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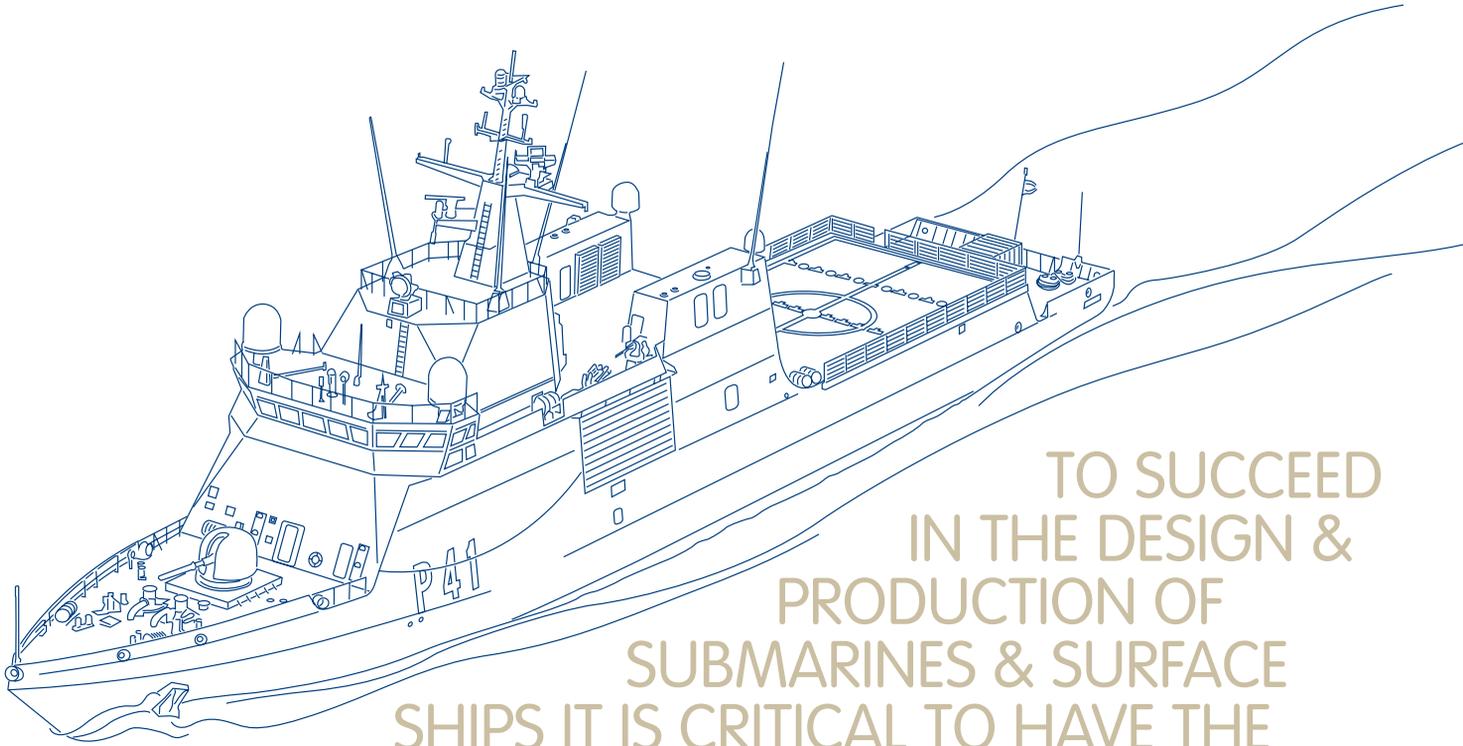
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First Announcement

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The key to the future success of the maritime industry will be innovation in all aspects and sectors whether it is in research, design, construction or operations. And in an industry which is technologically led, such innovation will be provided by engineers who have the professional skills to meet the future demands and challenges.

Such engineers will achieve the knowledge and understanding which underpins those professional skills while at university, and develop them through training and experience after graduation. But what are the particular skills required by different sectors of the maritime industry - commercial, naval, recreational, offshore, renewable energy? What are the interpersonal skills which engineers of the future will require to complement their technical skills? Are the universities and colleges adapting to deliver these skills? And what is the role of industry in enabling those skills to be developed?

The Seminar will build on the success of the International Conference on the Education and Professional Development of Engineers in the Maritime Industry, held in 2011, and provide an interactive, but less formal forum for representatives of both industry and academia to present and discuss how those engineers of the future will achieve the knowledge, understanding and professional skills which the industry will need. The Seminar will examine the differences in the requirement and delivery of education, training and professional development in different sectors of the industry and in different countries, seeking to both learn and benefit from such differences. Given the lead time to provide professional engineers, the Seminar will also seek to identify the changes needed now to provide the engineers of the future.

The value of such a Seminar lies in the exchange of experience, views and discussion between the stakeholders of this vitally important subject. Therefore, in order to involve as many participants as possible, the Seminar will consist of a number of presentations and panel discussions.

For more information, visit www.rina.org.uk/education2012

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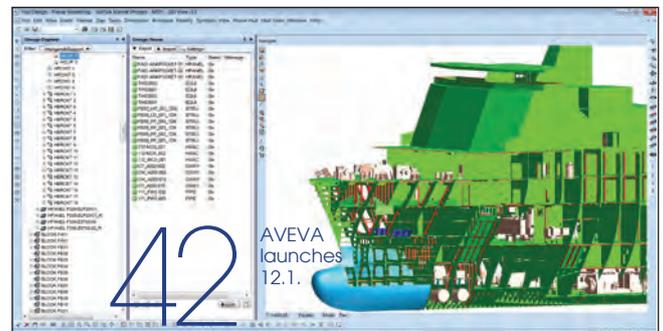
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Ingrid Marie Vincent Andersen, a PhD student at the Technical University of Denmark.

On-line Edition

The Royal Institution of Naval Architects is proud to announce that as of January this year, *Naval Architect* journal has gone digital. We are very pleased to inform the maritime industry that each issue will be published online, on the RINA website. Visit www.rina.org.uk/na and click on the issue cover you wish to view. This means that the entire publication, including all editorials and advertisements in the printed edition, can be seen in digital format and viewed by members, subscribers, and (for a limited time) any other interested individuals worldwide.



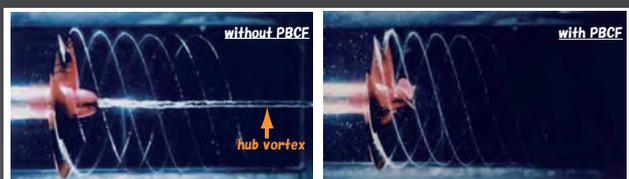
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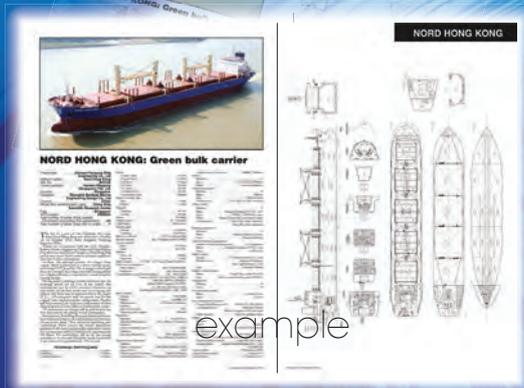
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The Royal Institution of Naval Architects published the 22nd edition of its annual **Significant Ships** series in February 2012. Produced in our usual technically-orientated style, **Significant Ships of 2011** presents approximately 50 of the most innovative and important commercial designs delivered during the year by shipyards worldwide. Emphasis is placed on newbuildings over 100m in length, although some significant smaller cargo ships, fast ferries and offshore vessels are considered, including a cross-section of ship types, with each vessel being either representative of its type or singularly significant. Each ship presentation comprises of a concise technical description, extensive tabular principal particulars including major equipment suppliers, detailed general arrangement plans and a colour ship photograph

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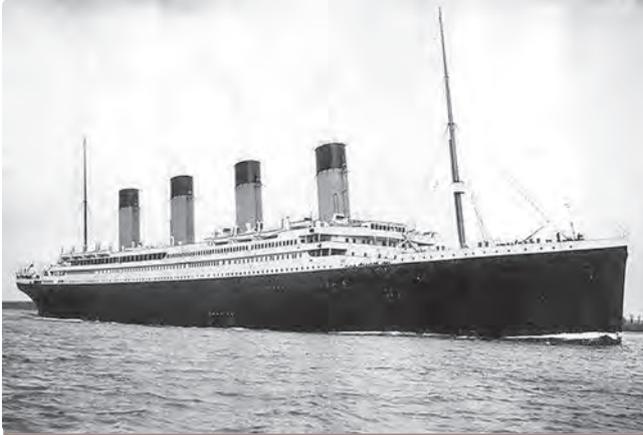
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The mourning after

Shipping is learning the lessons from previous accidents, but there is still more that can be done to save lives say industry experts.

The loss of *Titanic* on 15 April 1912 and the resultant loss of life, 1517 in total, served to awaken the maritime industry to the significant dangers of sailing the oceans with large cruise ships. Indeed it could be argued that the changes that took place as a consequence of the *Titanic's* loss have served to protect cruise passengers since.

Crudely, if one looks at the numbers only, the loss of 30 lives as a result of the loss of *Costa Concordia* pales into insignificance. Of course playing the numbers game is not an option when it is your relative, friend, lover or work colleague that has been lost in these terrible accidents.

Clearly the profound damage done to confidence in the industry by such accidents and the fact that the collective memory has an image of *Titanic* as it was lost is testament to the enduring nature of such tragedies.

To glibly say that it is something that should never happen again is pointless. In fact accidents have happened again and again even before *Costa Concordia*, with a number of significant accidents having occurred throughout the century since *Titanic*. At intervals of very roughly every 10 years on average, there has been a major passenger vessel loss, mainly through fire that spread rapidly through a ship's interior.

Fire resistant materials have improved this aspect of ship design as has fire training for crew and vessel design and fire-fighting equipment. In effect the likely lesson from *Costa Concordia* is that some form of human error was to blame for this accident. Though until the final enquiry

reports nobody is certain about the causes of *Concordia's* demise.

One element that was disturbing from the recent events in Italy was that even though *Concordia* had sufficient space for all passengers and crew to find a seat on a lifeboat or liferaft, launching the lifeboats was a problem once the ship's list became significant. In addition, from unconfirmed reports, it appears that passengers started to board lifeboats before the crew had called for passengers to abandon ship.

“A little training can go a long way and the fact that cruise passengers have little in the way of lifeboat training is a shocking revelation”

If this is indeed the case and passengers did take matters into their own hands then some very significant questions must be asked about crew training and company procedures, a topic that at least two experts have already touched on in last month's issue and again in this month's opinion piece.

In *The Naval Architect*, in both the March and April issues, maritime professionals have offered their opinions on some of the changes that are necessary in order to make cruise ships safer. In March Francis

Chan talked about the size of individual passengers as a possible problem as well as highlighting the difficulties that cruise companies may have when an emergency occurs in *Fat is a maritime issue*. This month Kevan Stokes, senior partner at Augmentias, describes how training could literally be a life saver for many cruise passengers, many of whom have never seen the inside of a lifeboat.

In his excellent opinion piece Stokes also points out the value of making certain that vulnerable passengers stay with friendship groups or relatives and are placed with them in lifeboats rather than relying on crew who most probably will not know the passenger or their possible disabilities.

A little training can go a long way and the fact that cruise passengers have little in the way of lifeboat training is a shocking revelation in a world where other modes of transportation, most notably the airline industry, take a far more proactive role in reinforcing safety procedures for passengers.

Two opinion pieces have now appeared in successive months in *The Naval Architect* and this is something that the editorial team would like to encourage. We would like readers that can produce a reasoned discursive piece on a topical issue to write to editorial@rina.org.uk with stories that are from 800 words up to, but no more than, 1600 words long.

It is with sadness that the maritime industry will remember those who lost their lives 100 years ago this month, but it should be with renewed hope that the industry can find the answers that will improve its safety record still further. *NA*

Lubricants

Seeing is believing say Castrol

Marine lube oil provider Castrol has fired another volley in the war of words between Castrol and the French company Total Lubmarine, which manufactures the world's only universal lube oil, Talusia Universal (TU). (See *The Naval Architect* January 2012, pp10 and March 2012 pp. 26).

To recap Castrol claim that a midrange base number (BN) lube oil like TU – which has a value of BN57 – could damage a marine engine particularly in this age of slow steaming. Total for their part say that TU is a new formulation that cannot be measured in the same way as other lube oils. It works, say Total, by increasing the rapidity of the neutralising reactions and therefore the BN value in this context becomes less relevant.

In the latest verbal volley Castrol have released a story in which it claims two Chinese owners voiced their “disquiet”. “When we choose the lubricants we use, we consider three main points... Of course, we consider the competitiveness of pricing, but we also need to be convinced that technical support and port coverage are available. The third, no less critical, consideration is that we can rely on a product that is fit and right for purpose,” said one owner.

Another Chinese ship operator was “more explicit” according to Castrol: “Clearly, as sulphur content levels are restricted, the concept of a single solution cylinder oil is quite appealing, but we are sceptical... It promises an effective and convenient resolution to a difficult problem. But, when it comes to a knowledge-based answer, we are of the view that different sulphur content fuels will demand cylinder oils featuring different BNs. We feel more comfortable with the different types of products that Castrol supplies.”

In a more significant statement Paul Harrold, technology manager marine and energy lubricants at Castrol, suggests that the company has seen vessels that have swapped from a universal oil to Castrol and he says: “we have seen higher corrosion rates”. He emphasised that all mid-range BN products could cause excessive wear and that Castrol has “evidence from inspections”.

Castrol went on to say that a recent service letter “from a leading engine maker” advised that “when ships are slow steaming, operators should increase lubricant feed rates due to incidences of corrosive wear.”

However, Castrol say that: “increasing the BN in cylinder oil is a better alternative to having to

increase feedrates for mid-range BN cylinder oils when using higher sulphur fuels.”

Even so, both, Castrol and Total have claimed in this very public debate that the engine manufacturers support their view, however, *The Naval Architect* found both Wärtsilä and MAN Diesel & Turbo very reticent to comment. “At this point Wärtsilä does not have any comments on this topic,” said the Finnish firm, while MAN Diesel responded with, “the topic is under discussion in the CIMAC (The International Council on Combustion Engines) work group Lubes and they haven't reached any conclusions yet.”

Adding to the debate will be Shell, which announced at the end of last year that it too would be marketing a new universal lubricant, Alexia S4.

Shell Marine Products said at the time: “Marine lubricants add up to 20% of operational costs for ship owners. Currently, the global marine lubricants market is valued at more than US\$5 billion.”

Alexia S4 is currently undergoing field trials that are designed to gain the approval of the engine manufacturers. Asked to comment on the recent debate between Castrol and Total, Shell declined to comment. It appears that until the field trials have been completed there will no significant comment from Shell.

Ancillary equipment

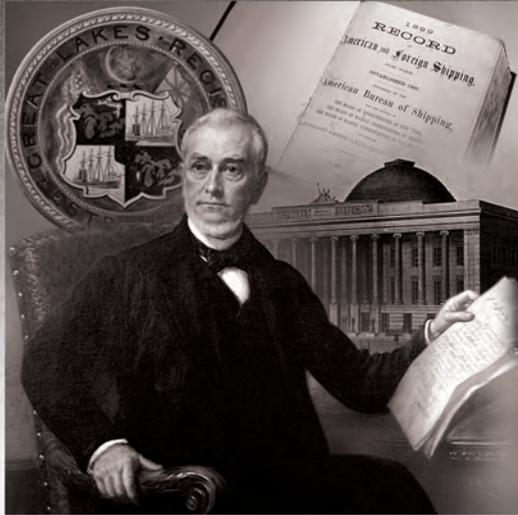
Viking Lady goes hybrid

Norwegian class society DNV, part of the FellowSHIP research project, is taking further steps to reduce shipping emissions, by installing a battery pack on *Viking Lady*.

Viking Lady was fitted out with a fuel cell as part of its propulsion system in 2009, which generates an electric output of 330kW and has so far run for more than 18,500hours. The installation of the battery pack will give the vessel a total of 30% increase in efficiency claims DNV.

A half MW battery will be used for the testing on *Viking Lady* with initial onshore trials of the battery system later this year, DNV expect that a full 2MW battery to be installed at the end of the testing. DNV says there are many gains in using this type of power onboard, such as in the areas of noise and vibration and for harbour and dynamic positioning operations, but also it claims that the battery will be ‘maintenance free’.

Bjørn-Johan Vartdal, project manager, DNV explains: “We know that the hybrid system will reduce the energy consumption. When operating, for example, on dynamic positioning, there will be a major fuel saving potential. When in harbour,



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too, the ship should be able to operate on the fuel cell and its battery power alone, which will reduce emissions significantly. For environmentally sensitive areas, this will be an essential benefit. Additional benefits are related to reductions in machinery maintenance costs and in noise and vibrations.”

DNV will also be running studies later this year looking at applying the propulsion set up on *Viking Lady* to other ship types.

Propulsion

Cruise operator opts for electric power

In a US\$60 million order cruise ship operator AIDA has opted to power its two new 125,000grt cruise ships, currently under construction in Japan, with ABB power and propulsion units.

The ships, which will have a passenger capacity of 3250 people, are being built at Mitsubishi Heavy Industry's Nagasaki yard and are due for delivery in 2015 and 2016. ABB will supply complete electrical systems for both vessels. This equipment includes generators, and transformers for propulsion, engine room and distribution, frequency converters, bow thruster motors, and other related power system equipment, as well as its latest generation Azipod XO propulsion systems, said ABB.

Newbuildings

OSD seals 10 new PSV orders

Dutch naval architects Offshore Ship Designers has signed contracts to design 10 platform supply vessels (PSV) to be built at three yards, in Brazil, Japan and Spain, for two operators.

The large diesel-electric PSV's will be built for Swire Pacific Offshore Operations which has ordered four IMT-997 Platform Supply Vessels to be built in Japan by the Universal Shipbuilding Corporation and a further four sister vessels will be built in Brazil's EISA shipyard. The 97m long, 5000dwt vessels will have a DP2 capability from their diesel-electric propulsion systems that will operate azimuth propulsion units. Delivery of the eight will begin in 2014.

Additionally Northstar Shipping has ordered two IMT-982 PSV's to be built at Balenciaga in Spain. Like the larger vessels being built Swire Pacific the 83m long PSV's will have diesel-electric propulsion systems.

The vessels have an initial operating deadweight of 2550dwt, a useable deck area of 912m² and are powered by four MAK 9M20 1450kW generator sets driving two Steerprop 1900kWe Azimuths. The vessels are specially designed to operate at less than 5000tonnes displacement to work with older North Sea Structures where vessel size and weight restrictions apply and will be also classed with DP2 capability.

Two IMT-982 PSV will be built at Spain's Balenciaga yard for Northstar Shipping.



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Sailing into a low-sulphur future

Low-sulphur bunkers are set to become the shipping industry's standard and this will have implications for ship design, writes *Julian MacQueen*.

The first step towards cleaner bunkers has already been taken since, from January, the IMO has moved the global sulphur cap for ships' bunkers down to 3.5% from 4.5%. These sulphur targets, along with those for other pollutants, are only going to do one thing – get tougher.

One industry response to tightening regulation has been the emergence of scrubbing technology, which allows ship operators to remove pollutants in bunker fuel by 'washing' the vessel's exhaust fumes.

Scrubber manufacturer Alfa Laval Aalborg told *The Naval Architect* that it made its first commercial sale, to Dutch company Speithoff, in February. Alfa Laval had already run a scrubbing trial with ferry operator DFDS. The product in question is called Pure Sox.

According to Speithoff, the scrubber is the first "to operate with several exhaust gas inlets in combination (both main engines and auxiliary engines) at 28,000kWh engine power".

Alfa Laval's exhaust gas cleaning systems marketing manager, Reme Diks, says that the company's sales focus is on short-sea shipping operating in Emission Control Areas (ECAs) where sulphur targets are more stringent.

Diks has noted greater interest from shipping companies in scrubbing technology. "In the last three months, approaches from companies have been increasing rapidly," he says.

The commercial argument behind scrubbers sets off the initial investment in purchasing and installing the equipment against later fuel savings which can amount to "millions of dollars" annually, according to Diks.

By burning – and scrubbing – the standard 380 centistoke (cst) bunker fuel grade, ships transiting ECAs can avoid using low-sulphur distillate fuel, which is significantly more expensive than main grade bunkers. In Rotterdam, late March, prices for 380cst were around US\$700 a tonne while distillate-grade fuel was trading at around US\$1000 a tonne.

But, installing the equipment can be complicated. Diks says that installing a wet scrubber is akin to "open heart surgery" as, in addition to pipes and other equipment, it must be inserted inside the funnel. "It's not easy, but it is doable," he says.

With a newbuild, the situation is more straightforward. "There is far more flexibility,"

explains Diks. However, so far interest in putting scrubbing technology into new ships has been minimal, and what interest there has been has come from Asian shipyards which are the main builders in the current climate.

The acceptance by some ship operators of scrubbing as a feasible response to tougher regulation tallies with studies made on the future shape of the bunker industry.

Marine fuels consultant Robin Meech says that fuel oil with 3.5% sulphur will retain a role as onboard scrubbing becomes a "viable" option for owners. From a supply point-of-view, the consultant argues that the IMO's 2020 target of 0.5% sulphur content for bunker fuel is unachievable given current levels of investment in refining.

Shunning bunker fuel altogether, some ship owners are considering liquefied natural gas (LNG) as an alternative fuel source.

Classification society Registro Italiano Navale (RINA) has published a new notation, called Gas Fuelled Ships, which establishes requirements for the use of LNG or compressed natural gas (CNG) onboard ships. Certainly, LNG is effective in eliminating sulphur oxide (SOx) as well as other pollutants from bunkers such as nitrous oxide (NOx) and particulates.

On the downside, the cost of installing an LNG engine plus fuel tanks is estimated to be around twice that of a conventional diesel engine and its fuel tanks. In addition, the owner will face the loss of cargo-carrying income as hold space is displaced by the larger LNG fuel tanks.

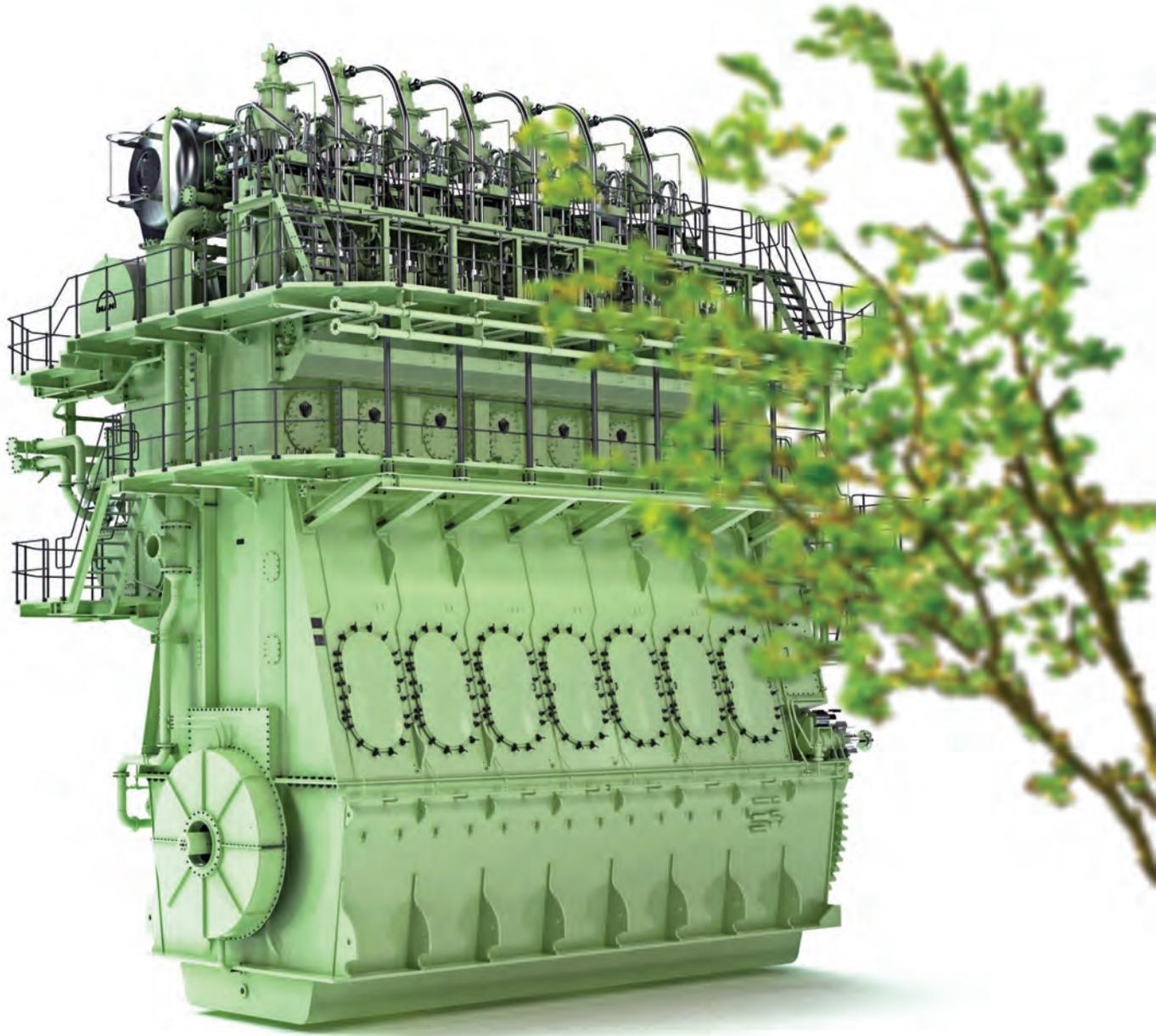
As with scrubbing technology, LNG suppliers are looking at the short-sea trades. Norwegian LNG supplier Gasnor, for example, has started an LNG bunkering operation at the German port of Brunsbüttel, which is aimed at inland and coastal shipping.

In addition to global limits laid down by the IMO, other authorities have even tighter emissions' reduction goals in mind. From August this year, the North European ECA, which covers the Baltic and North Sea, will require a switch to fuel with 1.0% sulphur content. From 2015, compliant fuel will need to have a sulphur content of 0.1%. ECAs are also set for US and Canadian waters.

Hot on the heels of emissions regulation, the shipping industry can expect further moves on green house gases (GHG). In January, for example, the European Union launched a consultation document on GHG and shipping. [NA](#)

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Engines

Cummins launches QSM11-CP generator

Cummins Inc. has announced the latest addition to its C Power product line, the QSM11-CP marine generator set. The QSM11-CP features a Cummins QSM11-DM marine auxiliary engine matched to a Cummins Generator Technologies marine-grade HCM434F1 alternator. All of the major components of C Power generator sets have been designed and manufactured by divisions of the Cummins company.

With ratings from 250 to 300ekW, the QSM11 C Power has been optimised for primary ship's service and emergency power. The QSM11-CP includes customer-selectable options, this includes Cummins C Command HD panels, that allow the generator to be tailored to the vessels application. Certified to US EPA Tier 2 and IMO Tier II emissions standards, the QSM11-CP is SOLAS compliant and certified by the industry's major classification societies, including ABS, Bureau Veritas (BV), DNV and Lloyd's Register (LR).

"The launch of the QSM11-CP allows us to fill a gap in the 200 to 300ekW range while meeting the latest emissions requirements for marine equipment," says Donald Ho, director, Commercial Marine Center of Excellence. "Components like filters and dipsticks can be mounted on either port or starboard side, giving the genset flexibility in installation and maintenance onboard. But, what's most impressive is Cummins' ability to offer a genset fully integrated by the factory that carries with it the benefit of Cummins service and warranty support."

Cummins Commercial Marine and Offshore Oil & Gas Center of Excellence will deliver a wide range of customised and integrated power packages, including an expanded line of C Power marine generator sets.

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Cummins launches the latest generator on to the market.



Interiors

Drumarkon floors the market

New regulations are banning the use of traditional floors and compelling yards to fit non-combustible floors in yachts of over 100m in length. Drumarkon is meeting this challenge with its latest product in non-combustible floor panels, called Druma-Floor NC/SR that will meet the new regulations and are certified in accordance with IMO Res. 754 (18) in class B15 and SOLAS. At the same time, their construction, features, weight and installation are identical to conventional sandwich floor panels.

www.drumarkon.nl

Ancillary equipment

Hose securing unit from Kongsberg

Kongsberg Evotec has received an order for a second Bulk Hose Securing Unit (BHSU) for the LNG vessel *Viking Queen* from Eidesvik Offshore ASA.

Kongsberg Evotec developed the technology through Statoil's LOOP technology development programme in co-operation with Innovation Norway and Eidesvik. The prototype was installed and tested aboard *Viking Queen* in December 2010.

The company says that the prototype has completed an extended test program and the feedback has continued to be very positive.

Kongsberg Evotec's BHSU system will make the operation of hose handling safer as the procedure can now be coordinated and maintained from the wheelhouse with crew no longer needing to enter the hazardous area. This increases safety for both crew and vessel during critical bulk transfer operations.

www.km.kongsberg.com

Interiors

Vescom launches latest Vinyl

Vescom has announced the launch of its latest vinyl upholstery collection, Upholstery 03 vinyl. The collection brings seven new vinyl designs available in a broad colour series.

Five of the designs come in different effects such as a metallic sheen (Keri and Sanak), an appealing structure (Dodan) or a subtle grain (Brant and Dalma). The other two qualities, Furka plus and Leone plus, now come in a new and a wider range of colour.

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www.vescom.com

Ancillary equipment

Plugging the leak

Tracerline has introduced its Dye-Lite All-In-One full-spectrum fluorescent dye to the market, which pinpoints leaks in all oil and oil-based fluid systems, including engine oil (includes synthetics), fuel, automatic transmission fluid, power steering and hydraulic fluid (petroleum-based), the company claims.

The All-In-One dye provides leak detection in marine vessels systems because it contains two distinct fluorescent dyes. One dye fluoresces best under ultraviolet light and the other under blue light.

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www.tracerline.com

Propulsion

Samsung chooses STADT

Samsung Heavy Industries has ordered the STADT STASCHO No-Loss Drive electrical propulsion system for vessels that will be powered by LNG currently on its order book.

This system enables to separate power production from the propeller system. The LNG fed generators will operate with a steady load, quite independent of how much power is used on the propeller. The propellers are driven by the robust STADT electric No-Loss drive system.

The product range covers propeller systems from 100kW up to 100MW in many voltage classes from 220V up to 15kV. No big power transformers are used in the STADT technology, saving space,

weight and losses. One of many technological benefits with the new STADT-system the company highlights is that it is completely free from any disturbances, such as electromagnetic interference-EMI, acoustic noise and vibrations. In the STADT STASCHO drives, the use of DC capacitors is limited, and only used temporary, eliminating problems from past generations drives.

www.stadt.no

Ancillary equipment

HFT launches PurgElite

Huntingdon Fusion Techniques (HFT) has now launched the MKV version of its designs with its PurgElite series of Tube and Pipe Purging systems for diameters from 2.5-30cm inclusive. This particular range is suitable for stainless steel, duplex steel and nickel alloys.

The new series has a number of advantages over previous weld purging systems and has taken into account the evolving technology in all market places where much higher specifications of materials and work finish are expected, the company says. The key feature is the development of a low profile purge gas release valve that is required to purge the chamber between the two dams once they are inflated. The new low profile valve allows manufacturers to purge pipes locally rather than fill complete systems with large amounts of expensive inert gas.

Employing latest developments, HFT, has selected lower vapour pressure materials to ensure that the outgassing rate into the weld zone will be reduced to the barest minimum during welding to protect the molten weld pool from oxidation and the problems arising.

www.huntingdonfusion.com

New purging systems from Huntingdon Fusion Techniques.

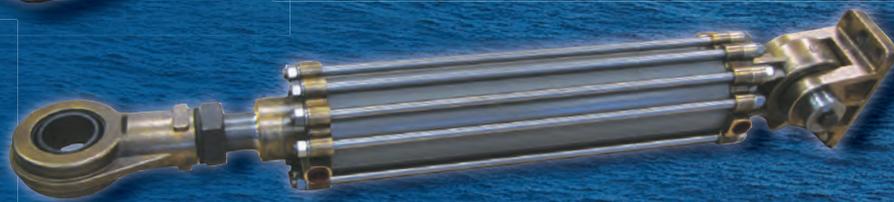


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A Titanic legacy

In the century since *Titanic* foundered on an iceberg in the Atlantic many changes to safety regulations have been put into practice. Yet accidents can, and do, still happen. Dr Stephen Payne, former vice president and chief naval architect at Carnival Corporate Shipbuilding Southampton, assesses the lessons of *Titanic*.

Public focus into passenger ship safety was brought back to the fore with the loss of Costa Cruises' *Costa Concordia* on 13 January 2012. Fire aboard *Costa Allegra* has further concentrated that attention on the safety issues surrounding modern cruise vessels.

We await the verdict of official inquiries, but media focus has centred on how a modern ship could founder, the timing of safety drills and the length of time between the incident occurring and the decision to abandon the ship.

The ship was designed and built to comply with the SOLAS requirements prior to the new probabilistic damage stability and safe return to port rules. If, as widely reported the side damage extended through over 60m with up to five compartment lengths breached, it is not surprising that the deterministic two-compartment damage stability arrangements were overwhelmed.

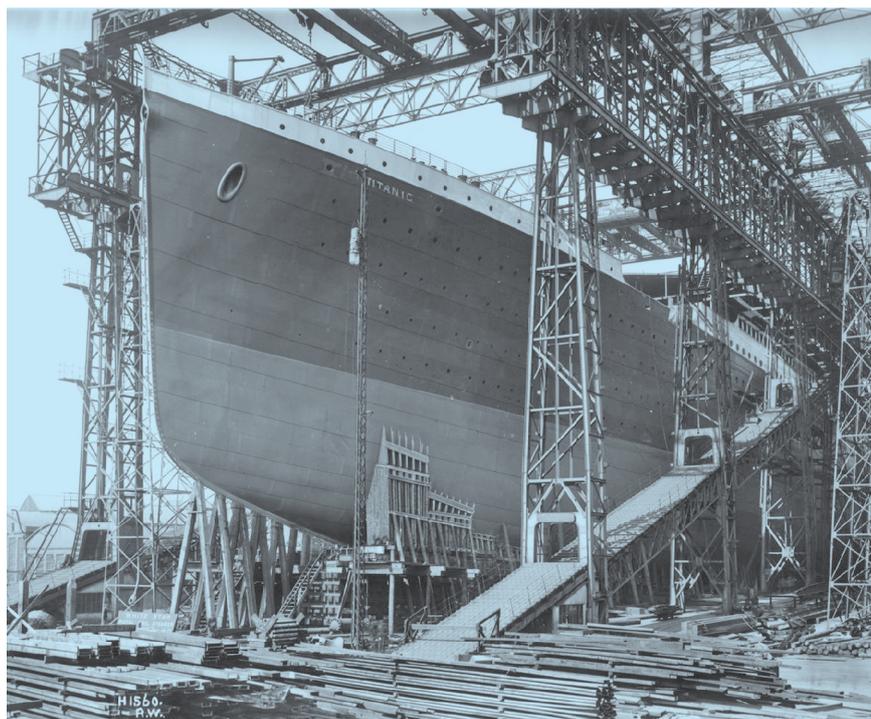
As safe as ships are designed, the consequences of massive damage such as suffered by *Titanic* and *Costa Concordia* cannot be easily mitigated. In many cases a whole raft of other factors such as initial stability, loading, weather etc, will have a bearing on the ultimate consequence. It is certain that passenger ship safety will be re-examined at IMO and elsewhere and future legislation will reflect the lessons learnt.

On the 100th anniversary of the loss of *Titanic* it is a timely reminder that large cruise ships with many passengers onboard must improve their safety systems and the story of the White Star Line vessel remains a potent reminder today of what happens when we get it wrong.

In 1907 Joseph Bruce Ismay, chairman and managing director of the White Star Line, and Lord Pirrie, chairman of Harland and Wolff Limited, met to discuss how White Star Line could compete with Cunard Line's transatlantic liners *Lusitania*

and *Mauretania*, introduced earlier that year. These two 31,000grt ships were the largest and fastest steamers in the world and had been largely financed by the British Government subsidising both their construction and operation on the basis of strategic contingencies.

generate as much profit without the need for subsidies through economies of scale and a significantly slower steaming speed, 21knots rather than 25knots. A particular selling point was to be the level of comfort offered by the new trio. The slower steaming speed necessitated an installed horsepower



RMS *Titanic* was built in 1911 and sank on its maiden voyage to New York from Southampton after hitting an iceberg in the North Atlantic on 15 April 1912 with the loss of 1517 lives.

This remarkable arrangement was a direct result of the International Mercantile Marine Company, an American conglomerate owned by John Pierpont Morgan, having acquired White Star Line and several other companies in an attempt to monopolise the transatlantic route at the turn of the 20th century. White Star Line's reply was to build a trio of liners that would be half as big again as the Cunard ships and that would

of 46,000shp as compared to the 70,000shp for the smaller Cunarders which led to significantly less noise and vibration.

On 14 June 1911 the first ship of the trio, *Olympic*, entered service to considerable fanfare. She was followed on 10 April 1912 by *Titanic* which attracted little media attention prior to her loss. The third ship was to have been called *Gigantic* but, this was changed to *Britannic* following *Titanic*'s

demise. *Titanic* was built according to the Board of Trade regulations applicable at the time, but unlike her Cunard contemporaries she was not classed with Lloyd's Register of Shipping. In fact Lloyd's Secretary, A. Scott, was moved to write a letter to *The Times* which was published on 8 July 1912, repudiating press reports that *Titanic* had been built in excess of the Society's standards, particularly noting that the ship's structural arrangements in some important aspects were not compliant with Lloyd's Register (LR) rules for a vessel of her size.

On 20 September 1911 *Olympic* was involved in an incident off the Bramble Bank in the Solent when she was in collision with the Royal Navy cruiser HMS *Hawke*. The damage received necessitated a return trip to its builders for repair. The significance of the incident was that *Hawke* claimed that the suction caused by the bulk of *Olympic* moving through the narrow deep water channel in combination with the power of the liner's propellers caused it to be drawn towards the liner, making collision inevitable.

A similar situation occurred as *Titanic* left the Ocean Dock at the commencement of its maiden voyage. As it emerged from the rectangular dock to execute the 90deg turn to head up Southampton Water a number of ships that were tied up at the adjacent quay were drawn from their moorings, several being set loose when their moorings parted under the strain. Only the deft action of a number of attendant tugs averted a collision that would have in all probability delayed the departure and possibly prevented the greater disaster four days later.

The British Board of Enquiry into the loss of *Titanic* opened in London on 2 May 1912 and was chaired by Lord Mersey. The enquiry looked into three specific aspects of the disaster that would have far reaching consequences for future maritime safety; navigation, watertight subdivision and life saving appliances. These matters would be discussed further and new regulations drawn up in 1913 at an international safety conference in London, as we shall see later.

The loss of *Titanic* sensationalised Edwardian society and news spread rapidly around the world through wireless telegraphy. The world's largest and newest ocean liner had met its demise on its maiden voyage – *Titanic* was in fact the largest

moving object built by man to date in 1912. Although incorporating much advanced technology such as the ability to close all its watertight doors remotely from its bridge rather than just locally, some features of the design were at best unfortunate.

“The enquiry looked into three specific aspects of the disaster that would have far reaching consequences for future maritime safety...”

Propelled by a triple screw power plant, the central propeller was driven by a steam turbine utilising exhaust steam from the two wing propellers driven by reciprocating engines. Whilst the latter were reversible, the turbine was not, being fitted with ahead blading only. The ship's single flat plate “sailing ship type” rudder was set under her graceful counter stern immediately behind the central propeller. It is open to conjecture whether the order to stop and then reverse the engines upon detecting the iceberg right ahead led to the efficiency of the rudder being compromised through the central propeller being slowed or even stopped causing a less than optimal flow around the already inefficient rudder.

The ship sped on for 37 seconds, slowly turning to port before contacting the iceberg, travelling a distance of approximately 430m. *Titanic* bumped along the side of the berg and riveted seams opened up, the damage extending along the starboard side for a distance of 90m (more than one third of the ship's length) in the region of the turn of the bilge. Although provided with compartmentation well above any rule requirement of the day, consecutive flooding of adjacent compartments due to the forward trim was assisted by the watertight bulkheads having an air gap at the top, presumably to aid ventilation. Whilst the cumulative damage was not so

great (estimated at about 1.17m³), being spread along such a great length and thereby compromising so many compartments was fatal and the ship foundered in less than three hours.

It is well known that *Titanic* was seriously deficient in the number of lifesaving places provided by its lifeboats. Despite sailing with only half its maximum passenger complement (i.e. 1308 versus 2603) it was deficient by 1039 lifesaving places. However, the addition of extra boats may not have resulted in many more lives being saved since there was barely time to launch the boats it did have before it sank, the last collapsible boats floating off from the sinking ship. It is incredible to consider that many of the boats left the ship less than half full as passengers were reluctant to leave *Titanic*, which although sinking beneath them still seemed to offer greater comfort than an open lifeboat.

After completing its 1912 summer season *Olympic* returned to Harland and Wolff for extensive modifications in light of lessons learnt from *Titanic*'s demise. The double bottom was extended around the turn of the bilge, some bulkheads were extended upwards and side bunkers were installed amidships to provide increased compartmentalisation. Additional lifeboats were installed so that the whole length of the boat deck was occupied by lifeboats and in some places boats were nested and double banked to provide lifesaving for all onboard. These modifications were theoretically designed to enable *Olympic* to survive the damage that sank *Titanic* and took six months to effect, costing £250,000, a considerable sum for the period.

Construction of the third member of the class, *Britannic*, began in November 1911, but work was suspended immediately the *Titanic* was lost in order that the design could be reassessed. The beam of the ship was increased by 18 inches so that a watertight double skin could be incorporated along 60% of the length of the hull. The double skin was heavily compartmentalised and rose four feet above the load waterline. Elsewhere bulkheads were extended even further than with *Olympic*'s alterations, five of them now extending 40ft (12.19m) above the waterline with an additional bulkhead worked in providing 16 watertight compartments instead of 15 on the earlier

sisters. *Britannic*, completed in December 1915, featured 48 lifeboats ranged in four groups serviced by huge girder type davits that could handle each group of boats in such a way that any adverse list could be adequately compensated.

Olympic had a full and successful career with White Star finally being broken up for scrap in 1935 after 257 Atlantic crossings and trooping during the First World War. *Britannic*, like *Titanic*, was not so lucky. Entering service as a hospital ship late in 1915, the ship served in this capacity for eleven months before striking a mine in the Kea Channel in the Aegean whilst en route to Salonika at 8.12am on 21 November 1916. Fortunately, only crew and medical staff were onboard as the ship was travelling to pick up wounded from the Gallipoli campaign.

The mine exploded forward on the starboard side and opened up two compartments to the sea. Theoretically *Britannic* should have remained afloat as her enhanced subdivision allowed for the first six compartments to be breached before risk of foundering. However, the

arrangements that had been designed to counter exactly this situation.

The ship's master attempted to beach the ship, but as forward trim increased the propellers emerged from the water and headway diminished. At 9.07am, less than an hour after the explosion, *Britannic* heeled over to starboard and sank. Twenty nine lives were lost in the incident, many of them the occupants of one of the 35 launched lifeboats that was mauled by one of *Britannic's* propellers. *Britannic* that had so comprehensively been redesigned to improve her floatability had sunk twice as quickly as *Titanic*, the only saving grace was that she wasn't carrying wounded troops at the time. Thus ironically, only one of White Star Line's planned trio of superliners was to reach her western terminus of New York.

One aspect of the *Olympic* class is worth reiterating since it is not generally considered. Although White Star Line was a British company with the Line's ships registered in the UK, the company was American owned through being part of J.P. Morgan's International Mercantile Marine (IMM). This huge conglomerate

forms part of Carnival Corporation, the modern day American equivalent of the IMM, with Micky Arison assuming the role that Morgan had with his company.

Public outcry around the world following the loss of *Titanic* led the British authorities to convene an international conference in London in 1913 to examine maritime safety. Thirteen nations participated in the discussions which led to the first Safety of Life At Sea convention being signed on 12 November 1913 with entry into force set for 1915. The First World War frustrated universal adoption, but many of the national participants chose to incorporate the new provisions in their own domestic regulations. Chapters dealt with lifeboats and emergency equipment, safety procedures and continuous wireless radio watches, safety of navigation, ship construction including stability, watertight subdivision and fire protection. The establishment of an international ice patrol keeping watch on the southerly progress of the Atlantic ice fields was promulgated and quickly established by the United States Coast Guard. Initially two surface patrol cutters were designated to the task; post World War II aerial reconnaissance was used which continues to this day.

It was not until 1929 that a second maritime safety conference was convened resulting in an updating of the first provisions with attendance increasing by five nations to 18. This convention entered force in 1933. Updating has continued ever since and from 1960 the conference has been held under the auspices of the United Nations agency, the IMO, the headquarters of which is based in London.

Although there have been relatively few major passenger ship incidents since the demise of *Titanic* in 1912, there have been a number that have had a significant impact on subsequent passenger ship legislation. Fire has always been regarded as the most dangerous safety issue to be managed at sea. In September 1934 the small American coastal liner *Morrow Castle* caught fire on a voyage from Havana to New York resulting in 135 persons out of 549 onboard losing their lives. The ship was barely four years old and fully complied with the then current legislation, but deficiencies in many aspects compared to present arrangements resulted in the fire taking hold unchecked.

Costa Concordia capsized after it struck rocks off the coast of Italy on 13 January this year and up to 30 people died in the accident.



combined effects of blast damage, faulty watertight doors and watertight doors in the fireman's tunnel not being closed led to a progressive flooding situation that could not be contained. Within half an hour after the explosion the resulting list to starboard made it impossible to launch the portside boats, despite the davit

acquired most of the steamship lines engaged in transatlantic service, this fact prompting the British government of the day to sponsor the building and operation of Cunard's *Lusitania* and *Mauretania* to ensure that Cunard remained a purely British enterprise for strategic defence purposes. It is ironic that Cunard now

The incident resulted in the provision of the use of fire-retardant materials, automatic fire doors, ship-wide fire alarms, the necessity of emergency generators, mandatory crew training in fire-fighting procedures, and greater attention to fire drills and emergency procedures. Three further passenger ship losses due to fire occurred in September 1949 (*Noronic*; 139 deaths), December 1963 (*Lakonia*; 128 deaths) and November 1965 (*Yarmouth Castle*; 90 deaths). All three ships were of elderly construction and their wood paneled interiors greatly contributed to the spread of the fires, whilst many other deficiencies were identified in both procedures and arrangements.

These incidents led the US to impose unilateral and stringent new requirements for passenger ships embarking passengers from American ports in the late 1960s resulting in the premature withdrawal of a number of prominent passenger ships, including Furness Bermuda Line's *Queen of Bermuda*. The required measures were ultimately incorporated into SOLAS 1974.

A fire on the cruise ferry *Scandinavian Star* in 1990 where 158 persons died showed that there were still lessons to be learnt. Subsequently regulations were further tightened with the elimination of dead-end corridors and a phasing out of certain grandfather clauses that had previously allowed superannuated ships to remain sailing under the rules that they had been built, regardless of the adequacy of the standards compared to modern requirements.

In the fifteen years from 1898-1913 the size of passenger ships dramatically increased from under 20,000grt to 50,000grt, but the applicable regulations failed to keep pace as demonstrated by the rules that were in force when *Titanic* was designed and built. A rapid surge in the size of passenger ships has occurred again in recent years culminating in the behemoths 220,000grt *Oasis* and *Allure of the Seas*. Concerns over the number of passengers and crew carried by such ships led to a tightening of damage stability

requirements through the introduction of probabilistic, rather than deterministic, method of calculation.

The expectation was that the new provisions would lead to an enhanced level of safety. There is still considerable debate as to whether the new arrangements do in fact cover all eventualities and lead to such enhancement. The introduction of Safe Return to Port rules from 2010 provided additional safety through a carefully stipulated level of redundancy, which would allow a vessel to return to port following an incident that may have otherwise rendered this impossible. The occurrence of accidents to both *Concordia* and *Costa Allegra*, which caught fire in February, show that there are no guarantees at sea. **NA**

Author

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Yizheng's shipbuilding industry strives for quality and growth

The accumulated turnover of Yizheng's shipbuilding and ship repairing sector reached RMB21.1 billion (US\$3.3 billion) and RMB15.6 billion (US\$2.47 billion) respectively during 2011. Chen Bin, Yizhen City Shipbuilding Industry Office reports for China Ship News.

Over the past year, Yizheng's shipbuilding industry has maintained a stable growth and the city's economic indices have climbed steadily. In the first 11 months of last year, the city's shipbuilding firms that had core annual sales of RMB20 million [US\$3.17 million] and over have achieved production totals worth RMB20.1 billion (US\$3.18 billion), up 43.1% from the same period in 2010. This represents 40% of the production values of all the industrial enterprises with the designated size in Yizheng, or one-third of the production value of all industrial enterprises within the designated size range in Yangzhou.

According to statistics, the shipbuilding sector of Yizheng delivered 145 vessels last year, totalling 2.4 million dwt, up 5.9% from the previous year in terms of tonnage; the total goods value amounted to RMB7.53 billion (US\$1.19 billion). The city's shipbuilding sector received new orders for 130 vessels last year, totalling 3.15 million dwt and achieving a goods value of RMB9.14 billion (US\$1.5 billion). The city's orders in hand increased to 203 vessels, totalling 5.08 million dwt, up 10.2% from the previous year. The total goods value of all these orders amounted to RMB15.31 billion (US\$2.43 billion). The city planned to deliver 166 vessels during 2011, totalling 2.71 million dwt, with an aggregated goods value of RMB8.69 billion (US\$1.38 billion).

In 2011, CSC Jiangsu Jinling Shipping Co Ltd (Jinling Shipping), Sainty Marine and Yangzhou Guoyu Shipbuilding Co (Guoyu Shipbuilding) – the three major shipyards in Yizheng – reported aggregated sales (including tax) of more than RMB1 billion (US\$1.53 billion). Jinling Shipping, which paid taxes of more than RMB100 million (US\$15.85 million) in 2011, has become the big brother of the shipbuilding sector in Yizheng.



Jinling Shipping and Sainty Marine built 82,000dwt bulk carriers - *Theresa Jiangsu* and *Theresa Hebei* were delivered this year.

In terms of technological innovation, the 25,000 tonne heavy-lift vessel of Sainty Marine, the dual-phase stainless steel ship of Yangzijiang Shipbuilding (Holdings) Ltd, the largest dredger in Asia, built by Jiangsu Jiuzhou Shipbuilding Co Ltd, the 82,000 tonne bulk ships built by Jinling Shipping and Sainty Marine, Huanqiu Yangzhou Shipbuilding Company Limited (Huanqiu Yangzhou Shipbuilding's) 57,000 tonne bulk vessel and Zijinshan Shipyard's 25,000 tonne oil tanker have all gone into production. Guoyu Shipbuilding's 76,500 tonne bulk vessel and liquefied gas carrier were about to be delivered.

Meanwhile, Yang Zhou Wan Long Shipbuilding Co Ltd has already started building its 2000 tonne floating crane. Major shipyards have gradually completed their first sample vessels for PSPC (Performance Standard for Protective Coatings) survey regulations. Additionally, Jinling Shipping is importing the digital shipbuilding

techniques from South Korea. Sainty Marine has become a provincial-level model to demonstrate the application of the enterprise information system. Guoyu Shipbuilding has applied the techniques of block erection and marine air bag launching into the construction of its 76,500tonne bulkers, creating a new world record.

Furthermore, the city has promoted the applications of new techniques such as the customisation, break forming, zero-waste cutting and automated welding of steel plate. The shipbuilding sector of Yizheng has evolved from ship skin production to whole ship production as the city's major shipyards improved their system integration and project management skills.

Yizheng has faithfully executed the guidelines set for the shipbuilding sector in the 12th Five-year Plan (2011-2015) through its centralised planning of coastal resources, enterprises' merger and acquisition and restructuring, production optimisation

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CONTINUAL PROGRESSION

and industry development. The city has developed its four key functions namely shipbuilding, supply of ancillary services, trading of ship-related materials and public services at the same time. The second phase of Guoyu Shipbuilding has been completed and commenced production at full strength, so has the ship dock at Sainty Marine. Meanwhile, Yangzhou City Leye Ship Equipment Co Ltd has also been set up and has commenced operations.

A central business district has been established around the Yingjiang Ship Technology Park which was complemented with a neighbouring public services district. As the shipbuilding sector of Yizheng grew rapidly, the scope of businesses, products and services have also expanded, so have the shipbuilding and related production service businesses.

Yizheng has formulated its own solutions for industry projects and annual execution plan in light of government control and market demand and supply mechanisms. In order to integrate shipbuilding resources, the city has implemented control over production factors including coast line and land resources, capital investment, electricity supply and human resources etc. Resources were guided to flow to advantageous enterprises to raise efficiency and further industry integration.

In April 2011, Jiangsu Chaoran Steel Manufacturing Co Ltd became part of the "Jinling shipbuilding cluster". The cluster has achieved centralised management of production, human resources, operations, technical standards, quality control and internal testing and examinations. In October 2011, Jinling Shipping took over Jiangsu Soho Marine Heavy Industry Co Ltd through a leasing agreement and commenced production of ship blocks, achieving a breakthrough in resource integration.

Having gone through the initial period of fierce competition between enterprises for both businesses and resources, Yizheng's shipbuilding enterprises have started cooperating and exchanging information and resources with each other in the production, technology, funding, equipment, human resources and management aspects, under the coordination of government departments and industry organisations.

In terms of industry management, Yizheng has on one hand brought in investors and

attracted investment funding into the city; while on the other hand regulated the sector to ensure a healthy and scientific development.

Yizheng has strengthened its efforts to attract inward investment, targeting sizeable onshore and overseas ship-related businesses to bring in supplementary projects that are of a high technical level, high efficiency and sizeable investment. The city has supported major ship-related supplementary businesses such as Yangzhou Hanghai Accessories Co Ltd and Jiangsu Chaoran Steel Manufacturing Co Ltd to cooperate with enterprises in China and overseas in terms of capital investment, technology and branding, so as to improve design and



The Yangzhou Guoyu Shipbuilding Co Ltd has passed an inspection that puts it among the highest ranked enterprises.

production quality of local enterprises; speed up the development of a ship blocks and upper construction production centre and a specialized pipe valve process centre. The city also aims to promote a modular, professional and a consignment oriented approach to production for mid-stream ship products, and increase the usage of local supply and enhance the development of ship accessories and ship repairing businesses.

Yizheng has leveraged on its brand, funding, human resources and technical advantages of key enterprises to coordinate cooperation between ship accessory and ship repair businesses and help on the growth of production service businesses, thus improving the commercial, financial, technical, information support functions of its Ship Technology Park, while at the same time it has improved the quality of public services for the community.

The city government has taken part in the control over resources inventory and

the integration of smaller shipyards. It has overseen the planning and execution of the construction of Jinling Shipping's dock No.3, the west-side expansion of Sainty Marine and the construction of Guoyu Shipyard. At the same time, the city authority regulated the expansions of shipyards to ensure the closing down of smaller yards that operated with outdated equipment; or did not fit into the region's development plan, or that may cause harm to safety or the environment.

The city has also strengthened the quality management of the production teams of ship products; set requirements for workers who want to enter the industry; substituted production units that do not match the minimum industry standards and are not able to maintain production quality.

Meanwhile, Jinling Shipping and Sainty Marine have each passed the production standards survey with their parent companies. Guoyu Shipbuilding has passed the on-site examination organised by experts from the Jiangsu Economic and Information Technology Commission. Jinling Shipping and Sainty Marine have also finished the preparation works necessary for the yards to pass an inspection that will see them upgraded to enterprises of the first rank.

Jinling Shipping has already been awarded the China Classification Society's 3-in-1 certificate for shipbuilding companies on quality, safety and environmental protection. Sainty Marine, Guoyu Shipbuilding, Huanqiu Yangzhou Shipbuilding and Nakanishi Shipbuilding were also working hard to gain the same recognition.

According to the development plan of Yizheng's shipbuilding industry, there will be five major shifts of focus in the industry including from size to quality; from speed and scale to efficiency; from basic skills to technology and innovation; from low-end products to high-end products and from shipbuilding only to an all-around industries aggregation consisting of shipbuilding, ship repairing, ship accessories production and the provision of related services. The city's goal is to achieve an annual production of 5 million dwt and an annual production value of RMB5 million (US\$793,000); branding Yizheng as an influential and competitive inland shipbuilding base in the Yangtze River Delta economic zone. **NA**

Cruise ship passenger training

Further to Francis Chan's noteworthy article in the March 2012 issue of *The Naval Architect*, 'Fat is a maritime issue', Kevan Stokes, senior partner, Augmentias, considers some of the other issues that also affect the safe and timely loading and launching of lifeboats on very large cruise ships.

Augmentias has been working on the upgrading of survival craft on offshore installations in the North Sea and it is useful to compare and contrast these with cruise ship lifeboats. Table 1 summarises some of the main differences that are discussed here.

In 2005 the UK Civil Aviation Authority upped the weight allowance for offshore oil workers to 98kg per man and 77kg per woman and this in turn led to the issuance of the UK Health and Safety Executive information circular – Big Persons in Lifeboats – in 2008 [1]. This directed offshore installation duty holders to review their lifeboat design loads and seating space. The weight allowance given is quite specific, but with regard to seating space it states the following: "It is recommended that duty holders select a small group of the largest members of the offshore workforce on the installation, and ask them to strap themselves in position on adjacent seats within the lifeboat, to confirm the ability of the seats and seat belt/harness to accommodate them." The reason for using a small group – five is recommended – in the SADIE alert 436 [2] concerning injuries occurring during lifeboat drills. The International Association of Drilling Contractors [5] has devised a "Gulf of Mexico Standard" seating width of 530mm in place of the IMO minimum of 430mm. The current SOLAS rules [6] state an allowance of 75kg per person on passenger ships and 82.5kg per person for cargo ships but statistics published in 2002 by the US Centers for Disease Control in Atlanta [7] quote 86.6kg for adult men and 74.5kg for adult women, which is an average of 80.6kg.

If we consider the 370-person, Umoe Schat-Harding CRW55, lifeboats that Francis Chan referred to. These weigh 16.3tonnes with all stores, fuel and equipment, but no persons, onboard. The SOLAS LSA (Life Saving Appliances) code design hook load is then 370 persons x 75 kg + 16.3tonne boat =

Parameter	Large cruise ship, class 1 voyages	Best practice on a 'typical' offshore installation
Anthropometric allowances	75kg per person x 430mm seat pitch	98kg per person x 530mm seat pitch
Number of persons onboard (POB)	> 5000	< 500
Statutory minimum lifeboat requirement	75% x POB plus life rafts for 50% x POB = 125% total	200% x POB
Lifeboat capacity	Up to 370 persons	Max allowed 150 persons (LSA code 4.4.2.1)
Physical condition of POB	Many are not able bodied, few are fit and some will be under the influence of drugs and or alcohol, some are children	All POB are able bodied, fit and sober adults
Drills	Regular lifeboat drills for crew (about 25% of POB) but muster drills only for passengers	Prior to 2003 weekly drills included full boarding and occasional launches were common but boarding is now limited to five persons at a time in UKCS
Training	Deck officers and certificated persons trained in boarding and launching. Some other crew also trained in crowd management	Everyone on board will have undergone survival training

Table 1

44.0tonnes. Some cruises carry no children at all so, if we assume this lifeboat is loaded with 370persons x 80.6kg + 16.3tonne boat = 46.2tonnes, the hook load is increased by less than 5% of that design value.

Whilst not advocating the utilisation of factors of safety to accommodate an increase in the design load, it is clear that passenger weight per se is unlikely to be the cause of an evacuation disaster. However, size and the number of people are another matter.

If the LSA code states no lifeboat shall be approved to accommodate more than 150 persons, why are 370-person lifeboats being installed on some of the latest, very large cruise ships? Well, it's a simple scaling issue that was probably never adequately considered when

these rules were drafted. The Oasis class vessels carry 18 x 370-person boats. If they were limited to 150-person boats, it would be necessary to carry 45 boats and where would they be stowed? It is conceivable that they could be shorter, allowing more than nine per side, but not enough to accommodate 22 in a single tier. Two tiers are theoretically possible but, a full-scale launching scenario would be very problematic. *Oasis of the Seas* can carry up to 6296 passengers and 2394 crew, making 8690 in total. The lifeboat capacity is 6660 which meets statutory requirements as it exceeds 75% of this total, but it does leave up to 2030 people who will have to board life rafts if the ship is abandoned. Were it not for the development of inflatable life

rafts it is doubtful if we could have 2000-plus passenger capacity ferries crossing the English Channel as we do today.

People size also matters. One disadvantage of the enclosure of boats following SOLAS 1974 is that the cramped interiors have become even more so and boarding has been constricted by the size and number of doors or hatches provided in the canopies of fully enclosed boats. The CEW55 boat has four doors on each side. The doors are generously sized and it is not unreasonable to expect that 90 'big persons' can pass comfortably through each door at the rate of one every six seconds, for they will have had plenty of time to observe the doors and most of them will also have had to watch many of their fellow passengers pass through. However, what happens when they are inside is quite a different matter. Many will be disorientated and stand still; some will be looking for the best seats; others will be weighing up who they will sit next to or looking to see where their friends are; some will refuse to occupy the upper level seats or the seats immediately below; and some are bound to knock the removable walkway bridges out of place.

I have never had to occupy a lifeboat in earnest, but based on experience in obtaining certification of new lifeboats; the rate of seat occupancy slows up progressively as the boat fills and random empty places become much harder to fill. A typical cruise contains a fair portion of passengers with impaired mobility – not just those who use mobility scooters and wheel chairs – sufficient to make boarding and stepping down from the walkway bridges unaided difficult or impossible.

We often hear about lifeboat drills for passengers. This is a misnomer as what they do get is a muster drill. Muster drills are important and useful, but they are not a lifeboat drill. The average passenger has very little concept of what it is like to be inside a lifeboat in an emergency.

Crew training

Augmentias and others are currently working on concepts to improve evacuation, including the boarding and launching of lifeboats and it is clear that there is one area where improvement that can be made now and at very little cost, and that is training; improved crew training and passenger training.

Crew training is inconsistent and of variable quality with an inadequate minimum standard. It should be reviewed and a rational set of rules devised. For example, whilst there is justification for 'women and children first' when there are not enough places for all on the lifeboats, to attempt to split up family groups when there are enough places for all is plain folly. It would be better to take the opposite tack and take steps to create temporary family groups such that all those that need assistance are grouped with sufficient able-bodied passengers to assist them.

Where it is company policy that the lifeboats are for the passengers and the life rafts for the crew – on virtually all large cruise ships – it is unlikely that the lifeboat crew alone is large enough for this task of aiding those in need; and there is the added bonus that it gives some of the other passengers a job to do and added responsibility at a time when panic could easily set in. Not all people with reduced cognitive ability or mobility are readily identifiable; there are some with heart problems for instance who are very able physically for a short time only. Their individual needs cannot be readily communicated to every crew member they meet as they are passed along the chain from muster station crowd control through boarding to seat allocation; they need their assistants with them continuously.

Above all this though is the need to have proper rules for the conduct of senior officers that take precedence over company rules. Never again should passengers be ill-informed or misinformed when an emergency arises.

Passenger training! Why not?

The likes of the survival training of offshore workers and the training of military personnel is not a realistic option in this instance, and they cannot all be trained, for some can't and some won't. Nevertheless, even a little training of some of them will have big benefits should an emergency arise and this can be achieved at very little cost. For example; instructional videos can be played on a television channel in the passenger cabins (given the quality of most of the programmes played, this should prove popular); mock ups of a lifeboat can be installed in cruise terminals so that passengers can get an inkling of what it is like inside; enrichment lectures on safety and survival can be given onboard; etc. It is easy to devise this list, but getting it implemented is another matter, even though it does not

require any change in legislation or regulation – the cruise lines themselves can implement such changes through an industry sponsored body.

It could be construed that there is an aversion to cruise passengers coming into contact with anything that is perceived to disturb their fantasies and stop them from enjoying themselves to the maximum or to lead to adverse publicity for the cruise industry. It is our contention that such perceptions are outdated and wrong. Knowledge leads not only to the confidence to deal with an emergency it also leads to comfort. We need a step change in attitude away from spreading misinformation and secrecy to one of transparency and education on all aspects of shipboard safety. **NA**

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LCM drives safety and efficiency advances

Bureau Veritas' (BV) Philippe Renard, manager ships in service projects department, Paris, outlines the future of life cycle monitoring for ships and offshore units.

Advances in technology now mean that it is possible to maintain, in a centralised electronic location, the computerised details of a vessel's structural history throughout its service life. This is part of the overall process of Life Cycle Management (LCM), which holds clear benefits for the safety and efficiency of today's shipping industry.

BV has been closely involved in LCM developments and pilot operations. Motivated by the increasing use of 3D structural models for the classification and maintenance of ships and offshore structures, the class society has combined the strengths of its wide range of software resources to achieve a conceptual breakthrough in terms of integrating the different systems used throughout the maritime industry. In this way, a clearer picture is now emerging of what future systems will look like.

Shipyards will be able to retain the drawings, technical notes, and computerised models of ships, as delivered, in an electronic Ship Construction File (SCF). The SCF will be located in a server under the shipyard's control, and will be maintained throughout the entire life of the vessel. It will also keep track of all Non-Disclosure Agreements (NDAs) relating to the vessel's data in order to automatically filter access to the information held by the shipyard. In this way the shipyard will remain in full control of its intellectual property rights during the whole life of the vessel, while the vessel's details will remain securely stored in one single location, with appropriate access control.

Together with the structural drawings of the ship in electronic format, the SCF will contain a structural 3D model for use by ship owners, classification societies and thickness measurement companies for maintaining the Life Cycle Management of the vessel.

Using the SCF details as input material, classification societies will be able to run their own integrated LCM suite of tools. At BV, those functions are covered by the VeriSTAR-

HLC, VeriSTAR-AIMS, VeriSTAR-Hull and Hydrostar modules, but any suite should typically consist of a structural 3D viewer, a survey tool for ultrasonic thickness measurements (UTM) and observational input and reporting, an integrity tool for advanced processing of the structural data, and modules for risk-based inspection, finite element modelling and hydrodynamic calculations.



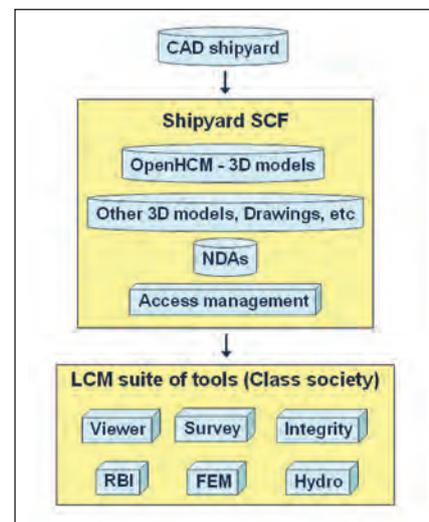
Philippe Renard says that the new LCM system could benefit the "wider maritime community".

In order to meet the needs of so many users, the only practicable solution is to have the 3D model expressed in a neutral exchange standard. BV initiated and promoted the OpenHCM standard, managed by the OpenHCM (Hull Condition Monitoring) Consortium, the only standard currently available for this purpose. The OpenHCM is an initiative to increase ship safety through the transparent electronic processing of assessment data for the in-service operation of ships and offshore units. It was formed to carry on the work started under the CAS project initiated by the EC to develop a neutral exchange standard focused on improving, through a fully electronic process, the availability of a variety of inspection data.

Members of the OpenHCM Consortium - mainly CAD editors, classification societies and thickness measurement companies - exchange information and experience, with particular emphasis on the 3D modelling of life cycle management techniques, typically involving thickness measurements, and - in recent years - on coatings, cracking, defects, pitting or buckling and specific issues relating to offshore units.

The use of 3D modelling is ultimately of benefit to the wider maritime community. To date, the use by shipyards of 3D models and electronic drawings to perform classification and maintenance tasks has been limited to pilot schemes. The aim must be to extend the initiative, so that it becomes common practice throughout the industry. This will be achieved by the continuing efforts of the members of the OpenHCM Consortium, by the Community of European Shipyards Associations (CESA) and by the Shipbuilders Association of Japan in leading the SCF initiative, and by individual class societies and CAD editors in developing their own suites of LCM tools. **NA**

Structure of the LCM management system between class society and shipyard that protects the yard's intellectual property.





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Back to basics and block coefficients

In March *The Naval Architect* published a story called ‘Back to basics’ that looked at the historical development of tankers and the energy efficiency design index (EEDI). This month Technical University of Denmark (DTU) researcher Hans Otto Holmegaard Kristensen takes a closer look at block coefficients.

The block coefficient is an important non-dimensional main parameter which influences ship resistance. Based on hydrodynamic considerations and according to normal ship design practice the block coefficient should decrease with an increasing Froude number.

Figure 1 shows the development of the block coefficient from 1971 to 1990. It is seen that both the block coefficient and the

Froude numbers have increased, which is in contradiction to normal ship design procedures and guidelines.

This statement is illustrated in Figure 2 showing the actual relation between the block coefficient and the Froude number for the period 1971 to 2010, compared with three different theoretical guidelines proposed by Professor Harvald (1983), Watson and Gilfillan (1998) and, finally,

one of the oldest guidelines given by Ayres’ formula. All the proposed guidelines clearly indicate that the block coefficient should decrease when the Froude number increases, which is quite opposite to the development trend (the black line in Figure 2) during the last 40 years.

The last non-dimensional main parameter which influences the ship resistance is the length displacement ratio,

$$\frac{\text{Length}}{\sqrt[3]{\text{Displacement volume}}}$$

From a hydrodynamic point of view, this ratio should be as large as possible as the ship resistance/propulsion power decreases with the increasing length displacement ratio. The development of the length displacement ratio since 1971 (Figure 3) shows that the ratio has decreased from an average of approximately 5.3 to an average of approximately 4.95. This development also contributes to the increase of the EEDI over the same period.

Changes and consequences

With the ship design model developed by DTU it is possible to see the influence on the EEDI when the block coefficient and the length displacement ratio are changed from the present level and back to a level 25 years and 40 years ago, respectively. The results of such an analysis are shown in Table 1 for a 70,000dwt tanker, where the deadweight, breadth and draught are kept constant, while the length has been increased by 5% and 10%, respectively. By this length increase the block coefficient is reduced from 0.857 to 0.823 and 0.793, respectively, and the length displacement is increased from 5.01 to 5.25 and 5.48, respectively, values corresponding

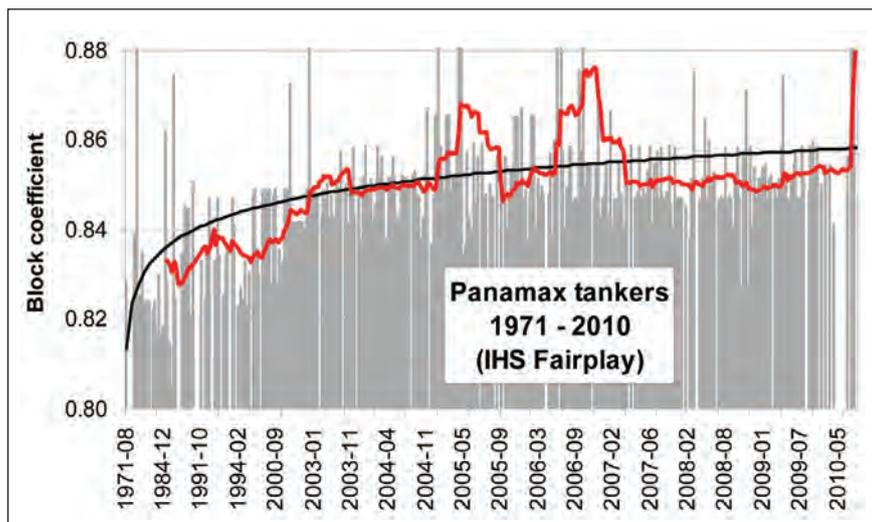


Figure 1: Block coefficient for Panamax tankers delivered between 1971 and 2010.

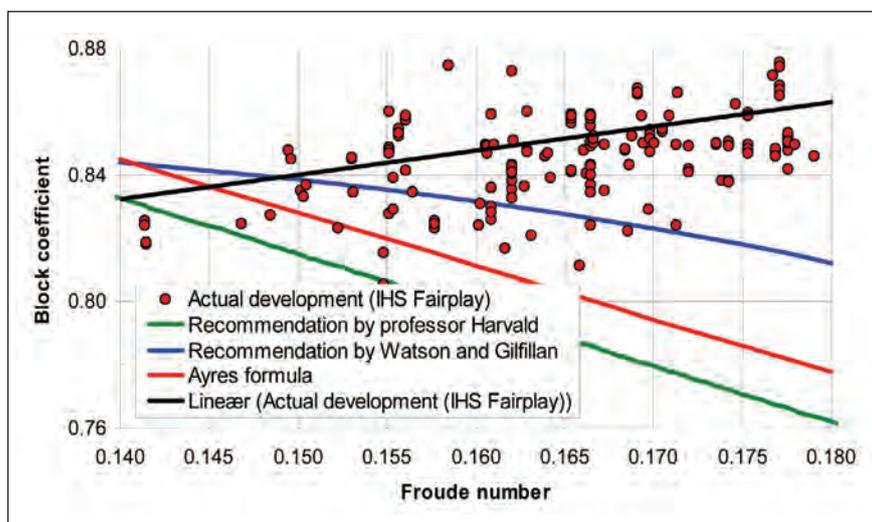


Figure 2: Block coefficient for Panamax tankers delivered between 1971 and 2010.

to approximately 1985 and 1971 levels (Figures 1 and 3).

In order to keep the deadweight, breadth and draught constant the length has been increased, which is in contradiction to the actual development, where the length between perpendiculars has been kept nearly constant around 220m, at least for the last 10 years.

Certain harbours have this length restriction, which has been the reason for keeping the length constant, with the consequence of an increased block coefficient and a decreased length displacement ratio as just pointed out. In order to meet still more strict requirements of the EEDI the length limitation has to be re-evaluated and needs to be re-evaluated.

As seen in Table 1 the power requirement and the EEDI are reduced by 18%, by selecting these more favourable dimensions – even without introducing any new technologies – but by increasing the length by 10%. If the length is only increased by 5% the power and the EEDI are decreased by 12%.

Design Development for Tankers

The investigation made by DTU shows that for the different tanker segments, nearly the same development trends are observed as for Panamax tankers, however, not as significant as for the Panamax tankers.

Nevertheless, the following trends are observed:

1. The block coefficient has increased over the last 30–40 years
2. The length displacement ratio has decreased over the last 30–40 years
3. The Froude number has either been constant or has increased during the last 30–40 years

The above-mentioned design changes (for the last 20 years) are summarised in Table 2.

Summary and conclusion

An analysis for tankers and bulk carriers of the design parameters (block coefficient, length displacement ratio and Froude number) which have a direct influence on the propulsion power shows that during the last 20 years the block coefficient has increased by 1 - 5% and the length displacement ratio has decreased by 1–5%.

Maximum deadweight (tonnes)	70000	70000	70000
Elongation in percent	0	5	10
Length between pp	217.97	228.87	239.77
Length in waterline incl. bulbous bow	222.33	233.45	244.56
Breadth mid.	32.22	32.22	32.22
Depth	19.86	19.86	19.86
Design draught	12.63	12.65	12.67
Maximum draught	13.68	13.68	13.68
Design deadweight/Maximum deadweight %	90	90	90
Maximum draught - design draught	1.05	1.03	1.01
Design deadweight	63000	63000	63000
Lightweight coefficient (t/m ³)	0.098	0.098	0.098
Lightweight (tonnes)	14353	15070	15788
Displacement at design draught (tonnes)	77353	78070	78788
Displacement at maximum draught	84353	85070	85788
Block coefficient at design draught	0.850	0.816	0.785
Block coefficient at maximum draught	0.857	0.823	0.792
Lpp/Displ. ^{1/3} at design draught	5.16	5.40	5.64
Lpp/Displ. ^{1/3} at maximum draught	5.01	5.25	5.48
Midship section coefficient	0.995	0.995	0.995
Service speed at design draught	15.0	15.0	15.0
Froude Number (Lwl) at service speed	0.165	0.161	0.158
Max. draught trial speed at 75% MCR (EEDI ref. speed)	14.66	14.71	14.76
Froude Number (Lwl) at EEDI reference speed	0.161	0.158	0.155
Main engine power (MCR) (kW)	11478	10054	9363
Auxiliary power at sea design draught	537	501	468
Propeller diameter (m)	6.70	6.70	6.70
IMO Energy Efficiency design Index (CO ₂ emissions)	5.05	4.43	4.11
IMO Energy Efficiency design Index (MEPC 62)	5.27	5.27	5.27

Table 1: Consequences of change of length, block coefficient and length displacement ratio.

Both developments lead to higher EEDI values over the same period.

The speed and the Froude number have increased over the same 20 years, which also has a negative effect on the EEDI as this is strongly speed dependent.

The combined increase of the block coefficient and the Froude number is very problematic as it is against rules and guidelines based on hydrodynamic principles, according to which the block coefficient should be decreased when the Froude number is increased.

Computer calculations where the above-mentioned parameters have been varied for the different tanker and bulk carrier sizes show that based on the typical ship design standard today the EEDI may be decreased by 5–10% by selecting more

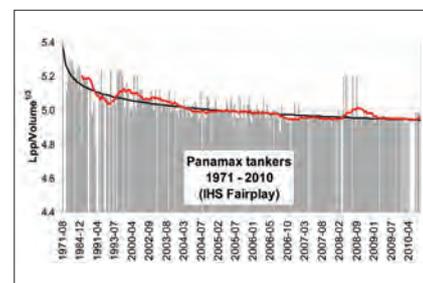


Figure 3: Length displacement ratio for Panamax tankers delivered between 1971 and 2010.

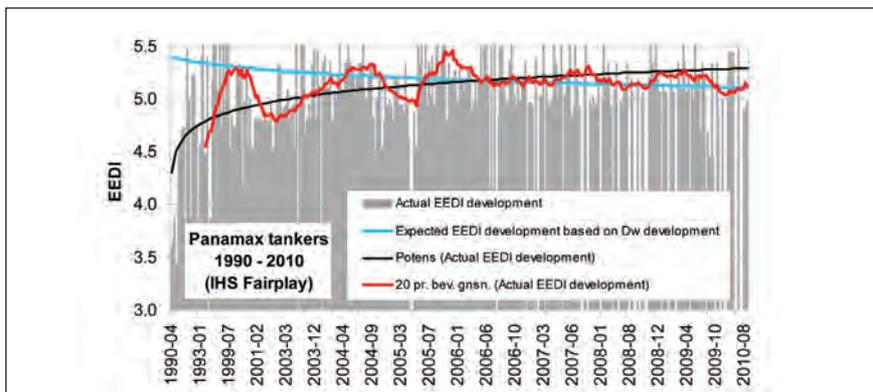
favourable hull proportions resulting in a lower block coefficient and a higher slenderness ratio, even without changing the speed or introducing any new technical measures. **NA**

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Table 2: EEDI for Panamax tankers delivered between 1990 and 2010.

Ship type	Block coefficient		Length displacement ratio	
	1990	2010	1990	2010
Handymax	0.80	0.805	4.7	4.55
Panamax	0.83	0.86	5.2	4.95
Aframax	0.82	0.84	4.9	4.7
Suezmax	0.83	0.825	4.75	4.7
VLCC	0.815	0.82	4.7	4.55



In the March issue the EEDI graph showed the development of tankers' EEDI from 1971 to 1989, this graph should have been supplemented with another graph bringing the EEDI figures up to 2010. This is published to the left (Figure 4). *The Naval Architect* would like to apologise for this oversight.

Figure 4: EEDI for Panamax tankers delivered between 1990 and 2010.

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Flexible feeders can be carbon light

Power company ABB asked ship designer Knud E. Hansen to come up with a vessel design that would showcase its marine technology. The result is the E-Max and the smaller Bangkok-Max container feeder vessels that are 20% cleaner say the Danish designers.

As vessel designs go the ABB/Knud E. Hansen feeder vessel which has a capacity of around 2000TEU, depending on the configuration, can be considered innovative in that the design allows owners the flexibility to choose the optimum design for their vessel for the trade that it will operate in.

The design also utilises ABB's DC Grid electrical distribution technology and its Azipod electrically driven propeller, along with a more conventional contra-rotating propeller directly driven via a shaft to the main engine. The hybrid design concept is expected to offer owners flexible and cost-effective feeder ship operations.

Birger Myklebust, ABB's vice president of dry cargo and specialised vessels BU Marine Global, explains that ABB's view was that demand for feeder vessels would grow due to the significant number of large container ship newbuildings on order. This persuaded ABB to employ Danish designer Knud E. Hansen whom they gave a specific brief for the vessel design; it would need to have improved energy efficiency, a minimum ballast water requirement, a hybrid propulsion solution and it must accommodate new technologies in power storage. The new design would be efficient, clean and, above all, flexible in its operations.

Continuing the theme David Tozer, container shipping expert at classification society Lloyd's Register, says flexibility in this market is everything. Changes to the way ships are now designed, ensuring efficiency over a range of speeds rather than at a single design speed, as in the past, means the design must prove itself over that range and the flexibility of the system is crucial.

In addition Tozer says: "the new generation of [conventional] engines are so efficient that they produce much less waste heat. Design solutions which utilise waste heat must be carefully considered to ensure that they are efficient, and operable, throughout the operational envelope of speed and power.

Power management is more complex than in the past."

Casper Ulback Nilsson of Maersk Broker, who is charged with the marketing of the new design, agrees with Lloyd's Register's assessment that owners in today's market must have a flexible option. "There is a lot of interest in the ABB/Knud E. Hansen ships, primarily from German owners and some state-owned yards in China and a privately owned yard has also taken an interest," says Nilsson. He added that in today's market, which he says is a buyers' market, yards and designers need to provide "attractive and appealing" designs for owners.

"The major fuel saving advantages of the ABB powered feeder vessel is that it can sail equally efficiently at 2knots or at 20knots"

Economics are one attraction that cannot be ignored and ABB is currently making the calculations that will establish what the payback period would be for an owner buying the feeder ship with the extra capital costs put at US\$3-5 million for the electrical power units and the electric propulsion systems. "But if bunker savings of 12% can be achieved then owners will be interested," said Nilsson.

The major fuel saving advantages of the ABB-powered feeder vessel is that it can sail equally efficiently at 2knots or at 20knots. "If you need to cruise at 8knots to meet your terminal slot you can do it, others must sail at 14knots and then wait outside the port," explains Nilsson.

To achieve this flexibility on speed Knud E. Hansen have designed the vessel with a 16.3MW main engine and three auxiliary engines, one of 1200kW power output, one of 2800kW and a third of 4300kW.

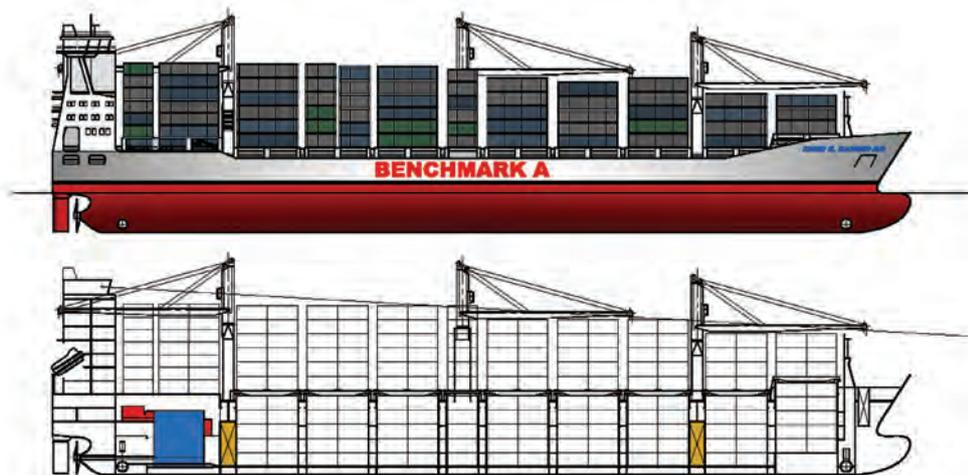
All the hotel and other electrically operated systems, such as reefer containers, will be powered by electricity produced onboard and distributed through ABB's DC Grid. Using the grid, electricity can be directed to where the demand is needed and as the power plants are of varying size electrical production can be tailored to the needs of the vessel at the time.

Essentially, the vessel can produce enough power to operate at 21knots with all propulsion systems in operation and still meet the other electrical power needs of the vessel, or it can operate at as little as 2knots depending on the needs of the time. At periods of varying power demand the vessel can run on one, two, three or four units offering significant fuel savings. It can operate all power plants at their optimum rate and vary the electrical power used to maintain the desired speed.

According to Jesper Kanstrup, senior naval architect at Knud E. Hansen, the positioning of the accommodation block just forward of central means that the vessel would need a minimum of ballast water and this design reduces the necessity for trimming the vessel. "In principle the ship can sail without ballast water, which means the loading flexibility is great."

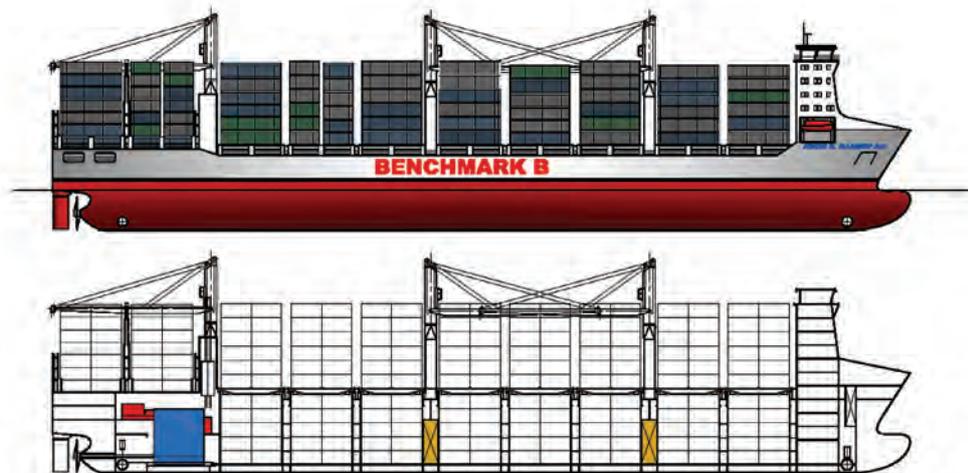
The position of the accommodation block in the centre of the ship does reduce the cargo capacity slightly compared to moving the accommodation block forward, but it offers greater capacity than having the accommodation situated in the standard position aft. (See illustrations on pp34). However, Knud E. Hansen believe that the central position for the accommodation is a workable compromise that reduces discomfort for crew and maximises the cargo capacity as well as improving visibility.

Knud E. Hansen decided that moving the accommodation block just forward of the centre was a good compromise, improving capacity and visibility over the rear-mounted accommodation and giving the crew a more comfortable ride compared to a ship with the accommodation block situated in the bow.



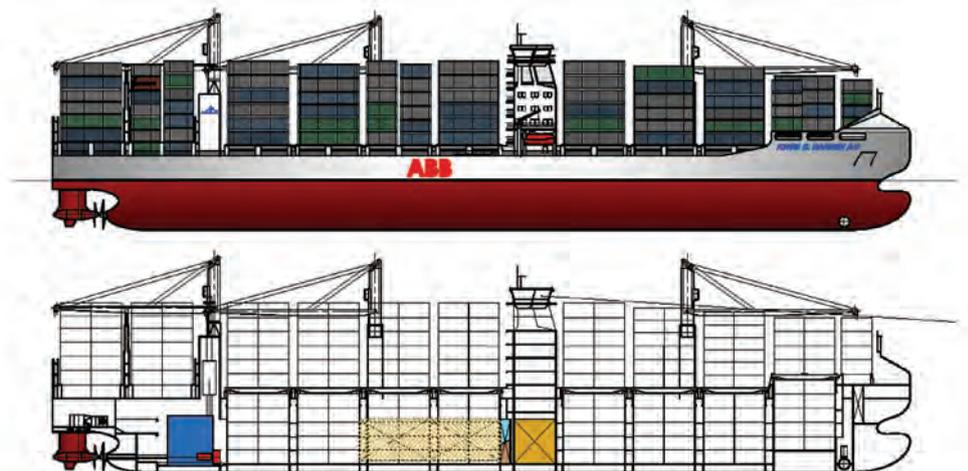
Gearless version	
TEU on deck	1260
TEU in holds	726
TOTAL TEU	1986

Geared version	
TEU on deck	1245
TEU in holds	726
TOTAL TEU	1971



Gearless version	
TEU on deck	1480
TEU in holds	708
TOTAL TEU	2188

Geared version	
TEU on deck	1460
TEU in holds	708
TOTAL TEU	2168



Gearless version	
TEU on deck	1448
TEU in holds	668
TOTAL TEU	2116

Geared version	
TEU on deck	1382
TEU in holds	668
TOTAL TEU	2050

Cell guides on the vessel are designed to handle hi-cube containers with ultra-wide boxes carried on deck, says Knud E. Hansen. The cargo storage system is again designed to offer the maximum flexibility to the owner.

Payback time for the Bangkok-Max is likely to be longer than for the E-Max which is 14m longer, with an extra cargo hold behind the accommodation block, than the 172m long Bangkok-Max, which also has an 8.2m draught. And the various configurations available, that is geared, gearless etc will mean that the return on investment for owners could vary. For example, the geared Bangkok-Max will have a capacity of around 2050TEU

while the gearless version would be able to accommodate 2116TEU. However, the E-Max versions will be able to carry 2300TEU and up to 2360TEU.

The two contra-rotating propellers allowed the design to utilise smaller screws which in turn allows the ship to use a minimum of ballast water for trimming purposes, and the Azipod system allied with tunnel thrusters will give the E-Max vessels sufficient manoeuvrability to be able to enter port and dock without the aid of tugs.

This type of vessel needs an owner with vision for it to gain acceptance, claims Nilsson: "It needs an owner like Maersk to back it up with a charter, because the

design is a little more complicated than other ship designs," he adds.

Kanstrup confirms that owners were sceptical about the extra cost of the Azipod and DC Grid. "Owners think in a conventional way. They consider the design, investment cost and reliability and so they are interested in more traditional propulsion plant," he says.

Knud E. Hansen do offer an alternative to the ABB propulsion system, the vessel can be fitted with a derated MAN 8S 60ME or a Wärtsilä RT Flex 58 engine with seven or eight cylinders. In addition owners can request that the ship is designed with LNG power with LNG fuel tanks beneath the accommodation block. *NA*

T is for maritime engineer

A booming maritime industry in Denmark is suffering from an image problem as new recruits to the industry falter. A new initiative from industry and academia is looking to raise the profile of the industry and convince graduates that there is a challenging future within maritime engineering.

New recruits to the Danish maritime industry are few and far between, with the industry estimating that it could need up to 10 times as many graduates as it is producing at the moment. As a result Denmark's academics have formed a partnership with Danish maritime companies to raise the visibility of the industry.

According to Ingrid Marie Vincent Andersen, a PhD student at the Technical University of Denmark (DTU), of the nation's universities only DTU produces maritime engineers and in 2011 this university only produced six maritime engineering graduates, but demand in the industry is anything from 30 to 40 graduates annually. The exact demand is unknown, admits Andersen.

Attracting young people into the maritime industry has proved to be difficult while other industry sectors have been more successful in raising their profile and demonstrating a greater ability to entice new and younger recruits. "Part of the problem is that the maritime industry is not visible, and the perception of the industry in Denmark is also negative," says Andersen. She says that many people have seen that the yards in Denmark



Ingrid Marie Vincent Andersen, a PhD student at DTU, says that universities must train students to have a broader approach to the maritime industry.

have closed and concluded that ship design and development have been lost.

In fact Danish industry is importing maritime engineers from Asia, Eastern Europe and other regions to meet increasing demand

as the age profile of Danish engineers increases every year. With many of those that remain approaching retirement, the demand for maritime engineers can only increase further.

As a result of this growing demand and a slackening of interest for careers in maritime design and engineering, a working group formed from the partnership between Danish industry and academia.

That working group embarked on a survey, financed by the Danish Maritime Fund, of the major players in the Danish maritime sector; and a report from that survey was completed by the Danish Academy of Technical Sciences (ATV) with the work carried out by a working group formed of senior staff from industry and academia.

The survey sought to establish the types of skills required in the Danish maritime industry, and to recommend a course of action that will reverse the current trend by highlighting the advantages of the maritime sector.

Nine recommendations came out of the survey including: increasing the visibility of the industry in both schools and universities; strengthening the "value chain" between

The survey was carried out by a working group formed of:

- Vice President Bo Cerup-Simonsen, AP Møller – Mærsk (chairman)
- CEO Anders Ørgård Hansen, OSK-ShipTech
- Consultant Esben Fiedler Røge, ATV
- PhD student Ingrid Marie Vincent Andersen, DTU
- Assistant professor Marie Lützen, SDU
- Head of Centre Mogens Schrøder Bech, Danish Maritime Authority
- Senior Vice President Peter Tang-Jensen, ABS
- Senior Vice President Thomas Knudsen, MAN Diesel & Turbo
- Associate professor Ulrik Dam Nielsen, DTU

research, education and industry; updating engineering courses to meet the demands of industry; multi-disciplinary university education should be offered across a number of disciplines; and the maritime industry should prepare summer schools, internships, placements, projects and other opportunities for young people.

Most importantly, however, was the outline of what skills future maritime engineers would need. According to the ATV report “future engineers should have a T-shaped competence profile”. That is a “broad multidisciplinary knowledge about the maritime industry, its structure and disciplines as the horizontal bar. The vertical bar represents the ability to immerse oneself in highly specialised academic and technical fields.”

The horizontal bar in this T-analogy effectively represents operations, management, performance monitoring and management, environmental reporting and management and the operation of ships and offshore structures.

In contrast the vertical element of the T represents naval architecture, stability and seakeeping, structural assessment, fluid dynamics, thermal energy systems, machinery and combustion engines, material science and vibrations, among other things.

Education initiatives

As a result of the survey and the initiative shown from the Danish Maritime Fund, and with the backing of the Danish Maritime Industry, DTU is committed to upgrading its maritime education. To respond to the recommendations, DTU Mechanical Engineering has already taken steps and is considering initiatives that will see an update of its maritime engineering education, develop

industry collaboration and, in the long run, attract more students.

One initiative already taken three years ago at DTU was to develop the Nordic Master’s course.

The Nordic Master in Maritime Engineering is a cooperation between DTU and four other Nordic Universities (the Nordic Five Tech), the Aalto University, in Helsinki, Finland, Chalmers University of Technology, Gothenburg, Sweden, the Norwegian University of Science and Technology (NTNU), Trondheim, Norway and the Royal Institute of Technology (KTH), Stockholm, Sweden.

“universities need to match the taught curricula with industry demands, educate engineers for the shift from the shipyard industry to shipowners and the ship design industry.”

“The programme targets international students wishing to profit from the Nordic Five Technical universities’ long standing tradition and competence in the field and Nordic students wishing to specialise in a specific area of expertise offered within the alliance,” says Andersen.

According to the programme students will spend the first year of the two-year course at one university studying topics from the maritime engineering, naval architecture and offshore engineering fields at a master’s level. These include stability, resistance and propulsion, seakeeping, manoeuvring and ship and ocean structures.

Students specialise in the second year at a different university by focusing on one of five study tracks offered individually by the different universities. The five study tracks are Ocean structures (at NTNU), Passenger ships (at Aalto), Ship design (at Chalmers), Ship operations (at DTU) and Small craft (at KTH).

New course development

Meanwhile, the University of Southern Denmark (SDU), which currently has no maritime education, has begun the process of introducing courses adapted for the maritime industry. Initially SDU is analysing what type of graduates there is a demand for within the Danish maritime sector and asking whether it will be possible to attract students to this “new education”. Then SDU will ensure that it has the academic basis to support maritime education and research before looking at how courses will be structured.

A working group of four participants, two from a school of engineering (Svendborg International Maritime Academy, SIMAC) and two from SDU has been established to develop maritime engineering courses. In February this year the terms of reference were given to the group and in May 2012 the group is expected to deliver a report to ACE-Denmark (The Accreditation Institution), that will form the basis for the colleges’ application for accreditation for their courses. If the SDU executive board accepts that there is a basis for the new education, then an accreditation application will be submitted and if the accreditation turns out to be positive, the new courses will finally be able to begin teaching in September 2014.

Andersen sums up the Danish approach: “Universities and industry need to make the maritime industry attractive to young people, the universities need to match the taught curricula with industry demands, educate engineers for the shift from the shipyard industry to ship owners and the ship design industry. We need engineers with a broader approach to the industry.” **NA**



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Evaluating ship design changes using a fuzzy logic set-based design tool

Set-based design methods have already been incorporated into the design processes for the automotive and aerospace industries. Thomas A McKenney, Alexander W Gray, Carolina Madrid, and David J Singer, of the University of Michigan, USA take a look at how set-based design can apply to maritime projects.

While ship design remains a highly intensive and complex process, advanced design methods such as set-based design (SBD) can provide a structured approach to evaluating the design space while moving towards a globally optimal design. SBD has been used for applications in the automotive and aerospace industries, but has recently been proposed for the ship design process [1]. SBD is design by elimination of unfeasible or dominated solutions. The SBD process can be described as a concurrent engineering approach with the following characteristics:

1. Considers a large number of design alternatives through an extensive exploration of the design space
2. Separate groups of specialists are able to evaluate the design and provide preferences for solutions based on their own perspectives
3. Intersections between sets are used to establish feasibility before commitment and guide the design towards a more optimal solution, and
4. Fidelity is increased as the design progresses [2, 3].

Proper implementation of the SBD process: “requires shifting to a paradigm where design team members reason and communicate about sets of designs” [4]. In reference to the SBD process, Ward et al states: “Since there is no proven formal methodology, learning the process will be slow and error-prone” [5]. The development of a design tool can help provide a more formal methodology for the SBD process. A hybrid agent fuzzy logic (HAFL) design tool was developed at the University of Michigan to simplify communications of design variables and solutions within the SBD environment by

automating aspects such as data collection and analysis while allowing for human designer input [4].

One important advantage of using SBD is the ability to delay decisions until later in the design process when more information is known and design trade-offs are more fully understood [5, 6, 7]. In an effort to confirm the theoretical advantages of SBD, the HAFL design tool was used to facilitate a ship design case study using the SBD process. Specifically, this initial study focused on the evaluation of how delaying design decisions using SBD could cause higher adaptability to varying complexities of design changes later in the process. Multiple SBD experiments instituting design changes of varying magnitude late in the design process were conducted using the HAFL SBD tool. By documenting how the SBD process handles designer preference changes, the impact of design requirement changes can be determined.

A simplified planing craft design was selected for the design experiments. The representative mission for the planing craft design was based on the Mark V Special Operations Craft (SOC). The ship design was broken down into

independent functional design groups and the groups are represented as design agents in the HAFL design tool. The selected design groups include resistance, weights, stability, and seakeeping. Each functional design group has an objective that they hope to optimise, for example, the resistance agent’s goal is to minimise the resistance of the hull. Variables and parameters were selected for the planing craft design based on their influence on the design itself, and whether or not they were required by the agents. The design groups utilised mainly empirical calculation methods for their design analyses. Using the four design agents, variables were selected based on the possibility of conflicting preferences between two or more agents. A preference can be defined as the design variable values that are more preferred than others by an agent. The selected design variables were length (L), beam (B), deadrise (β), longitudinal centre of gravity (LCG), and full load displacement (Δ). There are also design requirements based on the representative mission that were provided to the design agents. These requirements included speed, range, payload, and a representative wave height

Table 1: List of negotiated variables, requirements, and interactions.

	Unit	Resistance	Seakeeping	Stability	Weight
Variables					
Length (L)	ft	N	N		N
Beam (B)	ft	N	N	N	N
Deadrise (β)	deg.	N	N	N	N
Long. Center of Gravity (LCG)	ft from stern	N		N	
Full Load Displacement (Δ)	lbs	N	N	N	N
Requirements					
Speed (V_s)	kts	In	In	In	In
Range	nm				In
Payload	lbs				In
Significant Wave Height ($h_{1/3}$)	ft		In		
		In = Input		N = Negotiated	

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The new user interface combines a modern Office 2007 look and feel with enhancements welcomed by both novice and experienced users. It will change the way the software is used and allow for faster and more efficient work. In V6 it is available in Plant Modeller with other modules to follow in due course.

The software's easy-to-use 3D modelling tools can be used for early and basic design, detailed engineering, and the production of workshop drawings and generation of ready-to-use production data for production machinery.

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Version 6 highlights

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associated with a sea state. The negotiated variables and design requirements can be seen in Table 1.

An initial design space exploration was conducted to ensure that there were feasible regions of the design space. For logistical purposes, the experiment length and the number of rounds needed for convergence were also identified. A round is defined as a completed negotiation on every design variable. An increase in speed was selected as the final design change for the experiments based on the total impact on agents and how preferences shifted after a speed change was implemented. The hypothesis developed to guide the design of experiments was that the SBD process is robust enough to handle late-stage design changes of varying complexity. Three levels of process variables were defined. These levels included no change (the speed initially set to 45knots), a moderate change (47knots), and a major change (50knots) that would most likely cause failure. The response characteristic for the experiments was robustness, which is defined as the observed or measured number of design failures that occur after the design change and by witnessing whether or not the design can regain feasibility.

Since the initial development of the HAFL design tool it has been further studied and utilised for additional ship design experiments including a modified version for the Navy's ship to shore connector design [1] and preliminary containership designs [8, 9]. The HAFL design tool breaks the SBD process into a hierarchical structure, with a chief engineering agent at the top of the structure and functional design agents beneath. The chief engineering agent has the responsibility of controlling the pace for the SBD process by sending requests for the negotiation of ship design variables to the design agents and then later narrowing the set-ranges of design variables based on results from the HAFL design tool.

The HAFL design tool provides the means of facilitating set-based communications. Human design agents input preferences for design variables that are described via a set of design values

ranging from $[x^{min}, x^{max}]$ utilising any of three linguistic terms Preferred (P), Marginal (M), and/or Unpreferred (U). Fuzzy logic (FL) was chosen for use in the HAFL design tool as it has the ability to handle uncertainty of the negotiated design variables and linguistic terms [10]. By representing design uncertainty, FL utilises additional design information to enhance set-based communications during the design process. A fuzzy logic system (FLS) is capable of mapping an input value of x into an output value of y . In the HAFL design tool the FLS converts the linguistic preference inputs, coming from multiple design agents whom have independent and often conflicting design goals, into a single joint output preference (JOP) curve. The JOP curve represents the combination of all design agents' preference information into a single curve. The chief engineering agent then utilises the JOP curve to determine how to appropriately reduce the set-ranges of the negotiated design variables. Figure 1 shows an abbreviated example of the HAFL design tool process.

The HAFL design process displayed in Figure 1 shows two design agents with conflicting linguistic preference

information as input into the FLS. The input information describes the agents' preference for the negotiation variable set-range values. The FLS sweeps across the set-range from minimum to maximum activating rules from a fuzzy logic rule bank based on different combinations of the preference inputs. The activated rules are then centroid defuzzified to a crisp preference value. As the process is repeated for every value within the set-range a continuous curve is produced representing the negotiated preference for all design values. This curve is referred to as the JOP curve. The chief engineering design agent uses the JOP curve information to determine how to reduce the set-range for a subsequent negotiation round. The reduction process is illustrated in Figure 1 where the set-range is reduced to the "new x_l " and "new x_u " defining the lower and upper bounds of the set-range for the next negotiation round.

Out of all the experiments used for this paper, only one led to a complete design failure. All other experiments showed that the SBD process could handle varying magnitudes of design changes. Agent preferences are modified depending on the change implemented. The agent

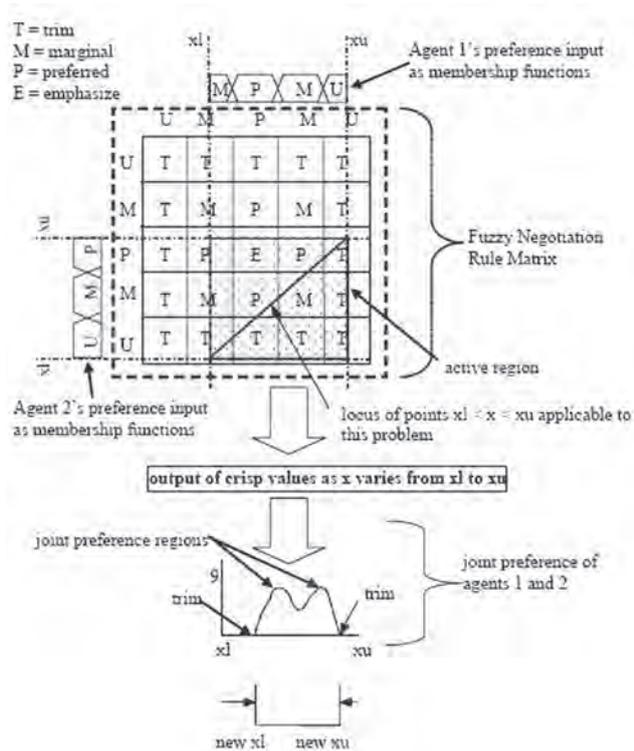


Figure 1: HAFL design tool FLS mapping of multiple preference inputs into a single JOP curve.

preferences are then combined via FL to generate a JOP curve. The JOP curves can, in addition to showing convergence, show how the preferences have been modified since the implementation of the design change and what direction set preferences are moving towards in the design space.

The major design changes constrained the solution space more than the moderate changes. For the major change, the speed was increased from 45 to 50 knots. Figure 2 shows the length JOP curves for all rounds with a major change occurring in round 4. It can be seen from the round 4 preferences that the increase in speed made the most preferred region from round 3 shift to larger values. Round 5 preferences confirm that the preferred region continues to be in the new direction determined after the change. Figure 2 along with the other major change experiments show that as speed increases, higher lengths are preferred. This trend makes sense from a ship design perspective as well. High level trends such as how speed changes affect variable values can be very helpful for decision-makers in chief engineering roles. From Figure 2, it can be seen that the design change reduced the set at the lower end, which could be used to reopen the upper set-range to further explore the design space in that preferred region.

The results of the experiments conducted for this paper show how the robustness of the SBD process can handle late-stage

design changes. The robustness of the process comes from the ability to delay decisions and keep sets open longer. Also, by being able to reopen sets after a failure occurs, feasible regions can be located and the new design direction can be found. The experiments show that more complex design changes can further constrain the design process. One of the most important conclusions made from the experimental results is that regardless of the complexity of a design change, the SBD process can show how changes affect the design and where new design directions should be. *NA*

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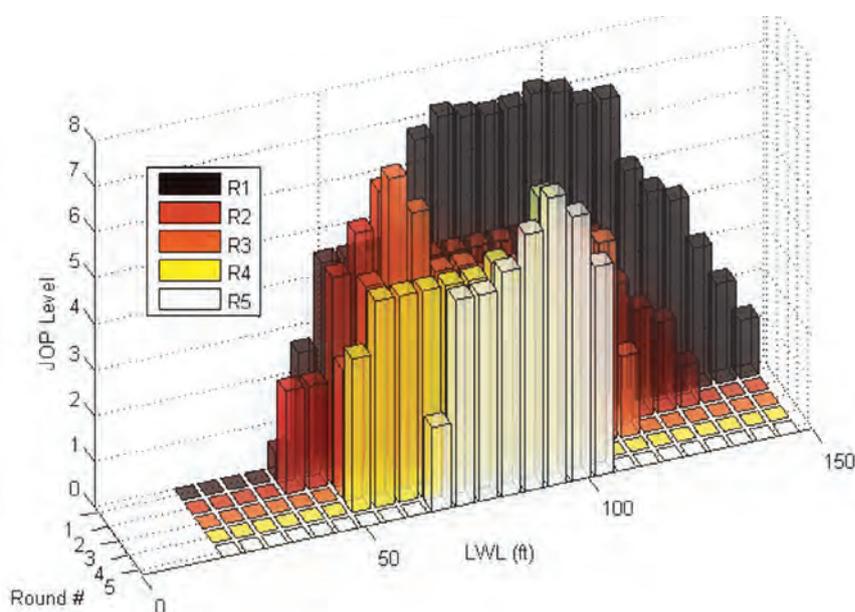


Figure 2: Length JOP plot with major change.

AVEVA launches AVEVA Marine 12.1

AVEVA launches the latest update of its software product AVEVA Marine, Stéphane Neuvéglise, head of business management for marine systems at AVEVA explains what the latest update brings.

Version 12.1 of AVEVA Marine was launched in the second half of 2011 and the company has added several completely new modules, including AVEVA Engineering, AVEVA Design Reuse and coming soon AVEVA Electrical. Of these, the latter offers the greatest potential for saving time and costs by enabling previous design work to be reused on new projects, whether entire vessels or, more usually, individual blocks and modules.

“We estimate that Design Reuse could save up to 70% of the design time for a new vessel, making it especially valuable for shipyards which frequently build the same type of ship. This has been one of our customers’ most common requests”, says Neuvéglise. Design Reuse carries over a huge amount of the ‘intelligence’ in a design, both in hull and outfitting, so proven design can be readily adapted to new projects, saving effort and exploiting design know-how.

AVEVA has also introduced a Standard Model Library feature to its software. This feature will enable users to create smaller design elements and store them for reuse on other projects. Another important improvement comes from increasing the integration between engineering and design disciplines. AVEVA Engineering is a new product which achieves this

by enabling engineering information, schematic or tabular, to be entered directly into the project database. This brings it under effective change control from the outset and makes it readily accessible by all the disciplines that need to use it, even across a multi-site project. Equally valuable is the programme’s ability to import and validate existing data held in the many disparate spreadsheets that engineers tend to create to meet their particular needs.

Duplicating information is wasteful and prone to errors; to avoid this AVEVA Marine allows engineers and designers to collaborate globally using a common set of data. “You can think of it as they’re seeing the same information from different viewpoints, rather than using separate, disconnected sets of information. This greatly improves the handling of the continual changes as a design evolves,” says Neuvéglise.

Electrical and instrumentation specialists can be responsible for a large proportion of the equipment costs and the maintainable items onboard, so it is surprising that their needs have not been better catered for. AVEVA has filled this gap with AVEVA Instrumentation and are now building on its success with the new AVEVA Electrical.

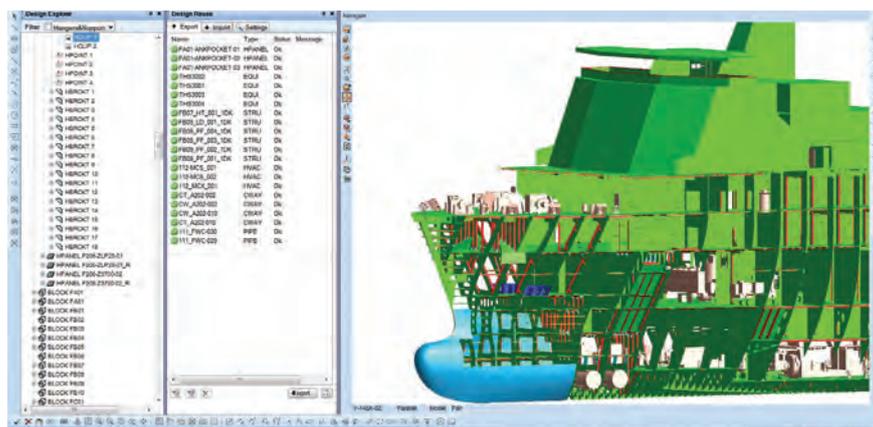
“Both offer power, ease of use and extensive specialist functions. These

disciplines continually accommodate changes imposed by others, but often have only poor-quality tools for the job. AVEVA Instrumentation quickly established itself as the best-in-class solution, with users reporting considerable savings in time and cost. We expect AVEVA Electrical to do the same”, comments Neuvéglise.

In all the engineering industries, simply tracking down and verifying information can take up to 30% of available man-hours. Improving the accessibility and quality of information can themselves deliver significant productivity gains.

“Typically, that leaves about 60% of the man-hours spent on productive design work, which is a big opportunity for technology. In tests to compare the speeds of various operations between AVEVA Marine and its predecessor Tribon M3 we achieved an average of 10% improvement in hull design, and an impressive 50% improvement in outfitting design disciplines. These are significant time savings for designers’ routine tasks” says Neuvéglise.

Other improvements are made in design communication. Unicode support now makes it easier to create design deliverables in local language, while enhanced reporting functions make it easier to create a wider range of higher-quality reports across many of the AVEVA Marine modules.



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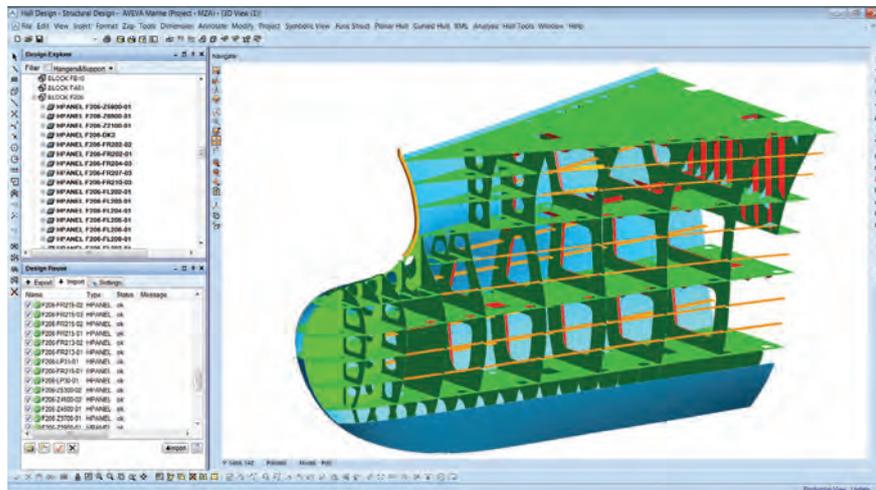
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3D view of the data copied and updated in target model.

The AVEVA Marine solution now supports Windows 7. “Regarding AVEVA’s support both for the technology platform and for Tribon, we have to enable customers to keep their IT infrastructure up to date. Windows 7 support is also

allied to our increasing support for 64-bit technology, which is principally beneficial for 3D visualisation”, says Neuvéglise.

“AVEVA Marine users will have to upgrade to 12.1 in order to use Windows 7 and there are several features in Tribon

which will not support Windows 7. We are actively encouraging customers to upgrade as soon as possible, we believe the business benefits to them are now considerable and we offer a migration service to help them achieve these”, adds Neuvéglise. **NA**

Orca launches new version

US-based Orca3D, a Rhino plug-in software, has announced its latest Work-in-Progress (WIP) software update, that it says will offer greater benefits to its users.

The latest version of the software was launched late last year, pre-empting the launch of Rhino’s latest update that came out shortly afterwards. The WIP version of Orca3D will give the user a lot more functionality and at a low cost, said Orca3D.

The WIP version has been launched as a new concept for Orca3D in response to customer demand. A lot of emphasis has been put on interfacing, giving the user smoother use of the software, says the company.

Orca says the software now has support for Rhino 5 with 32-bit and 64-bit versions allowing for more complex design work. It also features automated evaluation of intact stability criteria to allow users to check designs as they are working on them. Real-time sectional area curves, as the model is being modified, including

the ability to input and display a “target” sectional area curve, has also been added. Other tools to manipulate surface area and a new output format have also been added.

“There are a steady flow of customers. We have a lot of student users, also one-man design outfits, US military, also shipyards such as Damen and Newport port use the software. It is heavily used in small craft but we are working towards larger vessels. Orca currently has in the region of 700+ users”, says Bruce Hayes, naval architect, Orca3D.

Orca was first released in 2008 and claimed to have the first Nurbs modeller. Rhino was its main competitor in naval architecture at the time. Orca joined forces with the Rhino team to develop the software together. Today Orca3D is a tool for hull design and for calculating speed

and power studies. Hayes comments that: “It builds on the capabilities of Rhino.”

The launch of Rhino 5 sees the introduction of ‘Display’, a new transparent background display mode that allows viewports to be captured with ViewCaptureToFile with a transparent background; ‘ExtractUVMeshes’, a command function that extracts the flattened UV meshes. The ‘Layers and Blocks’ functionality contains a possible solution to the problem described above by letting the user choose between a “simple” and a “detailed” approach to handling layer names when importing models and creating linked block definitions.

RPCSetAnimationFrame is also a new command which allows the user to set the animation frame number for an RCP object. This is so that walking/moving people animations work. **NA**

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2012 Update GHS Version 13.00

GHS keeps getting better in response to feedback from the large user base. Well over 170 improvements during the last year have gone in to further the performance and reliability of this mature software. New features include vessel profiles drawn on Longitudinal Strength plots; a weight distribution report and graph; enhanced international character set support; multiple threads on multiple-processor machines; enhanced GROUP report including maximum FSM and permeability columns.

GHS Load Monitor (GLM), the onboard configuration of GHS, allows GHS users to configure onboard systems and provide their clients the best combination of features.



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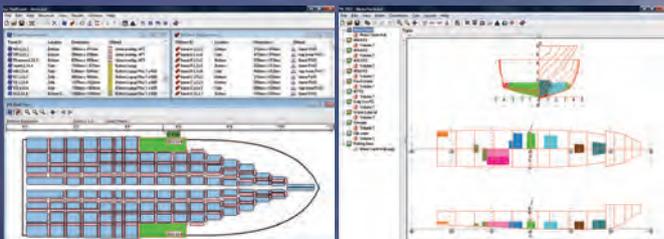
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Adding dynamism to fluid computing

New computational fluid dynamics (CFD) developments allow marine simulation of multiple moving bodies. Stephen Ferguson, manager, corporate market communications, CD-Adapco explains further.

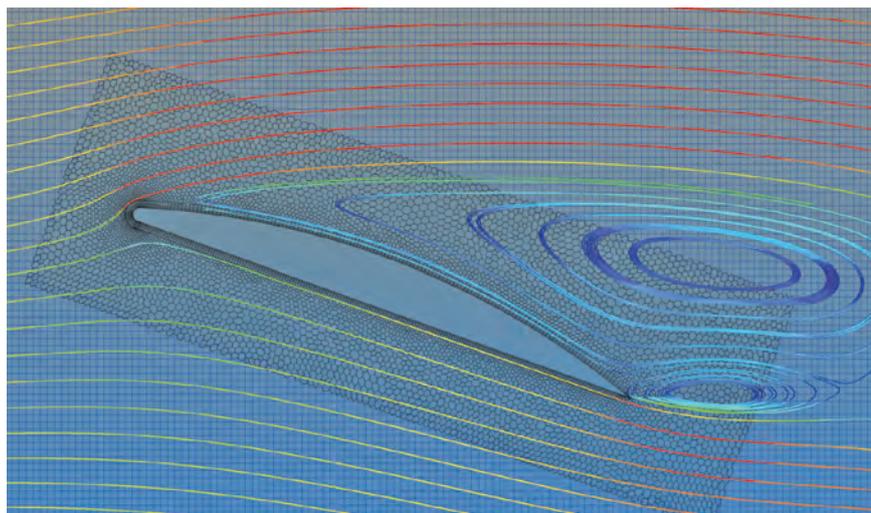
The launch of CD-Adapco's latest software update will see an enhanced new feature, the "overlapping grid method" which will make it possible to easily simulate moving objects.

Development of CFD technology means it can now easily handle a problem that involves a single moving body (for example the wave-induced motion of a ship), but it has traditionally been more difficult to accurately account for the interactive motion of two bodies, for example, the motion of a smaller vessel that passes through the wake of a larger vessel, or the interaction between a propeller and a moving rudder, or a lifeboat launch from an offshore platform or ship.

Although these types of simulations were possible in principle, the manual effort required to make a single computational mesh that connected both bodies, and was able to account for all of the possible movement between them, made it very difficult to perform them reliably and reiterated in practice. This is especially true in cases like the "wake-disturbed boat" described above, when the two vessels might come close to touching, or where the size of the wake disturbance is large enough to capsize the smaller boat.

An alternative, and more convenient, approach is "Overset Meshing", where each object is surrounded by its own computational mesh and is free to move (rotate or translate) without any concern over the connectivity with other bodies. This allows the engineer to concentrate only on the physics of the motion, without having to worry about how distorted the computational mesh will become at extremes of motion.

Each mesh can be of any type, whether you prefer the general polyhedra mesher, the trimmed-cell mesher, or to import existing grids. In fact, mixing of mesh types is not a problem. This means that each mesh can be arbitrarily complex, which reduces the number of individual overset meshes needed. A novel solution has been developed, where all grids are implicitly coupled within the linearised coefficient matrix of every equation solved.

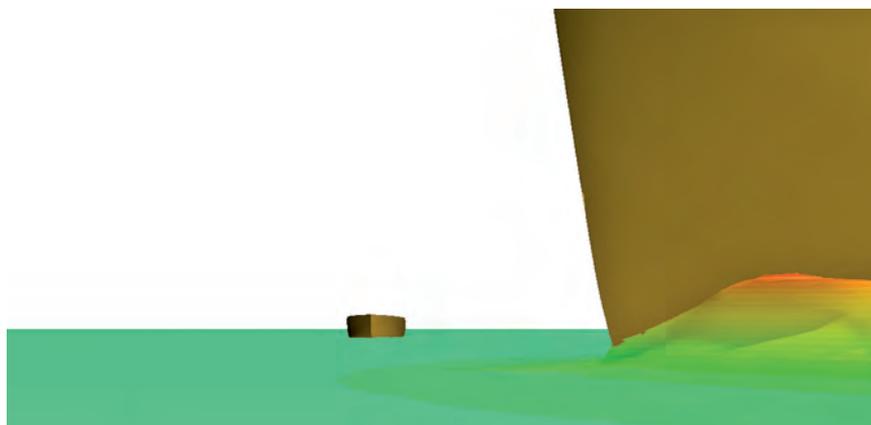


Overset meshing: note how the mesh around the hydrofoil is different from the background fluid, allowing it to move independently.

There are no "internal boundaries" used at the mesh interfaces, and the solution, at each iteration level, is computed simultaneously on all grids. This ensures that the iterative solution method can be converged down to the round-off level of residuals, and that the convergence rate is similar to what would be obtained for the same problem on a single grid. In addition, for the case of dynamic fluid-body motion, the equations of motion are fully implicit and fully coupled with the

flow solution, meaning larger time steps and better stability than with explicit schemes.

Of course the approach is not limited to just two bodies, in principle, any number of independently (or dependently) moving bodies can be simulated using the overset mesh approach in STAR-CCM+. The first set of overset meshing functionalities is available in STAR-CCM+ V7.02, with many enhancements and improvements planned for the future. **NA**



Passing Simulation 1: Large vessel (travelling right to left) passes in front of a smaller vessel (travelling towards the camera), generating a bow wave.

Design and optimisation with CFD

In marine engineering, computational methods have been used for a long time to design and optimise vessels. OSK-ShipTech offers a new vision for using computational fluid dynamics (CFD) to redesign and optimise a bulbous bow on a container ship.

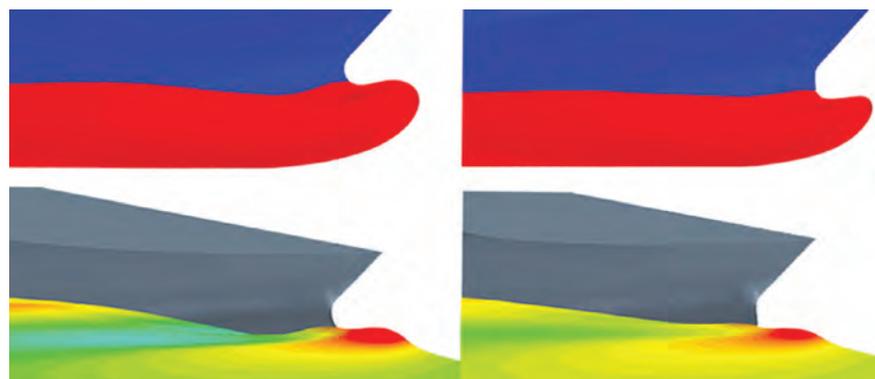
CFD is based on numerical methods and algorithms and is used to solve and analyse complex problems involving fluids and gases. Calculations simulate the interaction of liquids and gases with defined boundary conditions.

CFD is regarded as a reliable and accurate tool to calculate the hull resistance of a ship at a certain speed and find the optimum design in the early design phase. In that phase many important overall design considerations and decisions are made and the propulsion system is selected. CFD can solve a long list of complex problems e.g. resistance, noise from propellers and investigate the interaction between propeller, hull and rudder. The impact of waves on the hull, superstructures or offshore structures can also be investigated.

Traditionally, the hull lines have been optimised by model tests in combination with skilled naval architects. With the traditional use of model testing, the combination of hull and propeller design was checked relatively late in the design process where changes are very costly. Today, the use of CFD speeds up that process by calculating the most efficient hull form using numerical methods. It can be beneficial to place CFD analysis in the early design phase where it is easier and more cost-effective to clarify the design. One of the main drivers in this development is the financial aspects of sending your ship design to a virtual towing tank test made by an experienced naval architect with top-end software.

Operational profile

Ships are often designed for a specific draught and speed as specified by the ship owner. Nevertheless, the actual sailing conditions can be very different making the vessel's operational profile very different from its design profile. That may lead to excessive fuel consumption as a result of added resistance due to an inefficient bulbous bow. An analysis of the operational profile including route, load, speed and draught can be helpful



The left hand side of the image is with the old bulbous bow aft and trim and the right side of the image shows the new optimised bulbous bow and aft trim.

Model ID	18.5kn	Trim (m)
Power Pe at C1 (%)	100	-0.97
Power Pe at C7 (%)	90	-0.97

C1 with old bulbous bow. C7 with new bulbous bow.

when optimising the design to increase the spectrum of profitable sailing conditions. With a CFD analysis it is possible to design the vessel to the actual operational profile and optimise the performance by improving the trim, the form of the bulbous bow or the displacement and thereby reduce resistance and fuel consumption.

In the following part a case will show how CFD can be used to investigate and optimise vessels. The analysis was performed by naval architects at OSK-ShipTech, which has been engaged in numerous projects regarding optimisation of hull form, propellers, appendage alignment as well as wave force studies to name but a few.

OSK-ShipTech was commissioned by a leading shipping company to investigate and clarify the reasons for excessive fuel consumption compared to vessels of similar type, size and capacity.

The solution

OSK-ShipTech based the study on CFD calculations of the hull form with focus on

resistance from a non-working bulbous bow. As input for the calculations an analysis of the operational profile has been provided by the client and the most common draught and speed listed.

The hull form has been modelled in 3D and CFD calculations have been used to verify the results from a former towing tank test. Trim investigations for a matrix of trim and speeds have been conducted to check the influence of the trim on the resistance. If the trim is incorrect due to the loading condition the resistance increases and so does the fuel consumption. At aft trim (C1) the bulbous bow generates more resistance and does not fulfil its purpose – it simply adds more waves. On the other hand, when trimming the ship forward, thereby creating an even keel condition (C3), the resistance from the bulbous bow is reduced. To fully remove the added resistance from the bulbous bow greater forward trim (C5) is needed, but then the headbox above the rudder penetrates the surface and increases the resistance aft. [NA](#)

More Gusto for construction vessels

The GustoMSC Constructor class of vessels has been specifically designed to accommodate present and future requirements of the offshore oil and gas construction and SURF markets.

The latest family of designs from GustoMSC was developed last year as part of GustoMSC's strategy to meet the future needs of construction vessels in the offshore market. The project, Mattijs Faber, sales manager, GustoMSC explains: "was carried out on the basis of strategic data analysis and also in consultation with our customers, to discuss the future needs of the market."

Over the past couple of years there has been a large increase in the development of equipment and vessels for the offshore market. Faber says that vessels are now going into deeper waters and more remote locations in harsher conditions. Because of these factors, development of the GustoMSC designs have focused on the size of vessels, the lifting capacity and also the station keeping capabilities.

It is easy to increase the power of and engine, but "you need a good

balance between the installed power and the other effect that it can have", Faber points out. GustoMSC has made further studies of hull optimisation, to reduce the wind coefficient and also the optimisation of the hull lines. GustoMSC has also carried out studies into the sources of noise and vibration to improve the environment onboard for personnel and how those vibrations carry through the vessel.

Gusto MSC says that the family of vessels can be provided with various mission equipment systems, such as pipelay systems (S-lay and J-lay), reel-lay systems, flex-lay systems or be equipped for deepwater installation or cable lay. Mission equipment can be installed to operate either through a moonpool or over the side. Ample crane capacity is provided for surface installation and subsea operations as well as giving full coverage of the deck and moonpool area. The vessels have good sea keeping

and DP capabilities in combination with good transit speed and operate in accordance with DP-3 and DYNPOS ER requirements. The vessels provide a stable platform for lifting operations. For higher crane loads an active ballast system can be used to reduce heeling angles.

The vessel designs have also been designed to be adaptable if in the future owners wish to take up further green initiatives. The vessels designs has been prepared for a full suite of environmental measures consisting of NOx, SOx and particle reduction as well as a waste heat recovery unit. GustoMSC is in regular talks with owners about the designs and is confident that it will see orders soon. Also, GustoMSC has plans for the development of a SURF XL vessel, which will be 50% bigger than the constructor class. This vessel will be aimed at the niche market for large SURF projects. [NA](#)

GustoMSC launches latest designs for the offshore construction market.



BBC Chartering rides the wave

Germany-based BBC Chartering is renewing its fleet to meet today's demands in the heavy-lift market with 14 vessels of the *BBC Amber* type.

BBC's 'New Wave' fleet renewal and expansion programme was initially started in 2008 when the economy was still buoyant and large orders for vessels were still frequent, highlights BBC Chartering.

However, even with the economic crisis hitting the shipping market at the end of 2008 and its effects still being felt three years on, BBC Chartering still sticks to its charter commitments for the new building tonnage, Raymond Fisch, senior vice president, BBC Chartering explains: "Many companies were discussing different projects at the time, however, not expecting to see the major tonnage that we now see on today's market. From a demand perspective, the mass market reacted early [to the economic crisis], whereas the heavy-lift market reacted with a time lag because projects had already been started, so we are still benefitting from previous orders in the pipeline."

Fisch also adds that it is still too early to see a recovery for the market. Dry bulk and container ships compete on the lower end of the market, which is what is keeping rates under pressure. On top of that the industry is suffering from high oil prices that are quickly eating up intermediate rate recoveries. According to Fisch, the overall situation remains difficult.

BBC Chartering's latest vessels and deliveries on order allow the handling of heavier and bigger cargoes featuring increased lifting capacities. With that the company also aims to help the offshore and energy sector which continues to be a driver for maritime transport demand.

The first of the vessels, *BBC Amber*, was delivered in August last year, with the rest of the series of vessels being delivered up until 2014. The series of vessels have all been named after gemstones to "metaphorically appreciate their high profile" the



BBC Chartering's first in the series of 14, *BBC Amber*, was delivered at the beginning of 2012.

Amethyst, delivered shortly after *BBC Amber*. Both are now servicing Asian and European charters. The series of vessels are 153.44m in length overall and have a deadweight of 14,360dwt. The ships are fitted with two NMF cranes that each have a lifting capacity of 400tonnes and a combined capacity of 800tonnes. Some of the new vessels are also planned to offer 2 x 450tonne cranes, allowing a combined lifting capacity of 900tonnes. The vessels feature an additional starboard crane which can lift to 800tonnes.

The vessels are powered by a MAN 6S46MC-C engine with a power output of 8280kW. The vessels also have three generators delivering a power output of 970kW/440V at 720rpm and one emergency generator with an output of 330kW/440V at 1800rpm. The ships are fitted with a bow thruster that has a power of 900kW.

BBC Chartering is also updating its Everest type multipurpose vessels, together with *BBC Everest*, *BBC Fuji*, *BBC Kibo*, and *BBC Mont Blanc* are fourth members of the vessel programme, and are referred to by BBC Chartering as 'flexible workhorses'. The company reported earlier it plans to operate eight vessels of this type with 9300dwt that offer a combined lifting capacity of 700tonnes. Being delivered from the shipyard in Xingang (China), *BBC Mont Blanc* commenced her maiden voyage earlier this year from Ulsan, South Korea to Kakinda, India on a full charter basis.

"The first Everest type was delivered August last year, with all eight vessels to be delivered by 2013. The larger capacity will help us get better leverage into this market segment", comments Fisch. [NA](#)

TECHNICAL PARTICULARS

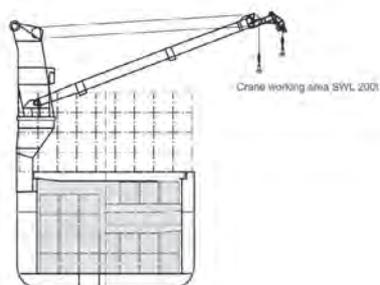
BBC Amber

Length oa:	153.44m
Breadth moulded:	23.20m
Depth to main deck:	11.95m
Height above keel:	40.85m
Gross tonnage:	12,838gt
Deadweight:	14,360dwt
Speed:	17.5knots
Classification:	GL +100 A5
	E3 IW BMW DG + MC E3 AUT
Cargo hold capacity:	18,176m ³
Cranes:	2 x NMF cranes
	situated Portside 400tonnes
	capacity each/
	800tonnes combined
	1 x NMF crane situated
	Starboardside 80tonnes

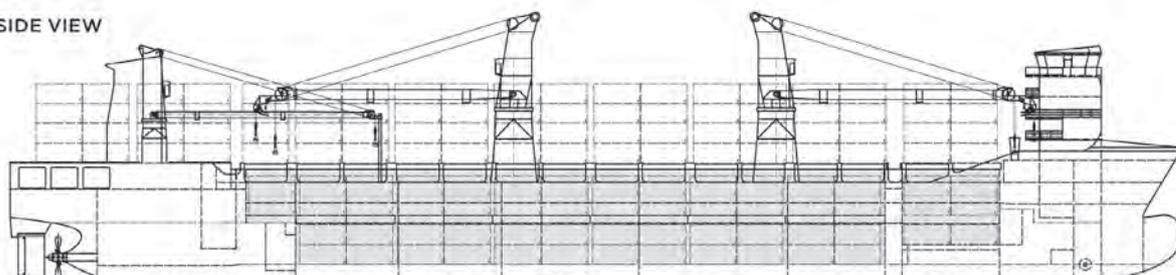
company says. Fisch highlights the significant features of the ships: "The vessels are unique for a large series; the superstructure is located on the forecastle of the vessel, allowing good visibility also for high-reaching cargoes, and a cargo hold of 83m length allows stowing long cargoes, giving charterers additional flexibility."

The vessels are being constructed at Chinese shipyard Jiangzhou Shipyard with the second in the series, *BBC*

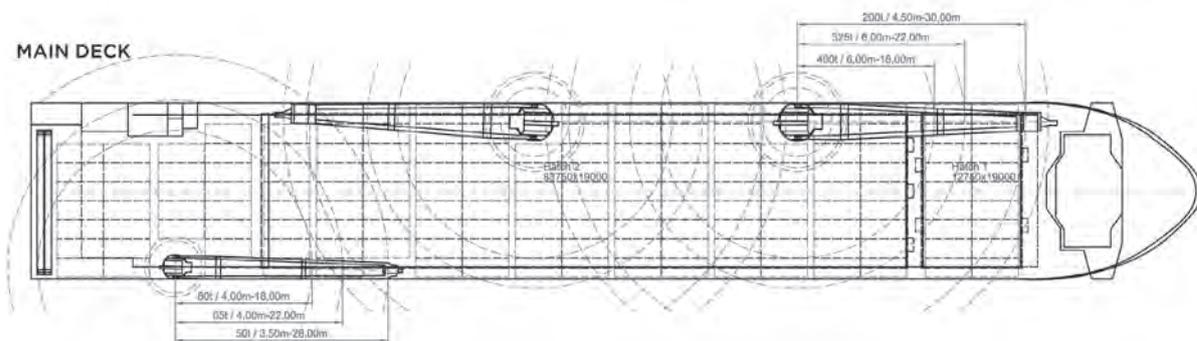
GA plan for *BBC Amber*.



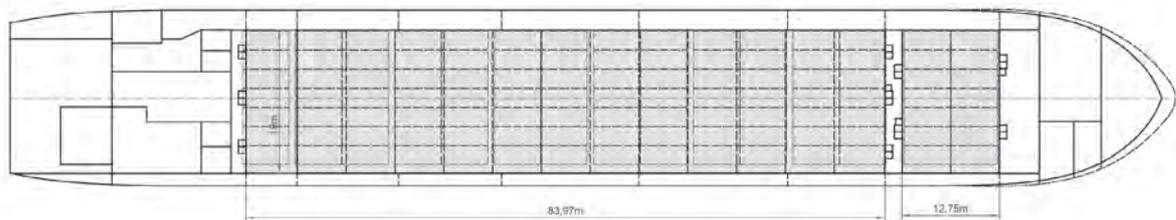
SIDE VIEW



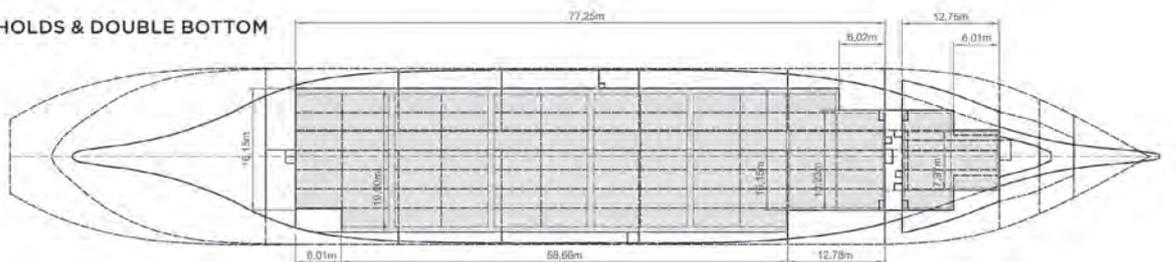
MAIN DECK



TWEENDECK



HOLDS & DOUBLE BOTTOM



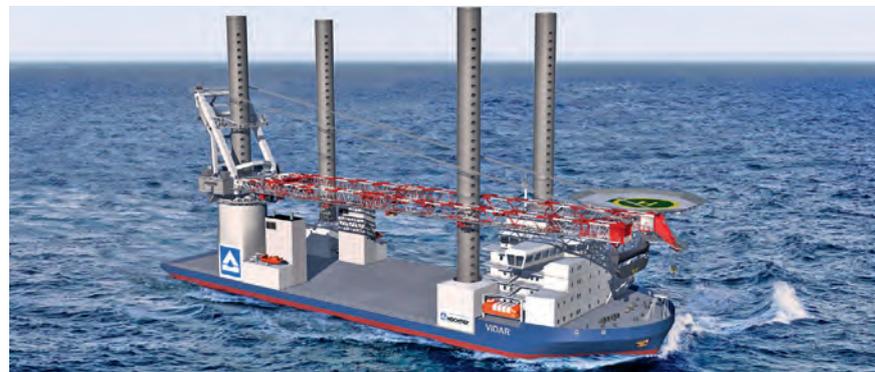
Vidar offers greater capacity

Flexible Hochtief jack-up vessel will offer customers larger lifting capacities.

Vidar, named after the Norse God Thor's brother, is the latest jack-up vessel design from Hochtief Solutions and is aimed at the offshore wind farm market. Ulrich Trottnow, project manager, Hochtief Solutions says: "We have had experience in the wind farm sector and we have also had a lot of enquiries about this type of vessel."

The solution that Hochtief has presented to the market has been the development of a combination of the company's different designs. The vessel features 90m-long legs that will allow it to operate in waters of 50m in depth. The vessel also features a large load capacity and large surface area, allowing the ship to cater for larger cargoes. "The vessel will be able to provide different solutions to the customer, such as construction for wind farms, maintenance and also support to the oil and gas industry", says Trottnow.

With increasing development in the offshore wind farm sector, Trottnow comments that



Vidar offers larger support to the offshore market.

there is still a lack of both construction and maintenance vessels for this market. He highlights that the sector does not need many large vessels, because offshore logistics is more efficient using vessels, which have a strong crane capacity plus a high payload.

However, Vidar has been constructed with

a large crane capacity which Trottnow says is the main attraction for customers in wind farm construction. The vessel will be 136.50m in length with a width of 41m with a deck area of 3400m². Vidar will be constructed at Crist Shipyard in Poland where it is expected to be delivered in the second half of 2013. **NA**

Rolldock signs for two more ships

The Netherlands-based heavy-lift company Rolldock has commissioned the construction of two more semi-submersible vessels that are due to join its fleet in 2014.

The two semi-submersible heavy-lift vessels are planned to be part of Rolldock's fleet expansion into the larger vessel market that will cater for customer demands in the area of wider cargo.

Jasper Ras, lead project engineer, Rolldock says: "The vessels have come about from demand for vessels with bigger capacity; we are having more questions from our customers for wider cargo handling."

The two vessels will have the same flexibility in operations as the present S Class vessel through the different loading and discharging methods available as well as the ramp and hatch cover systems, which have been developed by Rolldock, says the company.

The detailed design of the new vessels will be carried out by the Flensburger

Shiffsbau Gesellschaft yard based on Rolldock's concepts. The vessels will be constructed at Flensburger Shipyard in Germany and not Larsen & Toubro as the previous S Class vessels were.

The two latest heavy-lift vessels from Rolldock follow on from the same design as the S Class, but offer larger cargo carrying capabilities. The vessels can be loaded and unloaded in three different ways, with two heavy-load cranes that can move cargo up to 700tonnes. In addition, the ships have adjustable stern ramps and hatch covers which can be adapted to different quay heights in ports and allow the loading or unloading of individual cargo up to 3000tonnes in weight.

The ships when fully laden will be able to achieve a speed of 16knots and will be propelled by two diesel engines and a double

power plant. The vessels will be 151.50m in length with a width of 19.4m and a deadweight of 8000dwt. Hold dimensions for the vessels are 119.4m long by 19.4m wide, with a maximum vessel draught when fully laden of 5.67m. The vessels will also feature ballast water treatment systems and integrated systems that will monitor and control the relevant procedures built into the bridge system.

Ras also highlights the improved and larger accommodation section onboard. "The accommodation block will accommodate 32 persons, this has come about as clients sometimes want to send their own personnel, which has been difficult onboard the previous S Class vessels", comments Ras.

The construction of the vessels is expected to begin in February 2013 and they will be delivered in 2014. **NA**

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SAFEGUARD Passenger Evacuation Seminar



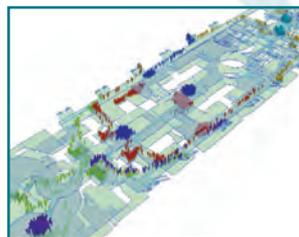
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- *Do we really know that cruiseships and ferries can safely evacuate passengers in an emergency?*
- *Can we be certain the current passenger evacuation simulation software is realistic?*
- *How do "real" passengers actually react in an evacuation?*

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

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

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



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Eco-friendly ice-classed PCTC's

Japan has set the benchmark with the launch of its two Pure Car and Truck Carriers (PCTC) that have been developed to be more efficient.

The two latest PCTC *City of St Petersburg* and *City of Rotterdam* for Nissan Motor Car Carrier Co., Ltd were designed to meet with the advanced environmental regulations that are faced by ship owners today. *City of St Petersburg* was launched at the beginning of 2010

with its sister vessel *City of Rotterdam* delivered in March 2011.

Commenting on the latest design T. Mitsui, senior managing director, Kyokuyo Shipyard Corp, says: "It is the world's trend to save energy because of limited fossil fuels, and also in the shipping world it has been a strong requirement to reduce the fuel oil consumption due to the jump in crude oil prices, we have investigated how to reduce resistance against wind as well as against water."

The design of the 2000-unit PCTC's feature a Semi Spherical Shaped (SSS) bow that reduces the ship's resistance and thereby saves fuel. A rounded SSS bow gives the vessel less wind resistance than a more angular front due to less surface resistance Mitsui explains. "When building the bow portion of the ship, a part of the spherical shape has the same diameter. This means that the same mould can be used when bending the plate by the press machine."

This innovative design was developed by Kyokuyo Shipyard and proved its aerodynamic performance in wind tunnel testing at the Research Institute for Applied Mechanics of Kyushu University, in Japan. The results showed that longitudinal/lateral force (air resistance) and yawing moment, due to the winds from forward and oblique directions, against the ship are significantly smaller

than those of conventional PCC design. Wind tunnel tests proved that the wind resistance of these vessels is up to 50% less than that of a conventional PCC design. "Theoretically, a new 'SSS bow' ship can save about 800tonnes of fuel oil and about 2500tonnes of CO₂ emissions every year, in average oceanographic weather conditions of the North Pacific, at a running rate of 75%," adds Mitsui.

It would be remiss not to not recognise that this vessel, with its enhanced bow, is also an ice class vessel as requested by the ship owner to be able to sail the Baltic Sea. The vessel has Ice Class 1A class notation, with strengthening of the propeller, shafting and side shell plating to be able to cope with the extreme cold.

City of St Petersburg and *City of Rotterdam* are 139.98m in length overall with a width of 22.40m and a deadweight of 47,130dwt. The vessels are powered by a single MAN B&W 7L42MC Mk-6 diesel engine giving a service speed of 16.9knots at 81.4% MCR with 15% sea margin. The three diesel alternator sets are cooled from a central cooling plant, which also serves the main engine and air conditioning plant.

The vessels have nine fixed decks which can load up to 2057 cars, and a combination of fixed internal ramps can be arranged effectively and pillar-less construction for car space enables rapid car handling to all car decks as well as efficient car stowage. **NA**

TECHNICAL PARTICULARS

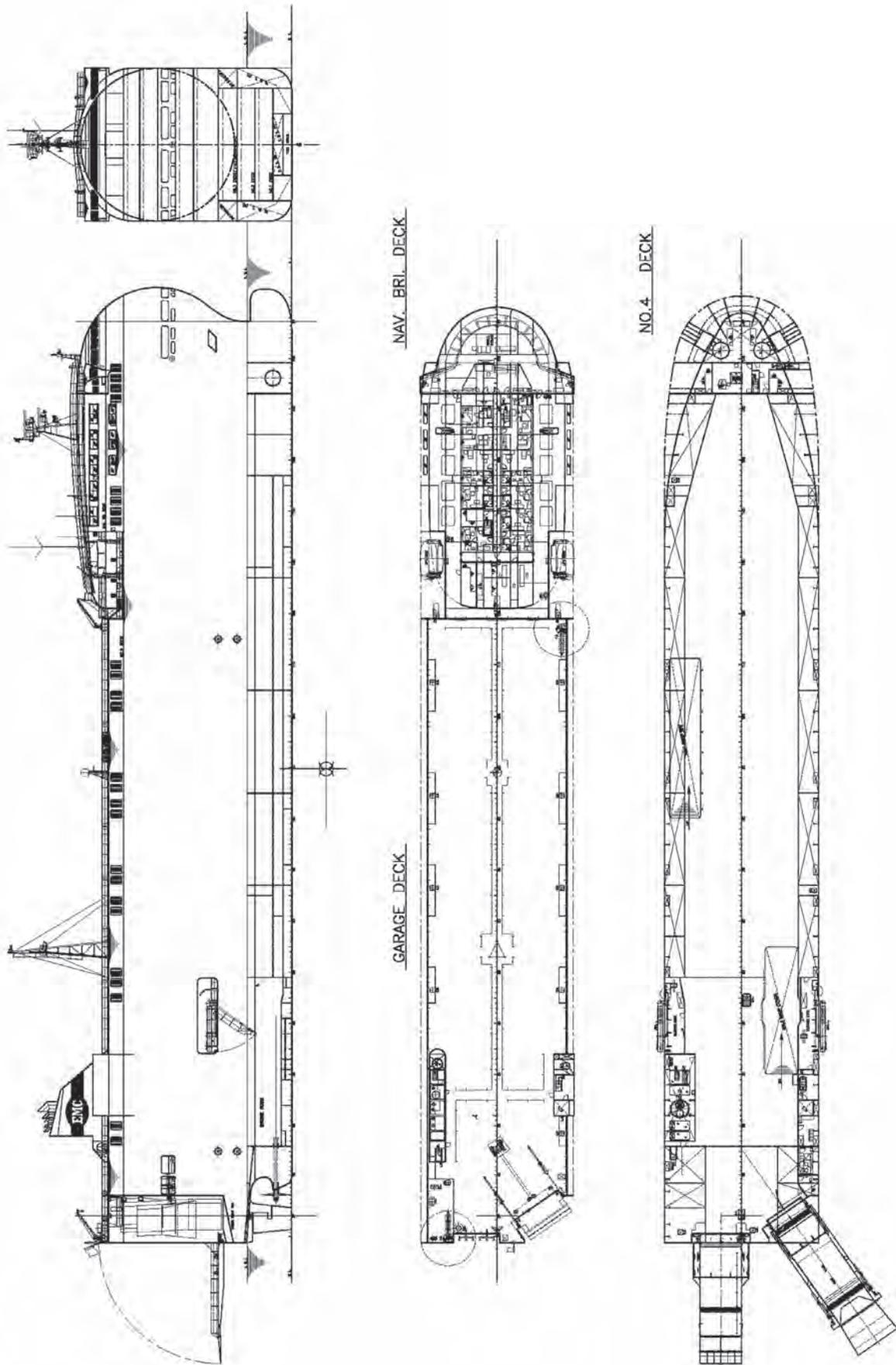
City of Rotterdam

Length oa:	139.98m
Length bp:	131m
Breadth moulded:	22.40m
Depth moulded	
To main deck:	7.95m
To upper deck:	24.45m
Draught	
Scantling:	6.50m
Design:	6.50m
Gross:	21,143gt
Deadweight	
Design:	4713dwt
Scantling:	4713dwt
Speed, service:	16.9knots @ 81.4%
	MCR with 15% sea margin
Classification society	
and notations:	Bureau Veritas I * HULL,
	*MACH Ro-Ro cargo ship
	/Pure Car Carrier (PCC)
	Unrestricted Navigation,
	*AUT-UMS, Ice Class 1A
Main engine	
Design:	MAN B&W
Model:	7L42MC Mk-6
Manufacturer:	Hitachi Zosen Corporation
Number:	1
Type of fuel:	HFO
Output of each engine:	6965kW
	x 176rpm
Vehicles	
Number of vehicle decks:	9 fixed
Total cars:	2057
Doors/ramps/lifts/movable car decks	
Number of each:	2 ramps
Type:	1 x Stern ramp-way door
	1 x stern quarter ramp-way door
Design:	MacGregor-Kayabe Ltd

City of Rotterdam gets wind efficient.



GA for City of Rotterdam.



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KHI aims for Latino offshore thruster market

In looking towards the South American offshore market Kawasaki Heavy Industries (KHI) hopes to maintain its market share for tunnel thrusters in the face of stiff European competition.

Currently, KHI says that it is the market leader in tunnel thruster production, claiming a 70% market share of the Korean market and a 20-30% share of the global market.

In Japan there are two main tunnel thruster manufacturers, Nagita, which focuses on smaller sized thrusters, and KHI, which specialises in thrusters of 1-3.3m, says Shiro Mase, manager of the overseas sales section of the Marine machinery sales department at KHI.

It is KHI's overseas competitors, however, that Mase concentrates on as Rolls-Royce and Wärtsilä offer significant competition to the Japanese company. Both Rolls-Royce and Wärtsilä can offer a complete propulsion package for an owner which would include a main engine, propeller and drive shaft along with its thrusters.

In sourcing its marine engines through a licencing deal with Denmark's MAN Diesel & Turbo, which last year surpassed a remarkable 100 years, KHI is not in a position to offer such a package, instead the company has to

play to its strengths. "We are looking to expand our business for Azimuth thrusters because this type will benefit the offshore market," says Mase.

That strategy received a boost from Korean shipbuilders STX Offshore & Shipbuilding and Samsung Heavy Industries who have placed orders for thrusters for shuttle tankers to be used in offshore development in Brazil.

The orders received from STX for two shuttle tankers are for the full package, including two controllable pitch propellers, four Rexpeller units, and six side thrusters, while Samsung has ordered five controllable pitch propellers to be utilised as the main propulsion system for five shuttle tankers. All the thrusters and propellers will be delivered during this year and next year say KHI.

Mase puts the success of KHI's thruster business down to the fact that the Japanese company produces all its own machinery and gears. There is a limited capacity to build the specialist machined parts for thrusters, says Mase, only a few manufacturers are capable of producing

them, "so if there is a boost in demand, as happened in 2008, then a one year delivery time could become two to three years," he explains.

According to Mase both Rolls-Royce and Wärtsilä rely on outside contractors to manufacture the gears and machinery contained in the thrusters that they build, KHI already builds similar machinery for the steam turbines it produces and the company is using its design philosophy to improve the quality of the gears it produces for its Azimuth thrusters.

"We have the most sophisticated machine in the world that produces gears, the Maag machine from Germany; there are only two units of this type in the world and Maag owns the other one and they produce gears for both Wärtsilä and Rolls-Royce," explains Mase.

It is the Maag machine that offers KHI a competitive edge, adds Mase. It allows the company to offer thrusters at prices that, he says, are 4-5% more competitive than KHI's competitors.

Mase says that KHI's European competitors have a different business philosophy to the Japanese company. Europeans "buy many small companies and they become part of Rolls Royce," or the company that bought them, he says. "At KHI there are only two ways to do it, either you produce in house or you buy from a sub-contractor," he added.

For a company that began building tunnel thrusters in 1965 KHI has evolved this element of its multi-faceted business into a thriving sector of its own. The gas turbine and machinery division, which includes the thruster sector, is a healthy 16.5% of the total KHI sales, says Mase, that business is expected to grow with the development of the South American offshore market. **NA**



KHI's Rexpeller Azimuth thruster that can turn through 360deg.



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