrugated bulkheads depends on how a vessel's loading conditions have been designed. For example, if a vessel is designed for homogenous loading, it must be checked for the worst condition. Ship owners and operators should also be aware that low density cargoes with a higher filling height exert a larger total force on the corrugations, according to the guideline.

DNV GL has suggested strengthening ore carriers by the reinforcement of bulkheads with a higher percentage use of high tensile steel. According to Helling, past concern for high tensile steel fatigue has been quelled due to improved fatigue control, and this build process keeps the steel weight, and therefore costs, lower, making it more viable.

The current International Maritime Solid Bulk Cargoes (IMSBC) Code defines cargoes of particular properties, splitting cargoes that may liquefy into Group A, cargoes with chemical hazards into Group B, and cargoes that have neither of those properties into Group C. In doing so, the organisation has aimed to control the transportation of bulk cargoes and make the process safer.

However, as with any safe system, its success depends upon the rigour of those operating within it. Inaccurate cargo declarations in the form of unreliable moisture content readings and the confusing of cargo identification and the identification of the correct cargo group have shown regulatory shortcomings and why ship design could be a saving grace. In addition, up until 1 January 2015, the IMSBC Code stated that liquefaction did not occur when the cargo contained very small particles, something that has now been removed from the Code.

The new guideline recommends a tightening of operational procedures, especially in relation to conventional bulk carriers. DNV GL suggests a number of measures including: always making sure the cargo is correctly identified and proper documentation of the cargo is received before loading; using an independent surveyor or cargo specialist to assess TML; and carefully considering the metacentric height of the vessel when carrying cargoes that may liquefy. It also suggests that cargoes that may slide should be trimmed reasonably level, thereby improving their stability and weight distribution. However, this may increase the time and cost of loading.

The nature of bauxite is also demystified in the new guideline, which quotes Intercargo's secretary general, David Tongue: "What is normally considered a Group 'C' cargo may have the potential to behave like a Group 'A' cargo when that cargo's specified characteristics are not maintained, especially when cargoes with higher levels of fines and moisture beyond those specified in the IMSBC Code are presented." This is the case with a fine-particled bauxite cargo, and is exemplified in the sinking of *Bulk Jupiter*, an 8-year old Supramax bulk carrier believed to have capsized after the liquefaction of its bauxite cargo on 2 January 2015. *NA*

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Ramping up the size

Expansion of the Panama Canal will lead to new car carrier designs says TTS. But for the moment the company is keeping to tried and tested technology. Development of ramps and hatch covers for two Norwegian Car Carriers vessels on order from Hyundai Samho set the scene for TTS equipment sale in 2015

Car carriers over the last 10-15 years have seen little change to their design. Much of what has been produced has been efficient such as the Norwegian Car Carriers (NOCC) vessel *NOCC Oceanic* built in 2012.

So successful has this design been that NOCC has ordered two more pure car and truck carriers (PCTCs) with a capacity for 6,500 units from the South Korean yard for delivery in the last quarter of 2016 and the first quarter of 2017.

Specification for the new vessels will be similar to those on *NOCC Oceanic* with some minor upgrades to that design, said NOCC.

"The vessels are designed for carrying high and heavy cargo with a heavy capacity ramp (150 Tons) and twelve decks of which four are hoistable. Some decks will be specially prepared for carrying vehicles with new energy solutions including pressurized hydrogen and natural gas in their tanks that will be requiring safety zones on board," said a NOCC statement.

Built to DNV GL class TTS will supply the ramps doors and deck equipment for these vessels as it had done for *NOCC Oceanic*.

TTS is also involved in the design and development of new Panamax size PCTCs which will be the first major change to the vessel type for some years according to Bjorn Rosen, Vice President, Sales and Projects at TTS.

"We are involved in several other ongoing PCTC newbuilding series, where the technology step has been somewhat larger, in comparison with the NOCC vessels, which are built as almost sister vessels to the 2012-built NOCC Oceanic," said Rosen.

He added: "The upgraded canal restrictions have given naval architects new possibilities elaborating ship's dimensions designing more efficient ships and this has given new proportions also to car carriers. The length of the vessels has remained around 200m, but the vessel's width has increased to about 35-37m giving a larger flexibility choosing one or two pillar arrangements and engine room arrangements, all adding more flexibility and cater for greater variety and capacity of cargo as well as efficient cargo handling. The new main dimension ratio has also given potentials for significant increased hull efficiency with improved fuel economy."

Since 2012, TTS Marine AB has contracted Cargo Access Equipment to abt. 40 post-Panamax car carriers and during the last ten years, we have delivered equipment to almost 150 car carriers. The list of customers to choose TTS Marine AB in Gothenburg as equipment supplier for their recent or ongoing newbuilding series includes Eukor, Glovis, Höegh Autoliners, Ray Car Carriers, Wilhelmsen, Wallenius, UECC and Siem Car Carriers. Longstanding strong relations with end users and newbuilding yards constitute the foundation of our robust performance.

The Norwegian company is now looking to build a similar reputation in the offshore sector with cranes designed and built for long-term endurance.

According to the company the cranes, "undergo rigorous fatigue testing in order to withstand harsh and heavy-duty applications.

Key facts

Capacity: SWL 50t–150t
Radius: 36m–72m
Operation: Lift boats, jackups, semi-submersibles, offshore vessels TTS NMF delivers a wide range of pedestal mounted lattice boom cranes, designed to be used for both onboard and offboard lift tasks during construction, commissioning, decommissioning and salvage activities.

TECHNICAL PARTICULARS

TTS Marine AB

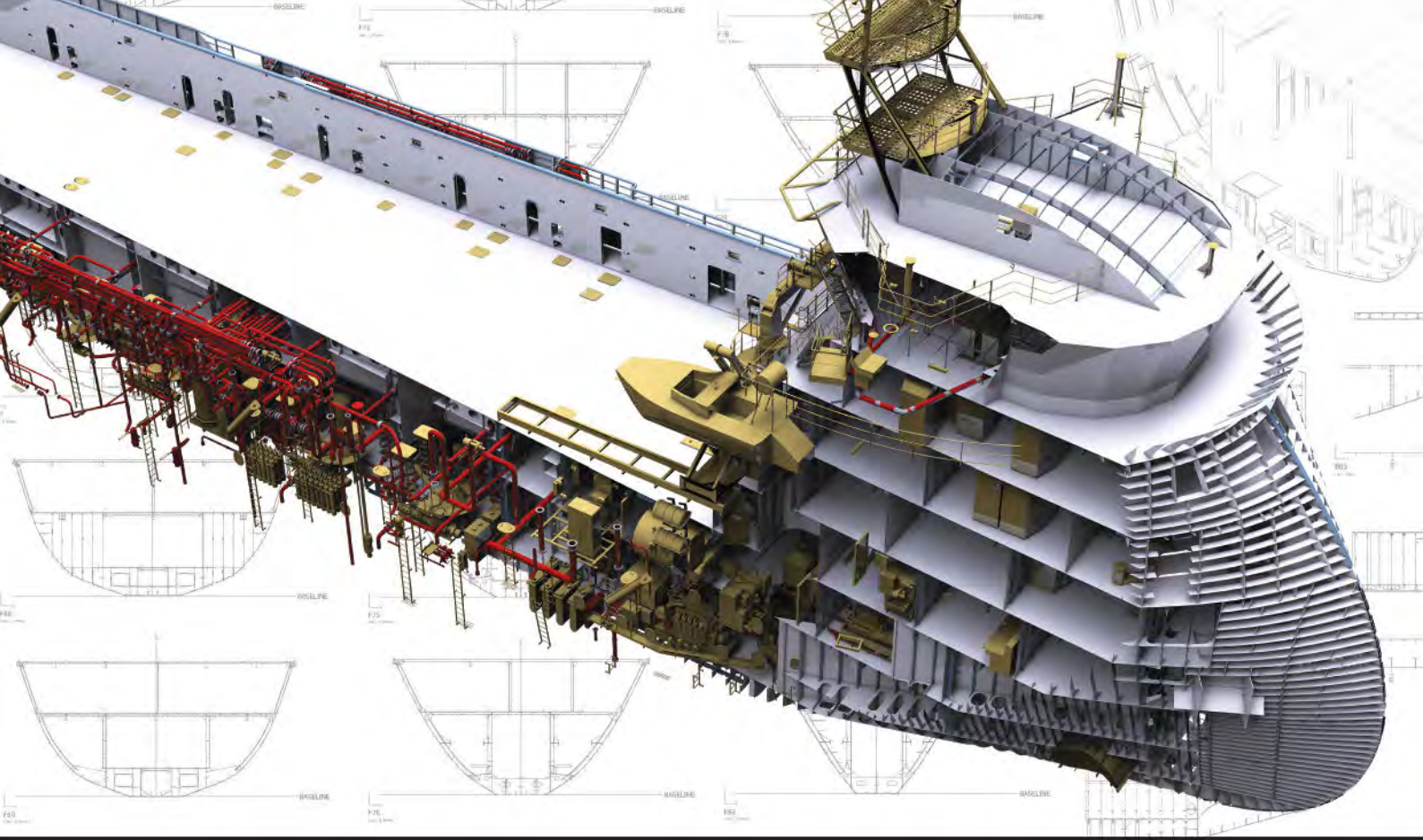
Item 1 - Quarter Stern ramp/door (WT)
Length: ..... 39.7 m incl. flaps
Driveway width: ..... 7.0 m
Clear opening width: ..... 15.2 m
Clear opening height: ..... 5.3 m
The ramp consists of two section and flaps.
Design loads: ..... Total load 150 t
Gross weight: ..... abt. 201 tonnes

Item 2 - Side ramp/door (WT)
Length: ..... 25 m incl. flaps
Driveway width: ..... 6.5 m
Clear opening height ..... 5.6 m
The ramp is serves dk 5 and dk 6 (two levels)
Operated by hydraulic winch, hoisted by hydraulic jiggerwinch.
Design loads: ..... Total load 22 t
Gross weight: ..... abt. 55 tonnes

Item 3 - Movable ramp & cover dk 3
Total length: 31.9 m
Clear driveway width: 3.25+3.25 m
Clear height: 4.0 m
Both ramps and cover operated by hydraulic cylinders.
Design loads: UDL 1.0 t/m^2
Gross weight: abt. 66 tonnes

Item 4 - Movable ramp to deck 4 in fixed ramp
Gross weight: ..... abt. 66 tonnes
Total length: ..... 15.0 m
Clear driveway width: ..... 3.1 m
The ramp consists of one end hinged section.
The ramp is operated by hydraulic cylinders.
Design loads: ..... UDL 2.0 t/m2
Gross weight: ..... abt. 47 tonnes

Item 5 - Movable ramp & cover dk 5 (WT)
Total length: ..... 36 m
Clear driveway width: ..... 6.5 m
Clear height: ..... 4.6 m
Both ramp and cover operated by hydraulic cylinders.



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- Generate 2D workshop drawings
- Generate system arrangement drawings
- Generate cable pull schedules
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A TTS lattice boom crane bound for an offshore semi-submersible during its factory acceptance test

They also comply with international standards and are certified by established classification societies such as GL, DNV and ABS."

As with all TTS NMF cranes, these offshore cranes have an unlimited slewing range of 360° and are outfitted with a roller slew bearing. The cranes are electro-hydraulically driven using a closed loop system. The equipment and machinery is located inside the machine house to protect against harsh marine environments.

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Tested at its new €1 million facility TTS NMF says it has achieved satisfactory results after just accomplishing a Factory acceptance tests (FAT) of two SWL 85t pedestal lattice boom cranes at the TTS NMF facility of two SWL 165t TTS OS knuckle boom cranes.

A structured approach is a necessity for a successful commissioning phase of the newbuilding projects. Previously most cranes were tested on board, or on other test sites, but customer requirements have resulted in building up testing facilities at TTS NMF.

"Commissioning of an offshore crane is a time consuming, costly and complex process. FATs shall provide as much evidence as possible that the technology is fit for purpose and performs according to its functional specification before it leaves the factory. The tests represent part of the Quality Control procedure. They shall provide confidence that gross manufacturing defects are not present," said the company.

Testing at its own site gives TTS a significant advantage in that such testing, conducted close to the designers and engineers makes it much easier for the technicians to make adjustments.

All FATs include an accompaniment from a class representative. *NA*

Tried and tested the 2012 built PCTC *NOCC Oceanic* will be superseded by new tonnage built for the wider Panama Canal locks

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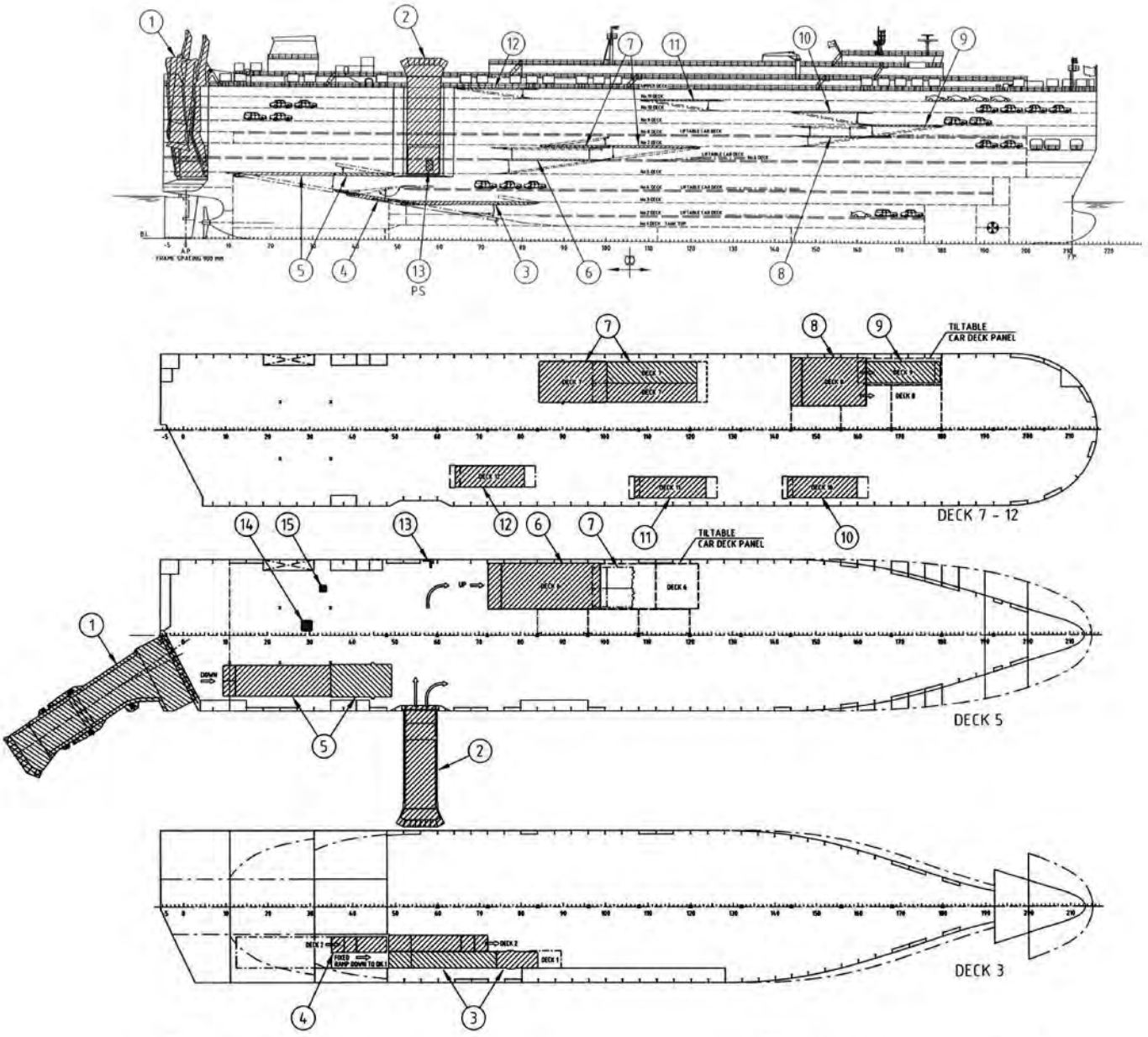
GA of roro equipment on for NOCC Car Carrier being built at Hyundai Samho



1. STERN RAMP/DOOR
2. SIDE RAMP/DOOR
3. MOVABLE RAMP & COVER IN dk 3
4. MOVABLE RAMP TO dk 4
5. MOVABLE RAMP & COVER IN dk 5 (WT)
6. MOVABLE RAMP IN dk 6
7. MOVABLE RAMP & COVER IN dk 7 (WT)
8. MOVABLE RAMP IN dk 8
9. MOVABLE RAMP IN dk 9
10. MOVABLE RAMP IN dk 10 (GT)
11. MOVABLE RAMP IN dk 11
12. MOVABLE RAMP IN dk 12
13. PILOT DOOR, PS
14. ER HATCH COVER
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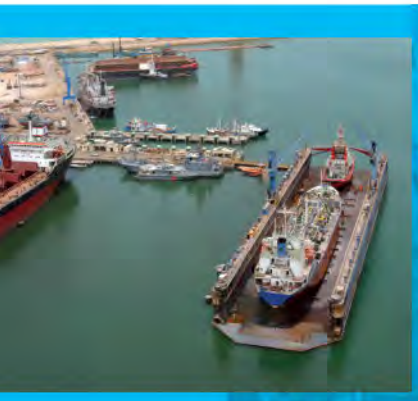

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Stereo 3D, a bi-focal view of ship structures

During a previous ICCAS conference there was an opportunity to test stereoscopic 3D presentations of aircraft engines and the complete ship's engine room. Gordan Šikić and Marin Bistričić of Uljanik Shipbuilding Computer Systems develop their views

Since the earlier ICCAS event the development of the Ship Explorer suite has been completed and that offered the opportunity to connect the two products, for aircraft and ships. But as it almost always happens, it turned out that the price of hardware and software libraries were out of our reach. The grim reality was telling us that it was simply too expensive.

On the other hand, being a software developer with a strong background in real time simulations, I knew that something might always be done, because, frankly, we didn't need the 'best car ever', just a 'bicycle'.

Initially, the only way of examining the 3D model in Ship Explorer was through the so called orthogonal view, and it worked very well for a long period of time. During 2014, however, there were some requirements to implement perspective views, as well as capability to position the viewer inside the ship (something impossible using orthogonal views).

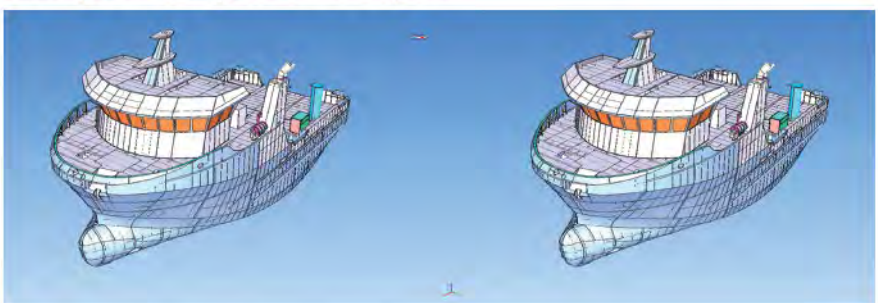
On the other hand, at the same time, relatively low cost hardware capable of presenting stereoscopic 3D started to appear. These included 3D TV sets, and projectors.

Having all that in mind, it was decided not only to implement what was required, but to go one step further, and implement stereoscopic viewing as well. In brief, we wanted to publicly show new capabilities during the Sorta conference 2014.

Stereo 3D presentation in USCS office

Basically, creating stereoscopic presentations consists of generating separate pictures for the left and right eyes, packing them into one frame, and sending it to an output device. The two main problems that we had to solve were how to place complete stereo information into one picture frame, and how to send it to an output device.

Cross-eyed stereo 3D presentation of ship hull



Frame packing

Frame packing means to place information about stereo 3D in an ordinary frame that is sent to an output device, the ordinary approach. Some of the possibilities of packing left/right eye information into one frame were (many of these may be tried using a link to 3D USCS content on youtube.com):

- Top–bottom representation, where the top part of the picture represents data for the left eye, and bottom part represents data for the right eye;
- Side-by-side, where the left part represents data for the left eye, and right for the right eye;
- Interleaved, where data for the left and right eyes are represented within alternating scan lines;
- Frame sequential, where there is no frame packing, but every even frame represents data for one eye, and odd represents data for the other eye;

- Red-cyan colour separation, where left/right eye data are separated by colours;
- Cross – eyed stereoscopic; this is similar to side-by-side, but information for the left eye is on the right side of the picture, and information for the right eye is on the left side of the picture. Using this approach, no additional hardware is required, one just has to "cross the eyes" in order to achieve stereoscopic 3D;
- Classical OpenGL approach; create and use 'left' and 'right' buffers (i.e. frames), and let the video driver 'do the rest'.

It can easily be concluded that every approach has its pros and cons. Also, there must be some data loss, whether through horizontal resolution, vertical resolution, frame rate, or colour related data. Options to use interleaved packing and red-cyan packing were ruled out very early because they presented additional problems to solve without any apparent gains. Frame sequential packing was an appealing option, but it was also ruled out, in order to keep everything as simple as possible, at least in the beginning.

The classical 'OpenGL' approach of creating and using mutually unrelated buffers (i.e. frames) for the left and right eyes was also ruled out because only professional grade video cards possess this capability, and there was a reticence to add new hardware constraints. There was a requirement to make the system work regardless of the quality of the video card.

Taking everything into account a decision was taken to use side-by-side frame packing, mainly because (in our opinion) lowering horizontal resolution is a much smaller sacrifice compared with lowering vertical resolution. In other words, splitting (for example) a 1900 x 1200 resolution frame into two 950 x 1200 sub frames was better than splitting it into two 1900 x 600 sub frames. Also, this approach allowed us to very easily switch into 'cross-eyed' during development.

About sending data to output device

One of the real 'black holes' was how to initiate stereo 3D, and whether it was necessary to take some special action while in stereoscopic 3D; why do we need HDMI? There were many questions of this kind. After much investigation, reading various documents and playing with 3D movies from youtube.com, a conclusion was reached that only creating side-by-side content should be sufficient, provided that the stereoscopic 3D mode on the output device is somehow initiated. In practice this means that stereo mode usually has to be activated manually, although some TV sets already require no action; as soon as we start delivering side-by-side data, a TV automatically activates stereo 3D.

Gordan Šikić (above), and Marin Bistričić (below) were part of the team that have completed the development of the Ship Explorer suite

About stereo 3D data generation

Up to this point everything was decision making. From this point on, there was a need to really implement stereo 3D. One of the decisions not mentioned before, was to create a complete data set in-house, without the help of a video card. Namely, some video cards are capable of creating stereo content out of ordinary 3D data, and a decision was taken not to exploit it, otherwise it would generate new hardware dependencies and worse, there would be little influence on the quality of the final results. So, a decision was taken to do everything the hard way and to generate all data from the ground up. Since all previous data presentations were done using OpenGL, it was natural to use it for stereo 3D as well.

Theory states that left/right eye data should differ according to distance between the eyes. Basically, what we see is presented using frustum, and in the case of stereo 3D, two overlapping frustums have to be created, one for each eye, with a slightly different viewpoint. Additionally, we opted for so-called asymmetric, mutually parallel frustums that converge at some distance. In practice, since OpenGL was used, only viewing data (i.e. the projection matrix) had to be initialised differently; the rest of the drawing did not require any change.

At the end, changes to the drawing process turned out to be much smaller than initially expected. There was a need to draw using the following steps:

- Activate left half of screen for drawing;
- Calculate left eye frustum (i.e. redefine projection matrix);
- Execute actual drawing call;
- Activate right half of screen for drawing;
- Calculate right eye frustum (i.e. redefine projection matrix again);
- Once more, execute actual drawing call;
- Indicate OpenGL that drawing is over, and frame is ready to be shown.

Project results and experiences

Complete stereoscopic 3D viewing started as a low priority task, almost as a hobby home project. Besides that, it quickly became one of the hottest capabilities of Ship Explorer. We can now create interactive stereoscopic 3D content using

any moderately new computer, coupled with a stereo 3D TV/monitor/projector. For this purpose we ordinarily use a €1,000 (US$ 1,105) class projector at USCS, and with perfect results.

During development it was soon realised that switching into stereoscopic 3D required changes to other programme subsystems. For example, due to resolution change, all mouse coordinates had to be recalculated. Also, stereo 3D implementation triggered change in mouse movement interpretation. In stereo 3D, usual model examination movement simply did not fit. As a result, a fly through mode with DOOM-like controls, incorporating mouse and keyboard for movement, was implemented. There are a couple of other changes of this kind, but it was all expected. All in all, the team reached all its project goals with excellent results and feedback.

What next?

This is surely only the first phase of the project, and there is lots of space for improvement. For example it would be useful to automatically initiate stereoscopic 3D mode on an output device and steps in this direction have already been taken, using the API of a supporting video driver. On the other hand, this problem might become obsolete, as some TV sets are already capable of automatically sensing a stereoscopic 3D signal.

One of the completely unexplored areas is GUI design, with respect of stereo 3D. In stereo 3D usual GUI elements like popup menus are not usable, and there are no guidelines about the design of the user interface. We are working closely with our users, trying to extract their needs, and to implement stereo 3D user interface that will fulfil their requirements.

One of the ideas that naturally comes to mind is to explore the possibilities of completely immersing into the model, and to literally do everything using this stereo 3D. The first step in this direction would be the inclusion of a head tracking device like Oculus. It would allow us not only to be in the ship, but to exploit the possibilities of head tracking as well. *NA*

References:

1) ICCAS 2011 Trieste (http://www.rina.org.uk/ICCAS2011.html)
2) Sorta conference 2014 (http://old.riteh.hr/sorta2014/index.php?sLang=2)
3) Stereoscopy from XZ to Z (http://developer.download.nvidia.com/assets/gamedev/docs/Siggraph2011-Stereoscopy_From_XY_to_Z-SG.pdf)
4) HDMI specification (http://www.hdmi.org)
5) Stereo 3D movie on USCS channel (https://www.youtube.com/watch?v=FU2Q4uKIsbU)
6) Cross eyed stereo 3D (http://www.vision3d.com/3views.html)
7) Šikić, Bistričić Perković, DEVELOPMENT OF INTERACTIVE TOOL FOR PAINT QUANTITY ESTIMATION OF SHIP STRUCTURES, ICCAS 2011 Proceedings
8) Benčić, Milanović, Šikić, Bistričić, MULTI-PLATFORM COLLABORATION TOOL FOR SHIP DESIGN AND PRODUCTION, ICCAS 2013 Proceedings
9) Abstract from a paper to be presented at the International Conference on Computer Applications in Shipbuilding (ICCAS) in Bremen, Germany on 29 September – 1 October 2015

Draft standard measures efficiency argument

The widely supported draft standard ISO 19030 has been approved by ISO's Marine Environment Protection Sub-committee for circulation. *The Naval Architect* reports on how ISO's new standard for the measuring of hull and propeller efficiency is taking shape and its important relation to the paints and coatings industry

ISO is in the process of drafting a new standard that should set out and define a universal method of measurement for the study of changes in ship specific hull and propeller performance.

The standard plots the relationship between the condition of a ship's underwater hull and propeller and the power required to move the ship through water at a given speed and will heavily impact the paints and coatings industry, which lacks a central method to accurately compare the performance of products on ships of the same type and size.

Since the ground-breaking work undertaken by Bob Townsin in the 1980s, including his papers on "Speed, Power and Roughness: The Economics of Outer Bottom Maintenance" (1980) and "Approximate Formulae for the Speed Loss Due To Added Resistance in Wind and Waves" (1983), hull efficiency has become more and more pressing for shipowners and operators who wish to streamline their businesses.

Ships with more efficient hulls are substantially more cost effective and environmentally friendly, allowing faster travel and fuel savings. According to Geir Axel Oftedahl, Jotun's Business Development Director for its Hull Performance Solutions: "Poor hull and propeller performance is currently estimated to account for around 10% of world fleet's energy costs and corresponding greenhouse gas emissions."

However, how the hull and propeller are made efficient can be problematic for purse strings and the environment alike. The unhappy marriage of economic and environmental concerns is an inescapable reality of the time we live in: forward facing, but hindered by ongoing economic instability. The paints and coating industry exemplifies this tension. It has the capacity to produce bio-friendly fouling releases instead of antifoulings, but is restricted by the financial realities of a reeling shipping industry that can, quite reasonably, be hesitant to invest in more expensive products such as fouling release coatings. These systems can be approximately four times the cost and require professional application, but offer attractive long term benefits, says Timothy Carr, technical sales engineer, Tudor Smart Surfaces.

ISO technical committee ISO TC8/SC2, the group responsible for developing ISO 19030

Efficacy is central to the issue, and it is in regard to this that ISO 19030 may come to the aid of responsible buyers that are attempting to make informed decisions. At present, performance guarantees can be a confusing marketplace for shipowners and operators, who are facing an array of product statistics and choices that have been derived by independent means. For example, Jotun's Sea Quantum X200 and HPS (Hull Performance Solutions) antifouling and Nippon's LF-Sea range antifouling boast five year guarantees that stretch the entire period between dry-dockings. However, each guarantee has been reached in relation to the companies' own methods of measuring hull and propeller performance. Without a standard to reference and utilise in practice, any performance data that is created in relation to the impacts of hull coatings is unfit for market comparison, giving an innately skewed reading. Oftedahl, who is managing the 19030 project on behalf of ISO, says: "The industry will have access to proven ways to measure speed loss [because of the standard], leading to better decisions about hull coatings and propellers."

At present, companies carry out tests relating to hull and propeller efficiency, such as the measurement of shaft speed, through different means, and within difficult circumstances. Testing a vessel in real conditions offers a better picture of performance in theory, but presents a variety of challenges due to the wide range of external variables, not to mention independent measurement methods, influencing readings.

The draft standard comprises three parts to target discontinuity, as defined by ISO. Part 1 (19030-1) "outlines general principles for how to measure changes in hull and propeller performance and defines a set of performance

indicators for hull and propeller maintenance, repair and retrofit activities."

Part 2 (19030-2) "defines the default method for measuring changes in hull and propeller performance and for calculating the performance indicators. It also provides guidance on the expected accuracy of each performance indicator." Within Part 2, Clause 4 will define the primary and secondary parameters and any external information needed. Clause 5 defines how data should be acquired, stored and prepared. Clause 6 will define how the performance indicators should be calculated, and Clause 7 offers guidance on the expected accuracy of each performance indicator.

Part 3 (19030-3) of the standard "outlines alternatives to the default method that result in lower overall accuracy but increase the applicability of the standard. It also provides guidance on the size of the impact on the accuracy of each performance indicator."

During an earlier stage of drafting, some Japanese shipping companies and shipbuilding companies expressed concern over points of the draft. "In particular, [the] application method of power curve… seemed to be problematic because it was thought to be largely away from the normal way based on shipbuilding engineering," says Akihiro Tamura, Director at Japan Ship Centre (JETRO). However, this has been corrected by a proposal by Japan, adds Tamura. Japan has actively participated in work on the draft, and according to Japanese sources: "Japanese members are becoming to feel more comfortable with the current draft of ISO 19030."

Recently, ISO's Marine Environment Protection Sub-Committee (ISO-TC8-SC2) voted in favour of circulating parts 1 and 2 as draft international standards. However, it still has a way to go before publication, requiring DIS and FDIS registration and approval, which may take longer to achieve than Jotun's optimistic expectation of a year. The current goal for the ISO technical committee (ISO-TC8-SC2) is to ready DIS ballot text for the end of December. If all goes ahead, a DIS ballot would start in either December of January.

Those aware of the standard appreciate its potential for positive change, but it can only be the start in a response that should be ongoing and forward thinking. In this respect, only antifoulings have been linked to the standard, leaving alternative coating technologies, markedly fouling releases, without mention or direct connection to the process. While most ships currently use antifoulings, the industry is likely to shift towards less environmentally damaging products as time progresses. As with the restriction on Tin coated hulls, biocides look to become a distant feature of an environmentally damaging past, ushering in a greener, more efficient period. Looking to the future, and most importantly for practical ship owners and operators, the product longevity and fuel savings associated with fouling release systems should prove their value as long term investments. *NA*

Krylov's tunnel vision

The Krylov State Research Centre is about to complete the construction of the Landscape Wind Tunnel. The test section size and state-of-the-art measuring instrumentation systems of this new wind tunnel will make it one of the most advanced facilities for the investigation of offshore structures, gas carriers, icebreakers and other ships

In the recent years, active development of offshore oil and gas fields in various regions of the world's ocean's highlighted the need for sophisticated marine platforms like drilling rigs, gas carriers, icebreakers, harbor facilities, regasification terminals, etc.

The golden rule in construction of such complex landscape structures is thorough and detailed consideration of all environmental impacts to be sustained in their lifetime. The international and Russian regulatory design documents identify aerodynamic loads as one of the primary environmental factors whose correct evaluation requires model experiments in special-purpose wind tunnels.

For proper investigation of all aerodynamic effects large-scale models of landscape objects should be tested including simulation of the surface boundary layer. It imposes extra requirements on the experimental facility whose test section should be sized to have

- at least 10m width for accommodating a large-scale model of structure with landscape details, e.g. model of regasification terminal with surrounding harbor infrastructure;
- at least 15m length for modelling the surface boundary layer being a very important factor.

New level of landscape research

The Krylov State Research Centre is presently completing construction of the unique Landscape Wind Tunnel facility to enable model testing of landscapes, harbours, berths, offshore structures, gas carriers, icebreakers as well as residential quarters and bridges. It is also a key to experimental investigation of long-span bridges.

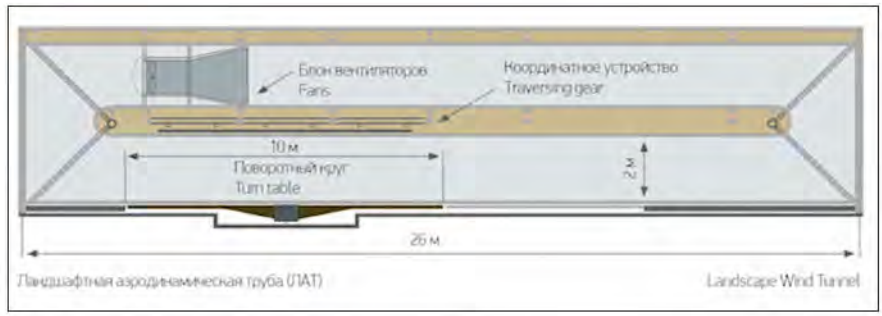


Fig. 1 – Longitudinal section of Landscape Wind Tunnel

Fig. 2 – Cross section of Landscape Wind Tunnel (test section width)

Main Data:

- closed-circuit wind tunnel with covered test section;
- rectangular test cross-section – 11 x 2 m;
- test section length – 18 m;
- incident flow speed – up to 14 m/s.
- flow speed adjustment step– 0.1 m/s;
- modeling of surface boundary layer.

A turntable of 10m in diameter on the LWT floor can be rotated to set any desired angle within 0.2° error. Thus, test models mounted on the turntable can be positioned at any specified angle relative to wind flow to simulate the full range of possible wind directions. The LWT ceiling is fitted with a three-axis traversing gear to move measuring probes and scan the flow around test models. The gear spans an area of 10 x 10 x 2 meters and the positioning error is 0.5mm.

The spacious test section and precise instrumentation of the Krylov Landscape Wind Tunnel supports large-scale model tests including simulation of the surface boundary layer which is deemed to be a very important factor. This combination of enablers would markedly raise the accuracy of experimental wind load evaluations, which is vital for design of unique landscape structures. For illustration let us look at some of the core research studies conducted at Krylov State Research Centre in this field.

Experimental investigations

Offshore platforms and icebreakers exposed to wind loads are faced with a similar range of issues. The primary concern is non-optimum aerodynamic design of superstructures. Wind patterns around such superstructures feature excessive vortices and separated circulatory flows imposing severe constraints on aircraft landing/take-off operations, crane jobs as well as affecting

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comfort and performance of crews aboard platforms and icebreakers.

Special studies are required to find the best locations for exhaust pipes and ventilation air intakes. The core experimental investigations conducted in wind tunnels for the design of offshore platforms and icebreakers are as follows:

- determination of factors characterising total aerodynamic forces and moments;
- investigation of flow patterns over helipads;
- development of arrangements to control separation flows around the superstructure and to smooth flow patterns over helipads for easing constraints on helicopter and crane operations.
- elaboration of recommendations regarding optimum locations of exhaust pipes, ventilation air inlets and outlets

Experts say that in the future liquefied natural gas (LNG) will dominate the world gas market. It is suggested that a continuous decrease of gas liquefaction costs and a greater flexibility of the LNG transportation network, as compared to pipelines, enable operators to serve multiple markets across the world.

Therefore, in the immediate future there will be a rising demand for the construction of LNG offloading and receiving terminals. For reducing the downtime due to bad weather, the construction site and layout of all harbour facilities have to be designed very carefully based on thorough experimental modeling of wind conditions. Thanks to the impressive size and equipment outfit of the newly built Landscape Wind Tunnel the Krylov Centre will be capable to undertake unique model tests of port infrastructure including landscape features to obtain large scope of valuable and accurate data.

One of the recent showcases is the model tests of Orlovka inlet (Teriberka bay). The purpose of these tests was a detailed study of wind patterns in the bay to choose the best berthing layout for LNG carriers with minimum downtime imposed by strong winds.

Another important area of aerodynamic research is finding environment friendly landscape solutions like:

Fig. 3 – Ice-resistant platform Prirazlomnaya: a model tests in Krylov's wind tunnel; b) photo of full-scale platform

- development of methods for reducing blow-off of loose cargo from stretched open stockyards.
- choice of the best locations for berthing facilities and recommendations for bulk cargo handling operations.

Conclusion

Newly emerging structural materials and construction technologies lead to erection of increasingly large-size and sophisticated structures. For successful design and construction of such facilities the art of wind load simulation and analysis should be brought to a new level of excellence. These kinds of investigations require model experiments in special-purpose wind tunnels. The Krylov State Research Centre has all necessary experimental assets, including the first Landscape Wind Tunnel in Russia, the multiyear experience and highly qualified staff to resolve all potential issues related to aerodynamics of marine structures and vessels. *NA*

Authors:

Mikhail A. Zagorodnikov, Cand. Sc. (Economics), Executive Director
Sergei Yu. Soloviev, Cand.Sc. (Physics & Mathematics)
Deputy Head of Hydro & Aerodynamic Division
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The man who explained ship behaviour

Through a mixture of theory, mathematical analysis and practical testing William Froude unravelled many of the factors influencing ship behaviour that had confused generations of designers and shipbuilders. Richard White explores the the work of one of ship design's biggest names

William Froude's early work, and his first paper for The Institution of Naval Architects, enquired into the question of why vessels roll as they do. In this he established the methodical approach that was to lead to perhaps his most valuable contribution: bringing respectability to model testing as a means of predicting ship powering requirements, performance and behaviour before building in full size.

This paper set out the forces causing a vessel to roll in a seaway, including resonant rolling, and was founded on close observation of the behaviour of a small float equipped with a mast from which a pendulum was suspended. Deductions were backed up with solid mathematics, almost too solid. Froude's groundbreaking work was acknowledged, but, as with other aspects of ship behaviour in a seaway, detailed mathematical analysis was impracticable in the pre-computer age. At later INA meetings he presented empirical solutions that made the ideas usable.

It seems that this work was a follow-on from studies of the likely rolling behaviour of the vast steamship *Great Eastern* that Froude had made for Isambard Kingdom Brunel. Froude's early career had been concerned with railways, starting in 1833 after he graduated in mathematics at Oxford. In 1837, he joined Brunel working on the design of the Bristol to Exeter railway, when his skill at developing a theory, testing it by experiment and refining the results led him into the marine world.

William Froude lived during the peak years of the transition from sail to steam for both merchant and naval ships. For sail there was a good deal of knowledge based on experience. Stability was mainly relevant as power to carry sail, while rolling was damped to a large extent by the sail plan. For steamships proceeding on a heading regardless of wind and wave direction, stability and rolling required new study. Resistance and power needed to achieve a given speed were factors that had to be pinned down prior to building the ship. Testing

The Froude towing tank in Torquay

models was an attractive idea in principle, but in the 1860s had become discredited.

Towing model vessels was not a new idea. Leonardo de Vinci, Petty in the 17th century, Chapman in the 18th and many other experimenters had made progress, especially in getting repeatable data. But the model data on resistance did not scale to give accurate results at full size for surface ships. It fell to Froude to show why this was so, and to deduce the scaling factors.

He had been towing 6ft long models on a river in south west England trying to compare the resistance of different hull forms. To see what effect size had he repeated trials with the same forms, but also 3ft and 12 ft long. He then recognised that the confusing factor was how gravity and viscosity influenced vessel resistance separately; the one controlling wavemaking resistance, the other frictional drag, and that they did not scale in the same way.

His findings on wavemaking resistance for different sizes of vessel were enshrined in Froude's law: that the resistance per ton of displacement is the same if the speeds are in the ratio of the square roots of the lengths. A good indication of frictional resistance could be gained by towing planks of the same length and wetted surface area as the model, but there continued to be argument over correctional factors, not really resolved until the mid-20th century and the *Lucy Ashton* full scale trials (see NA April 2015). However, not everyone agreed with Froude on the subject of using small models to predict full size ship performance.

A curious paper by Merrifield to INA, representing mainstream opinion, held that only testing of a series of full sized ships would provide reliable answers, and model testing was considered a waste of time. Scott Russell, who chaired the meeting, himself a reputable shipbuilder and naval architect, summed it up: "You will have on the small scale a series of beautiful interesting little experiments, which I am sure will afford Mr Froude infinite pleasure in making them, as they did to me, and will afford you infinite pleasure in the hearing of them; but which are quite remote from any practical results upon the larger scale."

But the Royal Navy, in the form of its Chief Constructor Sir Edward Reed, did not subscribe to this view, and supported Froude's proposal to build a towing tank in which model tests could be conducted under controlled conditions. The outcome was the Torquay tank opened in 1871, a prototype of test tanks whose descendants are still being built today and also pioneer in the dynamometers used to measure forces acting on the model being tested.

At this time, the early 1870s, the RN was not only dealing with the transition from sail to steam, but also with a constant stream of technology developments in construction, armour, big guns, turrets, boilers, engines and much else. Froude's work on rolling and stability was valued, and the ability to test different hull forms for power requirements at model scale would save money and help to avoid full scale fiascos.

Although it was agreed that hull form influenced resistance, there had been a widespread belief that there must exist a single ideal form, and strenuous efforts were made to try to find it, without success. Froude's work with models showed that such an ideal shape could not exist. Short, fat, long, thin, fine-ended or bluff, all had their place, depending on the speed and other qualities required, and

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Froude spent much time studying hullforms for resistance and the wave systems produced at bow and stern.

Towing models to develop hullforms of course involved building accurate scale models in the first place, quickly and economically. To do this Froude designed a copying machine, and essentially the same idea is used today to mill full sized plugs for FRP boats and much else.

His equipment worked from a line drawing with many waterlines faired in. The roughly shaped block that would become the test model would be clamped in the copying machine, which had a milling cutter in a head that could be moved in X,Yand Z axes on guides. A follower was moved along a particular waterline and its motion was copied by the milling cutter. The result was a gash representing that waterline cut into the block.

The operator then raised the cutter to the next defined waterline. This process was repeated until the inverted hull shape appeared as a series of steps. Excess step material was removed using hand tools until the waterlines remained just as witness marks. For the material of the model to be carved Froude made the inspired choice of paraffin wax. It had a suitable specific gravity, was easy to cast into the primary block and to mill and it could be worked to a good smooth finish with hand tools. Subtle changes to hull shape could be evaluated by cutting away or adding wax. A big advantage was that both model and cuttings could be melted down after trials were completed, and recycled into a new model.

The validity of towing models in tanks was quickly established on actual vessels, and more subtle effects of hullform could be investigated. For example, the powered warship was seen for a while as a weapon in itself, not just as a gun platform, ramming the enemy with a shaped underwater bow projection. In fleet manoeuvres this proved more dangerous to friend than foe, but tank testing showed that the ram bow could actually reduce wavemaking resistance, acting as a vestigial form of the bulbous bow used later for strictly hydrodynamic reasons.

Long before this, Froude had become interested in hull/propeller interaction, and in the 1850s tested out theories using a clockwork powered model on a lake. This work helped him in later years with hydrodynamic flow problem at the stern of ships, when some twin screw warships were reckoned to be almost unmanagable.

His towing tank and other work was continued and expanded by his son R.E. Froude. During his lifetime, William Froude presented many papers on aspects of his work, to INA and other organisations. RINA collected all these in a bound volume now in the RINA library. Other material is published from time to time, such as a report on Froude's research into the Ramus stepped hull hydroplane proposals of 1872, from the UK House of Commons archive, evaluated using today's methods by M.G. Morabito, and published in the latest RINA Part B1 Transactions, vol 157, 2015. *NA*

CFD in focus

Dear Sir,

I was especially pleased to read in the July/August 2015 edition of *The Naval Architect* your Editorial Comment entitled *Changing Times* and the various articles addressing the subject of computational fluid dynamics (CFD). It is a subject and a technique that we will get to hear about more in the future, as an alternative to testing models of ships in a towing tank.

However, I was most intrigued by the article entitled *Simulated waves bring real surprises*, following TNA's interview with Mattias Jörgensen and Janne Niittymäki of Foreship.

For some naval architects it may not have come as a surprise to learn that a hull form optimised for performance in a calm sea state, and, in the case referred to, fitted with a bulbous bow, should not provide the optimum performance when operating in waves. The bulbous bow is there to create a wave that counteracts with the natural bow wave formation of the hull and can lead to an overall reduction in resistance, but this interaction will be disturbed by waves present in the sea state and the pitching of the vessel.

Nonetheless, the article provides a useful reminder, at a time when the industry is looking for innovative solutions to reduce the fuel consumption of ships, that what works in calm seas may not be so effective in the usual ship operating environment, which will inevitably be in a mixture of waves and different headings, ship speeds, extent of loading, clean/fouled hull and propeller, etc.

The introduction of MARPOL Annex VI EEDI requirements suggests that in the future ships will be designed to achieve a maximum value of the Index for a defined transport capability, to satisfy the Regulation. The EEDI could become the new measure for optimisation, or it could just be another regulatory constraint. But if the former, the Regulation will lead to ships being designed around optimised calm water performance, confirmed by trials in calm water, which is not in line with the overall objectives of the MARPOL Annex VI measures, which is to reduce and minimise CO_2 emissions from ships in service.

The article makes repeated references to the terms 'optimum' and 'optimisation' without defining what parameter is being optimised. Is an optimum hull form identified as one having a minimum resistance, a minimum shaft power, or a minimum fuel consumption, and what are the design parameters that have been fixed? There may be a tendency for the designer of the hull to think that the optimum hull shape is the optimum ship, with all other persons engaged in other technological and commercial disciplines thinking that their area of expertise will yield the optimum ship.

I suggest that the real issue is that currently we do not really know how ships are designed within a contractual environment. As naval architects we think we know, but if we look at the pages of our Transactions, The Naval Architect and the other RINA publications and its conference proceedings, the reality is that we share a lot of detailed technologies, but do not share information and techniques used within the whole of actual design and contracting process, or the decisions taken by the various participants.

As a 'rule', ship builders and ship owners, together with their suppliers and advisors when contracting to have a ship designed and built are in competition with one another. Not sharing and restricting access to information and techniques is the major means of competition. Further, even within the same organisation, competition between disciplines and individuals, all eager to secure their jobs, promotions and livelihoods, restricts access to their information, knowledge and skills. This all has an adverse impact on the ship design, contracting and building process.

Maybe Messrs Jörgensen and Niittymäki might be encouraged to bring more of their fresh thinking forward, by presenting to RINA members how they see the place of CFD evolving and being used within the ship design and contractual environment.

The design and building of cruise ships may be the exception to the above 'rule' since most cruise ship operators tend to have their ships built by the same shipbuilder with whom they have developed a long term relationship, although there are generally few builders of cruise ships with the relevant experience and building capacity. But in the case of bulk carriers and crude oil tankers, it would appear that the free market is fully functioning and the objectives of builders and owner/operators are not aligned.

It surprises me not that the IMO has decided to set a target to reduce the emissions of new ship by 30% compared with old ships, because those old ships were so poorly designed in terms of energy efficiency. Further, it will not require major advances in ship technology to achieve this. Although the reduction in the specific fuel consumption of diesel engines, achieved by engine builders, is playing a significant part, much can be achieved by just applying the existing principles, knowledge and technologies, with innovation in new technologies offering some additional advantages.

There was a time when propulsion machinery was heavy and consumed large amounts of fuel, and naval architects played a major role in designing ships that maximised their speed and cargo/passenger carrying capacity, with minimum fuel consumption. But somewhere in the history of ship building, the focus switched to commercial interests deciding to make their purchases based on the lowest price and building cost, which lead to short fat ships being built, with low energy efficiency.

Several commentators have suggested that naval architecture, and naval architects, could be entering a new 'golden age' as a consequence of EEDI, but I do believe that we need to first have a better understanding of the ship design and contracting process, if we as naval architects are to be allowed to fully bring our influence to bear on this process. The use of CFD techniques could speed up the design process, and lead to better ships being designed, but without knowing what constitutes the 'optimum' ship, industry and the planet may not get full benefit from this important technique.

Kind regards

Jan van der Schans

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