

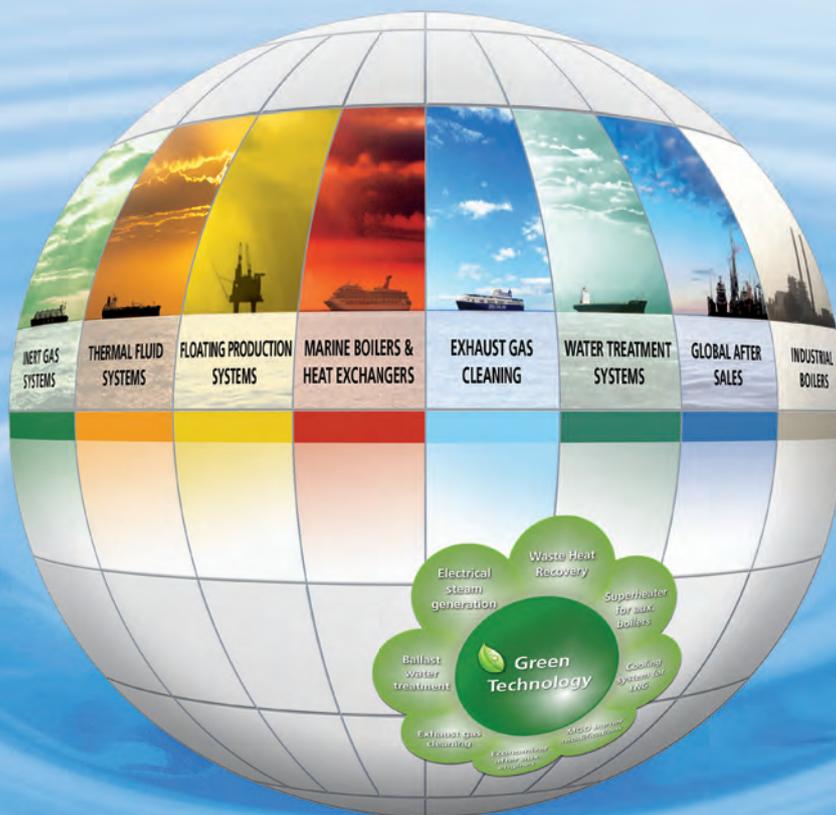


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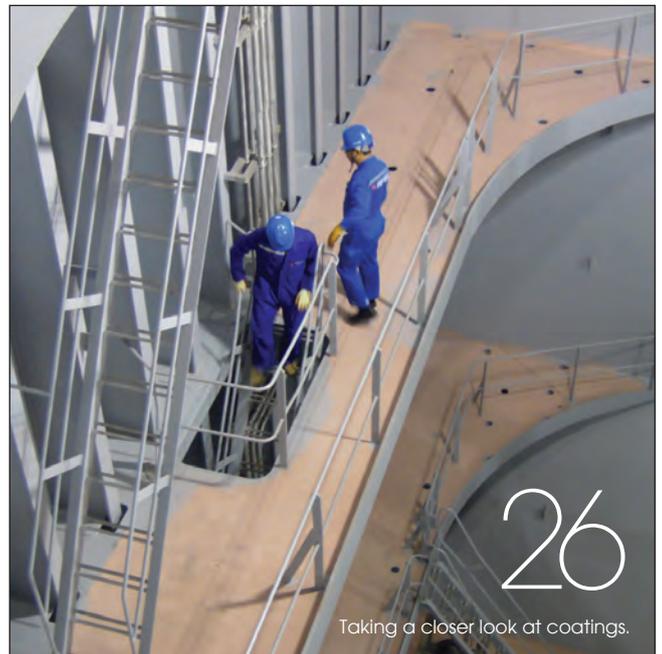
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On-line Edition

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



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Making amends

Hard chemical tanker coatings can be difficult to apply initially and to repair later when cracks appear say owners.

Coatings technology has evolved over the last 10 years or so to a point where the chemical technology employed is both complex, in its structure and application, and simple, in the methods through which it works.

That is to say the coatings are applied and cured; the coating then hardens and protects the steel structure of the ship, fairly straight forward. The chemical structure of both MarineLine 784, a polymer-based coating, and Interline 9001 which is an epoxy-based protection is very complex. Application of these coatings is not straight forward and the protocols for applying these coatings are very involved, as Dennis de Bruin, tanker office manager of The Netherlands-based BMT De Beer pointed out it is crucial that a MarineLine expert is on hand to make certain that the yard applying the tank protection is using the correct protocols.

Any variation from the procedure could render the coating useless or condemn the ship to having a coating that will crack and flake, exposing the ship's structure to the chemical cargoes.

In a sense this is the Achilles heel for MarineLine, which has a proven track record, but with yard coating work not being uniform there will inevitably be differentiations in the quality of the application process from one yard to another. Owners will not know how well the coating to their ship has been applied until two or three years down the line when it begins to crack, or not as hopefully the case maybe.

Interline 9001 which, although based on a different chemical, when hard its manufacturer, International Paint, makes similar claims to those from Advanced Polymer

Coatings, the manufacturer of MarineLine. Interline has not been applied to any vessel yet, it is too new, but it hardens with a smooth surface like its APC competitor and suspicions are that if the correct protocols are not followed then it too will crack.

Both companies say that their coatings are cheap and easy to clean, they offer owners a way to cut the cost of cleaning and the time it takes to clean a vessel. Yet at least one owner has said that when cracks appear in the coating it is "difficult to repair". Mechanical damage, that is damage caused by machinery in empty tanks carrying out maintenance work, can be deep, said the owner.

Mr De Bruin agrees that this damage can also be dangerous, but he also emphasised that he believes that MarineLine is a good coating. Many chemical tankers, indeed more than 50% of the current fleet according to APC, now use MarineLine to protect the chemical tanks, so getting rid of the coating is not a solution. More likely the coatings manufacturers must find a way to ensure that the application of their tank protection technology is applied properly by all those who undertake to coat chemical tankers' cargo holds. Yards must be encouraged to have more stringent checks so that they follow the application protocols much more closely.

Only in this way can the coatings be applied in a uniform way by all the yards doing the work. Only then can owners be assured that their ships will have tank coatings that are hard wearing and durable for the life of the ships.

Meanwhile, over at the International Maritime Organization (IMO) the Marine

Environment Protection Committee will be debating the application of its Energy Efficiency Design Index with particular regard to ro-ro ships.

Judging the efficiency of a ro-ro vessel may not be as simple as it first appears. For example some ro-ro's carry mainly freight, some freight and passengers and some cars, while all have a bigger volume than most tankers, particularly those that carry passengers which have vast areas reserved for the comfort of those travelling, cabins, toilets, restaurant and bars etc. in addition these ships often run to a tight schedule making it difficult to slow them down, as this would mean fewer sailings and the ships and their ferry routes become less viable.

The Danish Technical University (DTU) has devised a method of calculating the energy used to transport a tonne of cargo on a ro-ro and to compare that cost to other modes of transport, for ro-ro ships this mainly means trucks, the big competitor to ferries around the globe.

What DTU discovered using its new method was that trucks are very competitive compared to ro-ro ships and emit less CO₂ over a given route. Does this spell the end of ferries? Not really because as DTU pointed out last year (see *The Naval Architect* May 2010 issue pg 16 – pg 20) there are many other considerations that add to the cost of trucking goods that are more difficult to define and calculate.

Some of these would be the resources needed to build roads, the accidents caused by many large trucks, congestion, pollution from that congestion and the general well being of the population as a whole. So let's not go overboard about trucking!! NA

Coatings

Hempel seals Russian deal

Danish paint manufacturer Hempel has signed an investment agreement with local government officials of Russia's Ulyanovsk region, paving the way for Hempel to open its first paint production facility in the country.

The €23 million (US\$32.51 million) turnkey project to be built close to the city of Ulyanovsk, nearly 900km east of Moscow and is scheduled to start production in December 2012.

"This will be our first Hempel factory in Russia," said company CFO Kim Junge Andersen. "We've had a very good experience with our organisation in Russia, and they have become well-established in the market. This plant will significantly increase our ability to service our customers in the region." The new plant will feature the latest in environmentally-friendly coating production equipment technology, including a semi-automatic powder handling system, an automatic liquid dosing system and a solvent recovery unit.

Designed to house raw materials and the finished product under one roof, the one-building factory will occupy a 70,000m² plot and employ around 120 staff. Under a one-shift operation, the factory will produce 16.3 million litres annually. If further capacity is required, the factory can operate with two shifts to raise production capacity to 26 million litres.

In order to meet local and Hempel Group environmental standards, all floors will be sealed to prevent soil contamination in the event of a spill, or to collect water in the event of a fire. Solvents that have been used in the production process will be recovered in a solvent recovery unit and recycled for future use. It is estimated that this method can recover up to 90% of unused solvent.

Propulsion

Bumi Armada opts for diesel electric

Wärtsilä will deliver a new ship design and an entire diesel electric propulsion system for ship owner Bumi Armada in Malaysia.

Wärtsilä has signed a contract with Nam Cheong Dockyard of Miri, Malaysia, which will build a WSD (Wärtsilä Ship Design) 800 MPSV (multi-purpose platform supply vessel). This is the first in a new series of Wärtsilä designs being marketed as a total solution and including all the relevant systems.

The total solution concept of the WSD 800 MPSV design includes four gensets. These produce more than 6MW of electric power, which is distributed via Wärtsilä's Low Loss Concept for diesel electric propulsion, to two Wärtsilä main azimuth steerable thrusters aft, and two tunnel thrusters forward, and to provide all necessary electric power onboard. The 81.6m long vessel, which is scheduled to be launched by the autumn 2012, has a beam of 18.4m, and a summer draught of 6.8m.

LNG

Torghatten Nord orders LNG ships

Norwegian owner Torghatten Nord AS has ordered four liquefied natural gas (LNG) powered ships from the Remontowa Shipyard in Gdansk, Poland for delivery in the second half of 2012. The ships will serve two routes across Vestfjorden in Lofoten in the north of Norway. Both routes are known for their harsh operating conditions.

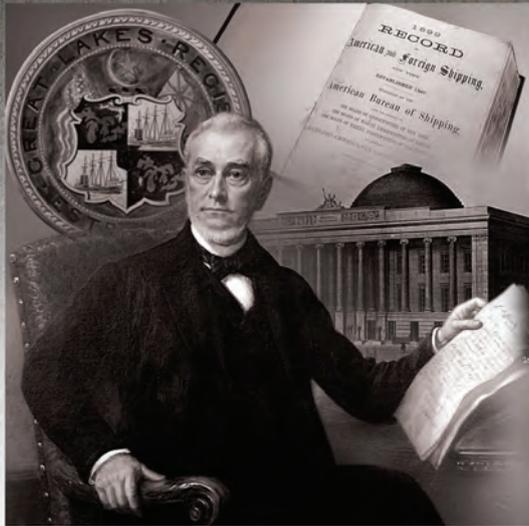
The complete LNG propulsion systems for the vessels will be supplied by Rolls Royce which has sub-contracted the work to install LNG storage tanks and fuel systems aboard the new vessels to Hamworthy Oil & Gas Systems. Each ship will have 150m³ capacity storage tanks designed by Hamworthy.

Reidar Strande, Hamworthy Oil and Gas Systems Director LNG, said: "LNG is a promising fuel for ships, with greatly reduced emissions compared to regular marine diesel or heavy fuel oil. Due to the establishment of the Emission Control Areas for the Baltic Sea and parts of The North Sea a lot of new ships are being equipped with gas engines. By utilising natural gas, SO_x, NO_x and particulate matter emissions are reduced by up to 80%, while CO₂ can be reduced by between 15% and 25%."

Mr Strande said that since natural gas has to be bunkered as LNG, special requirements for fuel handling had to be met. "The fuel has to be evaporated and warmed before it may be used as fuel in a gas engine.

Hamworthy will deliver the complete storage and handling systems, including bunkering stations on board to handle refilling of the ships' LNG tanks in less than one hour and evaporation and heating of the LNG from approximately -145°C to +30°C.

"To meet strict maritime requirements the systems are fully redundant, guaranteeing fuel supply under any circumstance," said Mr Strande. "No fuel pumps are necessary. Natural gas will instead be delivered to the engines by differential pressure between tank and engine. Tank pressure is maintained by controlled evaporation of LNG in a closed cycle with the fuel



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Artist's impression, showing how the complete Hamworthy LNG storage and handling system is installed.

tank. Bunkering lines and gas lines to the engine are normally installed in ventilated ducts, to eliminate the risk of explosion or fire.”

Hamworthy's LNG storage and handling system (LNG Fuel Gas System) is typically delivered as a complete skid prepared for installation in vessels. All hook up works and interconnecting piping to the vessel systems (e.g. utilities such as electricity, heating water, purging, gas to engine and LNG) are performed at yards.

Class

Anglo/American CSR collaboration

Classification societies Lloyd's Register (LR), of the UK, and ABS of the US have released common software for the International Association of Classification Societies' (IACS) Common Structural Rules (CSR) and establish joint venture to develop software for the Harmonised Rules.

ABS and Lloyd's Register (LR) announce the release of jointly-developed software that will be used to assess bulk carriers and oil tankers designed to comply with IACS' CSR. The common software draws upon the technical strengths of ABS and LR and will be used to evaluate new designs presented to either society.

Recognising the strengths of their collaborative efforts and to demonstrate commitment for consistency, ABS and LR also announced the establishment of Common Structural Rules Software, LLC – a joint company with offices in Houston and London. The

entity will maintain the newly released software and develop new common software which will assess vessels designed to comply with the harmonised CSR that will be submitted for industry review in 2012.

“I am pleased that the strategy laid out a decade ago is achieving our objectives,” said ABS chairman and CEO Robert D. Somerville. “First was the development of the CSR which was completed in 2005. It was always our vision that the next step would be the common software.” He added. The joint venture will hopefully help to drive the final step – the adoption of common software by other societies. It is ABS' and LR's desire that other societies join in this initiative.”

“This is what ship owners, designers and shipbuilders need. We can only obtain consistency in CSR calculations through common software,” said Richard Sadler, CEO of Lloyd's Register Group. “We very much hope that other classification societies will join this common project.”

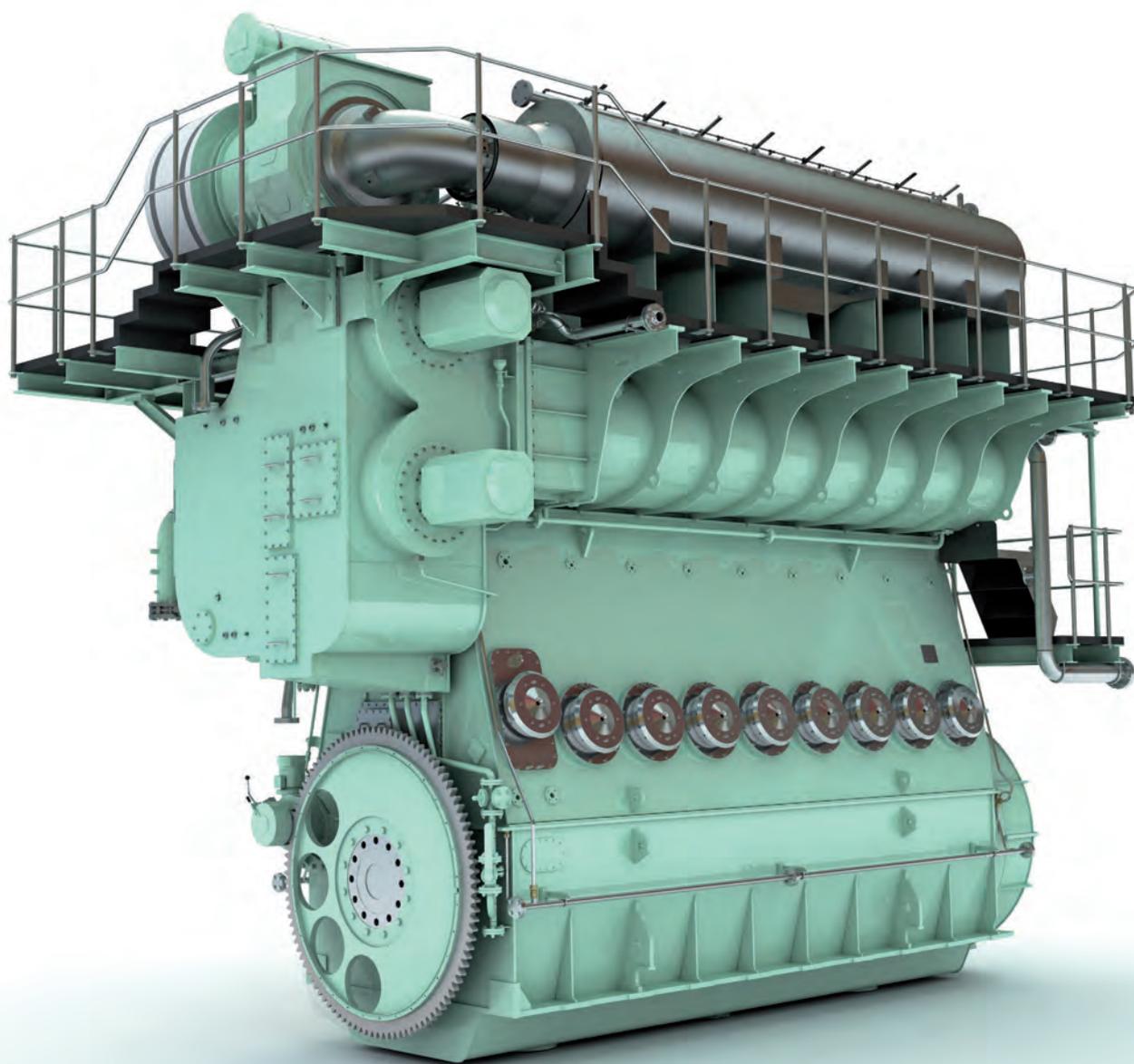
The CSR Software was officially released in April and the class societies are offering training sessions in key maritime regions.

CSR Software Managing Director Aidan O'Donnell, who has been with this project since its inception, is looking forward to the next stage, “Harmonised CSR presents an ideal opportunity to establish usage of common software in support of the new Rules. Establishing consistent application from the outset will be easier through our joint development.”

The common software can be downloaded at: www.CommonStructuralRulesSoftware.com Technical software support will be available all day every day.

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CAD/CAM

SKDY integrates with Intergraph

Japan-based Shin Kurushima Dockyard Company Limited (SKDY) has decided on Intergraph SmartMarine 3D as its 3D design and modelling solution of choice for its ship projects.

SKDY has implemented SmartMarine 3D to increase its leading productivity numbers, as well as to drive improved quality and performance. The company found SmartMarine 3D to meet the requirements it needed. SKDY has adopted SmartMarine 3D for its ship design department, using it as the shipyard's enterprise solution of choice for all of its projects.

SmartMarine 3D's unique architecture enables users to create their own custom rules that allow the automated creation of parametric structure detail, as well as manufacturing parts through either manual or automatic selection. SKDY has succeeded in changing part selection rules from manual to automatic through the integration of its unique shipbuilding know-how and expertise into SmartMarine 3D.

"We chose to standardise on SmartMarine 3D because of its proven efficiency and ability to include further design automation, leading to less labour costs without having to sacrifice quality," said Isshin Fuji, general manager, Ship Design Department of SKDY. "SmartMarine 3D's data-centric capabilities ensure that we always use high-quality manufacturing data with minimal design errors for enhanced safety, quality and productivity."

Gerhard Sallinger, Intergraph Process, Power & Marine president, said, "We are pleased that our solution has delivered continued productivity results for SKDY, one of the world's most productive shipyards, and it is an honor to have SKDY demonstrate the use of SmartMarine 3D at BARI-SHIP 2011. SKDY's choice validates Intergraph SmartMarine 3D as the premier ship design and engineering software in the industry."

Contact Intergraph Corporation, P.O. Box 240000, Huntsville, AL 35813, USA.

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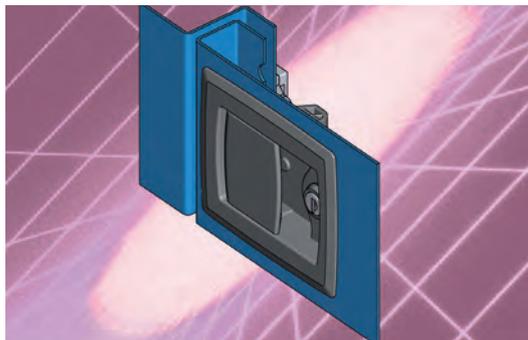
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Ancillary equipment

EMKA keeps it safe

EMKA has announced the launch of its latest product on the market, the 1130 concept flush slam lock. Particular attention has been paid to the simple fitting and operation the 1130, which includes easy to use paddle handle that is considered ideal for doors or covers on many types



EMKA launches its latest lock for cabinets and equipment housing.

of equipment housings, such as generator sets, HVAC cabinets or other free standing equipment where frequent access is required.

The 1130 features an injected foam gasket with 4 point fixing to achieve IP54 sealing compatible with these applications. It offers keylocking with all the standard EMKA key variants and unusually permits slam locking with the mechanism in the locked position as an operator friendly feature. Construction is in polyamide with a depth of 53mm to accommodate deep insulated doors.

Other compatible items from the EMKA programme include a full electronic locking system for remote installations as well as various stainless steel locks and hinges. Many extruded rubber door sealing profiles are also available in EPDM, neoprene and PVC so that specialist panel builders may match door sealing requirements.

Contact EMKA (UK) Limited, Patricia House, Bodmin Road, Coventry, West Midlands, CV2 5DG, UK.

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E-mail emka@emka.co.uk

www.emka.co.uk

Ancillary equipment

Carnival cruises supplied by Kone

Kone has signed a contract with the Italian shipbuilder Fincantieri for the delivery of elevators to two new cruise ships. The ships will be built at Fincantieri's shipyard in Monfalcone, Italy. At 141,000gt the two new vessels, which have a maximum passenger capacity of 3600, will be the largest cruise ships ever built by Fincantieri for the US-based Carnival Corporation.

For each ship, Kone will design, supply and install altogether 38 units tailored for passengers and service use, of which 28 will be custom-designed elevators, four platform lifts and six stair lifts for passengers with

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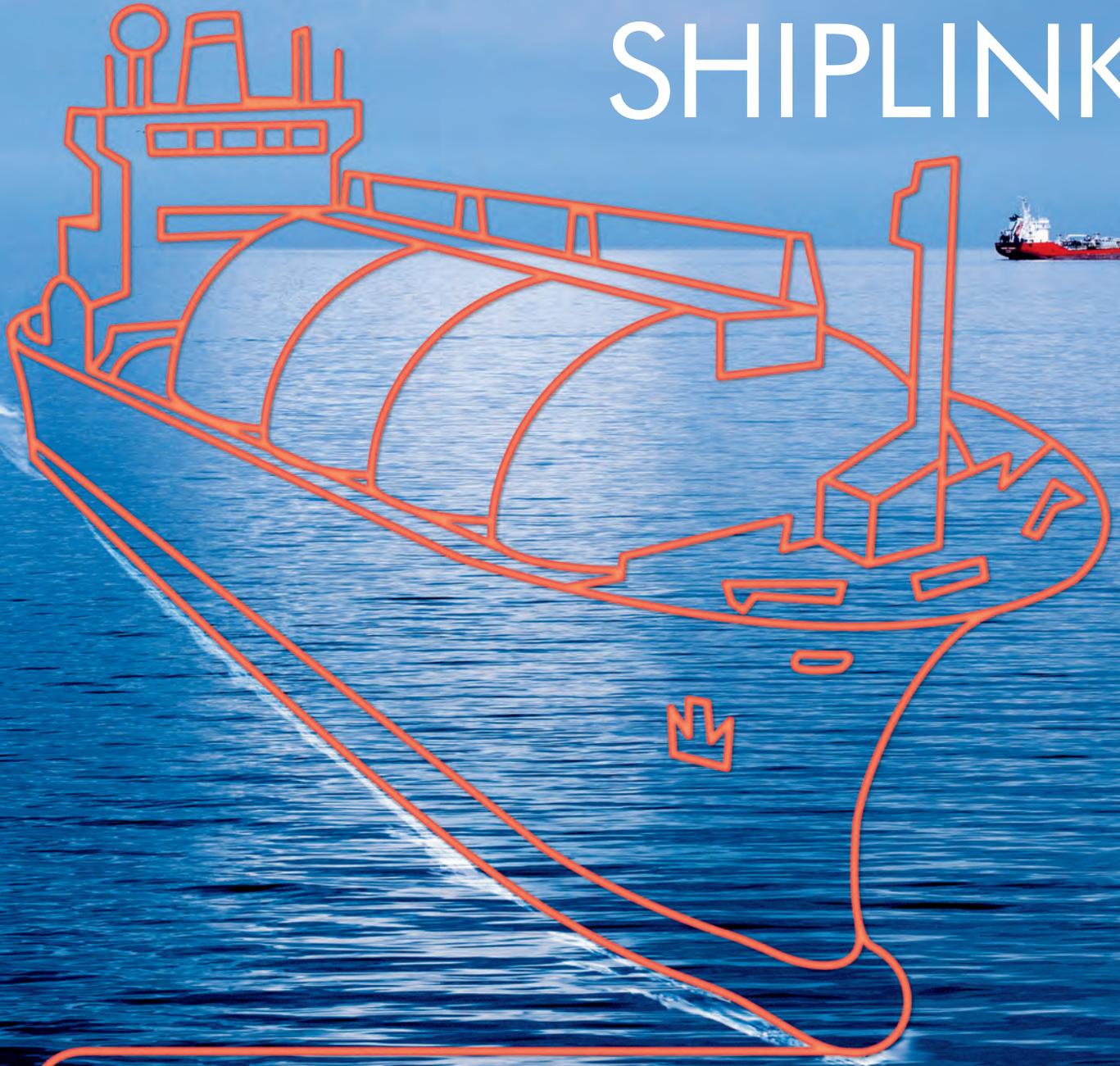


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Kone to install 38 units of service equipment onboard *Carnival Princess*.

impaired mobility.

Scheduled for delivery in 2013 and 2014, these two ships, as prototypes, are expected to become the most exclusive and innovative in the world, and they will be the flagships of Princess Cruises' fleet. Princess Cruises is the premium brand of the world's largest cruise ship company Carnival Corporation & plc. The first ship has been named *Royal Princess*.

"We are very pleased to work with Fincantieri again, and we are proud to have met the requirements of both Fincantieri and Carnival," says Heikki Leppänen, EVP, New Equipment, KONE. "With this collaboration, KONE continues its long-term commitment to the marine industry and strengthens its market leader position as the number one elevator and escalator solution provider for the cruise ship segment"

Contact Kone Oyj, Keilasatama 3, P.O. Box 7, Espoo, 02150, Finland.

Tel +358 204 75 1

Fax +358 204 75 4496

www.kone.com

Ancillary equipment

ESAB in control

ESAB has completed the purchase of the Master Process Controller (MPC) from Applied Thermal Sciences Inc (ATS) for use in its Hybrid Laser Arc Welding (HLAW) process. The MPC is a patented real-time control system for managing the laser, MIG/MAG welding equipment and the motion system that carries the laser and MIG/MAG welding heads. ESAB has been working with ATS for more than six years to develop this adaptive welding control system for hybrid laser arc welding.

Now that ESAB has acquired the MPC, its Hybrid hybrid laser arc welding equipment can be used on thicker materials, larger workpieces and joints with wider gaps. During the welding process, the MPC uses sensors to monitor the joint fit-up, weld geometry and welding conditions, making adjustments as necessary to ensure that the process achieves uniform fill, consistent penetration and excellent weld quality for the entire length of the weld.

With its improved tolerance of gap variations, the hybrid laser arc welding process enables customers to reduce the time and costs associated with joint preparation, post-weld operations and rework.

ESAB is committed to the HLAW process and has put in place an infrastructure so that it can manufacture, market, sell and support this process. In addition, the company will continue developing the process to create state-of-the-art hybrid laser arc welding systems that will help customers maximise productivity and maintain exceptional quality.

Contact ESAB, Hanover House, Queensgate, Britannia Road, Waltham Cross, Hertfordshire EN8 7TF, UK.

Tel +44 1992 768515

www.esab.co.uk

Navigation

Safebridge guides the way

Safebridge is set to introduce its online solution for type-specific Electronic Chart Display and Information System (ECDIS) training, developed in co-operation with leading marine equipment manufacturers.

Safebridge will be a training solution with complete independence from the training location – a detailed and type-specific online training that offers their students an intensive hands-on exercise of the navigation products installed on the ships they sail. The online training portal is available initially for various manufacturers' ECDIS, Radar and other maritime software will follow from 2012. Users can log on to the Safebridge server via the internet to access a range of e-learning modes, including a guided tutorial on the live system, self testing with feedback and free play of the live system. After passing an interactive test the successful completion of the course will be documented with a type-specific training certificate on behalf of the manufacturer.

Safebridge will launch their maritime online training portal in late summer 2011.

High-class co-operations with leading bridge equipment manufacturers such as Northrop Grumman Sperry Marine, Transas Marine and Imtech Marine Germany have already been agreed, with more to follow. Also, a close collaboration has been formed with MSG MarineServe. MSG is a well established maritime training company based in Hamburg, Germany.

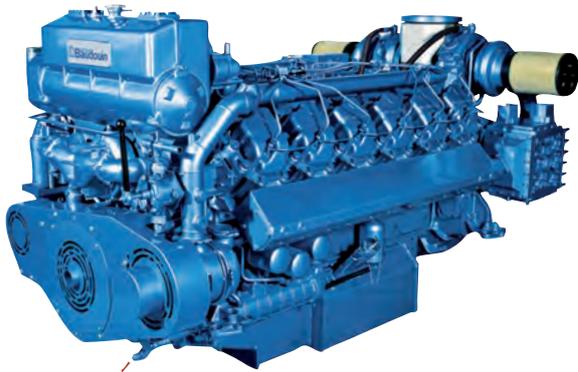
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Berlin hosts annual computer design debate

Berlin was the host city for the tenth annual COMPIT conference (International Conference on Computer Applications and Information Technology in the Maritime Industries). Over 50 papers were presented during the three-day conference covering a broad range of topics, writes Patrick Couser.

The broad scope of the conference included Milovan Peric (CD-adapco) and Volker Bertram (FutureShip) looked at the development of computational fluid dynamics (CFD) tools over the last 20 years. This paper emphasised that commercial CFD tools have become much more user-friendly and accessible over this period, but it should never be forgotten that, as with any tools, the results produced are only as good as the craftsman using them.

It was noted that CFD is still best used as a ranking tool to predict the relative differences in performance rather than to calculate absolute performance. Despite the exponential growth of computational power, the amount of time spent on CFD projects has generally increased, though more sophisticated analyses covering broader design-spaces are now being undertaken.

CFD is now used earlier in projects;

for example, during the tender and concept exploration phases of design. The experiences and feasibility of using

“A common theme of several papers showed a move away from the traditional design spiral methodology towards an “all-at-once” approach”

open-source CFD software in a small ship design office were revealed by Colin Barth (Conoship International).

A common theme of several papers showed a move away from the traditional design spiral methodology towards an “all-at-once” approach. This trend is now realisable due to the availability of a broad range of accurate numerical simulation tools and extremely powerful (yet affordable computers); several papers covered the subject of design-space exploration at the earliest stages of design.

The process of sketching as a means of capturing ideas and comparing design alternatives was discussed by Richard Pawling (UCL). Sketching software must not only provide natural drawing tools but also emphasise and promote the thought process embodied by sketching. Such tools must be quick and inexpensive to use and capable of efficiently capturing the design ideas at an appropriate level of detail. The different types of sketches and their application as different types of communication tools were discussed; some differences in the types of sketches typically made by engineers and architects were also compared.

The effects of uncertainty were discussed as well as methods to address evolving shipping markets by formal methods rather than “gut feelings” and “hunches”, this would aid ship owners in attempting to maximise the return on their investment over the complete life-cycle of a vessel.

The importance of feedback during the ship life-cycle was highlighted as a method of reducing uncertainty for future projects. Collaboration is often seen as a



Advanced PDM systems are the backbone of all IT applications for life-cycle management of ships (ShipConstructor Software).

one-way, down-stream flow of knowledge (through tender, design, production and operation) but the need for information feedback from operators to designers was emphasised. This would help to refine the cost and performance estimate models used. A similar feedback loop between software provider and software user was also discussed; software developers need to develop tools which promote the “natural” design methods of the user.

The novel idea of the application of social computing to facilitate informal communication “chats around the espresso machine” was put forward by David Thomson (Aveva Solutions). These informal communications channels are becoming increasingly important as the ship design and shipbuilding industries become more globally distributed. Social networking tools can make it easier to collate and organise discussion and data relevant to particular objects (or people) rather than manually sorting through vast numbers of emails.

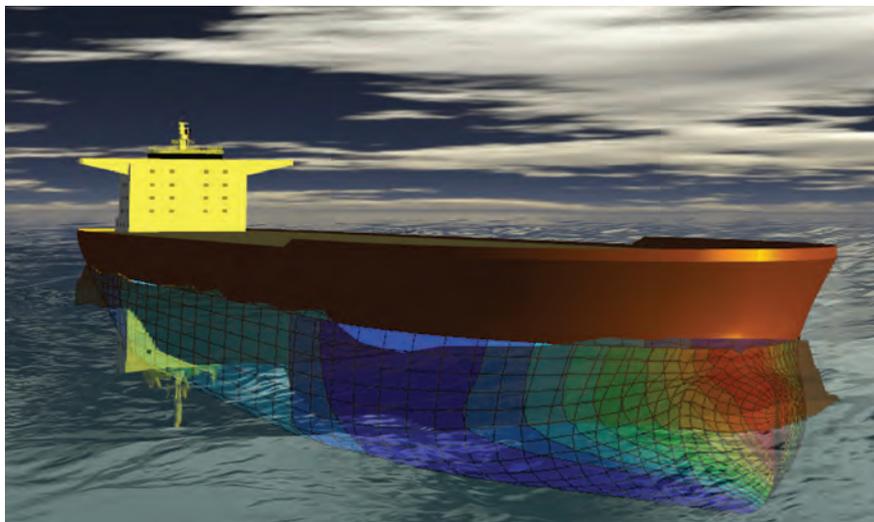
In the final session Denis Morais (ShipConstructor Software) explored some of the possible reasons for the perceived slow adoption of some technologies by the ship design and shipbuilding industries. The paper (for which Denis received the GL COMPIT Award) included comparisons with best practices in the automation, aviation and plant industries.

A lively discussion ensued which included which industries shipbuilding could be compared with best (possibly civil engineering is a closer discipline); the design of cars and aircraft being very different from the design of ships in several key ways, not least being the time available for design due to the high volume of identical units produced in the aforementioned industries.

A high volume of identical units requires a longer design process since any fault in the design will have extremely costly implications once production has commenced and the higher design cost is amortised over larger number of units. In contrast, the bespoke nature of ship design allows for only a much shorter design process and in many cases production often starts before the design is completed. In practice, the use of 3D product models is not as widely embraced in shipbuilding as in the aerospace, automotive and plant industries; for example, 2D drawings are often required for class approval and must be physically signed off and stamped.

The conference concluded at Gassthaus Krombach where the traditional Berlin cooking and beer were well appreciated. The conference continues its tour of some of Europe’s most interesting cities with the 2012 conference in Liege, Belgium, 16-18 April – see you there! Full details of the COMPIT conferences, including freely-downloadable proceedings and details of COMPIT’12 can be found at www.compit.info. **NA**

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DTU offers solution to the EEDI ro-ro conundrum

The International Maritime Organization's (IMO) Maritime Environment Protection Committee (MEPC) meets in London next month to discuss emissions evaluation for shipping, and in particular ro-ro ships, Hans Otto Holmegaard Kristensen of The Technical University of Denmark (DTU) looks at the industry's dilemma.

The environmental performance evaluation of ro-ro passenger ferry transportation can be compared to other modes of transportation using a formula. With more and more focus on the environmental performance of different transport modes (for example trucks, trains, ships and airplanes) it is of utmost importance that the different transport modes are compared on an equal basis, and that the environmental impact is defined as energy demand and/or emissions transport unit are related to the same unit for the different transport forms.

For ro-ro passenger ferries it can be difficult to find a suitable common transport unit, as they often transport a mix of cargo, such as passengers, passenger cars, trucks, lorries, buses and other rolling transport units. In this paper a method for determining a common transport unit for ro-ro passenger ships will be described.

A ro-ro passenger ship (often also called a ro-pax ferry or even just a ferry) is a passenger ship which can carry more than 12 passengers (a ship carrying less than 12 passengers is by definition a cargo ship) and which has one or more cargo decks for rolling cargo, such as cars, trucks, lorries etc. The size and capacity of ro-ro passenger ships varies considerably with a length ranging from 20m up to more than 200m (the largest ferry delivered in 2010 has a length of 240m 5500 lane metres cargo capacity).

EEDI (Energy Efficiency Design Index)

There has been a debate over the last two – three years at the IMO about the

Unit	General	Low comfort	High comfort
m ² /lane meter	4	-	-
m ³ /lane meter	24	-	-
m ² /car	15	-	-
m ³ /car	67.5	-	-
m ² /unberthed passenger	3.5	-	-
m ³ /unberthed passenger	10	7	13
m ² /berthed passenger	4.5	-	-
m ³ /berthed passenger	13	-	-

Table 1: Area and volume equivalents (ref figure 1-5).

EEDI expressing the CO₂ emissions/unit transport work. For most ships the unit for the EEDI will be gram CO₂/tonne deadweight/nautical mile. Originally this unit was also suggested for ro-ro passenger ships; however this led to a very large scatter in the EEDI statistical data, when calculating the EEDI for a large statistical sample of ro-ro passenger ships. One of the reasons for this scatter is the ship design diversity of these types of vessel. Some of the ships carry relatively few passengers and much cargo, resulting in a relatively high deadweight while other ro-ro passenger ferries concentrate on passengers and focus more on service and amusement for passengers.

These vessels typically have large passenger spaces (cafeterias, restaurants and cabins) resulting in large ships with a relatively low deadweight. In both cases a large amount of volume is needed which in general is proportional to the gross registered tonnage (GT) of the

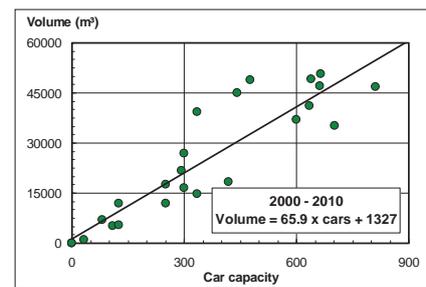


Figure 1. Volume of cars (Hagemeister).

ship. Therefore, IMO has suggested that in the EEDI calculation procedure for ro-ro passenger ships, deadweight has to be replaced by GT, such that the unit of EEDI for ro-ro passenger ships is grams CO₂/GT/nautical mile.

Energy Efficiency Operational Index (EEOI)

For existing ships it has been suggested by IMO to introduce an EEOI. The MEPC has agreed to circulate guidelines (MEPC.1 - Circ.684) for the voluntary use

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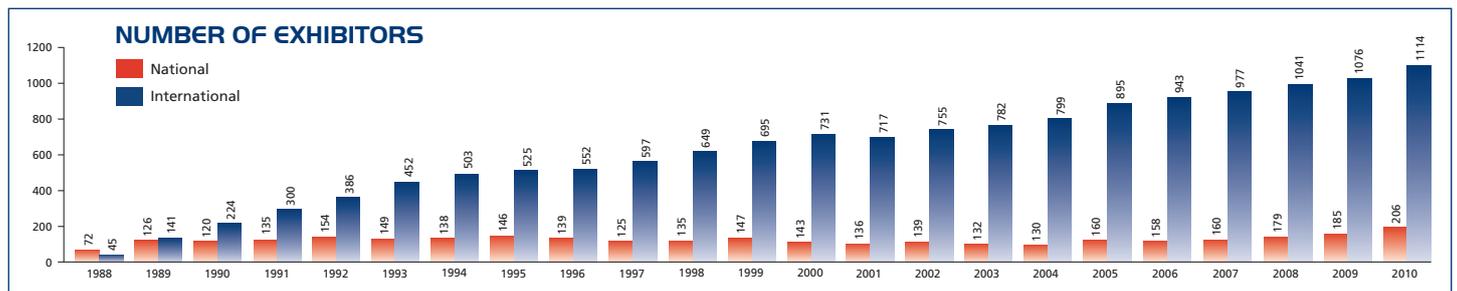
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of the EEOI. These guidelines can be used to establish a consistent approach to the use of the index which can be used in the evaluation of the ship performance with regard to CO₂ emissions. As the amount of CO₂ emitted from a ship is directly related to the consumption of bunker fuel oil, the EEOI can also provide useful information on a ship's performance with regard to fuel efficiency.

EEOI Guidelines present the concept of an indicator for the energy efficiency of a ship in operation, with efficiency expressed in the form of CO₂ emitted/unit of transport work. As the Guidelines are recommendations and present a possible use of an operational indicator ship operators are invited to implement either these Guidelines or an equivalent method in their environmental management systems and consider adoption of the principles when developing plans for performance monitoring.

In its most simple form the EEOI is defined as the ratio of mass of CO₂ emitted/unit of transport work: $EEOI = \text{Mass of CO}_2 / (\text{transport work})$.

Transport work and allocation principle

For ro-ro passenger ships, which carry a mixture of passengers (either travelling with their cars or as foot passengers) and freight, some operators may wish to consider a form of weighted average based on the relative distribution of passengers and freight or the use of other parameters or indicators as appropriate.

On a ro-ro passenger ship some of the internal volume is occupied for the carriage of rolling cargo including trucks/trailers and cars, while other volume is dedicated to passenger comfort, including restaurants, corridors, toilets, different types of service rooms, galleys and pantries. For day and night ferries cabins, including the associated corridors and store rooms for bed linen etc. is volume which is solely used for the passengers. The structural part and associated equipment of these volumes

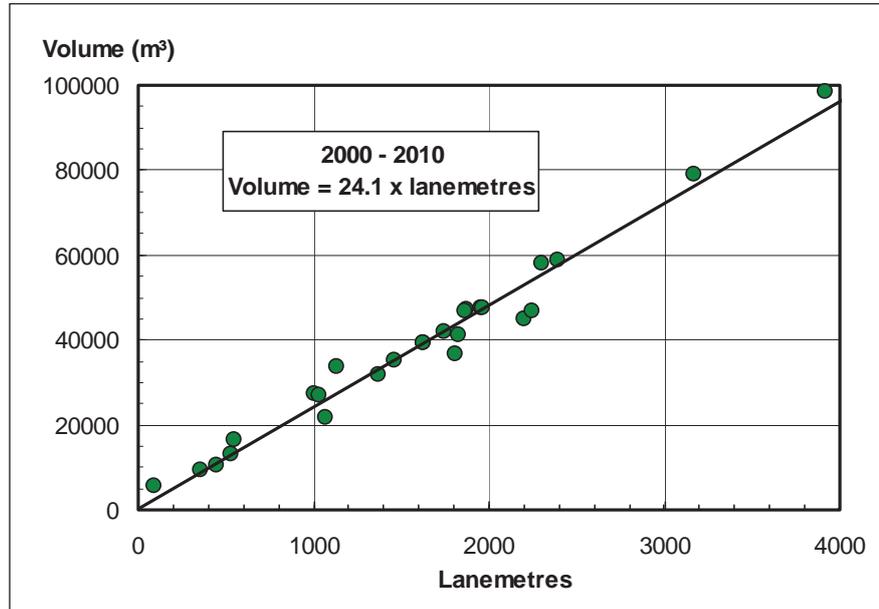


Figure 2. Volume for trucks and lorries (Hagemeister).

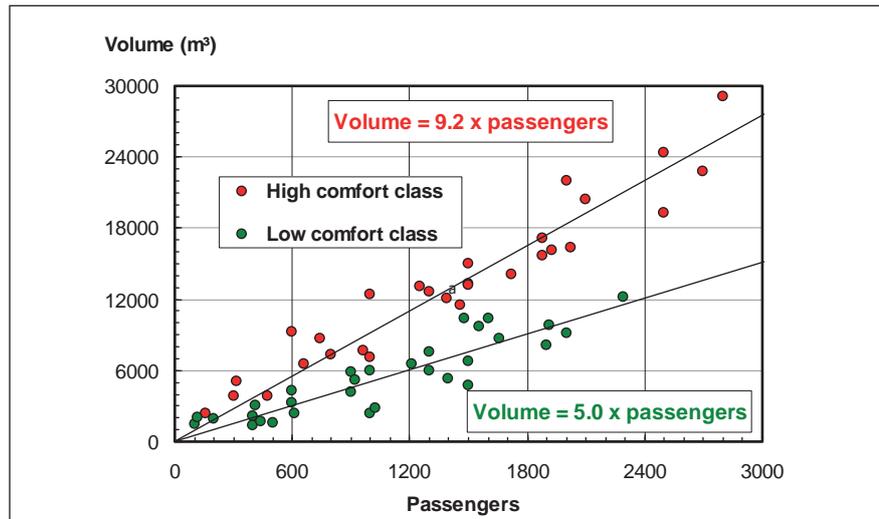


Figure 3. Volume of passenger related accommodation (restaurants, cafeterias, corridors, toilets etc.). (Hagemeister).

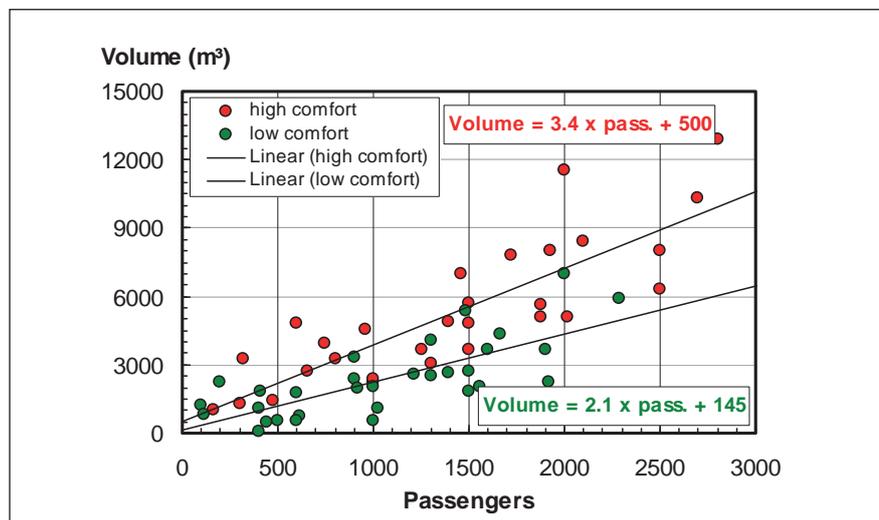
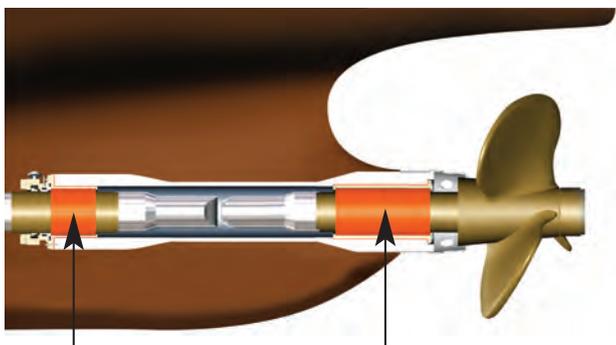


Figure 4. Volume of service accommodation for passengers (pantries, galleys, air condition rooms and store rooms).

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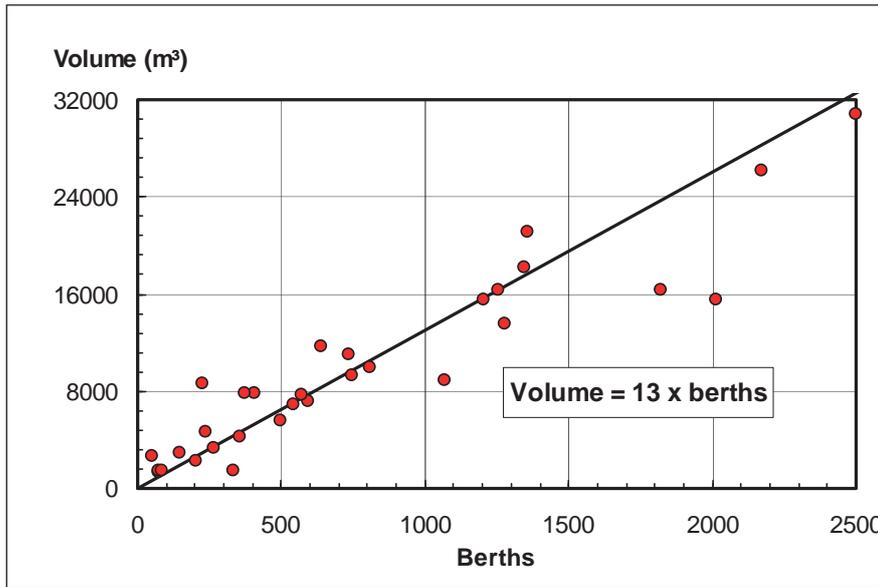


Figure 5. Volume of passenger cabins and associated corridors and store rooms (Hagemeister).

- Cargo space for rolling cargo
- Accommodation for restaurants, cafeterias, corridors, toilets etc
- Accommodation for pantries, galleys, air condition rooms and store rooms
- Accommodation for passenger cabins and associated corridors and store rooms.

The analysis was carried out as a bachelor thesis work (Hagemeister) at The Technical University of Denmark and Hochschule Bremen - Schiffbau und Meerestechnik.

The ferries are considered to be typical West European and Scandinavian ferries, built in the period from 1974 to 2009 with an average age of 16 years:

- 1974 - 1989: 17 ships
- 1990 - 1999: 17 ships
- 2000 - 2009: 26 ships

By using statistical data over 37 years it is also possible to see if there is a trend towards higher standards, that is larger volumes with the decreasing age of the ferries. The analysis show a slightly higher volume/lane meter and/car which is expected due to larger cars and higher standards with respect to free space on the car deck between the vehicles. As the volume is the product of area and height the area/cargo unit was also determined during the analysis.

The results of the area and volume analysis are summarised in table 1.

Allocation principles

Having established the volume for each separate cargo type it is now possible to establish the allocation principles.

For an actual sailing condition the occupied volume (V_{tot}) is calculated as follows referring to the number of utilised lane metres (lanes), number of cars (cars), passengers (pass) and the number of occupied berths (berths):

$$V_{tot} = 24 \times \text{lanes} + 67.5 \times \text{cars} + 10 \text{ (or 7 or 13 as appropriate)} \times \text{pass} + 13 \times \text{berths}.$$

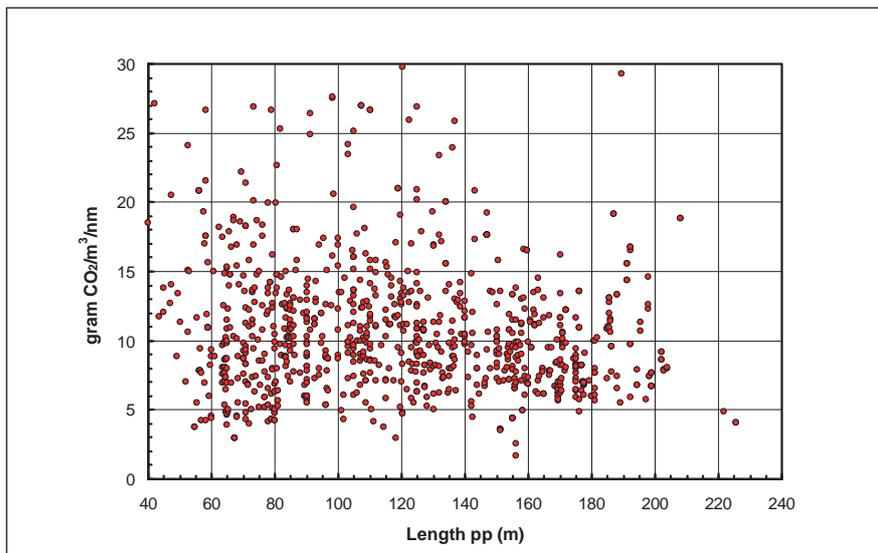


Figure 6. CO₂ emissions per m³ per nautical mile of ro-ro passenger ships (ShipPax 2011).

contribute to the lightweight of the ship which together with the deadweight has an influence on the propulsion power and consequently the exhaust gas emissions, including CO₂.

When the emissions are allocated to the different cargo types on a ferry it would be rational to allocate the emissions relative to the volume which each cargo type occupies. Calculating the average weight (ship structural weight + cargo) for the different volume types shows that the weight is roughly independent of the volume type which means that volumetric allocation principle can also be considered as a weight based allocation method. As the power demand is proportional with

the ships' total weight (displacement) the method is, therefore, rational seen from a ship design and hydrodynamic point of view.

The emissions or energy demand/transport unit for each type of cargo shall be related to the volume/ unit divided by the total occupied volume on the actual trip (see procedure later).

Determination of volumes

In order to determine the volumes for the different types of cargo carried on ferries, general arrangement plans for 60 ro-ro passenger ships have been analysed and the volumes for following spaces were determined:

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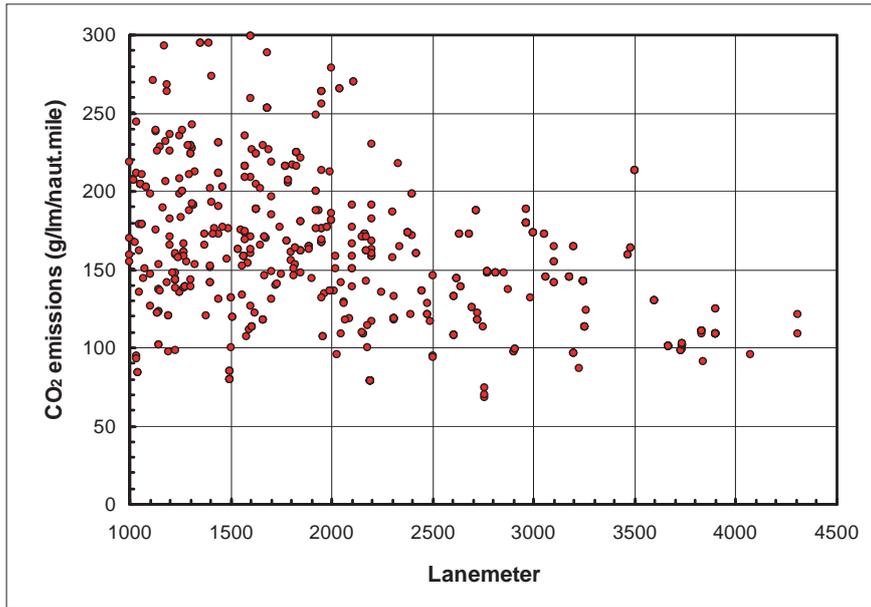


Figure 7. CO₂ emissions per lane meter per nautical mile of ro-ro cargo ships (ShipPax 2011).

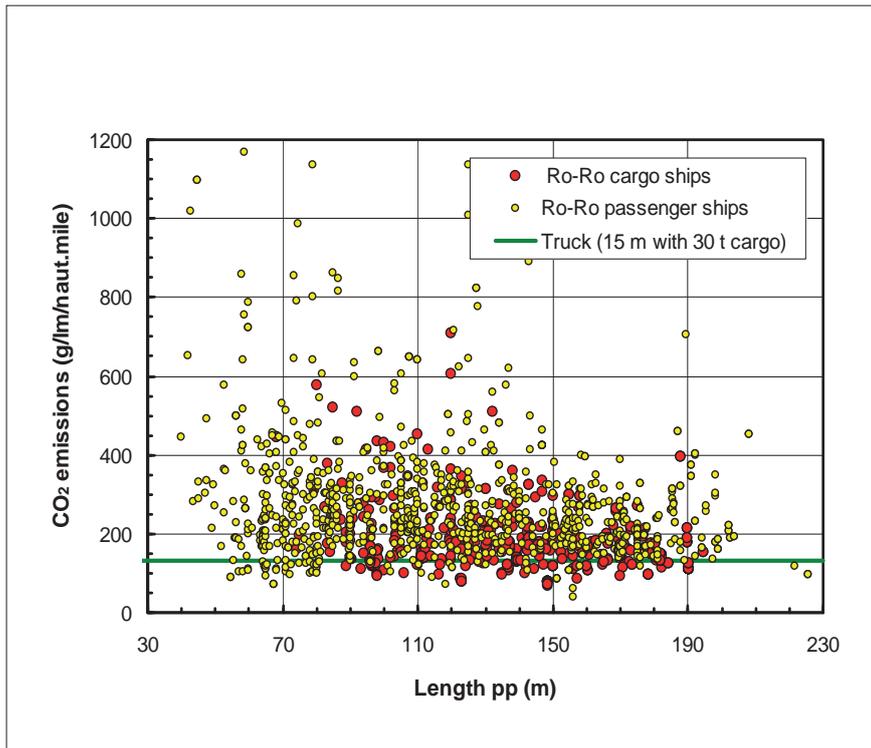


Figure 8. CO₂ emissions per lane meter per nautical mile of ro-ro ships versus trucks.

The comfort class of the actual ship must be judged individually such that the volume per passenger can be evaluated correctly to be either 7, 10 or 13m³ per passenger.

If the actual emissions or energy demand per hour is Q and the speed in knots is V, the emissions or energy demand per cargo unit per nautical mile for the actual trip are as follows:

- Lane metres: $24 \times Q/V_{tot}/V$
- Cars: $67.5 \times Q/V_{tot}/V$
- Passengers without berths: 10 (or 7 or 13 as appropriate) $\times Q/V_{tot}/V$
- Berthed passengers: $[10 \text{ (or 7 or 13 as appropriate)} + 13 \times Q]/V_{tot}/V$

The actual occupied volume is used instead of the maximum volume with

100 % utilisation. If the maximum volume is used not all the emissions or energy demand will be allocated for the actual trip which is incorrect as all emissions have to be distributed on the actual cargo including passengers.

Using the data in the Swedish ShipPax database it has been possible to calculate the CO₂ emissions per m³ per nautical mile. The results of these calculations are shown in Figure 6.

On basis of Figure 6 it is seen that the average CO₂ emissions are roughly 10 g/m³/nautical mile with 100 % utilisation of the ship. The average CO₂ emission per lane meter is therefore: $24 \times 10 = 240\text{g/lm/nautical mile} = 240/1.852 = 130\text{g/lm/km}$. For ro-ro cargo ships the corresponding figure is approximately 150g/lm/nautical mile = 80g/lm/km depending on the ship size according to Figure 7. For a 15m long truck carrying 30tonne cargo the average CO₂ emission is approximately 70g/lm/km.

Assuming the same truck transported (with a load of 30/15 = 2t/lane meter) on a ro-ro passenger ship and a ro-ro cargo ship following specific CO₂ emissions are obtained:

Ro-Ro passenger ship:
 $130/2 = 65 \text{ g/t/km}$

Ro-Ro cargo ship:
 $80/2 = 40 \text{ g/t/km}$

Truck:
 $70/2 = 35 \text{ g/t/km}$

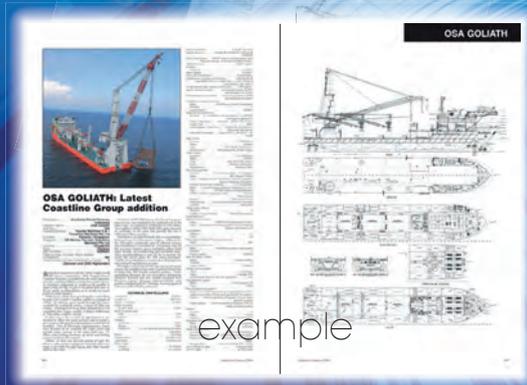
In Figure 8 is shown a comparison of CO₂ emissions per lane meter per nautical mile for Ro-Ro passenger and Ro-Ro cargo ships. **NA**

Reference list

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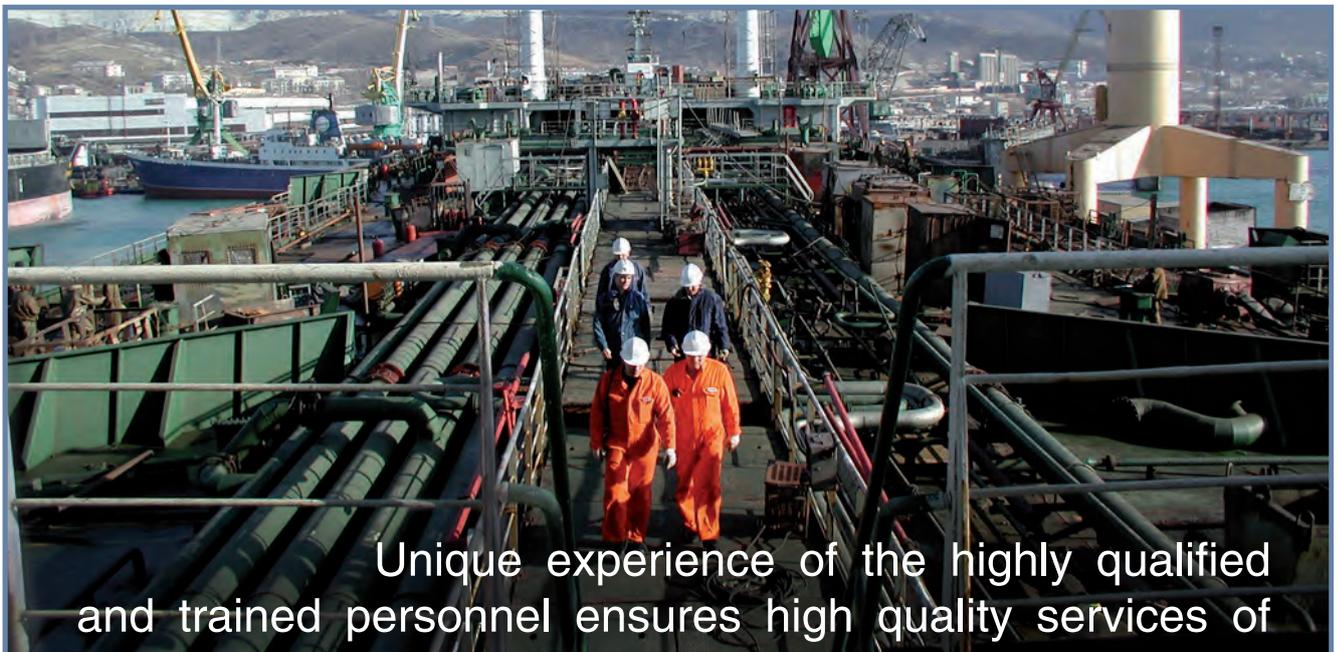
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Chemical ally

Just as International Paint (IP) launched its tank coating for chemical carriers, Interline 9001, reports of significant failures of another tank coating have blurred the market. Coatings manufacturers initially in competition may find themselves in an unlikely alliance in an effort to weather the gathering storm.

Charterers of chemical tankers, never the easiest people to please, are increasingly reluctant to use ships with hard coatings applied to their cargo tanks, according to some ship operators, brokers and surveyors.

Problems with hard coatings on relatively new ships, less than five years old, where the flexing of the vessel has caused the MarineLine coating, which dries hard like glass, to crack thereby compromising the efficacy of the coating, has led charterers to refuse vessels with MarineLine coated tanks, said a senior executive from a major chemical tanker broker.

MarineLine 784 is the most commonly found hard coating on chemical tankers and failures of this coating are causing owners, who are finding that their MarineLine coated ships are increasingly unwanted by their customers, to rethink their newbuilding strategy.

“In the last couple of years more and more charterers are removing MarineLine from their list of acceptable coatings following bad experiences with the coating,” said the broker.

One owner, who wished to remain anonymous told *The Naval Architect*: “the way things stand right now we will not be coating our ships with MarineLine”. He added, “Major charterers shy away from MarineLine coated ships, they do not look at the standard of the ship, a charterer just sees that he has had a problem with MarineLine coating and so he strikes it from his acceptable list”.

A spokesman for the MarineLine manufacturer, Advanced Polymer Coatings (APC) rejected the criticisms of MarineLine, he said that many rumours were being put out into the market by owners of stainless steel ships because the market has crashed and freight rates remain low with many ships competing to carry chemical cargoes.

“These stories are commercially driven,” he said, adding that “there is no problem with



A tank coating being applied to the cargo tanks of a new vessel.

MarineLine that was not there in 1999, but in 1999 there were few coated vessels in the market now they are more than 50% of the fleet”.

APC further pointed out that stainless steel ships also crack, “but you don’t see it... most of the time it’s not a problem”. APC believe that cracks in its MarineLine coating are easier to detect because the coating is a dark colour, whereas cracks in steel are not so readily visible.

According to APC mild steel vessels would not suffer from coming into contact with chemicals and many owners who claim they do not want to operate MarineLine coated ships have the more expensive stainless steel tonnage in their fleet and are desperate to find bookings for these ships.

Faced with the prospect of one owner saying it would not order more MarineLine coated vessels the APC spokesman commented: “I know a man down the road who says he will not buy a Mercedes, but I still think Mercedes are good cars.”

In fact at least one commentator, Dennis de Bruin, tanker office manager at BMT De Beer in The Netherlands, agrees with APC: “We are aware of the problems with MarineLine, but it is still a very good coating - better than stainless steel in some ways - but it is the application of it that is important.”

Mr de Bruin said that BMT De Beer had seen a number of cases, often through mechanical damage to the coating through the use of tools or machines in the tank that were deep “injuries” to the tank protection as well as cracking through the flexing of the vessel structure.

“These injuries must be remedied immediately otherwise the cargo will be in direct contact with the mild steel and this could cause the steel to corrode and deteriorate quite rapidly and this can occur over a wide area,” said Mr de Bruin.

However, Mr de Bruin believes that if the flexing of a vessel is causing the coating to crack then it is because the yard applying the coating has not used the correct protocol. “I

have seen the protocol for MarineLine and it mentions in it that the coating should flex to allow for this problem.”

Applying the coating in the correct way, using the correct humidity and heat processes for curing and cleaning the steel in preparation for the coating is critical and the process must be overseen by a coatings specialist, owners, however, will not know if there is a problem with the application until the coating cracks, conceded Mr de Bruin.

Competition in the chemical tanker market is already fierce as the boom shipbuilding years saw the chemical tanker builders flourish in Turkey, and Asia, principally China and South Korea. A stalling of the chemical market was preceded by heavy competition for cargoes, particularly in Europe, and the flood of new ships only saw the freight rates collapse further.

In the years leading up to the banking crisis the shipbuilding boom saw a flood of chemical tankers delivered many with MarineLine coatings which was considered a credible alternative to stainless steel (SS) tanks.

In March this year International Paint (IP) launched a new product, Interline 9001, and is hoping to secure orders for the new its new bimodal epoxy coating in what can only be described as one of the world's biggest bear markets. Turkish yards have all but stopped producing new tankers, many Chinese yards, particularly the smaller more transient ones, have closed and the South Koreans are looking for alternative markets.

Any fears over the use of hard coatings could see Interline 9001 still born. MarineLine has the advantage of having been installed and has been used widely for some years. A new product would need to show that it can compete before owners will order its use.

“Interline 9001 could well have the same problems, [as MarineLine, cracking through the ship movement] but it is an epoxy based coating and that could mean it has other problems with acid and alkaline cargoes, so I'm not convinced yet, it must prove its efficiency,” explained Mr de Bruin.

Epoxy coatings “swell” when they come into contact with cargoes such as methanol, styrene and acetone, said Mr de Bruin. “So I'm wondering what will happen with these cargoes, we will have to wait and see how it works in the field,” he added.

According to IP, “Interline 9001 is

a bimodal epoxy based on a carefully engineered blend of materials. Firstly, a special combination of low and high molecular weight materials creates a loosely bound, but highly cross-linked flexible network chain on ambient curing. The post cure process then locks these network chains firmly together to provide a highly chemical resistant paint film offering low absorption properties and easy cleaning”, said Jim Brown marketing development manager at IP.

Like MarineLine's manufacturer Advanced Polymer Coatings (APC) IP claims that its coating is capable of carrying many cargoes and its tight molecular structure prevent the coating from absorbing the cargo making it far easier to clean, reducing cleaning times and thereby allowing the owner to maximise the ship's earning ability.

According to APC, “MarineLine 784 is formulated with a polymer designed and engineered with 28 functional groups per molecule. When heat cured, MarineLine 784 coating forms three-dimensional, screen-like structures with up to 784 cross-links. This far surpasses phenolic epoxies that only deliver two functional groups with only four cross-links.”

This more dense molecular structure offers greater chemical and temperature resistance, higher reactivity at lower temperature, a greater resistance to absorption and is tougher and overall offers faster and more cost effective tank cleaning.

For its part IP said that while zinc silicate and epoxy phenolic coatings “provide excellent resistance to solvents and pure

chemicals” the company said these coatings “are limited in their use due to an inability to resist acids and alkalis”.

Cleaning costs of up to US\$100,000/ship clean can also add substantially to the overall cost of transporting certain cargoes, said IP.

“Interline 9001 is designed, therefore, to deliver greater efficiency and flexibility in the operation of chemical tankers, easily switching from one cargo to the next with minimal downtime. It can carry all of the cargoes standard epoxy phenolic technology can, plus a further 25% of the large volume cargoes that it cannot and has over 60% fewer cycling restrictions,” said an IP statement.

Crucially Mr Brown added that, “The skill of the formulating chemist is to protect the steel and the cargo, but that the product must have sufficient flexibility to flex with the ship”

Currently no ships using the Interline 9001 coating have been or are being built, but following the difficulties experienced by its established competitor IP may find that the marketing of another hard tank coating could prove very difficult.

Michael Adeltoft, the vice president of chartering for the Danish operator Nordic Tankers said: “We will always have a mixture of coated and stainless steel ships”, however, he said that the coating application is a crucial element to the coating maintaining its integrity over a sustained period.”

Nordic Tankers operates a fleet of 68 chemical tankers, 11 with the MarineLine coating and at least one more tanker is currently under construction. **NA**

Chemical tanker coatings can be brittle, though APC deny any cracking problems with the coating.



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Over the past few years oil prices have reached unprecedented levels: from a low of USD 110 per tonne in early 2002 to a high of USD 725 per tonne in mid 2008, and currently over USD 500 per tonne. With fuel as the key variable cost, the potential to help reduce this element is seen as a considerable advantage to vessel operators. PPG's SIGMAGLIDE system is proven to deliver cost reductions for new-build or dry docking and, with the launch of SIGMAGLIDE 990, offers guaranteed fuel savings of 5%¹.

How did the SIGMAGLIDE system achieve these savings and also improve performance?

Since the launch of the first generation SIGMAGLIDE in 1995, PPG has continued to develop the product range and sets the standard with its latest system – SIGMAGLIDE 990. This third-generation, pure silicone-based fouling release system offers major benefits to vessel owners with its unparalleled performance, enhanced slime release properties and the highest volume solids in the market.

As a coating systems supplier, the largest single factor PPG can influence in relation to fuel consumption is the frictional resistance of the underwater hull. It is estimated that frictional resistance can vary from 45% to 90% of the vessel's total resistance depending on vessel type and its operational characteristics. For lower speed vessels the frictional resistance is nearer to the upper limit of 90%. SIGMAGLIDE 990, the pure silicone topcoat, reduces frictional resistance to the point where significant fuel savings can be realized.

The system is based on two coats of epoxy: the first being the primer and the second



being an anti-abrasive coating; this is then followed by a tiecoat, SIGMAGLIDE 790, and then a topcoat of SIGMAGLIDE 990. A key advantage is that this two-component system, with the volume solids content of the tiecoat at 79% and the topcoat at 80%, considerably reduces packaging waste costs and reduced solvent emission at application.

The performance of this coating system is a function of the water-repellent or hydrophobic nature of the topcoat. In addition, the ultra-smooth finish that can be attained by standard airless spray equipment means the average hull roughness figures are also significantly lower to those achievable with a biocide-based coating – typically 50 to 70µm for the SIGMAGLIDE system. For comparison with conventional antifouling coatings an average hull roughness at application of 125µm is achieved. PPG's reputation has been gained by continuously developing coating systems that answer the challenges companies in the marine industry are facing throughout the world. A recent inspection of the m/v *Pacific Dream* (cruise liner) delivered the following outstanding results:

1. Excellent fouling release performance of the SIGMAGLIDE system on a cruise vessel that prior to the dry docking had been idle for two months in Genoa, Italy during the summer period.
2. Successful repair procedure at previous dry docking showing good system integrity and adhesion of SIGMAGLIDE finish refresher coat (redbrown) on the previous SIGMAGLIDE finish (black).
3. Based on the above SIGMAGLIDE performance, the vessel could sail from the present dry docking without any painting required.

4. Reply from the fleet manager of Pullmantur: 'The silicone paint fuel consumption saving has an average impact of 3-4% in our fleet sailing at average speeds of 15 knots and spending 30% time in port in West Mediterranean and Brazil waters. With a consumption of approximately 13,000 tons/year of IFO 380, the saving is around USD 200,000 a year per ship.'

Whether it is a new-build or dry docking, a key advantage of the SIGMAGLIDE system is that it offers the shortest minimum over-coating and re-floating times in the market. Additionally, the system allows an extended period for over-coating, ensuring the largest application window is available to the customer and the shipyard. With more than 200 vessels coated with the SIGMAGLIDE system ranging from static vessels (FPSO), low activity vessels (shuttle tankers), to high activity vessels (high-speed ferries) PPG is confident in the performance of the system that it guarantees a fuel saving of 5%² an impressive cost reduction for its customers.

Notes

1. The final savings percentage achieved is subject to the average speed and operational activity of the vessel. For tailored cost saving specifications please contact your local SIGMA COATINGS sales representative.
2. The final savings percentage achieved is subject to the average speed and operational activity of the vessel.

About PPG

PPG Industries' vision is to continue to be the world's leading coatings and specialty products company. Founded in 1883, the company serves customers in industrial, transportation, consumer products, and construction markets and after markets. With headquarters in Pittsburgh, PPG operates in more than 60 countries around the globe. Sales in 2009 were \$12.2 billion. PPG shares are traded on the New York Stock Exchange. For more information, visit www.ppg.com.

Contact: Sijmen Visser, Global Segment Manager, Marine – Maintenance & Repair
Sijmen.visser@ppg.com

Class voices its modal shift concerns

The International Maritime Organization's (IMO) proposed Energy Efficiency Design Index (EEDI) is intended to benchmark ship designs with respect to their CO₂ emissions. It is a sensitive issue, writes Andrea Cogliolo head of machinery, electrical & risk assessment sector, for Italian class society, RINA.

A potential failure in the IMO approval process of a world-wide recognised method to evaluate the design of new ships in respect of their capability of reducing CO₂ emissions increases the risk, to the shipping industry, of having to deal with many similar but different national regulations on the matter in the very near future. Consequently, there is no doubt that a global approach is to be supported.

However, some issues remain that have not yet been fully addressed.

While the principle of EEDI is not questionable from an environmental point of view, how the actual formula is applied is still a matter for debate. The proposed formula cannot be applied to some types of ship and

Andrea Cogliolo says that a consequence of EEDI should not be to encourage passengers and freight back onto the roads.

may lead to unwanted consequences for other vessel types.

Ships which are not involved in transport work, such as research ships, tugs, and similar are excluded. There is a very high likelihood that they will remain excluded from the application of the EEDI requirements. That may prompt local requirements.

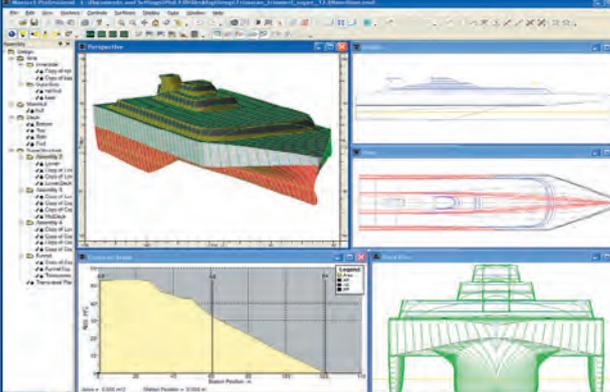
Unwanted consequences may occur for passenger vessels and ro-ro ships, so for them the application of the EEDI has been postponed.





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Considering the formula as it is now, a ship with lower engine power capable of a reduced speed of the transport of goods is the easiest way to improve a vessel's EEDI profile.

As an example, the same quantity of goods can be transported in a defined window of time by one ship sailing at a certain speed or by two ships sailing at 50% of the previously mentioned speed. Not considering the CO₂ emissions necessary to support the construction, the operation and the

logistics necessary for two ships instead of one, the single ship emits more CO₂ than the two ships operating at 50% of the speed, and the EEDI formula reflects this conclusion very well.

But, is this true for a ro-ro and ferry? Even if more ferries at low speed, in a defined window of time, will be able to transport the same number of passengers and lorries or trucks, if the cruise time is increased, will passengers still chose this transport means or will we give impetus to a modal shift to other means of transport (e.g. aeroplanes) with a very big increase in overall CO₂ emissions?

And with double time for the sea leg, will it be still convenient for lorries and trucks to use the "motorways of the sea" instead of using land motorways?

The consequence of the adoption of EEDI should not be a modal shift towards transport means less environmentally friendly than ships and or which cause congestion on land, and to avoid this danger we are confident that IMO regulators will adapt the current formula so that it can work correctly for this particular type of ships. **NA**



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Structural safety assessment of very large ore carriers

Demand for iron ore in China is driving orders for Very Large Ore Carriers (VLOCs). It is important, therefore, to verify their structural integrity considering the geometric configuration of the vessels. Chang-wook Kim general manager, hull dept. and Kuk-Yeol Ma senior surveyor at KRS report.

The Korean Register (KR) and STX Offshore & Shipbuilding have carried out an extensive direct structure analysis in addition to scantling analysis (based on the rule formula for 400,000dwt VLOCs) to access their structural adequacy at the initial design stage.

As with other ship types, the longitudinal strength of the hull girder is one of the most important factors for the vessel design, during the design stage it was confirmed

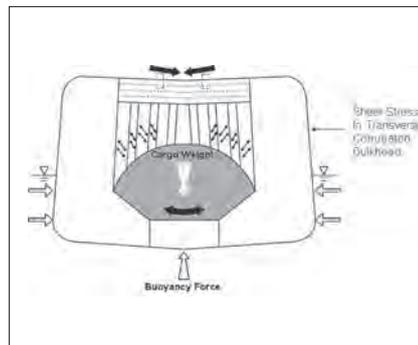


Figure 1. Load for VLOC.

that the longitudinal strength satisfies the class rule requirement.

VLOCs have a relatively small hold capacity compared to large bulk carriers or Very Large Crude Carriers (VLCCs), which means that loading is extremely concentrated at the center part of the ship. Therefore, transverse strength is an important element. Formula based calculation and direct hold analysis have been carried out to check the resultant stress, within the allowable stress limits, to ensure structural adequacy of the parallel body of the ship.



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VLOCs generally have long ore holds and large hatch openings in the middle of the ship and sandwiched between the ballast tanks and void tank. To allow more efficient ore handling, transverse bulkheads are not fitted in cargo holds even though the transverse bulkhead is important to maintain the transverse strength of the ship. Considering the high density cargo on the inner bottom, an intermediate floor is fitted in the double bottom. The height of the lower stool and double bottom is higher than a bulk carrier because of the small volume of the cargo hold.

The wave as an external load and the high/low density cargo as an internal load were specially considered for the web frame, double bottom and cross deck affected by transverse strength and compressive buckling strength.

Simplified calculation

As described above, longitudinal strength

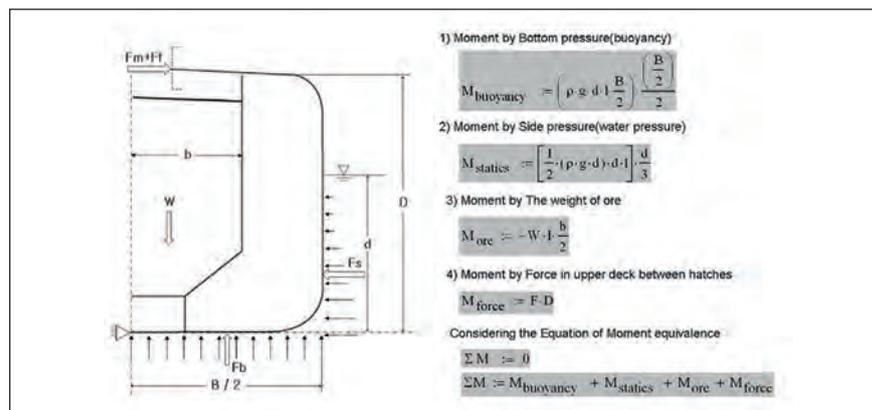


Figure 2. Compressive stress of cross deck.

has been confirmed to satisfy the Rule requirement. However, the transverse strength of a VLOC is also an important element. At the initial design stage, it is not easy to assume the size of deck plating affected by transverse forces without the Direct Analysis.

Compressive stress and relative strain on the wing tanks are used to determine the scantling of the primary members of the upper deck at the initial design stage.

In an ore carrier, a transverse force is generated in the deck between the hatches. Compressive stress is generated in the upper



deck outside the hatch and the cross deck. In order to analyse this stress, a model as shown in Figure 2 can be used.

Compressive stress acting on the cross deck is derived from the moment equilibrium considering the external and internal force as follows:

- Bottom pressure by buoyancy
- Side pressure by still water
- Cargo weight of iron ore.

Because the double bottom is more rigid than the upper deck between the hatches, a fixed boundary between the bottom and centre girder was assumed. To simplify this calculation, the model was idealised as a cantilever beam.

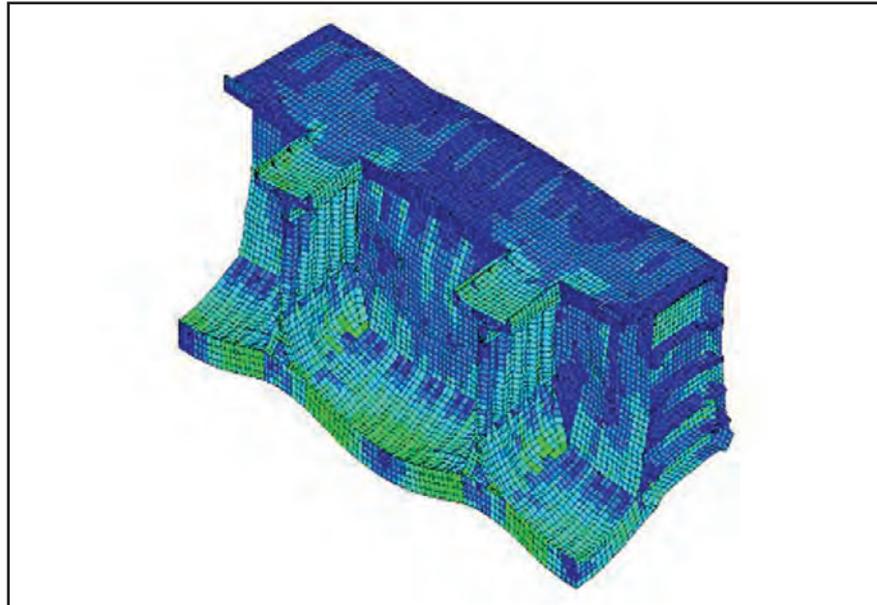


Figure 3. 3D Analysis Model.

Direct analysis

SeaTrust-Holdan (ver.4.53, pre/post processor) developed by KR and MSC/ NASTRAN (ver.2007r1, solver) were used for the structural strength analysis and evaluation, while the procedure used was based on the Rule Part 3 & 7 of the Korean Register.

The global X-axis is in the ship's longitudinal direction, the global Y-axis is in the horizontal direction to port and the global Z-axis, is in the ship's vertical direction from the baseline.

Longitudinal and transverse plating such as deck, bottom, transverse bulkhead, web frame including face plate etc. were represented by the shell elements. The longitudinal was represented by the bar element with bending stiffness. The plate thickness of the finite element model was applied with gross thickness.

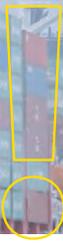
In order to confirm the proper modelling of the hull structure, the model was verified by the hull girder bending stress on the finite element. The hull girder bending stresses resulting from the finite element analysis was in good agreement with those calculated according to the beam theory by the section modulus of the mid-ship drawing.

The x-symmetric boundary condition was taken at the end plane of the finite element (FE) model. The y-symmetric boundary condition was taken at the centre line elevation due to the half model. The global z-boundary condition

No	Description	Draft	Load Pattern	Wave	Remark
1	Full Loaded (In case the density of ore is heavy)	T		Included	High Density=3.0
2	Full Loaded (In case the density of ore is light)	T		Included	Low Density=1.59
3	Ballasted(Light)	11.5		Included	
4	Ballasted(Heavy)	13		Included	
5	Tank Test (No.3)	T/3		Static	
6	Tank Test (No.2)	T/3		Static	
7	Harbour (In case the density of ore is heavy)	13.0		Static (No wave)	BLU-2 Notation High Density=3.0

Figure 4. Loading Condition.

Alert!



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The International Maritime Human Element Bulletin

Throughout the three series of **Alert!** bulletins a lot has been written about health, safety and wellbeing, but not so much about environment and quality which, combined, make up the acronym of HSEQ. Yet, each of these can affect the safe operation of a ship and the safe and timely delivery of its cargo. Add to that the increasing problem of security, and we have the essentials of an Integrated Management System (IMS).

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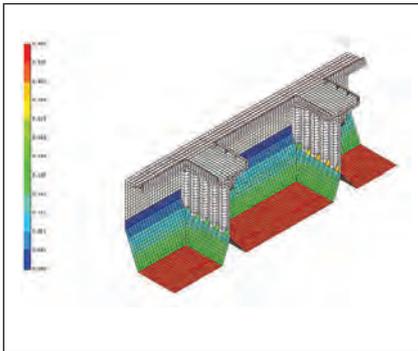


Fig 5. Applied Auto-load.

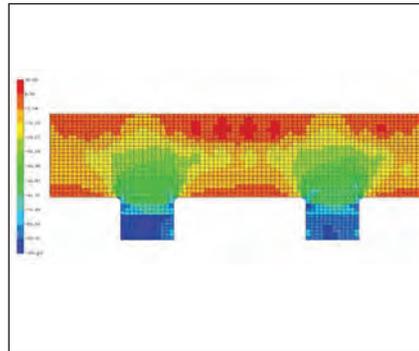


Figure 6. Compression Stress on Upper Deck.

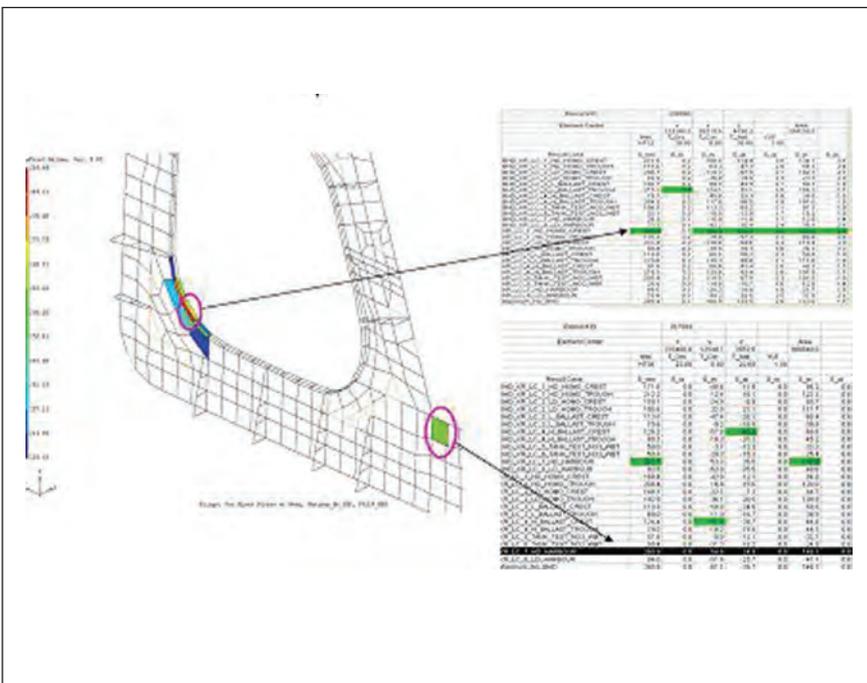


Figure 7. Max. Von-Mises Stress on Total L/C.

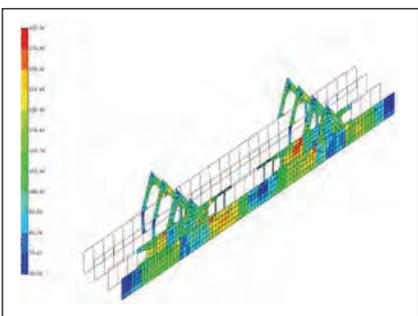


Figure 8. Von-Mises Stress on Bottom Girder.

was applied to the intersection point side shell and transverse bulkhead. To eliminate the reaction force at the z-boundary, vertical counter forces were distributed to the side shell at the transverse bulkhead.

The FE model was applied to cargo and ballast loads, with a combination of still water and wave induced load tests. Cargo loads were divided into high and low density ore.

The half model was used for the assessment considering the symmetry of the loading condition. Twelve loading conditions were considered, including the wave load as shown in the Figure 4.

These loading conditions were easily made by designating the compartment for loading and these loading conditions were inputted automatically by using VLOC Automatic Loading Method of SeaTrust-Holdan shown in Figure 5.

Evaluation of analysis result

From the result of the structural analysis, one can observe that the structural configuration of the VLOC and the characteristics of the cargo which caused the high stress to increase.

It can also be observed that the upper deck outside the hatch and cross deck suffer from buckling by the compression stress caused by the high density ore.

It was also observed that the transverse ring in the wing tank could suffer from compression when the vessel was fully loaded and tension when in the ballast loading condition.

At the connection of the double bottom to the hopper tank and bottom girder in way of the bulkhead, the yielding was caused by the large shear stress which results from the difference of counter pressure between the high density ore and the wave induced pressure (trough).

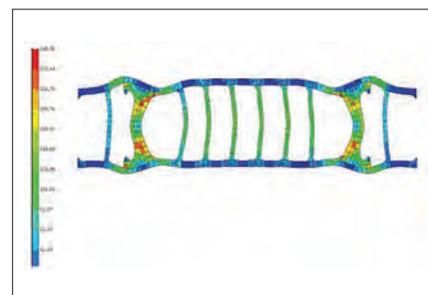
The high stress level at the end of the stringer in the wing ballast tank was also observed as shown in Figure 9. The high stress derived from the large shear and the bending stress by the internal pressure in the dedicated tank hydro test condition.

For transverse strength, the critical point can be observed. The result of the structural safety assessment of VLOCs shows that adequate structural modifications need to be made to ensure sufficient structural strength is achieved. **NA**

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Figure 9. Von-Mises Stress on Stringer.



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Russians gear up for offshore oil revolution

Results from studies on floating offshore oil and gas production units and subsea production systems by the Russian Register of Shipping (RS) have enabled the class society to expand its range of services in the offshore oil and gas industry.

According to oil and gas industry experts the main centres for oil and gas production in Russia will move to offshore areas during the coming decades. In the next few years, large-scale geological studies of the seabed, the development of hydrocarbon production facilities and oil and gas transportation systems will be organised on the Arctic and Far East sea shelf.

Development of the offshore energy industry and achievements in naval architecture not only make possible the creation of Arctic liquefied natural gas (LNG) carriers, but also require it. Such need has emerged from the industry's efforts to lower the costs of gas transportation, as well as plans to develop prospective gas fields in the Russian Arctic.

The key elements of an LNG carrier safety include hull ice strengthening, the interaction of the hull structure with the cargo containment system, minimum propulsion power requirements, and propeller strength. Therefore, another prerequisite to bring the Arctic LNG carriers concept to life is the development and construction of the Arctic double-acting shuttle tankers (e.g. Panamax series tankers, prototype ships – *Vasily Dinkov* and *Mikhail Ulyanov*). The development of



Academic Tryoshnikov operating in the field.



RS director-general Nikolay Reshetov.

is the basis for the continual improvement of existing rules and development of new ones. These tasks are implemented according to a unified plan. The research activity is under the co-ordination of the RS Scientific and Technical Council. A special feature of the last year is a full range of significant decisions on improvement and development of RS rules," said Nikolay Reshetov, RS director-general.

Currently, in the RS class there are the following types of offshore facilities: fixed offshore platforms (FOP), self-elevating mobile offshore drilling units (self-elevating MODU) and production platforms, submersible and semi-submersible mobile offshore drilling units (submersible and semi-submersible MODU), floating storage and offloading units (FSO), subsea pipelines all operated under the RS survey. In 2010, the RS classification documents were issued to offshore offloading complex *Yury Korchagin*.

ice strengthening and other standards for these ships has a potential application for future Arctic LNG carriers.

"The new ships and offshore facilities are constructed to the RS class and RS continues to contribute to the activity of international organisations as well as to improve the regulatory base with regard to new scientific developments and to implement new technologies. We are still paying a lot of attention to R&D [research and development] and innovation, which

TECHNICAL PARTICULARS	
<i>Academic Tryoshnikov</i>	
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Breadth:	23m
Depth:	13.5m
Draught:	8.3m
Diesel-electric power plant:	2x7.1MW
Gross tonnage:	12711
Design speed:	16
Crew:	59 people
Expedition staff:	80 people

Work on producing common guidelines for FPUs [floating production unit], meanwhile, will start in third-quarter 2011. In addition to the parameters used for the LNG guidelines, these will include feedback gained from the work undertaken in connection with a project on the Shtokman natural gas field in the Russian sector of the Barents Sea, one of the largest in the world.

RS has prepared the regulatory base for the use of gas fuel and is ready to introduce requirements for the ships, which will carry a new distinguishing mark in their class notation - GFS (gas fuelled ship). The RS requirements incorporate the regulations, established by the IGC Code (International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk) and International Maritime Organization (IMO) Interim Guidelines on Safety for Natural Gas-Fuelled Engine Installations in Ships (Resolution MSC.285(86)).

The adoption of gas as a shipping fuel emerged following the tightening of requirements for NOx and SOx emissions, both of which would be reduced considerably with wider gas usage. Arguments against the adoption of gas fuels on ships are connected with the danger of gas leakage and the possibility of explosions due to the dangerous concentration of gas in the engine room.

One major obstacle to using gas as an alternative fuel involves problems with infrastructure to supply ordinary transport ships with this fuel. The ships that might accept LNG as fuel are gas carriers or small ships operating on short runs. LNG fuel may also be used in ships supplying offshore facilities that have the capability of LNG bunkering.

Both Arctic and Antarctic regions are of special interest for researchers, but at the same time it is a hard experience for seafarers. Well prepared skilled crew and a reliable ship meeting all the requirements of severe climate are the keystone of success during ice navigation.

The state-of-the-art research ship *Academic Tryoshnikov* for the Russian Antarctic expedition has been under construction in St. Petersburg since 2009. It is designed taking into account the unrestricted area of navigation including independent navigation and drift in ice conditions of the Antarctic seas, navigation

in tropical seas. The high ice category Arc7 enables independent navigation in annual close floating first-year ice up to 1.7m.

The design of *Academic Tryoshnikov* developed by the Central Design Bureau Baltisudoproekt was reviewed and approved by RS. Based upon the review results the ship was assigned the RS class KM(*) Arc7 [2] AUT2 EPP Special purpose ship.

Academic Tryoshnikov has been designed to fulfil the following tasks:

- Antarctic station personnel replacement;
- cargo delivery for Antarctic stations, including food supplies, fuel, scientific equipment, means of transportation, aircraft, gas cylinders, spare parts, expendable supplies etc. as well as its offloading to the unequipped shore, ice barrier, shore ice belt;
- research activity in the ocean, as well as observation of natural phenomena;
- waste and garbage removal from the Antarctic. **NA**

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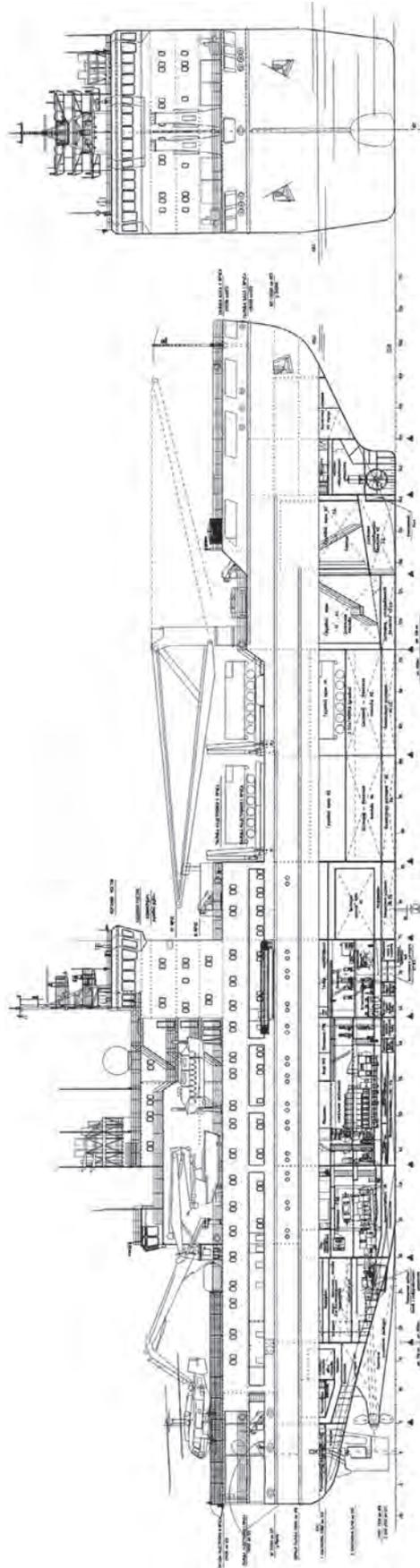
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BV focus on improving efficiency

Bulk carrier owners have had a volatile year with ship values and rates depressed, but as new designs have entered the market cash-rich owners have continued ordering thereby keeping the market moving.

Bureau Veritas (BV) has made it their main focus on solving problems for owners and yards and on improving the energy efficiency and operational efficiency of its bulk fleet with projects that look into the more efficient design of vessels. A new notation for single pass loading of ore carriers has been developed, alongside a technical service for ship owners to verify structural strength for loading aground under the NAABSA (Not Always Afloat But Safely Aground) clause in charters.

Working with HHI

A joint development project between BV and Korea's Hyundai Heavy Industry (HHI) was undertaken to investigate the hydrodynamic loading on an ore carrier due to whipping and springing. Along side this investigations into a container vessel of 18,000TEU were also carried out.

The investigation looked into the hydroelastic type of fatigue (Springing), which was investigated using Finite Element (FE) and 3D analysis. The studies showed that on larger vessels cracks would occur and from that further testing was then carried out.

The project was started just over a year ago, to date the testing for the bulk carrier has been completed, with further studies being carried out on the container vessel. Dr Sime Malenica, head of hydro-structure section, BV commented: "Studies for the container vessel are still being carried out, due to further information needed. HHI have used this procedure for their new designs of vessel. The project has allowed HHI to come here and use this tool and to gain experience using it."

Dr Malenica also highlighted that these types of tests are important for



Consortium group during KOM in Paris.

a ship's longevity, as the elastic test result of ship can reduce the static life of a vessel. With this study HHI was able to identify the critical areas of fatigue and will be able to add special reinforcement to that area.

Ulysses makes a start

A consortium of companies lead by BV has started on the European Union's (EU) project Ulysses. The theme of Ulysses is to improve the energy efficiency of commercial ship designs through a combination of ultra slow speed and complementary environmental technology. The aim of the project is to reduce bulk carrier Greenhouse Carbon (GHC) emissions by 30% by 2020 and 80% by 2050, as compared to 1990 levels.

The project was started in January this year and will have a duration of three years, with a budget of €3.6 million. In March the first stages of the project WP1 and WP2 were

started, Ulysses has been organised as a design activity. As such it is based on an augmented MIT design spiral (see Figure 1). WP1 'Requirements and Evaluation' defines the constraints the design team will be working to. In the MIT design spiral this is mentioned as an input "Requirements & Payload". The project has combined this with the 'cost' spoke, which is also covered by WP1. These inputs include market details, logistical requirements, safety aspects and environmental targets. WP2 'Technical Coordination, Design and Integration' defines a basic concept, target operational profile and completes one iteration of the design spiral in order to get the basic design underway. The third stage is that the requirements and basic design determined by WP2 will be passed on to each technical work package who will then investigate their area given the constraints placed upon them. This process is iterative, as described by



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RINA - Lloyd's Register Maritime Safety Award

The Institution believes that the safety of both the seafarer and the maritime environment begins with good design, followed by sound construction and efficient operation. Whilst naval architects and other engineers' involved in the design, construction and operation of maritime vessels and structures do not have a patent on such issues, nonetheless their work can make a significant contribution.

The Institution also believes that it has a role to play in recognising achievement of engineers' in improving safety at sea and the protection of the maritime environment. Such recognition serves to raise awareness and promote further improvements.

The Institution, in association with Lloyd's Register, is therefore introducing a new Maritime Safety Award to be presented to an individual, company or organisation which has made a significant technological contribution to improving maritime safety or the protection of the maritime environment. Such contribution can have been made either by a specific activity or over a period of time. Nominations may be made by any member of the global maritime community, and will be judged by a panel of members of the Institution and Lloyd's Register. The Award will be announced and presented at the Institution's Annual Dinner.

Nominations are now invited for the 2011 Maritime Safety Award. Individuals may not nominate themselves, although employees may nominate their company or organisation.



Nominations may be up to 750 words and should describe the technological contribution which the individual, company or organisation has made in the field of design, construction and operation of maritime vessels and structures.

Nominations may be forwarded online at www.rina.org.uk/MaritimeSafetyAward

or by email to MaritimeSafetyAward@rina.org.uk

Nominations should arrive at RINA Headquarters by 31 Dec 2011

Queries about the Award should be forwarded to the Chief Executive at hq@rina.org.uk

the spiral, and will require WP2 and the technical work packages to work closely together and constantly pass information back and forth.

Martial ClaudePierre, project manager, research department/SEE, said: "The project will look at the operation and design of the ship of the future. We are looking at drastically slowing down vessels by 2020 and even more by 2050, along side we will also be looking at be looking at available environmental technologies that will also further help reduce CO₂ emissions."

By 2050 the project is looking at reducing ships' speed to 7knots, which although is a drastic reduction in speed is achievable claims Mr ClaudePierre. However, "Travelling at such slow speeds will make ships venerable to piracy and more difficult to manoeuvre and increase fouling on the vessel", highlights Mr ClaudePierre.

The next meeting for the consortium will be held on 16 June, where the progress of the process and design package will be reviewed. The different sectors of the project will look at ship concept, hull geometry, resistance and propulsion, wind propulsion, arrangements, mass distribution and stability, structural design, machinery and equipment, sea keeping and manoeuvring, automation and manning, and costs.

Bulk market

At the end of 2010 BV classed a fleet of 784 bulk carriers totalling 50 million dwt, and had an order book of 440 bulkers totalling 27.7 million dwt. New orders during 2010 added 137 vessels and 10 million dwt to the order book. The bulk of the order book now consists of handysize and handymax vessels.

Interesting new orders during 2010 included three 206,000dwt capesizes for

Ocean Freighters to be built at Jiangnan Changxing, and two sister ships for Greece's Diana at the same yard. Cardiff Marine ordered two similar ships from SWS. In the next size down, around 180,000dwt, orders for bulkers to BV class were placed by Bocimar, Nisshin Shipping, Louis Dreyfus Armateurs, Oak Maritime and Wah Kwong. A major new order was for 14 ships of 63,500dwt each and five 58,000dwt bulkers for Setaf-Saget at Yangzhou Dayang. Western Bulk ordered six 37,000dwt handysizes at Hyundai Mipo. Kamsarmaxes have also been particularly popular, with eight new orders placed at Jiangsu Eastern, four at HHI and two at Daewoo Mangalia, all by top rated European and Asian owners.

During 2010 owners took delivery of 179 bulk carriers with BV class, totalling over 11 million dwt. There were 57 handysizes, 77 handymaxes, 10

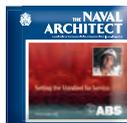
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In January every year since 1999, RINA has produced the following journals on CD ROM:

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The institution's journals are a source of valuable reference and provide a wealth of information. A title and key word search facility is available to help you find a specific article or issue.

The Naval Architect 2009 and Ship & Boat International 2009, on CD ROM price each: £40 (RINA Member £35 each).



Shiprepair & Conversion Technology 2009, Warship Technology 2009, and Offshore Marine Technology 2009 on CD ROM. Price each: £32 (RINA Member £27 each)

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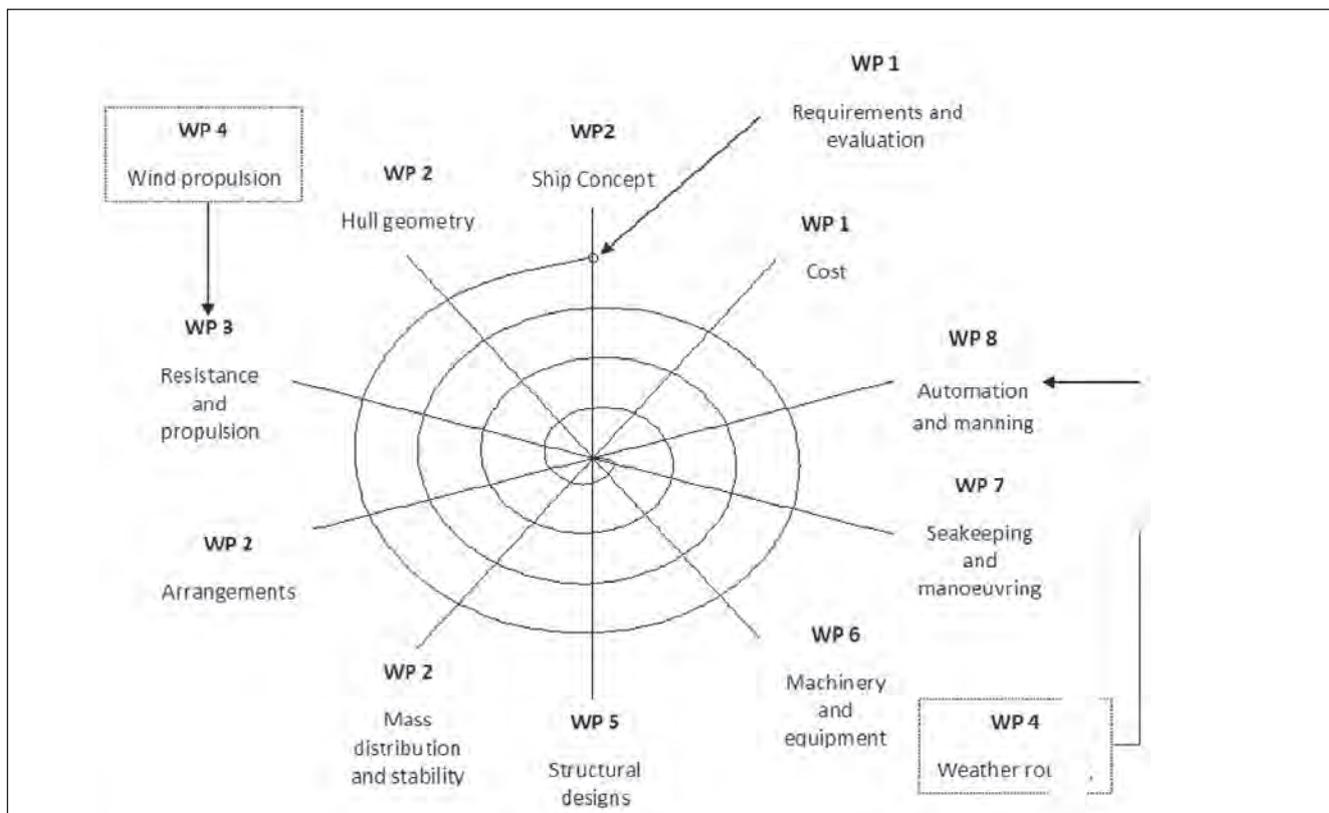


Figure 1: MIT design spiral of Ulysses project.

panamaxs and 31 capesizes. Examples include seven 170,000dwt capesizes for Enterprises built at Sundong, four 114,500dwt bulkers built for Norden at Shanghai Shipyard and two 75,200dwt vessels for Conti built by Penglai Zhongbai Jinglu. Groupe Bourbon subsidiary Setaf-Saget took 10 58,000dwt handymaxes built by Yangzhou Dayang and BV was chosen to class two 57,000dwt handymaxes for COSCO built at COSCO Dalian. In the handy segment Nordic Hamburg took delivery of three 35,000dwt vessels from Nantong Jinhua.

Apart from newbuildings, BV's classed fleet of bulkers grew as a wide range of owners transferred modern tonnage to BV class. Forty-eight ships totalling 2.7 million dwt came into BV class during 2010, including the 177,900dwt Iron Miner owned by Maryville and the 58,000dwt United Miravalles and United Milos owned by Uniteam Marine and built at Zhejiang in 2010. Oceana Shipping moved three 34,000dwt handysizes to BV, all built at Shinan in 2010. **NA**

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Order for Deltamarin's B Delta design

Finnish-based Deltamarin launched its B Delta bulk carrier design in 2008, the company has now announced that it has received an order for the design from Louis Dreyfus Armateurs SAS.

Deltamarin has signed an agreement with the Chinese Tianjin Xingang Shipbuilding Heavy Industry Co., Ltd for the design of four handymax bulk carriers to be built for the French Ship owner Louis Dreyfus Armateurs.

Deltamarin will oversee the basic and detail design of the vessel as well as the technical procurement handling and will also have a site team to take the design to production. The B Delta design that has been ordered is for the standard version of the design, with the only additional feature for log carrying capacity that has been added.

Markku Kanerva, director sales, Deltamarin said: "The owners have not currently decided on a ballast water treatment system for the vessel, which is still under review. The vessel will still have all the energy savings that have been included in the design."

The main feature of the design is the low fuel consumption that can be achieved by the vessel. Mr Kanerva commented on how this has been achieved: "The model testing was carried out at HSV, the bow of the vessel creates a good wave pattern. Also at the aft end of the vessel there is good wake pattern to the propeller giving better efficiency and because of this allowed the use of a larger propeller to be fitted. The average daily fuel consumption of this vessel is 18tonnes, whereas other vessels of this type would use in the region of 29tonnes per day."

The overall length of the vessel will be 180m and will have a beam of 30m. The service speed at draught design will be 14knots, and it will have a deadweight of 40,000dwt at scantling draught. The design will have five cargo holds and will be able to hold 50,000m³ of cargo. Deltamarin has focused on fuel efficiency, sustainability and safety during the concept development, while also focusing on cost efficiency of the concept. The model was tested for daily fuel oil consumption at design draft which will



Louis Dreyfus Armateurs SAS has ordered Deltamarin's green concept ships, the B Delta design.

be 18tonnes with a 15% seamargin and will have an annual output of CO₂ that has been estimated to be reduced by 5000tonnes compared to existing vessels of the same size range.

Deltamarin is pleased to have received this order, but does not believe that this is the start of an upturn for the bulk carrier market. Mr Kaverna commented: "Speaking to customers we hear that they are ordering for two years time and not for today. We cannot predict what will happen, but there is interest in the handysize market."

Derivative designs of the B Delta series (37 and 64) have also been ordered previously, and are currently under construction at Nantong Mingde Heavy Industry and Chengxi Shipyard. Some eight derivative type vessels have been ordered so far for the lake bulk carrying company Algoma-Upper Lakes and five self unloaders for the Canadian Steamship Lines and Klaveness. "The lakers [lake bulk carriers] are a very special type of vessel. The owner was previously working with another design team, but after seeing the fuel consumption savings of the B Delta design came to us, which gave us a challenge. With this type of vessel you are looking at a block coefficient of 0.9 which is very small. Also, more

displacement had to be added to the design and the owner requested a high beam, which eventually meant redesigning lots of parts to make it work," said Mr Kaverna.

Further to this Deltamarin has also signed an agreement with Nantong Mingde Heavy Industries for the construction of seven new Equinox class self unloading and gearless bulk carriers for Algoma Central Corporation and the Canadian Wheat Board. Deltamarin will provide the basic and detailed design of the vessel as well as procurement support.

The vessels are derivatives of the B Delta design and are designed to carry cargo on the Great Lakes and St Lawrence Seaways. The overall length will be 225.55m with a beam of 23.77m. The service speed at design draught will be 14.0knots. The deadweight is about 38,000dwt at scantling draught. The vessels will have five cargo holds and can take 39,000m³ of cargo.

Mr Kaverna also highlighted that these ships had undergone a redesign to meet the client's needs. Variations of the B Delta included the B Delta 37, 64 and also a 40,000tonne tanker. The B Delta concept offers enough flexibility to be applied to other vessel types including single screw type vessels. *NA*

The Royal Institution of Naval Architects

Marine Heavy Transport & Lift III

26-27 October 2011, RINA HQ, London

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Second Announcement



The marine heavy transport and lift sector has enjoyed a buoyant and growing market due to the boom in offshore oil & gas and large project cargo work. Current oil & gas prices have led to an increase in the number of offshore projects requiring transportation, installation or removal of a wide range of structures and modules. The project cargo transport market has been growing, particularly power generation and refineries work in US, South America, Africa, India, Pakistan and China.

As the structures and cargo become bigger and heavier and destinations seemingly more difficult to access the market is looking for more and better equipped vessels. There are also increasing safety and greater environmental concerns for all aspects of marine operations. The new generation of heavy lift vessels designs are responding to the demand for higher lifting capacity and larger outreach. There are also an increasing number of new designs concepts aimed at servicing this increasing demand in the marine heavy transport and lift industry.

This conference, the third in the series from RINA, aims to bring together naval architects, operators, project engineers, warranty surveyors and designers to examine the various design and operational issues associated with this industry. Papers are invited on all related topics including the following.



- Current design and operational experience
- Float over and float off; offshore discharge
- Station keeping
- Propulsion system redundant
- Ballast control, stability and stress monitoring
- Weather routing
- Design criteria for short trip scenarios
- Extreme cribbing loads
- Risk management

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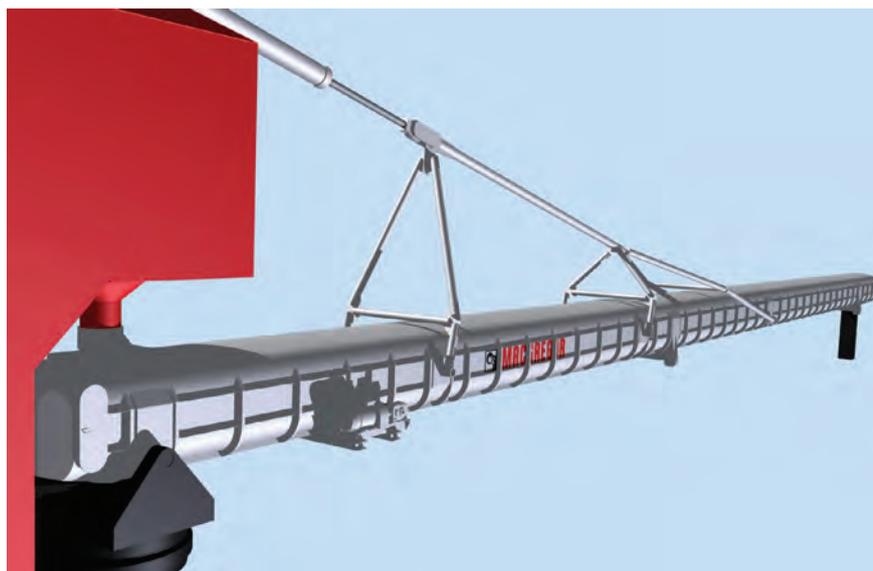
Cargotec Macgregor eases the flow

Finnish equipment solutions manufacturer Cargotec MacGregor has focused on providing greener solutions to the shipping industry with the development of its self-unloader systems.

Cargotec MacGregor has recently further developed its two gravity self-unloading systems the closed boom and full flow gate that will improve efficiency for the handling of cargo.

The MacGregor full flow gates are basket gates which give increased capacity and discharge rates. The cargo gates are the first stage in a vessel's gravity unloading system, which allows the cargo to fall on to the conveyor belt that runs below the cargo holds in a controlled manner.

As part of its further research and development Cargotec MacGregor has developed a full flow gate for the application of grabbing and lifting cargo onboard the vessel, which has been designed to handle different materials of varying size and density, such as coal, iron ore, gypsum rock and aggregates. The optimised design has



The MacGregor closed boom developed by Cargotec.

Cargotec secures deal with CNCo

Cargotec MacGregor has received €20 million (US\$28.42 million) of orders for its MacGregor cranes and hatch covers for a series of eight multipurpose 31,000dwt newbuildings for The China Navigation Company Pte Ltd (CNCo) being constructed at Zhejiang Ouhua Shipbuilding Co Ltd, China.

The vessels are scheduled for delivery between January and August 2013, with an option for a further eight vessels. Richard Kendall, managing director, CNCo said: "We have particularly focussed on designing a vessel that is capable of appropriate cargo handling and speed performance to operate successfully in a scheduled liner trade, while delivering ground breaking fuel efficiency at normal operating speeds."

The electrically driven cranes that will be installed onboard the vessels will use 30% less power than an electro-hydraulic versions. Martin Cresswell, CNCo director and general fleet manager, said: "When comparing the operation of the new electric cranes with its electro-hydraulic predecessors, we have learned that positioning any load, but particularly heavy cargo, is much more direct and more accurate as the crane responds to the driver's movement of the controls without the initial upward motion."

Each of the eight vessels will be equipped with four fully electrically driven cargo handling cranes with a SWL of 60tonnes for hook operation and a SWL of 37tonnes for grab operation. The hatch cover systems are based on special customer requirements and comprises of a combination of hatch covers maximising the ship's cargo space.



Cargotec MacGregor lands a €20 million deal for its cranes and hatch covers.

The Royal Institution of Naval Architects

International Conference on the Education and Professional Development of Engineers in the Maritime Industry

7-8 December 2011, Newcastle, UK

First Notice & Call for Papers

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As the global maritime industry emerges from its downturn in recent years, the key to its future success will be innovation in every aspect. And in an industry which is technologically led, such innovation will be provided by engineers who have the professional skills to meet its future demands. They will need to have achieved the knowledge and understanding which underpins those professional skills while at university, and to have developed them through training and experience after graduation. But what are those skills which the maritime industry of the future requires, how are universities and colleges to provide the graduates who are able to develop them, and what is the role of industry in enabling those skills to be developed?

The International Conference on the Education and Professional Development of Engineers in the Maritime Industry will bring together representatives of both industry and academia to present and discuss how those engineers who will be the key to the industry's future success will achieve the knowledge, understanding and professional skills which industry needs, both today and in the future. The conference will compare 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.

Papers are invited on the following topics:

- Industry's current and future requirements for professional skills
- Curriculum development - mechanisms for ensuring that education providers are responsive to industry requirements
- Collaborative provision, including experiences of educational and CPD programmes delivered by several institutions on more than one site.
- International developments, including: education's global market; the international student experience; programme delivery on a satellite campus
- E-delivery - successes and failures in delivering programmes remotely, including: web based material, video streaming, and live delivery via video link
- Visas and permits - the impact of governmental policies on the provision of educational programmes
- Accreditation - international recognition of nationally accredited programmes, and the future of accreditation

Contributions are also welcomed from graduates on their experience and views on how their education fitted them for their careers.

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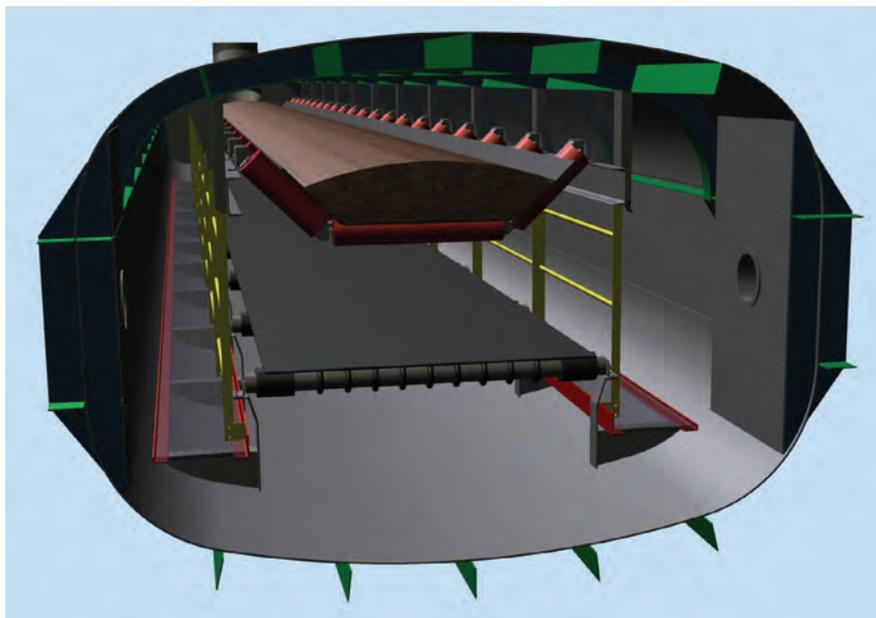
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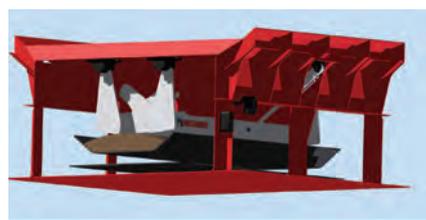
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The MacGregor closed boom has walkways alongside the belt for safe and easy access.



The Macgregor full flow gate will generate increased capacity and minimise flow disruptions.

lead to a wider gate opening allowing for increased cargo capacity, whilst minimising flow disruptions.

Tomas Wallin, technical director, MacGregor said: "Cargotec has managed to develop a gate with a high cargo handling capacity without compromising hull space. The more space occupied by the gates and conveyors, the less there is available for the revenue earning cargo. Thanks to the placing of the gate cylinders on the sides, the hog backs can be arranged much more efficiently, thus the MacGregor Full Flow Gates require much less space than traditional gates.

"Extensive research studies were necessary in order to achieve optimised material flow. The result is that the MacGregor Full Flow Gate has a wider gate opening for the same belt width than a traditional gate. 100% material flow through the gate will generate increased capacity and minimise material flow disruptions."

To help create a better working environment for the crew onboard, stevedores onshore and for the environment, and to keep dust down to a minimum. MacGregor has developed its closed boom. The boom also features a low pressure sprinkler system along it and also along side the conveyor.

Anders Bäckström, senior mechanical engineer, MacGregor, said: "The total enclosure of the conveyor system results in a truly dust-free operation, but the benefits of the new boom are not limited to environmental considerations," he added "the MacGregor Closed Boom has an optimal support structure. It has a smooth upper surface in order to prevent ice formation and a smooth inner bottom surface to enable easy cleaning. Furthermore, there is no need for any extra installation for overflow protection.

"Service and inspection of boom conveyors have not always been so easy. To eliminate the common problem of handling big, unwieldy cover plates during these operations there are walkways alongside the belt, allowing safe and easy access to the equipment within the walls of the boom. Consequently, service and inspection can be performed by a single member of staff. Emergency exits are located at both ends of the boom. There are safety wires and walkways located on the upper side of the boom to enable a safe exit from either end"; he added. [NA](#)

Graig China supports newbuildings

Shanghai-based Graig China has won a 10 ship order to supervise newbuildings for Chinese leasing company Minsheng Financial Leasing Co Ltd. Graig has highlighted that there has been an increase in Chinese leasing companies and power companies ordering and building bulk carriers in Chinese yards, for domestic use, in which they are seeing more involvement in.

Graig has been contracted to supervise the construction of 10 bulk carriers of 76,000dwt each to be built at Jiangsu Rong Sheng Heavy Industries Co Ltd with delivery of the final vessel scheduled for delivery in the first quarter of 2012. The 10 vessels are in addition to the eight vessels already under construction at the same yard.

John Coffin, CEO Graig China, said: "Chinese owners are now turning to Graig for its newbuilding expertise in China... It is our knowledge of Chinese shipyards and our ability to understand both the yard and the owners' needs that ensures vessels are built to owners' requirements."

Furthermore, keel laying for two 35,000dwt Seahorse design handysize bulk carriers being built for Graig at Jiangdong Shipyard, China, has started. Delivery of the vessels is expected in February and June 2012. The Seahorse design has been developed with a focus on economic and efficient operation, environmental friendliness and maintenance, safety, loading flexibility and latest regulations for bulk carriers.

The Royal Institution of Naval Architects

The Management of Maintenance, Reliability and Safety in the Maritime Industry

25 - 26 January 2012, RINA HQ, London, UK

First Notice & Call for Papers

Supported by:



From the bulk of Naval Architecture literature, it would be easy to assume that it was purely a design discipline. However many RINA members are employed in ship survey, ship owner and ship repair organisations. As offshore oil, commercial and naval sectors seek lower through life costs, the reliability of ship systems and optimising their maintenance become key elements in the cost equation. When the equation is flawed, the additional risk taken can cause spectacular outcomes.

There is a growing field of engineering that calculates the true cost of deferring maintenance and the risks to company and even to an industrial sector's reputation, these approaches try to square the circle of managing competing demands of availability, cost, levels of safety and environmental standards which the maritime industry must seek to achieve.

"Managing Reliability, Maintainability and Safety in the Maritime industry", will present and discuss developments in tools and asset management techniques for improving risk-based inspection, system availability & reliability, within reduced maintenance budgets whilst demands for increasing safety increase".

Papers are invited on the following topics:

- Risk-based survey and maintenance planning;
- Techniques for Reliability Centred Maintenance, Condition-based maintenance etc
- Asset management and governance
- Integrated safety and maintenance management;
- New technologies that save through-life costs of maintenance and repair
- Cost engineering and programme management
- Ship mid-life extension and conversion



<http://www.rina.org.uk/reliabilityandmaintainability.html>

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Taking the Northern Sea Route

Attempts are being made to open up a new trade lane that will allow vessels to shorten their transit times from Europe to China, the Northern Sea Route (NSR).

Nordic Bulk Carriers has endeavoured to push the boundaries further with the sailing through the NSR with one of its bulk carriers *Nordic Barents*. The project that was carried last year saw a bulk carrier with a non-Russian flag transit the trade route transporting 41,000 tonnes of iron ore from the northern part of Norway to China. The journey was one third shorter than traditional shipping routes and in future will not only save time, but also fuel and cut CO₂ emissions.

The project was undertaken by Tschudi Shipping Company through its subsidiary Tschudi Arctic Transit, Nordic Bulk Carriers and the Russian Maritime Authorities. Christian Bonfils, managing director, Nordic Bulk Carriers commented on the project: “We have approached this project because of the commercial aspect of the route.” He added that: “There were difficulties at the start of the project one of which was getting the right approval from the Russian Authorities. Also, getting insurance was a problem, as no one would insure us due to where the vessel was sailing. Getting parties to get involved in the start was a problem.”

The Northern Sea Route to China across the arctic is shorter than other routes; the journey was completed in 21 days, which was seven days quicker than the company had expected. It is also 16 days shorter than travelling via the Suez Canal and 26 days shorter than going around the Cape of Good Hope. Due to the route being shorter Mr Bonfils said that it will also save ship owners fuel and cut CO₂ emissions.

“This results in a significant reduction in fuel consumption and transportation time, and it also means much lower CO₂ emissions. The fuel savings alone add up to approximately US\$180,000/voyage. Not only does this route open up opportunities for the mining industry, but also for Nordic Bulk Carriers; we



Nordic Barents (vessel in front) gets going tackling the NSR.

are specialised in operating ice classed bulk carriers, and when we entered into a strategic co-operation with the owners of these specialised ships we quickly saw the potential of the ships”, commented Mr Bonfils.

Further, with bunker costs increasing the commercial value of this route will increase. “If you can save 16 days, then that’s 16 days of fuel and 16 days of not emitting CO₂. If you look at an average of 31 tonnes of fuel a day, then there is saving of 500 tonnes a journey.”

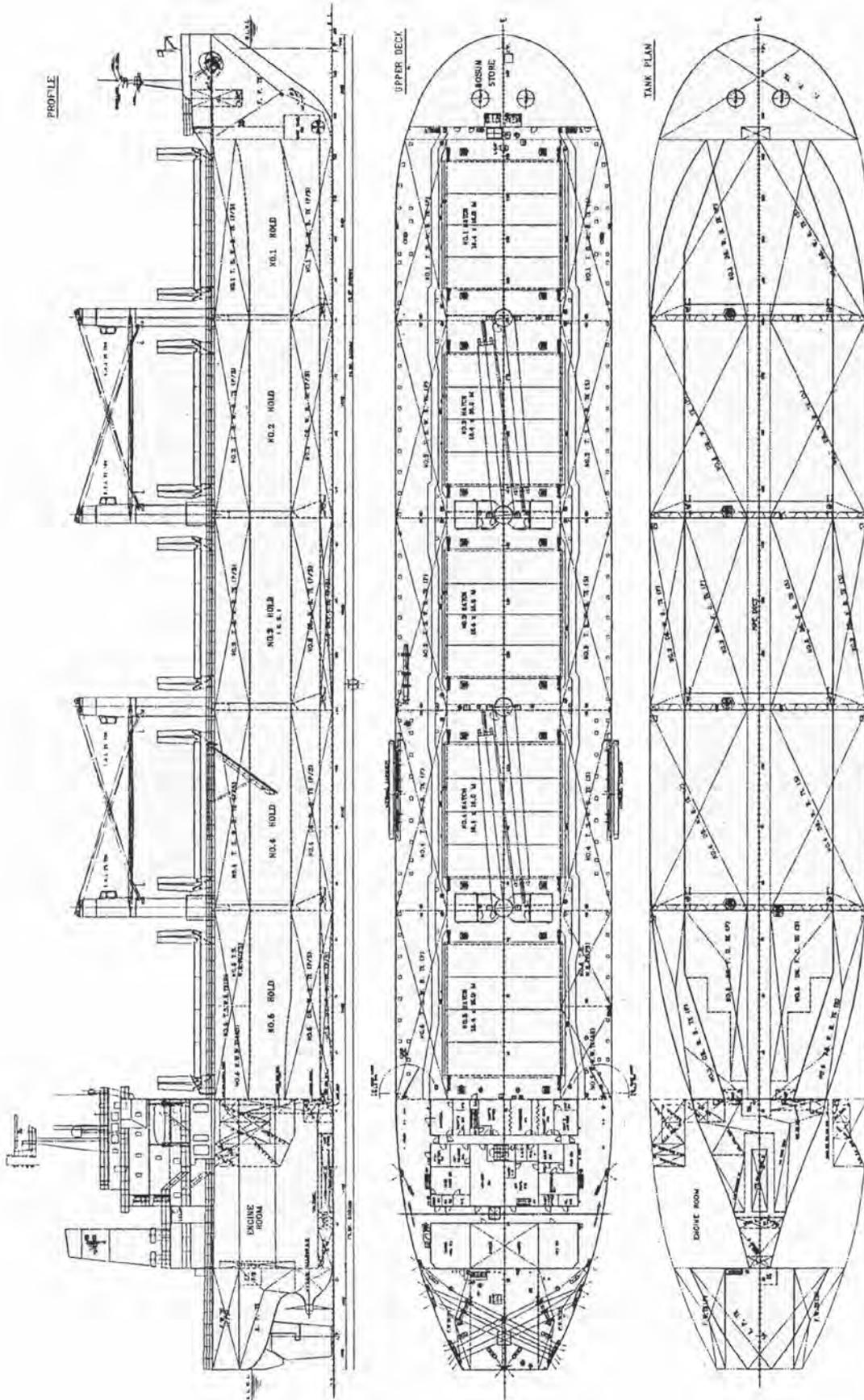
Although the NSR looks to be a viable option at the moment, the problem of cost for the use of the route will become a factor for most, as ice breakers will be needed to escort vessels for part of the journey. Mr Bonfils has highlighted that if the NSR does become more popular in the future, then it will be a good development for Russia. However, he commented that costs for ice breakers to guide the vessels are not transparent at the moment, but a model is being developed for this. If Russia was to over price itself then trade on the route is likely to disappear, “If the price goes too high then we’ll just go south”, Mr Bonfils said.

Nordic Barents is capable of being used all year round in the Baltic and for the NSR route. Mr Bonfils also highlights that the vessel that was used had the right ice class for the project. The vessel was also escorted through a section of the journey by two Russian ice breakers. Mr Bonfils noted that where in the Baltic the ice is easier to sail through as the vessel pushes it way through; caution is needed when travelling through the NSR where there maybe compacted ice.

“*Nordic Barents* is a so called ice class 1a ship. This is the highest conventional ice class, and it was the only ship classification that the Russian Authorities would allow to perform this transit”, Mr Bonfils said.

It is expected that the NSR will be open for transit voyages for two to four months/year during the early autumn, with four to five routes planned for the following 12 months. Mr Bonfils commented: “The Russians claim that we can make sailings all year round, but we believe that it would be easier during the summer months between August and the beginning of October.” **NA**

GA plan of Nordic Barents.



Brazil growth explosion

Brazil is the new hot-spot for foreign investors, with the offshore market still growing, Brazilian shipyards are expanding to meet the increase in demand.

Brazil's shipbuilding and offshore market is a country-wide industry, with shipyards in 11 states across Brazil. To date the Brazilian shipyards' orderbook exceeds six million DWT, in 269 hulls of different types of vessel from port tugs to Suezmax tankers, including offshore supply vessels, 18 production rigs, and seven drillships. Orders that have been placed at all 37 by the National Association of Industry and Shipbuilding and Repair Offshore, SINAVAL, member shipyards has shown that Rio de Janeiro, Pernambuco and Rio Grande do Sul are leading the market for orders.

The Brazilian market is pushing to become one of the top players in the Shipbuilding industry and has seen shipbuilding programmes starting up across the country. Petrobras has unveiled a 10-year plan to expand Brazilian oil production to over 4 million bbl/day by 2020. This will require the construction of an additional 40 production systems and a further five vessels for each system. To meet Brazil's expansion programme an 88-ship Brazilian flag tanker programme is pressing yards for newbuilding orders from Petrobras and Transpetro, its fleet operator.

The market has caught the attention of corporations, resulting in new shipyard facilities and the expansion of existing ones, totalling 13 projects to cope with the demand announced by oil companies, in the offshore investment programme led by Petrobras.

Sinaval has said that it expects the maintenance of government's industrial guidelines to support the shipbuilding industry with a framework in different taxation rules, financing

PROMEF – 1st Phase Contracted Constructions	Number of Units	GWT / Unit (thousand)	Total GWP (thousand)	Shipyard	State
Suezmax	10	157	1.570	EAS	PE
Aframax	05	108	540	EAS	PE
Panamax	04	75	300	EISA	RJ
Tanker	04	48	192	MAUÁ	RJ
Gas Tanker	03	4	12	Promar	CE
Total	26	-			

In the first phase of the programme, the following vessels are expected to be delivered: Suezmax (10), Aframax (5), Panamax (4), Tankers (4) and Gas Tankers (3), totaling 26 ships.

PROMEF – 2nd Phase Contracted and Foreseen Constructions	Number of Units	GWT/Unit (Thousand)	Total GWP (Thousand)	Shipyard	State
Suezmax	04	157	628	EAS	PE
Aframax	03	108	324	EAS	PE
Panamax	03	4	12	Superpesa	RJ
Tanker (bidding)	03	45	135	Superpesa	RJ
Tanker (bidding)	05	30	150	Superpesa	RJ
Gas Tanker (bidding)	08	4	32	Superpesa	RJ
Total	26	-	1.282		

In the second phase the following will be delivered: Suezmax (4), Aframax (3), Bunkers (3), Tankers (8), and Gas Tankers (8), totaling 26 ships.

and technological development. The Federal governments target's is to increase waterway transportation's participation from its current 15% to 29% by 2025. A significant action to reduce the logistics costs of having



Estaleiro Atlantico Sul (EAS) gets the lion's share of the newbuild orders for the Promef project.



Brazil gets started on its newbuildings.

more than 55% of the country's freight hauled by trucks.

Promef

One of the largest projects current underway in Brazil is the Fleet Expansion and Modernization Program from Transpetro (Promef) project. Transpetro has a fleet of 52 vessels that have an average age of 23 years, this number is expected to decrease to just 19 tankers by 2014.

When Promef was launched in 2004 the aims of the programme were to commission the construction of 146 supply vessels and 49 ships, costing a total of US\$5 billion. Promef will contract 26 ships in the first stage, and 26 during the second stage for a total of 52 ships. In the two stages, it is expected that the construction of the ships will take 680,000tonnes of heavy steel plates during the first stage and 240,000tonne during the second stage.

Atlântico Sul Shipyard (EAS) leads the shipyards with the largest number of Promef contracts for projects with 22 ships, 14 of which are Suezmax, and eight Aframax sized vessels.

The Eisa and Mauá Shipyards, belonging to the Synergy Group, have contracts for the construction of four Panamax and four ships for product transportation, respectively.

The vessel is part of the portfolio of

orders that includes 22 tankers from EAS by 2014. The first Suezmax produced at Atlântico Sul shipyard was launched 7th of May 2010, which required investments of around R\$ 220 million (US\$ 20 million) and should begin operations in August. It is the first Suezmax built by the shipyard and also the first vessel to be delivered to the Petrobras System in 13 years. The second vessel from the yard was launched at the end of last year. EAS has also recently announce that it has won a contract for a further seven drillships.

Transpetro gears up for market

Transpetro has said that with the Promef programme in place it expects that its fleet will exceed 100 vessels in 2014. Transpetro has highlighted that the Promef programme has had a positive impact on the Brazilian shipbuilding industry, adding that the project is based on the building of ships in Brazil, to achieve a nationalisation level of 65% in the initial phase and 70% in the second and enable shipyards to be competitive. Transpetro are expecting to receive its first vessels and also enter the second phase of the programme this year.

Looking to the future the exploration (studies and operations to discover reservoirs) and the start-up of production of the pre-salt fields will

open up important prospects for orders for Transpetro. The pre-salt wells are located approximately 250km from the coast, with the transportation of the oil and gas produced and the servicing of production platforms will require logistical solutions. A spokes person from the company added: "The shipyards' demands are still being estimated by the Petrobras system and Transpetro. At this time what is know is that the need for production platforms and support vessels should climb considerably as compared to the existing figures, prior to pre-salt operations."

However, with such rapid development of the shipbuilding sector in Brazil, the question stands, will the shipyards be able to cope to the vast amounts of orders that are coming through, as reports suggest that a number of vessels have been delayed? "Due to this demand, Brazil has the growing challenge to qualify professionals to work in this area. To achieve this objective, Transpetro, in partnership with the government and Brazilian Navy, is investing in the creation and expansion of existing training centres. Another challenge is to expand the supply of materials and equipments for the Brazilian naval industry by national companies", She added. **NA**

Ulstein keeps up Brazilian orders

Ulstein has announced that it has signed two ship design contracts with Brazilian Shipyard Alianca SA for the construction of two Ulstein PX105 platform supply vessels with the X-Bow hull design for Brazilian ship owner CBO.

The contracts for the two vessels are for the delivery of design, engineering, main equipment and building follow-up for two large platform supply vessels of the Ulstein PX105 design type. The contract is worth approximately NOK150 million (US\$27 million).

“These contracts are of great importance to Ulstein. There are major investment activities on the Brazilian Continental shelf and there are wide-reaching plans for the area. It is important to position ourselves in the market”, said Tore Ulstein, COO design & solutions, Ulstein.

“CBO is the first to build X-Bow vessels in Brazil, which proves that we are an innovative company constantly looking for new solutions”, commented Alfredo Naslausky, director, CBO. The company has four Ulstein-design platform supply vessels (PSVs) under construction at the Alianca yard in Rio de Janeiro, making a total of six vessels on order.

The advantages of the Ulstein X-Bow hull design is that it allows the vessel to have a higher transit speed in calm water due to low angles of entry and increased waterline length. There is no bow flare, eliminating bow impact and/or slamming in foreship, reduced noise and vibration levels in foreship due to soft entries in waves and less spray, lower pitch and heave accelerations due to foreship volume distribution and slender hull lines, negligible occurrences of green water on bridge deck, working deck and deck equipment better protected due to hull extended to full beam in accommodation area, higher transit speed in head and following sea, giving reduced power consumption and/or higher fuel efficiency in waves and still water.

The vessels will be 88.9m in length



Two more PX105 to be constructed for Brazilian company CBO. (Credit Ulstein)



Signing of the contract. (Credit Ulstein)

overall and have a breadth of 19m. They will have a depth (to main deck) of 8.0m with a maximum draught of 6.6m and a deadweight of 4700dtw. The vessels will have four 1580kW generators and a speed of 15.5knots.

Since the demand for large offshore PSVs has increased, both the P105 and PX105 have been increasingly popular with customers, Ulstein highlights.

“The size and versatility of these vessels make them suitable for many markets and operations. This has given Ulstein a leading position in the market for this type of vessel”, concluded Mr Ulstein.

The vessels once constructed will go into eight year contracts, with options for extensions, for the Brazilian state oil company Petrobras and will permanently be stationed in Brazil. **NA**

Human Factors in Ship Design and Operation

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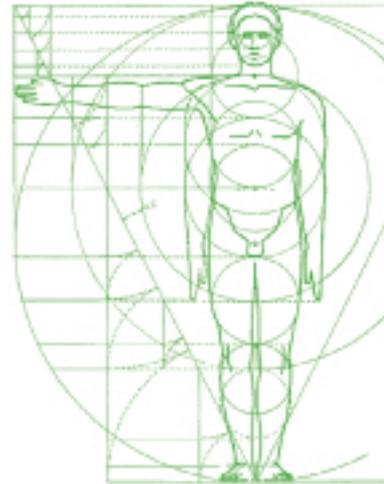
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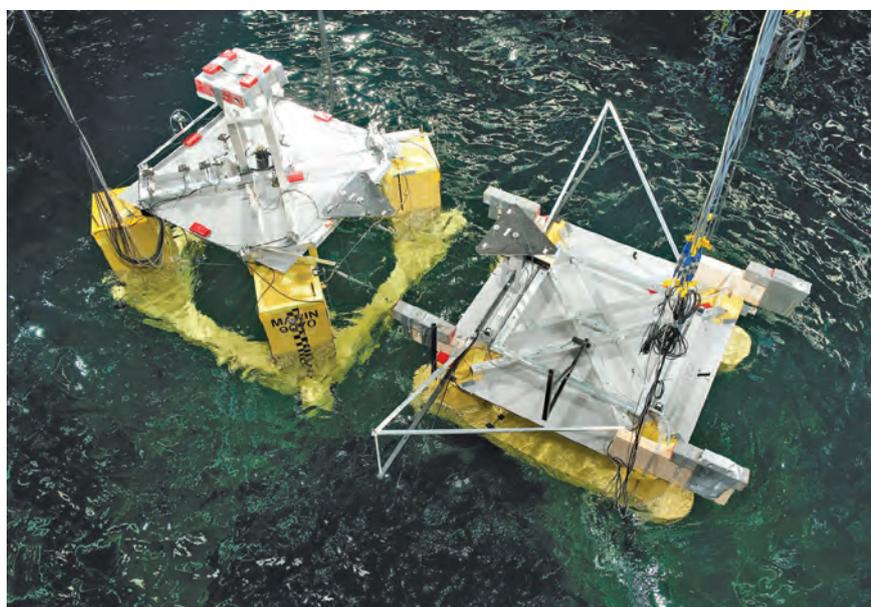
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Complex coupled model tests for Petrobras

Simultaneous model tests on three floaters in Marin's Offshore Basin and these were followed by two-body, coupled vortex-induced-motions (VIM) tests in the Depressurised Towing Tank. The complexities of this test programme are unravelled for the first time by managers Jorrit-Jan Serraris and Eelco Frickel working closely together with the FloaTEC design team.

In an ambitious project for the Papa Terra P61 field development, Marin recently carried out model tests on a Tension Leg Wellhead Platform (TLWP), a semi-submersible and a floating production storage & offloading (FPSO) vessel all at the same time in the Offshore Basin to assess interaction effects between the three coupled floaters. The floaters will be operated by Petrobras in an 1185m water depth, offshore Brazil.

The TLWP and the connections between the floaters were designed by FloaTEC. For the wave basin model tests the TLWP was moored with eight tendons installed in the deepwater pit of the Offshore Basin. Located at a distance of 35m from the TLWP, the semi-submersible platform will be used for tender assisted drilling during the first three years of the field development. The semi was installed in the Offshore Basin by means of a truncated bundled mooring system, representing the mooring system stiffness of the full depth system and it was coupled to the TLWP by means of a hawser system. The complex hawser system was modelled by means of linear springs linked together to represent the non-linear stiffness characteristics in surge, sway and yaw correctly. To be moored 350m away from the TLWP, the FPSO was also modelled in the basin to investigate the interaction effects of radiating waves. Fluid transfer lines run from the TLWP to the FPSO.



TAD semi submersible (right) coupled to TLWP (left). (Credit Marin + Floatec)



Three body model tests in the Offshore Basin: TAD semi submersible, TLWP and FPSO (from left to right). (Credit Marin + Floatec)

Movable floor

Due to the complexity of this three-model test setup, a detailed installation plan was prepared prior to the test campaign. All of the installation procedures and test configurations were accurately verified and documented to minimise any risks during the installation in the Offshore Basin. The movable floor of the basin again proved to be a helpful feature to minimise the installation time of the setup.

Only three yellow bodies can clearly be observed above the still waterline but under water and in close proximity to the basin, a lot of equipment, structures, actuators and instrumentation were installed to complete the test setup. In total, more than 80 measurement channels were simultaneously recorded

during the three-body basin tests. Video cameras were accurately positioned above and under water to capture the coupled motions of the TLWP and the semi-submersible. These videos, combined with the analysis of the measured relative motions, proved to be a helpful and powerful tool to help understand the hydrodynamics of such a complex coupled system.

VIM tests

After the wave basin test programme VIM tests with the coupled TLWP and semi-submersible were performed in the Depressurised Towing tank. These investigated the VIM and galloping interaction effects and the coupled system response. The TLWP was mounted underneath an air bearing

system to model the displacement correctly, without modelling the tendons and without affecting the mass and inertia of the model. The semi-submersible was installed in the basin by means of a horizontal mooring system and coupled to the TLWP with the hawser system.

In addition to the test series described, Marin also advised on the model test programme for the TLWP alone, which was performed at the LabOceano Offshore Basin in Brazil. A close cooperation between MARIN's engineers, its local agent Oceanica LabOceano and FloaTEC during the preparations, as well as during the execution of the model test programme, resulted in a very successful model test campaign. *NA*

Aker connects with the Brazilian market

Aker Solutions has seen activity increase in Brazil, with further ship building expected the company is supplying the market with its Pusnes range of offshore loading systems.

Originally designed for the North Sea, Aker Solutions loading technology and standards have been exported to other parts of the world. As oil field development in Brazil has evolved, the North Sea standard for loading systems has been adopted. Shuttle tankers that previously operated in the North Sea are now operating in the Brazilian offshore market. Aker Solutions has provided equipment for offshore loading on 12 floating production storage & offloading units (FPSOs) and on more than 25 shuttle tankers in Brazilian waters.

“Our office in Macae (Brazil) is part of our world wide lifecycle network which supplies customers with spare parts, service and support wherever the need occurs”, said Leif Haukom, head of mooring and loading systems, Aker Solutions. “As this area is of strategic importance, our Macae office will continue to grow in the years to come”

Mr Haukom also highlights that at the moment the Brazilian market looks



The HiLoad solution for tankers. (Credit Remora)

bright with lots of opportunities available. Aker Solutions, like most international companies, is facing the challenge of providing local content for Brazilian

contracts, and is constantly evaluating possibilities for increasing local content in deliveries. In order to retain its position in the Brazilian market, long



Aker Solutions has been involved in supplying equipment to many shuttle tankers operating in Brazilian waters. (Credit Teekay Petrojarl)

term good relations with high quality local sub-suppliers and manufacturers are of the highest importance, with key elements of the Pusnes offloading system looking to be produced in Brazil for the market.

Aker Solutions is participating in a FEED for offshore tandem loading of LNG for Brazilian waters. Another special project is the loading and docking vessel HiLoad DP (dynamic positioning) which is equipped with an electrically driven hose reel offloading system. HiLoad DP has recently successfully completed sea trials and offshore loading tests at the Marin test facilities, in The Netherlands, based on the Santos basin criteria.

The HiLoad system has been designed for tankers built on Remora's patented HiLoad Attachment System. The technology is based around a suction cup principle where the HiLoad attaches the connected object, utilising the basic laws of nature handling offshore loading of oil products.

The HiLoad DP is fully self-propelled

with diesel engines and can easily be relocated. It is equipped with a DP 2+ compliant positioning system, and can operate the tanker during offloading without any assistance from other vessels such as tug boats and anchor handling vessels.

The HiLoad DP vessel is classified by DNV (Det Norske Veritas) and has received a new class notation: OI Floating Offshore Oil Loading Installation.

Furthermore, there has been no tradition for the offshore loading of crude oil in the US Gulf of Mexico. It has been considered that FPSO technology and shuttle tanker operations in the Gulf of Mexico impose an impact on the environment. However, when production begins at the Cascade and Chinook fields, which are located in the Walker Ridge block, around 300km, south of the Louisiana coast; Petrobras will become the first oil company to operate an FPSO-type production system in US waters.

OSG will charter two shuttle tankers to Petrobras to transport the oil produced,

which will be equipped with Pusnes bow loading systems. In order to meet the US coastguard's environmental regulations, Aker Solutions has developed an efficient flushing system (Patent Pending) for the crude oil coupler which ensures that no oil will be leaked into the sea when it is disconnected.

In addition, Aker Solutions has also delivered Pusnes mooring systems and Pusnes riser pull-in systems to Brazil. Most recent contracts have included movable Pusnes chain jack mooring systems and hull-mounted Pusnes fairheads for the spread-moored FPSO's for Petrobras P58 and P62. The units will produce oil at the Norte do Parque das Baleias and Roncador fields, respectively, and will be moored in water depths of between 1400m and 1600m.

Lief Haukom has commented about future development of Aker Solutions in Brazil: "We want to be active in the Brazilian market. With projects such as P58 and P62, it is important for us to focus on being able to deliver timely solutions." **NA**



Sonic boom

Infrafone's sonic soot remover in situ onboard a ship.

Every chief engineer worth his salt knows the key to efficiency is good maintenance and boiler systems are no exception. Keeping ships boiler tubes clean is that much more critical in order to avoid soot fires.

The quantity of soot formed depends on the type of fuel used. The combustion of heavy fuel oil (HFO) generates substantially greater volumes of particles and soot than the burning of cleaner fuels like marine diesel and marine gas oils. Using soot blowers to clean boiler tubes has an added advantage. Less fuel needs to be burned to achieve the required heat transfer which in turn decreases the environmental impact.

Until recently, the ship owners' preferred choice in cleaning system was to use steam soot blowers which either used saturated steam, superheated steam, compressed air or water or sometimes a combination in order to achieve the desired objective. That is, until the new kid on the block arrived in the form of sonic cleaning.

The basic principle of sonic cleaning is to create a sound wave with an energy level exceeding the forces that tend to make particles suspended in a gas flow adhere to each other and surrounding surfaces.

The properties of sound differ substantially depending on the frequency range. Sound waves travel at 344 metres per second and can be divided into infrasound, audible sound and ultrasound.

According to Swedish manufacturer Infrafone, sound with frequencies below 20Hz known as infrasound, has properties that make it suitable for soot cleaning

applications. Its long wavelength means its acoustic power can reach areas far away from the actual acoustic source. Infrasound waves are omni-directional thus providing 360deg coverage in all directions with no loss in intensity. Finally, infrasound waves have low absorption so very little energy is lost.

Sonic cleaning utilises the acoustic properties of these high energy, low frequency sound waves. The sound oscillations created for a few seconds only, usually every 1min-5min are transmitted into the particulate dry material, ash and soot, causing the solid particles to resonate and dislodge from the surface they are deposited on or bonded to before they have a chance to form a hard layer. The actual cleaning is achieved by activating one or more sound emitters at intervals and frequencies to suit the specific conditions in the exhaust funnel uptake of each individual installation.

In the Infrafone system, the Pulsator feeds compressed air, normally between 6-8 bar as pulses into the resonance tube which amplifies the sound waves generated.

The Pulsator is the engine of the sonic cleaner that actually creates the sound wave. It contains a cylinder a piston and a spring. Mounted outside is quick ventilation valve controlled by a solenoid. During insonation or run which lasts just a few seconds, air is fed into the casing surrounding the cylinder and continues through the hose from the casing to the solenoid valve. This valve is set to normally open and lets air proceed into the cylinder behind the piston, forcing it to rest against the Teflon seat at the bottom. When closing

the solenoid valve, the air behind the piston is released and the spring forces the piston upwards inside the cylinder. When the piston reaches its top position it is turned back down through the force of the spring. The first 3-5 oscillations are thus created. Eventually a sufficiently high sound pressure is built up below the piston after which, the piston movement is maintained by the oscillating sound pressure. Put another way, the oscillating piston creates the sound wave and the sound wave maintains the movement of the piston.

The Pulsator is mounted on the resonance plate located on top of the resonance chamber. The length of the resonance tubes determines the frequency of the produced sound. To tune this frequency an adjustable plate inside the resonance chamber is moved up or down. A PLC control unit regulates the cycle and insonating time of the sonic cleaner. In most cases, the insonating time is usually set for seven seconds with the cycle time of 300 seconds.

The simplicity of the Infrafone design with its few moving parts – the spring and piston are the only ones – makes this sonic cleaner an attractive proposition. Add to this the fact it is a continuous non-abrasive process which increases the lifetime of heat exchangers by reducing the need for conventional cleaning systems and many more boxes are ticked. Finally, with the reduced amount of soot particles dirtying open passenger decks much to the delight of most bosuns, it is easy to see why sonic cleaners are gaining popularity in the cruise industry. *NA*

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John Lingwood

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Price: UK £29.00 EUR £30.00 OVS £30.50

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I C Clark Ref:

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By James Paffett FRINA

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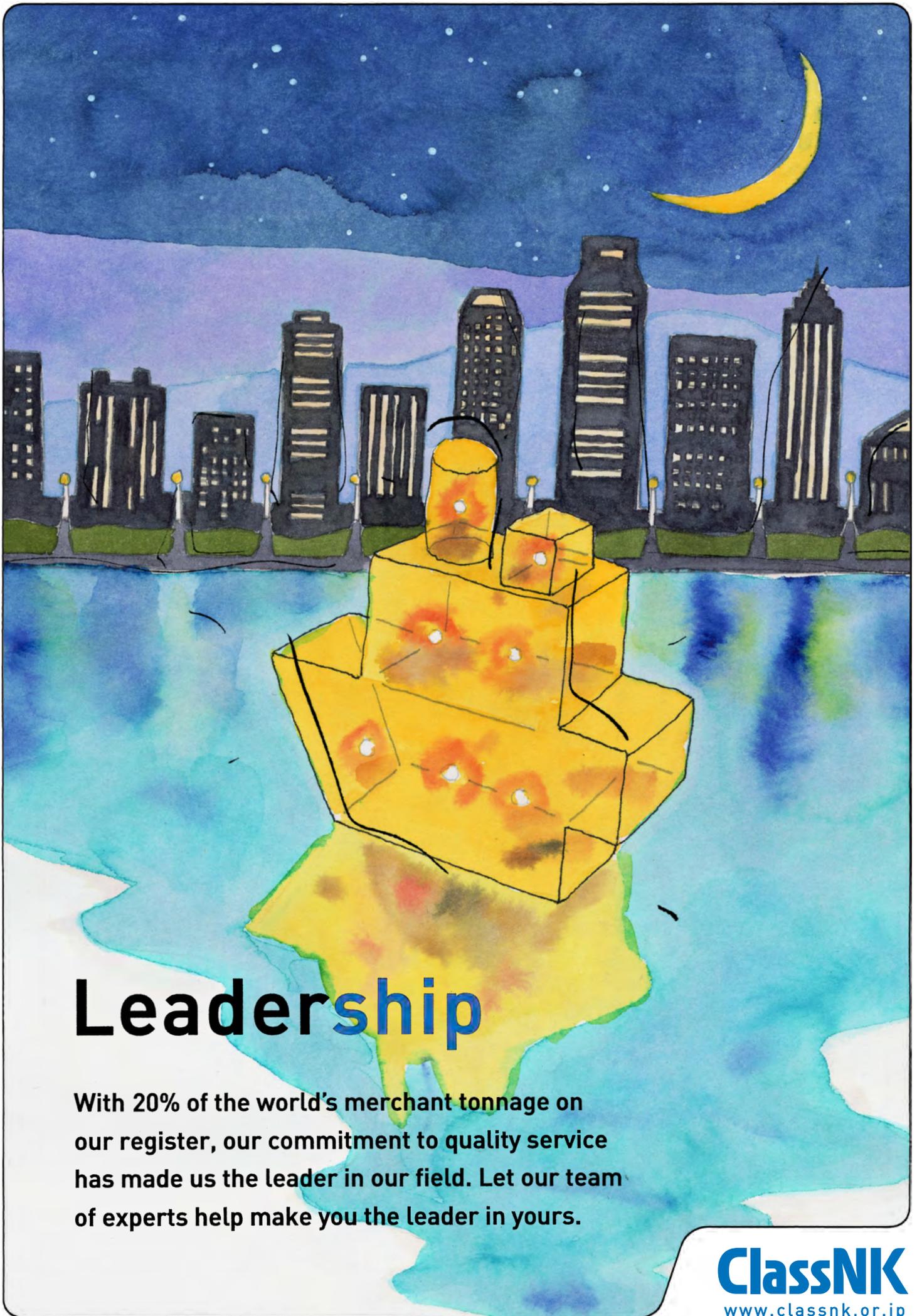


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