

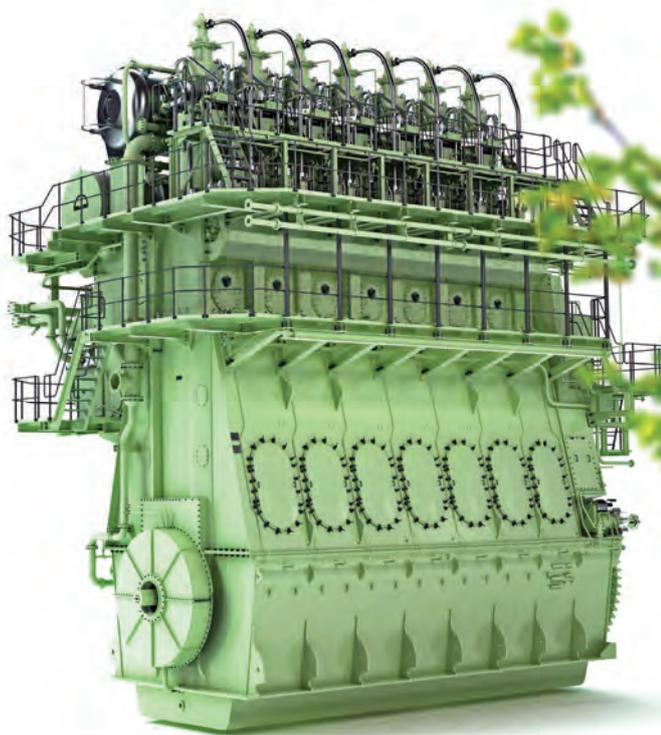


# THE NAVAL ARCHITECT

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Simple and flexible

### Ballast Water Treatment

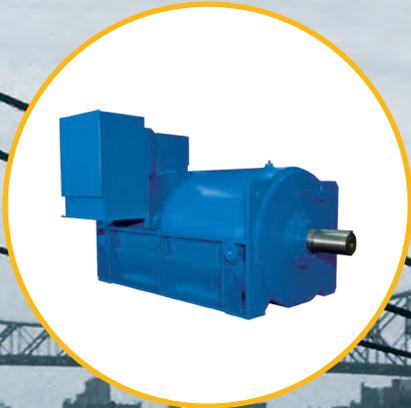
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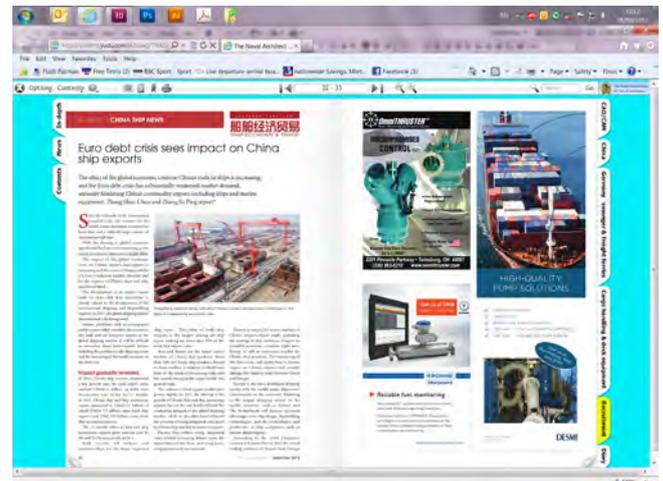
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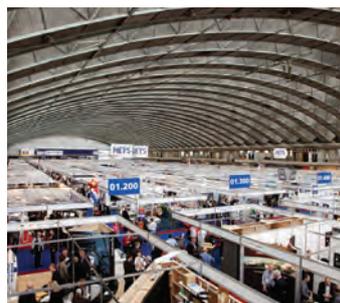
# METS 2012 – 25<sup>th</sup> ANNIVERSARY EVENT

## Time to celebrate

METS, the biggest and best attended leisure marine trade show in the world, celebrates its 25<sup>th</sup> anniversary in 2012. The show has come through boom years and lean times but every year for a quarter of a century METS has continued to build international recognition as the undisputed number one trade show of its kind.

## How METS works

METS and its associated SuperYacht Pavilion (SYP) is strictly trade-only, product focused and truly international with exhibitors and visitors coming from over 100 countries every year. There are renowned national pavilions, organised by 15 different marine industry associations from all over the globe.



## 25 years

Beware of the party spirit at METS 2012! A 25<sup>th</sup> birthday is a truly special landmark event. METS started back in 1988 with just over 100 exhibitors, and in 2011 had 1,331. In 1988 we had two national pavilions and modest exhibition space but by 2011 we had 15 established national pavilions and nine halls in the new RAI Europa Complex... there is a lot to celebrate!

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

## METS works

It is the best venue for serious face-to-face networking and has a unique family ambience. Industry professionals return to METS year on year to meet new faces but also to catch up with the many industry contacts they have built up over the years. If you only see someone once a year, you'll see them at METS!

## Products and prizes

METS is an unrivalled gallery of proven and new products in all categories within the leisure marine sector. It's the place to spot emerging trends and innovations, and to see the extra special products that have won acclaim as finalists in the DAME (Design Award METS) prize, the undisputed leisure marine design award of the year.

## Where is METS?

METS is held in the Amsterdam RAI exhibition halls just 15 minutes from Amsterdam's International Airport and 10 minutes from the historic city centre. Professionals can attend for free if you pre-register and show organiser Amsterdam RAI can also book hotel rooms for you and assist with other travel requirements. Find all the details on [metstrade.com](http://metstrade.com)



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## Marine dreams are green

Water your dreams with optimism and solutions and you will cultivate success, said ancient Chinese philosopher Lao Tzu

Shipping is fast becoming a data-led activity. Information flow from vessels monitoring compliance on new regulations as well as efficiency is turning into a flood. Data from vessel operations will be able to tell regulators, among other things, when and where a ship ballasted, switched fuel or used its scrubbers.

That flood of information can be used to improve design and operation or just bury the user in wave upon wave of incomprehensible information. That information would be a designer's dream allowing an innovative person the insight to develop new systems, but it can also be a nightmare if the data is not properly directed.

Ancient Chinese philosopher Lao Tzu cautioned: "Be careful what you water your dreams with. Water them with worry and fear and you will produce weeds that choke the life from your dream."

Data from key ship systems will in future reveal how efficient the ship is and how efficiently it is being operated. ABS is the latest class society to offer a ship efficiency programme. But, there is a danger that crew could be overwhelmed with the increase in new tasks and the vast amount of data.

Some information from ships' systems will be transmitted landside, collated and analysed allowing the owner to see if his or her ships are operating as efficiently as they can be and, through data analysis, suggesting a course of action.

The key for these systems is compliance with new environmental regulations once ships are operational. Ship designs have also

changed due to the influence of new rules and making sure these new designs are operating efficiently must be significant for an owner. After all why would you pay the extra money for a more efficient ship that does not do what the designers' said it would?

For many years ship designers have wanted better tools with which to design ships and to be able to measure how efficient those ships are. Now that these tools exist the greater power afforded the industry to design ships has also meant that there is a demand for ships to be cleaner and more efficient.

It is also a fact of course that pollution regulations are driving that change, but even here without the possibility of knowing how much pollution there is, there is no possibility of changing behaviours to improve the pollution conundrum. Data management through computers is crucial.

Computer power has developed significantly over the past 20 years or so and the world has, over the same period, become increasingly aware of the effects that mankind's activities are having on the environment in which we live. It is that very efficiency afforded innovators by the computer that has driven many of the modern developments including the use of satellites to monitor the Earth and its changing environment.

As a result the requirement for industry to clean itself up in relation to the emissions pumped into our atmosphere has become a clarion call that is hard to ignore and, indeed, in this issue we look at how computational fluid dynamics can help to improve the efficiency of ships, reducing emissions and reducing costs and answering the call of

nature for cleaner shipping.

Imtech of the Netherlands has launched its Green Competence Centre (pg 49-50) in an effort to help owners deal with the flood of information and thereby to meet the requirements of new regulations.

Design software is also developing allowing designers to meet new regulations and to design ships to meet new rules. ABS and SDARI (pg 37-39) have collaborated to produce software that offers a more "systematic process" to the design of propellers and the re-use of lost energy. Such studies could only have been undertaken in the computer age.

However, the US and Chinese companies along with the rest of industry can still only guess at the emissions from shipping as a whole. German class society Germanischer Lloyd has developed a system of monitoring ships that can reveal the actual ship emissions rather than merely offer a best guess.

Computer power is central to the ability of GL to perform the task of collating and interpreting data from ships on fuel use and sulphur content etc. Without computers such processes may be too cumbersome to perform to any meaningful level of accuracy.

All this data and computing power provides owners and designers with great opportunities to develop the industry into a cleaner more efficient one.

Or as Tzu would say: "Water them [your dreams] with optimism and solutions and you will cultivate success. Always be on the lookout for ways to turn a problem into an opportunity for success. Always be on the lookout for ways to nurture your dream." NA

## Propulsion

## US funds battery project

The US Department of Energy's Advanced Research Projects Agency Energy (ARPA-E) has announced that it will fund a joint Det Norske Veritas (DNV), NexTech Materials and Beckett Energy Systems project that will attempt to find the limitations of battery operations.

The project will use battery life prediction modelling and sensor monitoring to identify how far the limits of battery operation can be pushed. By implementing the modelling and sensor approach, together with an "innovative new sensing technique", the project aims to extract greater battery performance, says DNV.

"The project is innovative because it uses a novel and new off gas sensing technique, which improves safety, while also deploying life prediction models for commercial application. This detection method can optimize performance and help repurpose batteries for other applications. A second outcome of the project will involve the demonstration of second life batteries in an energy storage application," the class society added.

DNV's KEMA Powertest in the US, in which DNV acquired a majority stake earlier this year, will see the necessary testing take place at the Chalfont PA site.

## R&amp;D

## LR gets A-star

The Agency for Science, Technology and Research (A\*STAR) will collaborate with Lloyd's Register (LR) on research and development projects for the maritime industry at the class society's Group Technology Centre (GTC) in Singapore, which it says it recently set up.

"The intent is to establish a Joint Lab facility with A\*STAR's Institute for High Performance Computing (IHPC) to co-develop applications and solutions in the marine and offshore sectors. This arrangement will promote R&D activities in modelling and simulation, providing bespoke technical solutions for companies in these sectors," says LR.

In an effort to encourage the development of expertise PhD students will train at GTC, sharing their time with Singapore's universities.

Dr. Raj. Thampuran, managing director at A\*STAR, says that the areas in which the two groups would invest in research include; modelling and simulation; designing floating offshore structures, deep-sea drilling equipment and transportation, maritime safety and environment, and marine energy harvesting.

## Newbuildings

## ABB breaks the ice

Power company ABB has won an order worth US\$35 million from the Baltic Shipyard Ltd. to supply propulsion and energy efficient electrical systems for a new icebreaker vessel under construction for Russia's state shipping company Rosmorport FSUE. The order was booked in the third quarter of 2012.

The 25MW line diesel-electric icebreaker is the next-generation multifunctional diesel-electric icebreaker. ABB will provide the integrated power generation and distribution systems, thruster motors, fire-fighting pump motors as well as 25MW propulsion systems.

The propulsion system of the vessel features two Azipod thruster units (power output 2 x 7.5 MW) and one centreline arranged shafting with a fixed pitch propeller generating additional 10MW output. All Azipod propulsion units for this project are specifically designed for extreme Arctic ice class RMRS Icebreaker-8.

The icebreaker will be able to proceed continuously both ahead and astern at the speed of 2 knots in compact ice fields of up to 2m thick with 20cm of snow cover and temperatures as low as minus 35deg Celsius.

Construction of the vessel is due to start in 2013 and it will be delivered to Rosmorport in 2015.

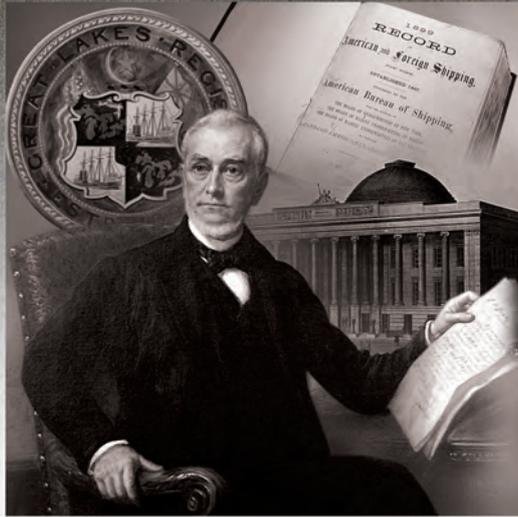
## Sloshing

## GTT and Amarcon join forces

Amarcon, a member of the ABB group, has announced that it has signed an agreement with Gaztransport & Technigaz (GTT) which will see the two companies collaborate to develop a forecasting and advice software system for LNG carriers. The deal was closed during the Gastech exhibition in London.

According to the companies there will be significant growth in the long distance transport of LNG in the near future. The International Energy Agency predicts that LNG trade will almost double between 2006 and 2015 to 393 billion m3 a year. Consequently, a considerable number of new build LNG carriers will come into the market. It is clear that the safe operation of these vessels will be imperative in order to provide safe conditions to the LNG tanks and to optimise the operational availability of the ships.

"In the coming years, Amarcon and GTT will work together to develop and market tools and



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services that enable the operators of LNG vessels with GTT containment systems to safely operate their ships by preventing sloshing. The new system will collect data from operation processes in order to control and fine-tune the quality of the sloshing measurements and predictions,” said a joint statement from the two companies.

#### Newbuildings

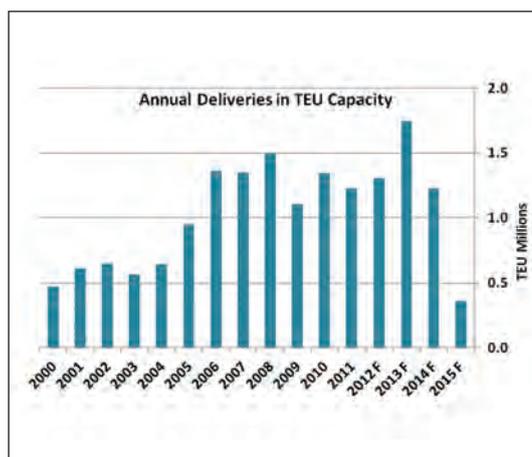
## Lines get box set

Deliveries of new container ships are expected to hit record highs during the next year, 2013, according to ship broker Braemar Seascope.

In Braemar’s latest Quarterly Container Ship Fleet Statistics, it estimates that around 1.7m TEU is scheduled to be delivered next year, expanding the fleet by approximately 9.5%. The record was set at 1.5m TEU in 2008 and Braemar says that 2012 deliveries are estimated to reach 1.3m TEU.

“In the post-Panamax segment of 10,000TEU or more, 2013 deliveries will total 48 ships with a combined TEU capacity of 650,000TEU. The container industry is becoming accustomed to accommodating large work horses of 10,000TEU or more. In 2011-14, annual deliveries of ultra large container ships in excess of 10,000TEU will average at approximately 50 units per year,” says Braemar.

Jonathan Roach, Braemar Seascope’s container analyst says: “With fleet management at the fore front of ship manager’s minds, supply growth this year has been actively countered with plenty of cellular demolition. During the first three quarters of 2012, containership demolition reached in excess of 220,000TEU and we estimate by the end of the year the TEU capacity scrapped will reach the 300,000TEU level. This represents the equivalent of approximately 2% of the 1 January 2012 fleet. Historically, the biggest year for cellular scrapping was 2009, with 370,000TEU sent for recycling.”



#### New design

## Wärtsilä launches Aframax design

Wärtsilä has launched a highly efficient Aframax tanker design that offers solutions for current and future emissions legislation, claims the company.

The double hulled, single screw crude oil tanker featuring a hull optimised using Computational Fluid Dynamics that will offer less resistance and higher propulsion efficiency.

“The CFD optimisation of the hull form has carefully considered the flow lines and pressure distribution along the hull, while the cylindrical bow accommodates a range of operational draughts even in rough weather conditions,” says Wärtsilä.

Propulsion of the new vessel design is based upon the 2-stroke Wärtsilä X62 electronically controlled, common-rail engine which has an extra long stroke and low rpm. The X62 is physically narrower allowing designers to form a slimmer aft body design, which further benefits the propulsion efficiency.

When compared to main engines currently on the market Wärtsilä says the X62 can achieve 7% fuel savings of on the Aframax design while achieving the same speed on six cylinders instead of seven. However, the company adds that the seven cylinder version can provide even greater efficiencies due to the lower rpm and higher de-rating.

The main engine, auxiliary engines and auxiliary boilers are all connected to the integrated Wärtsilä scrubber. The scrubber effectively reduces sulphur oxide (SOx) emissions, and meets the 0.1% sulphur limit even with HFO with a sulphur content of 3.5%.

A post combustion nitrogen oxides (NOx) abatement Wärtsilä Selective Catalytic Reduction system has been placed before the turbocharger turbine of the main engine. The SCR will reduce NOx emissions by more than 90%.

“The abatement equipment is tuned with the main and auxiliary engines for effective operations across the complete load range and IMO Tier III requirements can be fulfilled,” says the company.

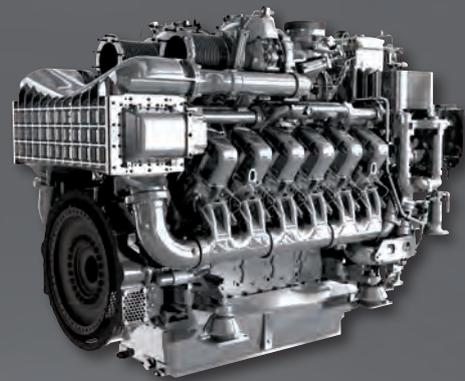
## Clarification

In our September issue we featured an opinion piece entitled ‘On the Vapour Trail’ with a photograph of a ballast water system. *The Naval Architect* would like to make it clear that the story referred to ballast water systems in general and not to a single ballast water treatment system.

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## BWM on a wing and a prayer

**B**allast water management (BWM), and the implementation of the convention has been high on the agenda in the past weeks, not least within the Marine Environment Protection Committee deliberations, although feelings have been mixed as some admit to being frustrated, while others point to progress achieved, *writes Sandra Speares*.

Part of the frustration, according to some owners, is generated by the feeling that the industry is being asked to test systems to see if they meet the necessary requirements, when they feel the process should have been reversed and guidelines should only have been put into place with the knowledge they would work.

One issue for owners with newbuildings in the offing is whether they should take the risk and delay installation of BWM systems pending fine tuning of the criteria to back them, or make a substantial investment on the off chance. As the shipping industry is not best known for the latter strategy, it seems likely that many may decide to “wing it”.

While some involved in the development or marketing of BWM systems suggest that pricing may be as much as 25% below the figures regularly carried in the trade press, the US\$1.5-\$2m figure continues to be widely quoted.

Another concern is that of whether the individual systems on offer will actually deliver what they say they can. There will need to be an evaluation of which systems really work and which, are breaking down in practice. One company marketing BWM equipment suggests that a shake out of suppliers is likely as they fail to perform, even among those that have received IMO approval.

According to IMO statistics there are now 28 type-approved BWM systems available.

To date, 36 states, with an aggregate merchant shipping tonnage of 29.07% of the world total, have ratified the BWM Convention. The Convention will enter into force twelve months after the date on which not fewer than 30 States, the combined merchant fleets of which constitute not less than 35% of the gross tonnage of the world's merchant shipping, have become parties to it.

Problems with the new convention have been highlighted by the International Chamber of Shipping, which has suggested that the type approval process is “seriously flawed”. It has also voiced concerns about the time line for retrofitting so many vessels to meet the requirements. Commenting at the end of the MEPC meeting ICS Secretary General, Peter Hinchliffe, remarked: “It is good that many governments seem to accept shipowners’ arguments that it will be very difficult indeed to retrofit tens of thousands of ships within the timeline of two or three years after entry into force as the Convention text currently requires. IMO has agreed to

develop an IMO Assembly Resolution, for adoption in 2013, to facilitate implementation work smoothly.”

The time line, however, continues to be a cause for concern as the next meetings will take place late next year.

According to Tim Wilkins, senior manager, environment at Intertanko, the recent MEPC 64 meeting was a starting point to a more practical implementation schedule for the convention. However he says it would be good to have more certainty on the schedule before the issue is due to be finalised at the Assembly meeting in November 2013. A lot of newbuildings will be arriving between now and then, not to mention the other work that needs to be done to refine the type approval process, port state control issues and the other issues that were covered at MEPC 64. However, “there are chinks of light coming through,” he said.

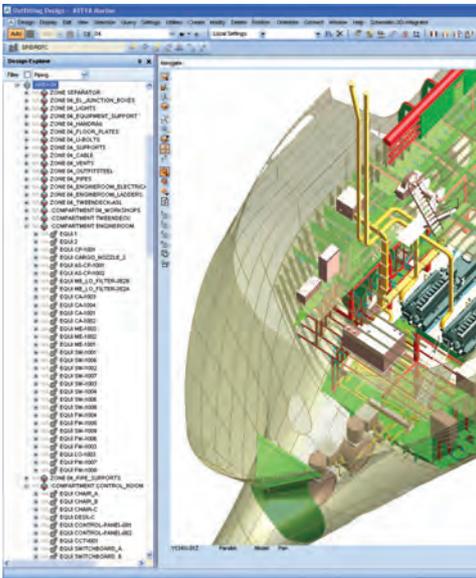
A lot of owners are building ships at the moment that do not have BWM systems installed simply because they do not have confidence that the systems will work given the costs of their installation. Wilkins says that the yards are confident that they can fit the necessary systems in time.

Intertanko has been approaching its members to ask them about whether systems that have been installed work or not. Wilkins said that some owners had stripped the systems off their ships because they kept on breaking down.

While feedback is an important part of the process, there is a certain sense of frustration that feeding back information to the IMO which may potentially point to the type approval process being flawed. “The whole point of type approval is you fit a system that is type approved and it will work”, Wilkins says.

Results from MEPC included instructing the Bulk Liquids and Gases Sub-committee (BLG) to provide additional guidance on the application of the G8 guidelines to address the issues raised in the Intertanko submission to the meeting. MEPC established a correspondence group, led by Japan, to develop a draft IMO Assembly Resolution in relation to the implementation of regulation B-3 of the BWM Convention. This in effect should see a more realistic and practical implementation schedule for the Convention, according to Intertanko.

MEPC approved an MEPC circular on issuance of BWM Certificates prior to entry into force of the BWM Convention and also agreed to instruct the BLG and Flag State Implementation Sub-committees that sampling and analysis procedures for port state control should be no more stringent than what is required for type approval of BWMS. *NA*



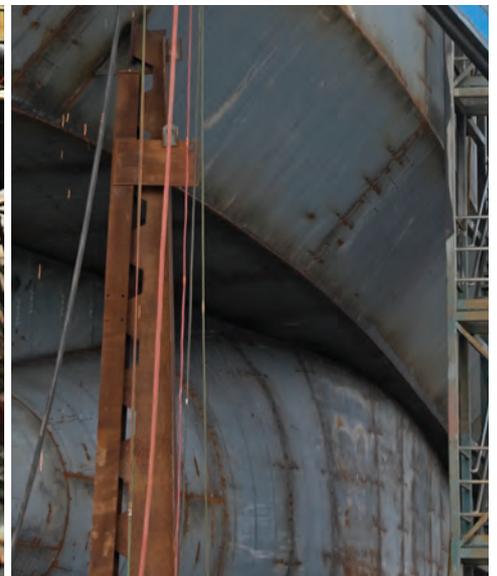
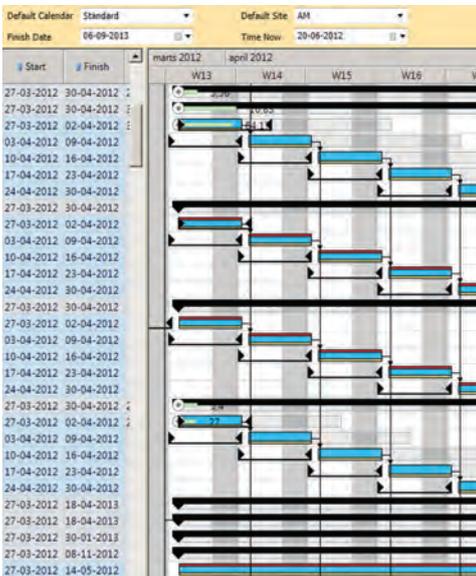
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## Engines

## MTU gets a restyle

Tognum subsidiary MTU Friedrichshafen GmbH has unveiled its Blue Vision New Generation automation system.

It is an automation system for the monitoring and remote control of propulsion systems based on the MTU Series 2000 or 4000 engines. The system will be available in a non-classifiable version called Blue Vision Basic New Generation and in an expanded classifiable version called Blue Vision Advanced New Generation. The latest automation system has undergone sea trials on a yacht that is propelled by twin 16V 2000 M93 engines from MTU, each delivering 1,790kW power output.



Blue Vision Basic New Generation is a new automation system for monitoring and control of propulsion plants in yachts and workboats with MTU Series 2000 or 4000 engines

Also being launched by MTU is its latest redesigned bridge components. Equipment such as control levers, displays, operating consoles and instruments have been styled by Italian designer Pininfarina. With its standard, latest smooth look for these components, MTU is responding to the exclusive requirements of yacht owners. The Pininfarina-designed equipment can be integrated into any yacht control stand, and is, therefore, also suitable for modular-built series yachts. It is also to be made compatible with MTU's Blue Vision Basic New Generation automation system.

[www.mtu-online.com](http://www.mtu-online.com)

## Engines

## Green Cats eye better performance

The latest C175-16 marine propulsion engine from Caterpillar Marine Power Systems will offer better size, power and rpm, says the company. The latest in a line of high performance engines has been designed to meet US EPA Tier 3 and IMO Tier II emissions requirements, the C175-16 is rated at 2001 – 2168kW @ 1600rpm.

With a bore of 175mm (6.9 in) and a stroke of 220mm (8.66in), the C175-16 will provide increased propulsion output in a high-speed engine platform. Additional features include turbocharged and aftercooled aspiration, MCS approved monitoring, alarm, and protection system, cross-flow head design and a simplified electrical system.

In response to customer needs, every core component in the C175-16 engine is designed for greater strength and durability. The engine offers 13% more power capability in the A and B duty cycle propulsion ratings with minimum footprint changes, along with a significant reserve power capability.

The C175-16 utilises ACERT Technology. Cat engines with ACERT Technology feature optimised turbocharging and aftercooling to provide reliable maximum power output.

The engine also features the Cat common rail fuel system enabling low emissions at all levels and requires no aftertreatment to comply with regulations, says Caterpillar.

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## Ancillary equipment

## Parker Hannifin corners the Italian market

Parker Hannifin Corporation and Samos has announced that Samos will distribute Parker Racor Village Marine Tec (VMT) water makers systems for the Italian Marine Market. The Racor Village Marine Tec reverse osmosis water purification systems and related service parts and accessories will be marketed alongside the Racor VMT Bilgewater separators. With expanding production starting in Italy to help bring support closer to the market and new products being developed working with the Experience of Samos was a natural choice, says the company.

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Samos will distribute Parker Hannifin's water makers



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Lifesaving and ship safety

## Carnival UK agrees contract with Survitec

Carnival UK has selected Survitec Group to provide critical safety equipment and management services for seven cruise vessels within the Carnival UK fleet.

Working closely with the Carnival UK onboard safety team, Survitec has devised a bespoke solution to provide onboard safety solutions with a hassle free management package. Survitec will replace life rafts with new rafts from the RFD Endura range on a long term hire contract. The company will also plan and manage all equipment servicing and safety certification in line with SOLAS regulations, with much of the servicing work and direct liaison with Carnival UK vessels being carried out at Survitec's service station in Southampton.

[www.survitecgroup.com](http://www.survitecgroup.com)

Propulsion

## Steerprop propels Italian-built passenger ferry

Steerprop Ltd. has been contracted to deliver the main propulsion system to a passenger ferry due to be built for Société des traversiers du Québec (STQ) by Fincantieri.

The vessel will be larger and faster than its predecessor and will be more efficient and environmentally friendly through the use of innovative technical solutions to improve total efficiency, says the company. The vessel will operate year round in the St. Lawrence Bay in Canada starting in late 2014.

Steerprop Ltd. has been contracted to deliver two SP 120 ECO CRP propulsors, each of these propulsors has a power rating 7,000kW. To ensure their safe operation year round, the propulsors will be ice-classed in the demanding Finnish-Swedish 1 A Super ice-class. Utilising the Steerprop Dual-End Contra Rotating Propellers (CRP), the propulsors are projected to offer a significant increase in efficiency and will cut down on both emissions and fuel consumption, says Steerprop.

[www.steerprop.com](http://www.steerprop.com)

Ancillary equipment

## Alewijnse gets smart

Alewijnse Marine Systems has brought a prototype of the very latest in screen technology to the superyacht industry. The Transparent Smart Window Screen will transform a simple window into multi-media platforms, says the company.

The Transparent Smart Window Screen looks like a sheet of glass. Once it is powered up individual icons and frames can be selected to give access to applications and computer programmes while maintaining a view of the world beyond, or all incoming light can be cut out enabling the Smart Window Screen to act as a black-screen monitor for TV and movies. Future capabilities which are under development will include touchscreen operation and even a virtual blind function that allows the user to control the amount of light coming into the room.

Alewijnse has evaluated the Transparent Smart Window Screen from a superyacht perspective and has introduced additional solutions for integration into ship-wide entertainment and IT systems. The screen is initially available in any size up to 46-inches, with larger options coming soon. Resolution is 1,366 x 768 pixels and input is via USB and HDMI. The Transparent Smart Window Screen can also be retrofitted. In addition these screens can be used for other applications such as displaying navigational or situational information.

[www.alewijnse.com](http://www.alewijnse.com)

Navigation

## TU Varna gets NAUTIS & RescueSim

The Technical University (TU) of Varna, Bulgaria officially opened its latest simulation training centre. The centre incorporates multiple VSTEP NAUTIS and RescueSim simulators that will be used for both maritime and incident management education and training.

Simulation developer VSTEP was selected as simulator contractor for the centre and has delivered two NAUTIS Bridge Simulators, including a 360deg Full Mission Bridge Simulator delivered in line with DNV Class A specifications, as well as five Engine Room Simulators and a full classroom with desktop Navigation Simulators for maritime training. A VSTEP RescueSim simulator was also delivered for incident management training.

Both the Maritime and Incident Management Response simulators include innovative concepts, says the company. The NAUTIS simulators feature the IMO Type Approved Kelvin Hughes Manta Digital ECDIS and radar/ARPA systems, with the radar video delivered by the recently released NAUTIS Radar Interface Module. The NAUTIS bridge can also be turned into an azimuth tug simulator in less than an hour. The ship controls can be easily exchanged, allowing students at TU Varna to train on a wide variety of ships and propulsion types. The RescueSim simulators allow incident response training, increasing preparedness and optimising response strategy during actual calamities.

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# Living the dream

Regulations governing the design of lifeboats are clearly inadequate says Capt Michael Lloyd, FNI, MNM. The regulations were designed by those living in a dream-world, but their dream could turn into others' nightmare

Seamen in general, are a stoic breed, which is to the advantage of not just the owners, but all those who have a hand in the design of the ships and associated safety equipment.

Now, having said that, I must follow with the caveat that you get what you pay for. Undoubtedly, for the majority of ship managers and owners, provided the ship or the equipment meets the existing legislative standards and does the job, then cost is the next imperative and regrettably, in most cases, the cheapest gets the contract and the way in which the type testing is allowed around the world, it is not surprising what passes as 'approved'.

I am sure that many of those who design the lifeboats, knowing what they could design, must feel the same frustration that the users experience when we are faced with some of the aberrations that are on the ships today. So this is not a critique of the designers, rather an assessment of some of the existing failures of the legislation under which our boats are designed and approved. Demonstrated amply by the legislation which allowed the on load quick release hook problems to develop and which have caused so many accidents. This is, and must be, a separate subject on which so much has been written already.

A ship's lifeboat today is designed for one purpose, to enable those on board a sinking ship to abandon that ship and to sustain them while they await rescue and yet increasingly there seems to be an unspoken thought which is that we have to provide these because the rules say so, but we don't think they will ever really be used in anger so let's not take it too seriously.

A prime example of this is the ludicrous notion that you can have an enclosed lifeboat/rescue boat.

In 1982 I wrote for Safety At Sea the following; 'The main Disadvantage

of an enclosed boat is that it is a boat designed for abandoning ship and nothing else. A ship equipped with just enclosed boats is in a poor position to deal efficiently with a man overboard situation. I strongly believe that if enclosed boats are to be carried then an adequate seaboat should be carried also, designed to perform the duties of a rescue boat should the need arise.'

To take a lifeboat, put go faster stripes on it, increase the power of the davit winches and label it a rescue boat is like taking a white van, putting a red cross on it and calling it an ambulance. Apart from the fact that once launched at sea even in moderate weather conditions, it is practically impossible for the average ship to recover it owing to the severe difficulty in hooking back to the on load quick release gear.

In addition the helmsman's view is very limited and there is no requirement for a windscreen wiper, essential in any sea conditions especially close to the sea surface, no requirement for any walk way for crew to work outside the boat, no requirement for a Jacobs ladder or similar retrieval system.

I could go on, but I am sure that anyone with the slightest knowledge of seamanship can understand the problems. It is quite startling to realise that ships of over a century ago had a better chance of rescuing people than many merchant ships today. They also had plenty of practice in boatwork as well which, with our enclosed boats and reduction in formal boatwork training, seamen today rarely have. Giving seamen who are less experienced more difficult boats to handle hardly makes sense does it?

Now let's move on to the lifeboat. Lifeboats are essential for abandoning a ship, no argument there, so why is it that cruise ships are allowed to go around with only 75% lifeboat capacity

relying on liferafts for the rest? Liferafts are fine in their place, but as emergency support, not the main means of rescue; especially when their type testing is allowed in a swimming pool which hardly resembles the open seas on a stormy night. Not that the testing of the lifeboats are much better. Only the odd mention of place of testing is the occasional reference to a seaway which is any inland waterway leading to the sea, even a canal.

So, on a hotel ship with a complement of 4,000 souls, we have around a thousand people, presumably crew as I can't see those in the upper deck suites being allocated a place in a liferaft, trying to get into liferafts while the rest board the boats. Unless of course those crew assigned to the liferafts decide that they should be in the boats as well, a not unimaginable situation.

According to the LSA code 2010, the lifeboats, which are allowed to carry up to 150 persons will be boarded in 10 minutes or if you prefer, 15 people per minute. Frightened and confused, probably with the ship listing, and in the dark, a figure such as this can only have been inspired in the same dream factory as the lifeboat/rescue boat. What about the handicapped struggling to get to the boat in their wheelchairs? Provided they can actually move them which, if the ship is listing, they cannot. Try pushing a wheelchair at an angle of 15%.

Of course if they are on a different deck, with the lifts shut down and only stairs, a fast crawl may be the only option. Considering the increasing number of elderly, infirm and handicapped people now sailing on these ships, I find it incredible that no one has given thought to specially designed boats for these passengers. In Europe, we have redesigned our entire cities to cater for the handicapped so why can't we do the same for a lifeboat?

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Otherwise if this cannot be done, we must ask why they are allowed in such numbers on the ships in the first place?

The fact that if the boats were smaller, they could be embarked and sent away faster also seems to have escaped our legislators. Even then, the stated aim of evacuating a cruise ship in 30 minutes with thousands of people on board is impossible even in good weather.

Finally, once the boats are away what next? 150 people packed together in a boat, unless immediately rescued, will soon begin to want to perform bodily functions and with no way of getting out on deck that leaves the boat the only option. Unfortunately this requirement also seems to have escaped the attention of the legislators with no requirement even for the most primitive type of lavatory. It is easy to imagine the condition of the boat within a few hours. Lavatory paper

would possibly be of more use than fishhooks as well.

Then there is the engine noise. The legislation states that it must be subdued enough for a shouted order to be heard. That's it. I have yet to have a lifeboat that I could give an order without having to stand and shout into the ear of whoever I was giving the order to, and yet I can go on a leisure craft with twin engines at full speed and talk quite normally in the cabin.

As cruise ships get bigger, so does the problem and eventually must come the recognition that drastic new considerations are going to be needed to deal with the situation. It is not difficult, just boats built with the aim of saving lives efficiently rather than conforming to legislation written by politicians rather than seamen.

It is going to cost a lot of money, especially when we may have to devote

an entire deck to assembly, boats and embarkation, which is probably why the industry is trying to bury its head in the sand and continues to apply a plaster when serious surgery is required.

This mind-set that the boats are not really required is a mind-set that encourages tragedy instead of realistically facing up to the very real possibility that ships that float on water can sink, regardless of the technology and equipment. Somewhere, someone uttered those dreadful words, 'the ship is a lifeboat.' Probably in the same dream factory that said we could get everyone off in 30 minutes. Legislation written for the convenience of the owners and suppliers rather than those at sea is becoming a hallmark of our maritime culture. Let us hope that in the years to come people don't look back as they do with *Titanic* in disbelief at what was allowed. **NA**



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# New Panamaxes get a wide berth

Expansion of the Panama Canal locks is about to change the way naval architects design ships, says Paul Stott senior lecturer at the School of Marine Science and Technology University of Newcastle upon Tyne, in a paper to the Low Carbon Shipping Conference held at the university in September 2012

**T**o the generation of naval architects practising at the time that the Panama Canal opened in 1914, the idea of a ship large enough to be constrained by the 33.52m width between the lock walls would have been almost unthinkable. To the current generation of practitioners the limiting panamax beam of 32.3m, 0.60m clearance either side of the vessel, comes as second nature, providing a hard constraint governing the design of ships up to a certain size.

This is about to change with the completion of a new set of locks and the deepening of channels to enable larger vessels to transit the canal. The US\$5.8 billion project was due for completion in 2014, precisely 100 years after the original opening, but, as is the way of things with such large projects, is currently at least six months behind schedule. Whenever the new channel does open the rules for ship designers will have changed.

This subject has been of significant interest in the consideration of low carbon shipping (Stott, 2012) for the obvious reason that larger vessels that may develop as a consequence of the relaxed constraint would confer economies of scale in the reduction of emissions, as well as in monetary terms.

Development of larger ships may result from the demand from shippers for transporting larger parcels in some fleet sectors. What is probably more significant than this for naval architects will be the change in the parametric basis on which, panamax hulls will in future be designed and optimised, and the precise nature of the new limiting constraints.

Unlike the existing constraint that is beam limited for all vessels, in the expanded canal the nature of the limitation changes depending on the



Figure 1: *USS Missouri* passing through the Panama Canal in 1945 (Wikipedia Commons)

proportions of the hull. It should also be noted that the existing constraint is not about to disappear. The old locks will remain in service alongside the new larger channel, so the existing constraint will remain relevant in some contexts. The panamax constraint is, therefore, about to move from the simple beam limitation that we are all used to, to a complex set of constraints the precise nature of which will depend on circumstances.

It is easy to overlook the importance of this change because the Panama Canal is in reality something of a backwater in 21<sup>st</sup> century shipping. In 2010 barely 2.5% of global seaborne trade passed through the Canal. Given that the demand for ships is in an economic sense a derived demand, that is to say derived from the requirement to move cargo, one would be forgiven for anticipating the change on ship design to be limited. Notwithstanding the limited volume of canal traffic, however, the relevance of the

beam constraint in the fleet is significant. Some 25% of all deep sea vessels (defined here as above 5,000gt), around 8,500 ships in total, have panamax beam and the range of ship types in the panamax fleet is far wider than bulk carriers and container ships.

The reason for the disproportionate presence of panamax beam in the fleet, compared to trades through the canal, lies in the nature of the perception of risk in the eyes of ship owners. Ships will comply with the beam constraint in case they ever have to transit the canal, rather than being directly related to a specific intention to route through it. Not to do so would reduce the flexibility of the vessel that, in economic terms, would increase the volatility of earnings and reduce the resale value of the ship.

## The influence of the Canal on ship design

Given that the original *raison d'être* for the development of the Panama Canal was strategic, to enable the US Navy to deploy readily on either East or West coast, it is perhaps not surprising that the first panamax vessels were military. The *USS Iowa* class, of which four were commissioned in 1943 and 1944, had an extreme breadth of 33.22m, stretching to the limit the potential of the panamax beam constraint by leaving only 15cm clearance either side when passing through locks.

The earliest record (Fairplay, 2012) of a commercial panamax bulk vessel was the tanker *W. Alton Jones* built for the Halcyon Steamship Company by Newport News of Virginia, one of three 70,000dwt tankers built by the shipyard in 1954. Unlike modern panamax tankers that almost exclusively carry oil products, these early ships were the large crude carriers of their day.

The earliest listed panamax products tanker, representing what we now regard as a panamax tanker, came along 10 years later with *Tanja Dan* built in 1964 by Mitsui Tamano for an un-recorded owner. The early panamax crude oil tankers were closely followed by three panamax oil/bulk/ore carriers (OBOs) built by Mitsubishi: *Veedol* in 1955, *Massachusetts Getty* and *Pennsylvania Getty* in 1958, all for Chevron Corporation.

The first dedicated panamax dry bulk carrier, the (small by modern standards) 58,000dwt *Pacific Maru* built for NYK lines by Kawasaki, came along a year later in 1959. This ship was large for its era but, interestingly, was built at the very start of the development of dedicated bulk carrier shipping, prior to which, with the exception of colliers, bulk cargoes were generally carried in relatively small parcels by tramp ships.

The first reference to panamax in relation to container ships, according to the Oxford English Dictionary, was in 1972, in a prescient article predicting that container vessels could expand to become as large as 5,000 to 10,000TEU! The first panamax container ship was the 2,450TEU *Kamakura Maru*, again surprisingly low capacity by modern panamax standards, built by Mitsubishi Kobe for NYK Marinera Shipping in 1971.

By the 1970s the term panamax had become more than simply a reference to the beam constraint and has since that time been used to designate classes of vessel. The largest of these classes is the dry bulk panamax sector of which there are currently 2,224 ships and a further 703 on order (Clarkson Research, 2012). The next largest is the panamax container sector of which there are currently 961 vessels with 26 on order. The smallest panamax class is the tanker sector, of which there are currently 415 ships and 39 on order.

It is not only in these eponymous classes where the constraint is used, however. The smaller handymax bulk carrier sectors, constituted by vessels between about 40,000 and 55,000dwt, also commonly adopt the panamax beam constraint to maximise the available cargo volume within the hull. These smaller classes are in fact larger than the panamax sectors,

with around 1,350 handymax tankers and 2,654 handymax dry bulk carriers in the fleet. Beyond these major classes there is a wide range of vessel types, from cruise ships to dredgers, where individual vessels have adopted the panamax constraint.

**The new constraints**

The complex set of regulations applying to ships transiting the canal are set out in the Panama Canal Authority’s notice to shipping generally referred to as the “Vessel Requirements” (Panama Canal Authority (PCA), 2010). Inter alia the Vessel Requirements set out the limiting dimensions and the 2010 revision of the document for the first time referred to the limitations that will apply following expansion. These are summarised as follows, set against the former limitations for comparison.

ships. The draft refers to the ship’s draft in tropical fresh water.

**The implications of change**

A modern capesize bulk carrier of 180,000 tonnes deadweight has a length of about 292m, beam 45.0m and draft 18.2m. Such a vessel will fit within the new locks, but is too deep to pass through the access channels. This opens up the proposition that for bulk carriers the canal will shift from being beam constrained to become draft constrained. Capesize vessels will be able to transit the expanded canal in ballast or partially laden. The limiting draft will constrict fully laden vessels to around 120,000dwt, estimated from the data presented in Figure 2.

Such an increase in vessel size would confer a significant benefit in terms of economy of scale and corresponding

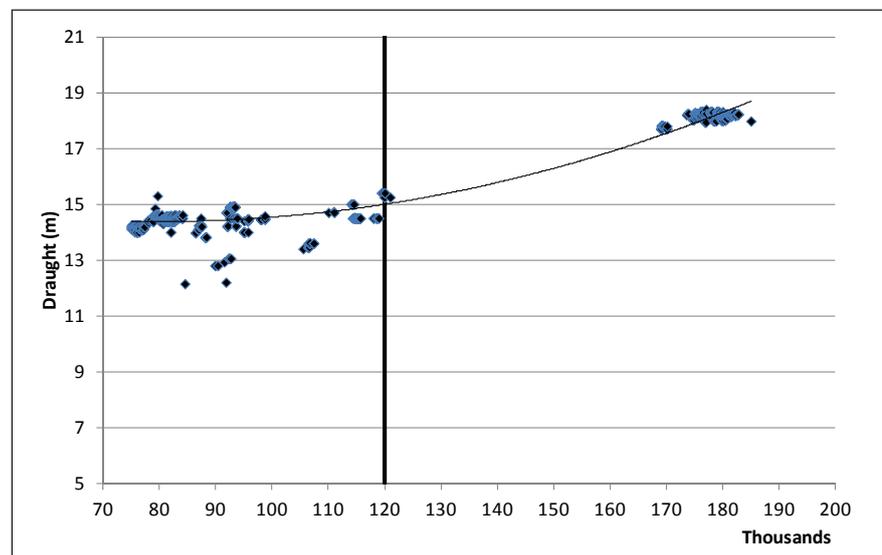
Table 1: Summary of panamax limiting vessel dimensions

	Length (m)	Beam (m)	Draft (m)	Air Draft (m)
Old Panamax	289.6	32.31	12.04	57.91
New Panamax	366.0	49.0	15.2	57.91

The new length and beam constraints are determined by the new third lock chambers and the new draft constraint determined by channel depth, with approach channels being dredged to accommodate the larger

reduction in emissions per tonne mile transported when compared to a conventional panamax bulk carrier, but only if shippers are able to make use of the larger tonnage. Data presented

Figure 2: draft of existing bulk carriers, showing the limit of deadweight at 15.2m



in RINA Transactions for December 2011 (Stott and Wright, 2011) demonstrated that bulk carrier operators are ready for a larger class of ship, based on analysis of bulk parcel sizes. This is confirmed by comparison of the profile of size of bulk carriers ordered since the announcement of the expansion of the canal in 2006 with those ordered in the 10 years before the announcement, as shown in Figure 3.

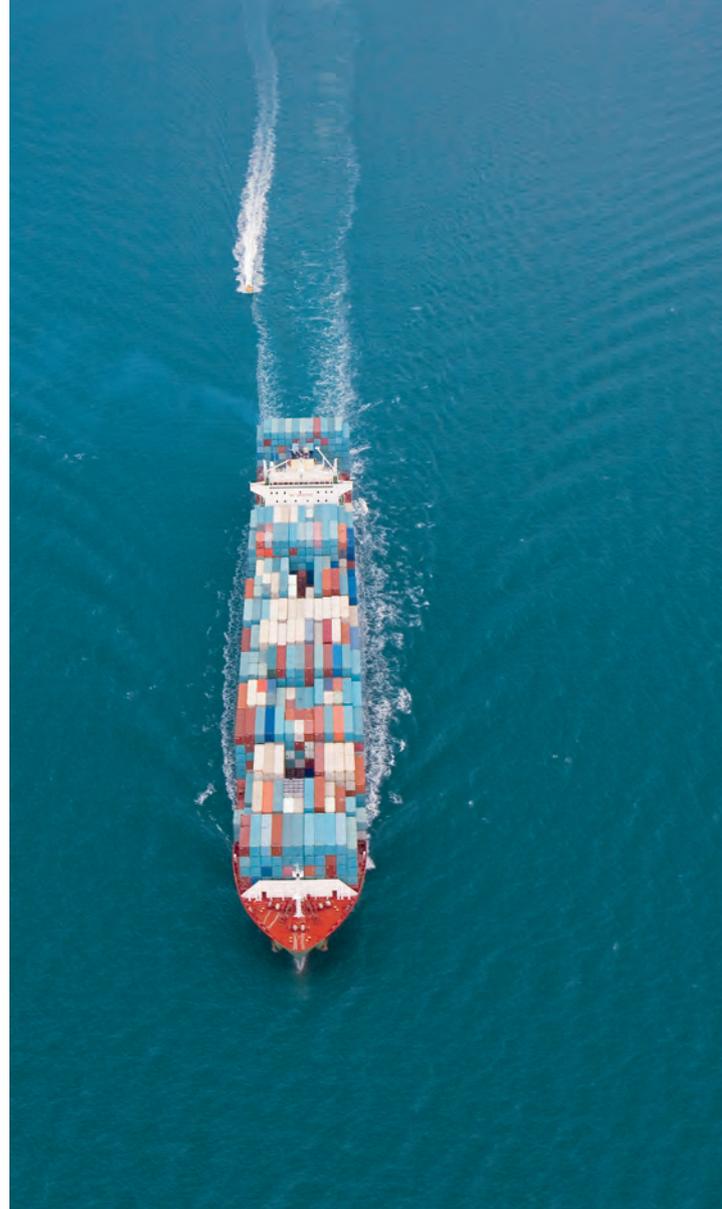
Early adopters of the new panamax class can clearly be seen in Figure 3 in the shift in the black line to the right in relation to the old panamax limit, with the emergence of a new class of ship currently designated by the market as 'mini-cape'. These mini-cape vessels are effectively the new panamax class although owners are currently clearly being cautious in relation to the potential to take advantage of the new 120,000dwt limit.

Whilst bulk carriers constitute the largest number of transits, the canal expansion programme is aimed specifically at increasing the transit of containers, to maximise the benefit of the asset to the Panamanian economy. When control of the Canal passed from the United States to the Government of Panama on 31 December 1999, the basis of calculation of charges for transits changed. Under the US regime the charging was based on the cost of operation and maintenance. Under the new regime charging is based on the value of the transit to the shipper. Because of the time value of the cargo, container shipping pays relatively more than other cargo sectors. In 2010 container ships constituted around one quarter of all transits but provided over 50% of revenues (Panama Canal Authority (PCA), 2011).

Studies undertaken for the PCA (Panama Canal Authority (PCA), 2006) estimated that the new Canal would facilitate an increase in the maximum size of container ship from around 4,800TEU to around 12,000TEU. The largest vessel within the constraints, however, is currently around 13,200TEU. A good example is *Maersk Edison* which featured in *The Naval Architect Significant Ships of 2011*. The vessel has a length of 366.32m, beam 48.2m and design draft 14.5m (it is important to differentiate the designed operating draft for the vessel from the designed maximum scantling draft of 15.5m). This suggests that container ships will become limited by length at 366m. Whether optimisation can arrive at a container ship within the constraints that can exceed 13,200TEU remains to be seen.

In the tanker sector the expanded Canal will permit transit of fully laden aframax tankers, the largest in this class having a deadweight of around 120,000 tonnes, with dimensions 250m length, 45m beam and 15.2m draft. Such a vessel constitutes the theoretical new panamax class for tankers. As with the dry bulk sector, however, the limitation is set by draft and larger vessels will be able to transit when not loaded down to their marks. A typical suezmax crude oil tanker of 160,000dwt has a length of around 274m and a beam of around 48m but laden draft of around 17m. The expansion opens up the possibility that such vessels could transit in ballast or partially laden.

Unlike in the bulk carrier sector there is no indication from parcel size analysis that panamax tanker owners are seeking a larger ship size than the current panamax form and there is no sign of any new class of ship developing within the current fleet profile (Stott, 2012).



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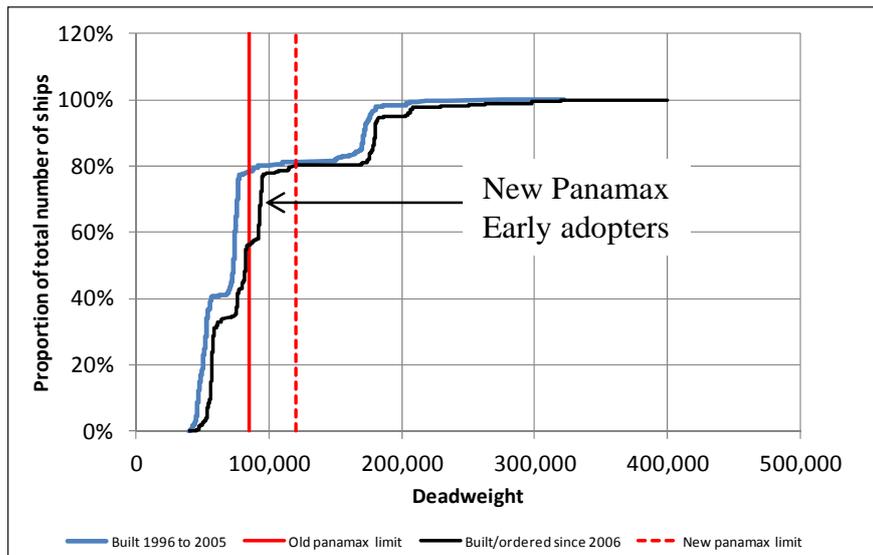


Figure 3: Comparison of bulk carrier fleet size profiles comparing ships built before and after the announcement of the expansion of the Panama Canal

In summary the change in constraint for panamax vessels can be seen in Table 2 below.

### Other limitations on sub-panamax ships

The preceding sections have considered the impending change to maximum vessel size for the main panamax ship classes. As indicated earlier, however, many smaller ships adopt panamax beam to maximise hull volume: what are the implications of the expansion for such smaller vessels?

Two factors should be taken into account in this respect.

1. In the expanded canal the capacity for the transit of ships within the old panamax beam constraint, through the existing two sets of locks, will be twice that for the new larger sectors, through the single new lane. In economic terms the capacity for larger vessel transits is considerably scarcer than for vessels within the existing constraint and is therefore likely to be more expensive. Increasing the beam of smaller ships may commit the vessel to higher transit charges.
2. Much of the world's ship repair capacity is limited to panamax capability. Exceeding

panamax beam for smaller vessels will force them to compete for drydocking space with much larger ships and this is will inevitably increase repair costs. Detailed analysis of the distribution of ship repair capacity (Stott and Wright, 2011) indicates that for vessels that will trade primarily in the Baltic or Mediterranean the availability of larger repair capacity is currently limited and this may constrain such ships to remaining within the traditional panamax limits.

For ships of traditional panamax deadweight or smaller, therefore, the temptation to increase beam above 32.3m should be very carefully considered, weighing any perceived advantage against the optimisation of such a dimension against the potential additional operating cost. *NA*

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Sector	Existing panamax	New panamax
Container	<ul style="list-style-type: none"> <li>• About 4,800 TEU</li> <li>• Beam-limited</li> </ul>	<ul style="list-style-type: none"> <li>• About 13,200 TEU</li> <li>• Length-limited</li> </ul>
Dry Bulk	<ul style="list-style-type: none"> <li>• About 85,000 T dwt</li> <li>• Beam-limited</li> </ul>	<ul style="list-style-type: none"> <li>• Capesize in ballast</li> <li>• About 120,000 T dwt laden</li> <li>• Draft-limited</li> </ul>
Tanker	<ul style="list-style-type: none"> <li>• About 80,000 T dwt</li> <li>• Beam-limited</li> </ul>	<ul style="list-style-type: none"> <li>• Suezmax in ballast</li> <li>• About 120,000 T dwt (afamax) laden</li> <li>• Draft-limited</li> </ul>

Table 2: Summary of the change in constraint

## Technological innovation heads industry development

Shipping rates are low, so are ship prices, has the ship market reached the bottom? Winning new orders is hard, so is delivery, are shipowners lacking interest in building new vessels? Liu Yin reports on the views expressed at the China Shipbuilding Industry Development Forum

Various marine regulations are being launched every now and then, raising the industry entry level ever higher. How should the China shipbuilding industry cope with them?

South Korea has chosen to snap up the high ground of marine engineering, while Japan relies on new technology R&D. How should China's shipbuilding companies react?

At the recently held Ship Economy and Trade 3rd Council First Meeting and China Shipbuilding Industry Development Forum, experts expressed the following views: China's shipbuilding enterprises must rely on technology innovation in order to survive in the current highly competitive market. Although it is difficult to forecast when the ship market will bottom out, there are still potential demands in the market. If the shipbuilding companies in China put effort into technology research and development, meeting new maritime regulations, upgrading standard ship models and the development of new high-tech ship models, they could achieve a breakthrough.

### New rules pose challenges and opportunities

According to Li Zhushi, vice chairman of the China Association of The National Shipbuilding Industry, the major reasons behind the present slow ship market are the slow recovery of the world's economy, the imbalance between shipbuilding demand and supply and the technology gap between Chinese shipyards and their Japanese and South Korean counterparts.

While it is certainly hard for shipbuilding companies to change the world's economy, a new balance between demand and supply would naturally be



Li Zhushi, vice chairman of the China Association of The National Shipbuilding Industry (CANSI)



Chen Hong, general manager of Chongqing Iron & Steel Co Ltd

attained in the long run as those less competitive players gradually get edged out, the technology gap is an area China's shipbuilding sector must work on.

In recent years, organisations such as the IMO and International Association of Classification Societies (IACS) have continued to launch new standards and raise their requirements for eco-friendliness and technological efficiency. This has exposed the inadequacy of China's shipbuilding sector.

Li said: "The entry level for shipbuilding is getting higher and higher, but Chinese shipbuilding enterprises seem to lack the means to reach it." The ballast water convention, the performance standard for protective coatings (PSPC) and the Energy Efficiency Design Index (EEDI), etc. are big challenges to Chinese shipyards which still lag behind their Japanese and South Korean competitors in terms of technological advancement. Chinese shipyards have to raise their standards to survive and grow.

However, the various new regulations and standards posed both challenges and opportunities, as they apply to every shipbuilding company in the world, thus putting everyone on a level playing field. They will eliminate incompetent players and provide a lift to those that are prepared in advance.

Li says: "If China's shipyards react properly, they have a chance to run in the forefront in this competition." Therefore, Li called on research institutes, shipbuilding companies ship accessories providers to focus on and promote R&D via various means.

### Demand still exists

At the forum, both industry analysts and executives from shipbuilding companies shared the same views about the current market situation that while it is hard to predict when the ship market will bottom out; there are still opportunities and some potential demand in the market.



Chen Liping, general manager of CSSC Guangzhou Longxue Shipbuilding Co Ltd



James Han, president of Wärtsilä China

According to Wang Ban, researcher of China Institute of Marine Technology & Economy, total ship delivery volumes in the world reached a historical high of 170 million dwt last year. In the first seven months this year, global ship delivery volumes amounted to around 100 million dwt. Even so, new ship deliveries may slow in the second half of the year, full-year newbuilding delivery volumes are still expected to reach a shockingly high level, at around 150-160 million dwt. All these figures show that the current market situation is still very harsh.

Cao Liqiang, deputy director of Jiangnan Shipyard (Group) Co Ltd, shared Wang Ban's view. According to Cao, it took three years for the ship market to bottom out

in the last market downturn, while the current market recession has been going on for four years, the management of Jiangnan Shipyard is of the view that the market could see a "U-shape rather than a V-shaped bounce back, and that the market is likely to stay sluggish for a while. The company estimated that ship prices of standard ship models are at the same level as 2000, taking into account the exchange rate and other factors. However, the profit margin of shipbuilding enterprises has narrowed due to the increased cost of raw material and labour.

Nevertheless, there are still opportunities in the market. Wang Ban suggested that since shipping rates remain low, shipowners are under pressure with rising operational costs. As old vessels are less economical to operate, shipowners still have reasons to build new ships and upgrade their fleets.

Chen Liping, general manager of CSSC Guangzhou Longxue Shipbuilding Co Ltd also agreed with Wang Ban. According to Liping, when sizeable shipowners in China compare their own fleets with their foreign counterparts, they would still prefer to build new vessels in the long run. In addition, the various new marine regulations have tightened the requirements of eco-friendliness, and thus forced shipowners to phase out some of their old vessels.

Rao Fuquan, general manager assistant of CSSC Guangzhou Huangpu Shipbuilding Co Ltd, takes Liping's view a step further adding that shipowners have told his yard that they were thinking of "buying in a low market". As soon as shipowners can get financing, or if shipyards could help them to secure funds, orders will flow in.

Wang Yang, vice president of Dalian Lianzhong Marine Group, said he believes this is the "buy low" thinking of shipowners is the route they must take. Wang Yang said some foreign shipowners have been negotiating with him lately expressing a willingness to build ships in China during the current market downturn at lower costs.

### Technology upgrades can turn a profit

If there are still opportunities in the market, how should Chinese shipbuilding sector



Wang Yang, vice president of Dalian Lianzhong Marine Group



He Xing, vice president of CSSC Guangzhou Marine Engineering Corp

win orders? Experts seem to think that the priority is to work on the three existing major ship types.

Li Zhushi said the country's ship product portfolio is still dominated by three major ship types, and these three ship types are where China's competitiveness lies. While South Korea has invested in offshore engineering and won market share; Japan has insisted on investing in new technology development and made progress; China should upgrade its three major ship types, making them more eco-friendly and efficient to meet the requirements of shipowners.

Concurring with Li Zhushi, Chen Liping said: "It is too early to give up on



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bulk carriers.” The competitors from South Korea and Japan, especially Japan, have not given up on major ship types either. For example, Japan’s Hizhino Shipyard is still building bulk vessels, but its technology level and efficiency is better than many Chinese shipyards. Chen Liping said China should strive to answer this question: How can China’s yards surpass Japan’s shipbuilders in the construction of the three major ship types?

Energy efficiency is now a constant requirement from shipowners, according to Wang Ban. Wang Yang also said foreign shipowners told him that they were interested in the 38,000tonne bulkers built by Japanese companies, which, he says, implies that new technologies still attract owners.

Experts from shipbuilding companies said at the forum that eco-friendly ship models that come with new technology indeed bring businesses. He Baoxin, director of Shanghai Waigaoqiao Shipbuilding (SWS) Co Ltd’s secretary section, said the well-known green, eco-friendly model of 175,000dwt capsize bulk of SWS has been well received by the market. The yard has already received orders for 150 vessels of that model. The company has also developed a new 180,000dwt capsize bulk and a new 206,000dwt Newcastle Max bulk carrier that has attracted a considerable amount of new orders.

The yard has recently developed a new model, a 321,000dwt VLCC. Through improving the shapes of the bow and the stern, increasing the diameter of the propeller the yard has managed to improve speed and energy consumption of that new model. The yard says that the VLCC has received an overwhelming response following its presentation at road-shows in Hong Kong and overseas.

Experts from research institutes said they would focus on new model development to support shipbuilding enterprises. Han Long from the Marine Design & Research Institute of China (MARIC) said the institute has speeded up its promotion of “selected ship types” in recent years. The company has accelerated the upgrading of its three major ship types through lowering the weight of the ships, improving the shape



Rao Fuquan, general manager assistant of CSSC Guangzhou Huangpu Shipbuilding Co Ltd



He Baoxin, director of secretary section of Shanghai Waigaoqiao Shipbuilding Co Ltd

and propulsion systems, upgrading the energy-saving and other systems and equipment on board, based on the latest international marine regulations. A series of energy-efficient, low cost, high value-to-money and competitive ship models, including 320,000dwt VLCC, 115,000dwt crude carrier and a 10,000TEU containership, have all been developed.

### Preparing for the high-end market

Apart from the three major ship types, experts have suggested Chinese shipyards

strengthen their R&D capability in order to compete in the high-tech and high value-added vessel and special ship markets. Wang Ban said there are still opportunities in certain specialised ship markets, such as LNG carriers and offshore support vessels.

James Han, president of Wärtsilä China, said despite the global economic downturn, Wärtsilä was able to keep its growth momentum as in 2011, according to the company’s interim report for the first-half of 2012, because Wärtsilä has adjusted its strategy to shift focus to marine engineering and specialised vessels.

Experts from Chinese shipbuilding enterprises concurred with James Han that the offshore equipment market is a growing area in the current market. According to He Baoxin, SWS entered the offshore equipment market in 2003 and has accumulated experience in the construction of FPSO (floating production storage and offloading) and *Offshore Oil 981*, a deep-water semi-submersible drilling platform.

The yard will proactively seize any opportunities in the offshore equipment market, He Baoxin said. Meanwhile, SWS’s 1,030,000m<sup>2</sup> offshore equipment base has commenced operations and was building two jack-up drilling platforms.

Moreover, SWS has established its own offshore equipment design company, which was developing an offshore support vessel model. Rao Fuquan also said that CSSC Guangzhou Huangpu Shipbuilding would input more resources on technology upgrades to enter the offshore equipment market. The company is ready to receive orders for offshore equipment such as submersible offshore support vessels, semi-submersible barge and drilling rigs etc, according to Rao Fuquan.

As a research institute, MARIC is going to further strengthen its offshore equipment division in order to help shipbuilding enterprises enter the market. MARIC’s offshore equipment division will leverage on its existing advantages to improve the designs of FPSO, semi-submersibles and jack-up drilling platforms, heavy-lift 1 pipelaying vessels and



Wang Ban, researcher of China Institute of Marine Technology & Economy

semi-submersible heavy-lift transport vessels; and to ensure that the designs meet international requirements. MARIC would also strive to break through the technical bottlenecks of dynamic position system and integrated drilling system, and to raise its own design capability of large-scale, complex offshore equipment. The institute would collect market data and input more resources on the development of semi-submersible service platform, drilling support barge and underwater supply vessel to path the way for its product diversification strategy.

Apart from offshore equipment, Li Zhushi suggested shipbuilding enterprises should pay attention to high-tech, high value-added ships and specialised ships. Li Zhushi said shipyards should grasp this quiet period during which they have less to build to focus on R&D of high-end products, such as luxury cruises. Besides, many of the existing fishing vessels in China are small in size and with out-of-date equipment which does not match the status of China as a major fishing country. Shipyards should grab this opportunity in the fishing vessel market, Li Zhushi says.

He Xing, vice president of CSSC Guangzhou Marine Engineering Corp, while concurring with Li Zhushi, said that the company would soon commence new projects on fishing

vessel conversion and construction. On top of that, the yard was also working with CSSC Chengxi Shipyard Co Ltd on a luxury cruise design and conversion project for a Taiwan shipowner. This could help the yard to accumulate experience on cruise design and conversion, says He Xing.

Chen Hong, general manager of Chongqing Iron & Steel Co Ltd, said the company has become China's largest ship

plate producer in the first half of 2012. In the first eight months, Chongqing Iron & Steel produced 1.2 million tonnes of ship plate, ranking first in China in terms of both volume and product variety. In the future, the company would put more emphasis on R&D based on the needs of shipbuilding enterprises and produce various types of ship plates that can fit into different types of high-end vessels and offshore equipment, he added. **NA**



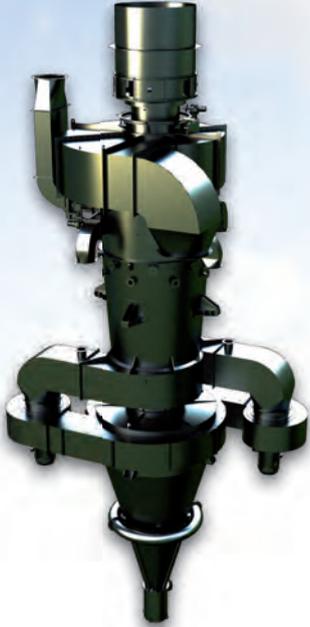
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# GL takes the sting out of emissions

Meeting increasingly stringent demands for cleaner ships is ever more difficult for owners and designers. Shipping is good value for the amount of cargo shifted per tonne of fuel consumed, but no-one is certain what the actual emissions are?

Germanischer Lloyd's Barbara Woltron and Martin Köpke report

Shipping represents the most efficient mode of transport. Its energy efficiency is most favourable when relating power output to performed transport work. However, society has started to call for 'cleaner' ships and ship operations. The shipping industry contributes to the anthropogenic impact on global warming and to the pollution of air and water, by releasing environmentally harmful substances during ship operations.

In recent years environmental regulations have tightened steadily and are expected to become even more stringent in the near future. Not only ship design, but operation is more in the regulatory focus, see Figure 1. In emission control areas (ECA) relative limits on operational sulphur and/or nitrous oxides are mandatory. The number of ECAs globally is expected to increase in the coming years.

The emissions considered in this study are, primarily those covered by the International Convention for the Prevention of Marine Pollution from Ships (MARPOL). This convention focuses on emissions discharged in daily ship operation, not those which may occur during emergencies.

MARPOL stipulates emission compliance with relative values rather than absolute amounts. However, records of absolute emissions are still rare in shipping. It is essential to gather reliable data by continuously monitoring emissions to be able to assess a ship's environmental performance and document improvements.

Both on a local and global scale industry derived environmental initiatives have been recently established, with the aim of evaluating the environmental performance of ships. While IMO compliance is mandatory, these environmental incentive systems pursue a business based approach. Companies sign up to the systems to promote the environmental sustainability of their fleet or to obtain a direct return on investment, e.g. funding of projects by installing cleaner technologies exempting owners and operators from the Norwegian NOx Tax or qualifying for discounts in ports.

Some of these initiatives have now begun to call for independent third party verification of the data.

This paper describes the methodology of assessing verifiable emission data and the calculation of total operational emission

amounts. The study is supported by three shipping companies which have provided documentation on operational emissions. The allocation of data onboard the vessels and the method of emission calculation are presented. The amounts determined are compiled in an emission inventory, which comprises the absolute values of emissions, to air and to sea, for each ship.

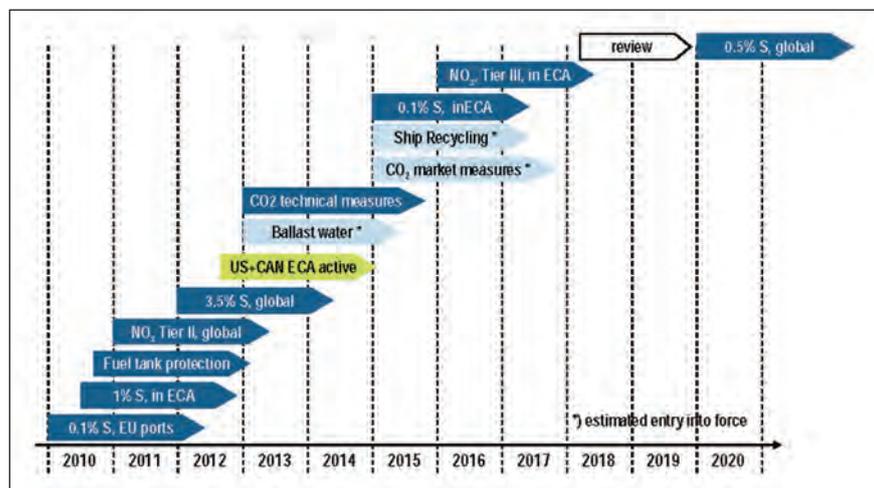
## The regulatory framework

Ships release emissions into the air and sea during normal operations. Emissions into the air include gaseous and particulate substances. Their occurrence is mainly linked to the combustion of fuel through the power generation and propulsion of a ship. Key compounds emitted include: carbon dioxide (CO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>), sulphur oxides (SO<sub>x</sub>), and particulate matter (PM).

Emissions into water may occur for various reasons at diverse ship to sea interfaces. The term 'emissions into water' is also used for emissions discharged to on-shore facilities, e.g. garbage. Oil is contained in bilge water, stern tube and thruster sealings. Sewage is accumulated as residual water from showers, sinks, toilets or from deck washing. Waste streams into the water may be imperative for a vessel in emergency situations for safety reasons. Uptake and discharge of ballast water maintains the stability and adjusts the trim of a vessel. Substances imperceptible to the eye may be introduced via any interfaces between ship and sea, such as toxins contained in the hull's paint.

MARPOL defines legally binding rules on the discharge of emissions into air and sea. The convention addresses the most significant ship emissions. The regulations cover ship design aspects for pollution prevention, monitoring and thresholds of operational emissions, as well as emissions from noxious cargo. MARPOL specifies

Figure 1: Overview of new environmental regulations for international shipping

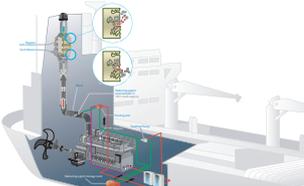


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relative values rather than setting absolute permissible amounts. For operational emissions Annexes I, IV, V and VI are most significant.

According to Annex I discharges of oily mixtures outside special sea areas are only permitted under certain conditions. The oily mixture shall be processed through oil filtering equipment which ensures that the oil content of the effluent without dilution does not exceed 15 parts per million, i.e. 15 gram oil per 1000 litres bilge water. Entries for discharges through oil filtering

Annex VI addresses air pollution, including NO<sub>x</sub>, SO<sub>x</sub>, PM, ozone depleting substances (ODS) and CO<sub>2</sub>. While ODS and CO<sub>2</sub> are considered greenhouse gases rather than pollutants, they are covered by the convention.

Nitrogen oxides are formed in Diesel engines during the combustion process under high temperature conditions. Engines installed on ships on or after 1 January 2000 need to comply with the requirements of the NO<sub>x</sub> Technical Code. Test cycles for a single engine or

Regulation of the sulphur content of fuels burnt is outlined in Table 1. Currently, the Baltic Sea and the North Sea are designated ECAs and the North American ECA became effective in August 2012.

Refrigeration systems installed on ships may be a potential source of Ozone Depleting Substances (ODS), e.g. chlorofluorocarbons (CFC), which are linked to global warming and climate change. The impact of ODS is defined by the ratio of the impact on ozone of a chemical compound, expressed as ozone

Effective	Global	Emission Control Area (ECA)
1 July 2010		1,0%
1 January 2012	3,5%	
1 January 2015		0,1%
1 January 2020*	0,5%	
* may be postponed to 2025, subject to review in 2018		

Table 1 Sulphur limits

equipment, i.e. oily water separator (OWS) and discharges of oil sludge to shore facilities are documented onboard in the Oil Record Book (ORB).

According to Annex IV the release of treated sewage is only allowed via an approved sewage treatment system at a maximum permissible discharge rate as described in IMO Resolution MEPC.157(55). A sewage treatment plant or sufficient holding capacity in tanks must be type approved and verified by a recognised organisation; effluents released must not exceed the limits defined in the regulation. However, it is not mandatory to keep a sewage record book onboard to document the quantities discharged.

Annex V prohibits the disposal of garbage into the sea. Exceptions outside special areas may apply and depend on the type of garbage and method of disposal. Vessels must establish a garbage management plan and maintain a Garbage Record Book (GRB) onboard. All discharges, whether to sea, ashore or via incineration, are to be documented in the GRB with an estimated volume for each category of garbage.

engine families determine specific NO<sub>x</sub> values for four different engine load points (25, 50, 75, 100%). A weighted average is calculated according to the test cycle. The NO<sub>x</sub> Technical Code specifies the value determined as “Engine’s actual NO<sub>x</sub> emissions value”. It is representative for the normal operation of the engine and specified in the Engine International Air Pollution Prevention Certificate (EIAPP Certificate), which must be carried onboard.

The quantity of sulphur oxide emissions produced during ship operation is dependant on the sulphur content of the fuel burnt. Adhering to this maximum permitted sulphur content is a mandatory requirement of MARPOL. Different limits apply worldwide and regionally, as shown in Table 1.

A bunker delivery note (BDN) is mandatory as per MARPOL Annex I and contains parameters of fuel received onboard. In particular the product name(s), quantities (metric tonnes), density at 15°C (kg/m<sup>3</sup>) and sulphur content (% m/m) are specified.

depletion potential (ODP), compared to the impact of a similar mass of CFC-11, a chlorofluorocarbon (CFC) and previously a commonly used refrigerant. The ODP of CFC-11 is defined to be 1.0. The ODS Record Book documents any consumption of such substances onboard.

Regulations for operational CO<sub>2</sub> emissions were adopted in July 2011 as an amendment to MARPOL Annex VI. The implementation of a Ship Energy Efficiency Management Plan (SEEMP) is mandatory from 2013 as an amendment to MARPOL Annex VI. A SEEMP is an operational tool intended to improve the energy efficiency of an individual ship. It describes energy efficiency improving methods for the specific ship and its operation, respectively.

Also introduced to reduce CO<sub>2</sub> emissions, the Energy Efficiency Design Index (EEDI) will be a new building standard for many ship types, mandatory from 2013. The EEDI represents the theoretic CO<sub>2</sub> emissions related to a ships transport work. While the EEDI is a once in a life time design index the Energy Efficiency Operational Indicator (EEOI) represents the operational transport

efficiency of a ship. The actual burnt fuel and emitted CO<sub>2</sub>, are divided by the actual conducted transport work for each voyage leg. A smoothed average for the EEDI is calculated by cumulating nominators and divisor for different voyage legs.

Beyond the MARPOL regulations the discharge of ballast water is regulated by the Ballast Water Convention. Ballast water is used to adjust the trim and maintain the stability of a ship. It may contain species and pathogens that, when discharged, may have a negative impact on the naturally existing marine ecosystem. The uptake, treatment and discharge requirements of ballast water are outlined in the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004. A record book documenting all ballast operations must be kept onboard. The convention is adopted by IMO, but not yet ratified.

An overview of operational ship emissions and their regulations is given in Table 2. It shows that generally operational emissions into air are only indirectly recorded via fuel consumption, while some of the emissions into water are recorded directly in official books onboard.

## Industrial standards and indices

In recent years the shipping industry has also begun to develop and establish voluntary environmental standards. These standards aim to promote cleaner ship operation and focus on monitoring and reporting operational emissions. Many also provide incentives and an environmental rating. Some of the initiatives require third party verification. Some of the more prominent standards and indexes are discussed below.

The Clean Cargo Working Group (CCWG) represents shippers, carriers and logistic companies who have agreed to collaborate to enhance environmental performance and energy efficiency within the global transport chain. The Group includes large multinational corporations (Wal-Mart, IKEA, Starbucks) and leading ocean carriers (NYK, CMA CGM, Maersk), representing more than 70% of global container transport. The CCWG established an intermodal emissions calculator which covers all transport modes.

Emission into air	IMO Regulation	Parameter to be recorded
NOx	MARPOL Annex VI, Reg. 13	[g NOx/kWh] to rated engine speed min <sup>-1</sup>
SOx	MARPOL Annex VI, Reg. 14	[mass/mass %] Sulphur content in fuel
ODS	MARPOL Annex VI, Reg. 12	[kg] consumption of ODS thereof ODP
CO <sub>2</sub>	MARPOL Annex VI, Reg. 22*	Ship Energy Efficiency Management Plan (SEEMP)
Emission into sea		
Oil	MARPOL Annex I	[ppm] oil content
Sewage	MARPOL Annex IV	No quantitative monitoring
Garbage	MARPOL Annex V	[m <sup>3</sup> ] estimated volume
Ballast Water	BW Convention (not yet in force)	BW management plan containing exchange or treatment procedures

Table 2 Emission regulation on operational emissions

The ocean segment of transportation only covers container shipping. The gathered data enables the environmental footprint of a transported good to be calculated. The data is broken down into four areas: CO<sub>2</sub>, NOx and SOx emissions; waste management; water effluents and chemicals; environmental management systems and transparency, i.e. public reporting of environmental performance of ships. Annual third party audits confirm compliance with the requirements.

The Clean Shipping Index (CSI) has been developed by the Clean Shipping Project, founded in 2007 in Gothenburg, Sweden. Requirements and calculations of the CSI are drawn from IMO regulations as well as regional systems and organisations, such as the Norwegian NOx Tax System, the Swedish National Maritime Administration and the CCWG. However the detailed requirements are more stringent than those stipulated in mandatory regulations.

The CSI determines the environmental performance of a verified ship as "good", "medium" or "low". Cargo owners may use the CSI as an instrument to benchmark vessels operation and to evaluate the environmental commitment of vessels and operators. The Index can be used for ten different vessel types. A vessel's environmental impact is assessed based on the emission of - CO<sub>2</sub>, NOx, SOx and PM, water, waste control and chemicals. The verification procedure for CO<sub>2</sub>, NOx and SOx performance includes office and onboard audits, as well as, third party verification and spot checks on the reported values.

The Environmental Ship Index (ESI) was established in 2008 by a group of fifty five ports world wide with the declared goal of reducing greenhouse gas (GHG) emissions and improving air quality. The index is part of a voluntary system intended to be used by ports to support improvements in vessel environmental performance.

The ESI is an incentive scheme used by shippers and ship owners as an evaluation tool and promotional instrument for all ship types. Participating ports grant discounts on harbour dues to ships which meet a set standard. Ship performance is assessed on air emissions.

## Methodology assesses operational emissions

The majority of operational ship emissions are reported directly or indirectly on board. To keep the administrative burdens at a minimum monitoring should be based on existing documentation. The availability of documentation onboard ships is basically determined by two constraints; legal requirements and owner/manager demands.

The majority of such record books are kept onboard as per legal requirements with their formats of the books and entries mandated by the flag state and by MARPOL. These are considered official documents. In addition so-called log abstracts are commonly kept onboard. They usually contain voyage data, such as distances, ports and fuel oil consumption. Based on the mandatory record books and log abstracts the total emission amounts can be calculated and estimated, without additional necessary documentation.

Vessel	Type	Delivery	Power Main Engine [kW]	Power Aux. Engine [kW]
1	Container	2007	25,270	4 x 1,840
2	Ro-Ro Ship	1995	13,000	4 x 4,500
3	Multi Purpose	2008	1,520	2 x 180

Table 3: Overview of investigated ships

The emissions considered are the same as addressed in MARPOL and by the industry standards aforementioned, as well as by the BW Convention.

In order to investigate the feasibility, administrative burdens and process of acquiring operational data and establishing an emissions inventory the data from three different ships were allocated and compiled. Three different ship types were chosen in order to gain a broader insight into operational patterns. An overview is given in Table 3.

Vessel 1 is operating on a scheduled service between the North Sea and the east coast of the United States, vessel 2 serves a trade in the Baltic Sea, and vessel 3 operates on charterer's demand in the Mediterranean, North Sea and Baltic. The itinerary of the ro-ro Ship (2) is entirely within an ECA, while the other two ships sail in both non-restricted areas and within the ECA's of the North Sea and the Baltic Sea.

Due to the different ages, flags and itineraries of the three vessels, required documentation varies between the ships. For example, a ballast water record book is not mandatory and one of the participating ships does not record the amounts of exchanged ballast water. Vessel 2, built before 2000, has no NOx certification for its engines. None of the participating

ships recorded amounts of sewage, or are required to keep a sewage record book onboard. An overview of the official documentation available onboard is given in Table 4.

During the study it became obvious that a large amount of data needed to be processed. Some voyage reports or log books are available electronically. But such electronic documentation is not considered as official log books and has no legal relevance. However, managers or charterer's request this data in electronic form in tables for further evaluation.

The format and extent of information given varies for every ship. Compared to the official documents, some of the tables provide identical or even more comprehensive information for the purpose of compiling an emission inventory. In the study priority was given to electronic files for reasons of efficient processing and calculating emission amounts. The verification of data was done via cross checks with the official log books.

Quantitative assessment of emissions in this project was performed in two approaches, direct and/or indirect calculation. Some record books, e.g. the garbage record book, display total amounts. The volumes extracted from the record book are summed up for the respective period of time. Indirect calculation was

mainly done for the emissions into air. The amount of emissions released is related to the fuel consumption, the fuel type and the engine load. Emission factors and formulas are utilised.

Onboard all of the ships the documentation was thoroughly maintained and the data up-to-date. However, for further processing and evaluation of the data it was crucial to agree on a single format. Together with the management and the ships' crews Excel spread sheets were created. Existing tables were amended for recording further input parameters.

### Calculation of operational emissions

Emission amounts of SOx, NOx, and CO<sub>2</sub> are not measured directly, but are derived from secondary data, such as quantity and quality of consumed fuel.

The calculation of quantities of emission values is based on the general mathematical expression:

$$E_x = \sum_{i=1}^n E_{x,i}$$

where:

- E is the quantitative amount of emission
- x is the type of emission
- i is the voyage leg
- n is the total number of sailed voyage legs.

Emission	Record Book	Vessel 1	Vessel 2	Vessel 3
CO <sub>2</sub>	ORB, log book	✓	✓	✓
NOx	EIAPP	✓	n/a	✓
SOx	BDN, ORB	✓	✓	✓
ODS	ODS record book	✓	✓	✓
Oil	ORB	✓	✓	✓
Ballast Water	BW record book	✓	n/a	✓
Sewage	Sewage Discharge Record Book	n/a	n/a	n/a
Garbage	Garbage Record Book	✓	✓	✓

Table 4 Official documents available onboard

By adapting the general formula the respective emissions into sea and into air are calculated and compiled in an emission inventory. Values were extrapolated for a period of one year.

The quantity of SO<sub>x</sub> emissions are calculated on amounts of consumed fuel oil and the sulphur content of the respective fuel. The sulphur content can be taken from the BDN, which could be also used for reasons of third party verification.

The conversion factor fuel to SO<sub>2</sub> is based on the molecular mass considering a complete chemical reaction. The atomic mass of sulphur (32.065) and two oxide atoms (2·15.999) equals the molecular mass of sulphur dioxide (64.063). Combustion of 1 kg sulphur subsequently results in 1.998 kg sulphur dioxide. The sulphur oxide emission factor is:

$$SO_2 \text{ emission} = 1.998 S_{\text{fuel}}$$

Where  $S_{\text{fuel}}$  is the sulphur content in fuel (%m/m). Multiplying the fuel consumption of all consumers, e.g. main engines, auxiliary engines and boilers, operated on a voyage segment with the conversion factor results in the total mass of SO<sub>x</sub> emitted.

NO<sub>x</sub> emissions are calculated with the rated power output for main and auxiliary engines, their operating hours and their specific NO<sub>x</sub> values derived from the engines' NO<sub>x</sub>-Technical Files. Ideally, an onboard continuous measurement of engine load provides accurate results. However, absence of onboard measurement on almost all ships led to the development of alternative calculation methods providing acceptable results, which are presented by the following formulas:

$$E_{NO_x} = \sum_{k=1}^{n_{\text{engines}}} \sum_{i=1}^{n_{\text{voyages}}} \bar{P}_{k,i} \cdot sNO_x \cdot t_i$$

Where:

$E_{NO_x}$  is the mass of emission [t]

$\bar{P}$  is the average engine load

$sNO_x$  is the specific NO<sub>x</sub> value [g/kWh]

$t$  is the time

$k$  is the engine, e.g. main engine, auxiliary engine

$i$  is the voyage leg.

In absence of a calibrated power measurement a mean power value for the voyage leg is taken, based on the above calculation:

$$\bar{P} = \frac{\sum FC_i}{SFC \cdot t}$$

Where:

FC is the fuel consumption

SFC is the specific fuel consumption

$t$  is the time of the voyage leg

$i$  is the voyage leg.

The figures are taken from the log book for main and auxiliary engines and exemplarily verified by ORB. The SFC derives from the NO<sub>x</sub>-Technical File or engine's manufacturer's test cycle reports. One of the investigated ships has engines installed before 2000 and not providing an EIAPP. Therefore, the specific NO<sub>x</sub> emissions were assumed as NO<sub>x</sub> Tier I values. Hence, this method represents a feasible approach for the calculation of total NO<sub>x</sub> emission for all engines irrespective of their age.

The amount of CO<sub>2</sub> emissions is calculated analogous to the IMO's Energy Efficiency Operational Indicator (EEOI). The fuel oil consumption of each type of fuel burnt is multiplied by the fuel depending conversion factor given in [2]. The amount of CO<sub>2</sub> is calculated by the following expression:

$$E_{CO_2} = \sum_{i=1}^n \sum_{j=1}^n FC_{ij} \cdot C_{Fj}$$

Where:

$E_{CO_2}$  is the mass of emitted CO<sub>2</sub>

FC is the fuel oil consumption

$i$  the voyage leg

$j$  the fuel type.

The fuel oil consumption for each voyage leg and fuel type are taken from noon reports and log books. If these voyages divided into legs and calculated CO<sub>2</sub> emissions are divided by the amount of cargo transported on each leg the EEOI can be calculated.

The amounts of transported cargo should be taken in an appropriate unit, e.g. tonnes, TEU and lane meters. By this,

a meaningful conclusion on the transport efficiency can be made. The use of the EEOI is also recommended within the SEEMP, which shall be onboard of all ships from 2013 on wards.

All input parameters for the calculation of total operational emission amounts can be verified on the basis of official documentation being kept on board for statutory reason, as outlined in Table 4.

## Emission inventory and discussion of results

An emissions inventory was established based the available onboard documentation. Relative and absolute operational emission values were calculated. The accumulated quantities need to be interpreted individually for each ship or similar ships with similar operational pattern.

To obtain meaningful results the emissions need to be monitored for a period of time which represents the operational patterns of the respective ship, including seasonal variations. The number of voyage legs varied significantly between the three ships, especially, when comparing the small number of voyage legs of the multi-purpose vessel operating on the spot market with the ro-ro ship. Emissions were monitored for a period of three months and extrapolated for one year, for robust conclusions and interpretation the monitoring period and number of vessels in this study may be too limited.

The significant operational emissions into air and sea are displayed in Figure 2 (see pg36). For ballast water it was of primary interest to examine the BW operations carried out in accordance with the regulations outlined in the BW Convention. Total amounts were not calculated and are not displayed in the inventory. None of the ships consumed refrigerants during this study, thus ODS are also not displayed.

For sewage discharge no record books are available onboard the three ships, and it had to be excluded from the emission inventory. It is not a mandatory requirement of MARPOL to keep a sewage record book in order to prove discharges.

The calculated totals served the purposes of establishing an emission inventory,

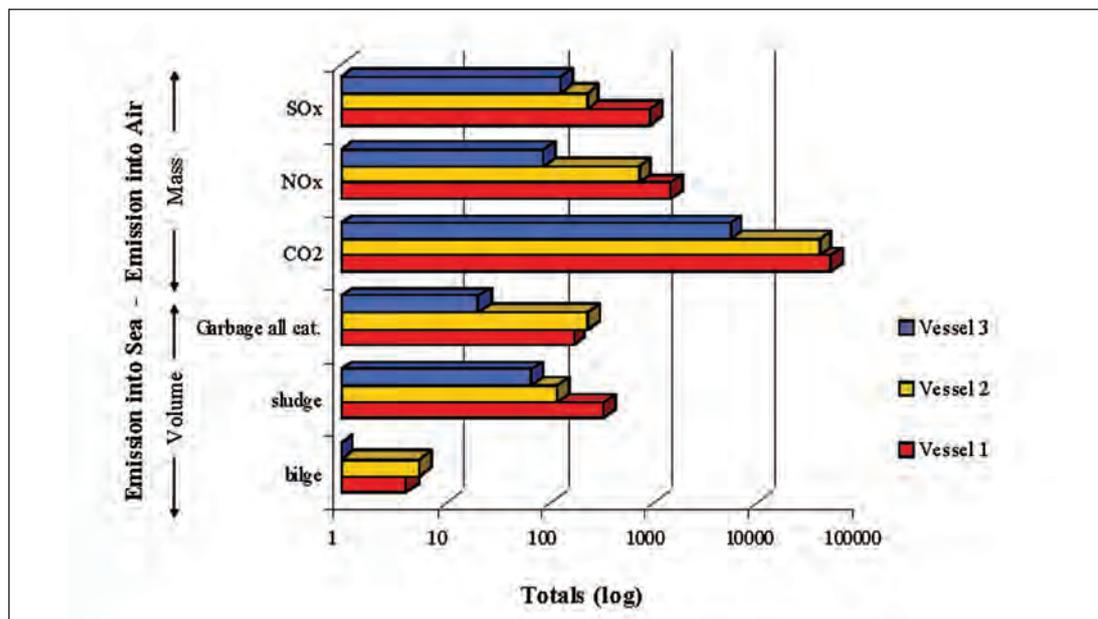


Figure 2: Emissions of all investigated vessels extrapolated for one year

rather than determining environmentally sound ship operation.

### Conclusions

This study investigates the collection and calculation of operational emissions from ships, based on existing onboard documentation. A deliberate choice of different ship types and operational patterns is made to gain an understanding of a common minimum standard for operational emission documentation. The compiled data was used to determine and calculate absolute emission amounts and concluded in an emission inventory for each of the three ships.

The amounts of emissions to air, i.e. carbon dioxides, sulphur oxides, and nitrogen oxides were calculated, as well as, emissions into sea included oil, ballast water and garbage. The data entries were checked for compliance with legal requirements and the total amounts were calculated.

The information value from gathered total amounts of emissions is limited, however, compiling the total amounts of operational emissions on a large scale and long term is a novelty within the maritime industry and the data could be used for evaluating environmental performance according to the existing rating schemes and indexes.

It can be concluded that the majority of significant operational emissions

from a ship can be compiled and calculated respectively, based on onboard documentation. However, for efficient processing it is crucial to use electronic files. These can be an assembly from commonly used log abstracts, supplemented by data from mandatory record books. A uniform standard for collecting all types of emissions is recommended. The continuous process of monitoring may enable managers and crew to analyse gaps, such as for reporting sewage amounts, and to define and improve the energy efficiency and environmental performance of ships.

In the long term the establishment of a comprehensive data base containing operational emissions for the maritime fleet would allow vessel benchmarking and enable ship owners and managers to more easily participate in industry standards and gain the benefits thereof. Making emission data from ships traceable and transparent to the public will enhance the competitiveness of individual owners who commit to investing in sustainable ship operation.

### Acknowledgement

The authors like to thank the crews, managers and owners of the participating ships from Reederei Hartmann, TT-Line and Wessels Reederei, who kindly supported this

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# Going with the flow

Computation Fluid Dynamics can aid the design and positioning of energy-saving devices write Sing-Kwan Lee and Yi-Fang Hsieh, of ABS and Zhiyong Zhou, of SDARI

**H**igh fuel costs and regulatory pressure to reduce emissions caused by burning fossil fuels are encouraging the shipping industry to seek solutions for more efficient and energy-saving propulsion.

The use of so-called energy-saving devices has long been recognised as being an effective measure in improving propulsion efficiency, although in practice, the design of such devices is based mostly on model tests and still employs a trial-and-error approach.

Among the best-known energy-saving technologies for marine propulsion are stern appendages, fitted around the propeller to enhance the stern wake field and/or to

recover flow energy. These appendages can be used not only for new designs but also for retrofitting to existing ships.

Although this technology has been in use for at least two decades, there appears to be no comprehensive or systematic method with which to evaluate its effectiveness. In addition, there are doubts as to whether existing energy-saving devices fitted to ships are fully effective.

To assist in making the design of energy-saving devices a more systematic process, ABS, together with the Shanghai Merchant Ship Design & Research Institute (SDARI) used this year's 11th International Conference on Computer Applications

and Information Technology in the Maritime Industries (COMPIT) to present a new analysis methodology for propeller energy loss based on Computational Fluid Dynamics (CFD).

The collaborators completed a case study into reutilisation of propeller energy loss for a Capesize bulk carrier performing three CFD simulations, which were then compared with model test results. Based on the validated CFD results of the propeller/hull interaction simulation, a propeller energy loss evaluation was performed and used to guide the design of energy-saving devices in order to maximise reutilization of lost energy.

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In a departure from the trial-and-error model-test approach typically adopted for optimisation of ship hull forms and gains in propulsion efficiency, CFD can be used to accurately evaluate the hydrodynamic performance of the device. By performing systematic CFD simulations, various forms of energy loss (blade friction and propeller-induced axial/swirl flow loss for example) from propeller operations can be ranked. This then provides key criteria for selecting the most effective energy-saving measures to be applied.

For the SDARI/ABS research, a Capesize bulk carrier was selected for detailed CFD analyses because of the potential for energy-loss reutilisation with energy-saving device applications. A ship of this type features a thick boundary layer flow field in the stern area, with associated energy-loss due to propeller-induced axial and swirl flows. Because of the high block coefficient of the hull form, stronger cross flow field and higher wake fraction are usual in the stern area compared to a slender ship hull form found on a containership.

In order to systematically evaluate the energy loss and its potential reutilisation for propulsion, three simulations were

completed. The bare hull wake field and open water propeller thrust/torque were firstly calculated by CFD and validated with model test data. After confirming the bare hull and open water propeller CFD results, propeller/hull interaction simulation was performed to obtain the detailed flow field in the stern area. Based on the detailed CFD flow field solution, a control volume approach was applied for energy loss analysis.

The simulations provided detailed flow information around the propeller in both the temporal and spatial domains - usually very difficult and expensive techniques in traditional model tests.

From this analysis, energy loss due to propeller-induced axial and rotational velocities could be evaluated and the appropriate location to install energy-saving devices for the most effective energy recovery was identified.

The three CFD simulations were conducted for model scale condition (1:39.45). The first, bare hull simulation was performed to validate the bare-hull resistance and nominal wake with the model test data. Second, the propeller open water simulation focused on examining the open water propeller performance

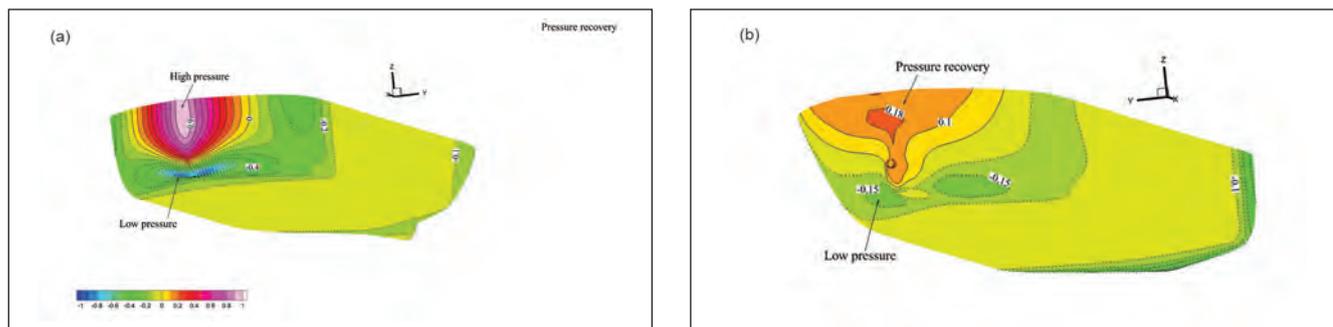
provided by the model test propeller. In the propeller/hull interaction simulation, the calculated propeller thrust and torque were compared against the available model test data. At this point the propeller energy-loss evaluation was performed, based on the validated solution in the stern area from the propeller/hull interaction simulation.

Based on the energy loss and energy distribution analyses performed, ABS and SDARI concluded that energy-saving devices can be applied to the hull in a more effective and appropriate manner to improve propulsion efficiency.

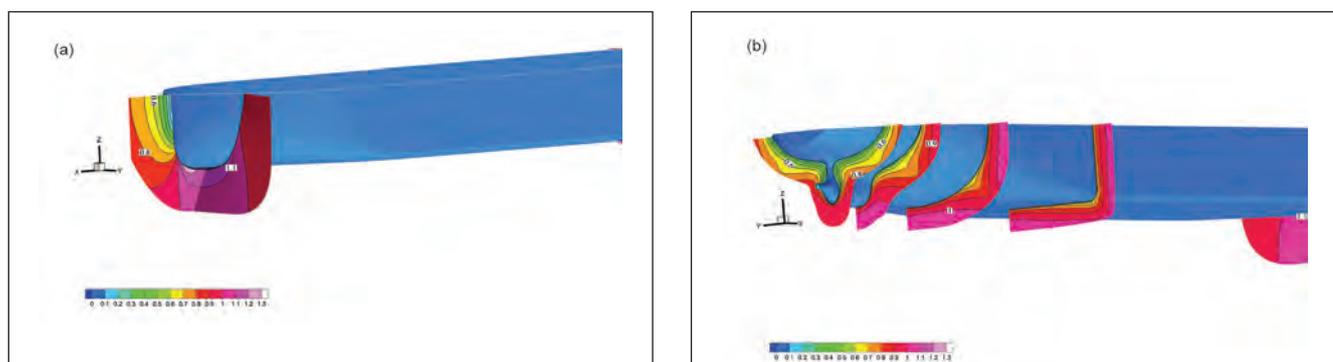
Such devices can be installed either in front of, or behind the propeller. Devices attached in front of the propeller can improve the incoming flow before the propeller to increase propeller efficiency. Devices used behind the propeller can directly recover the energy loss at the propeller downstream for propulsion.

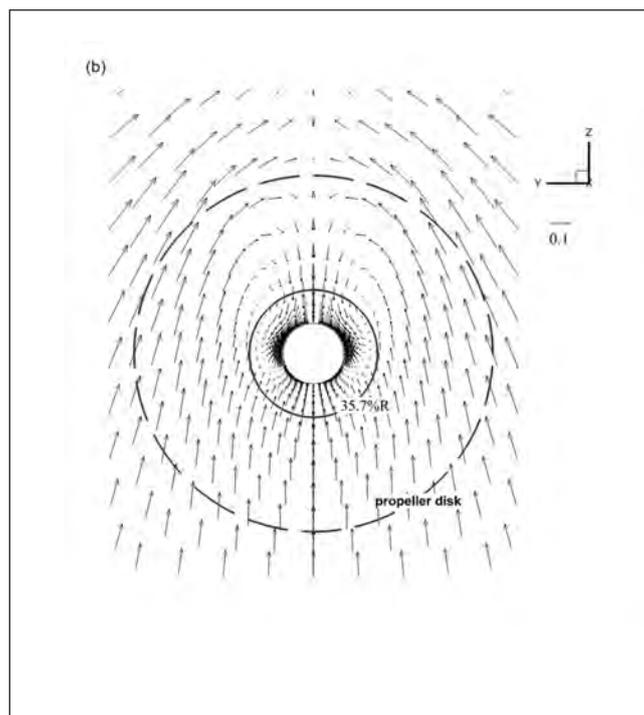
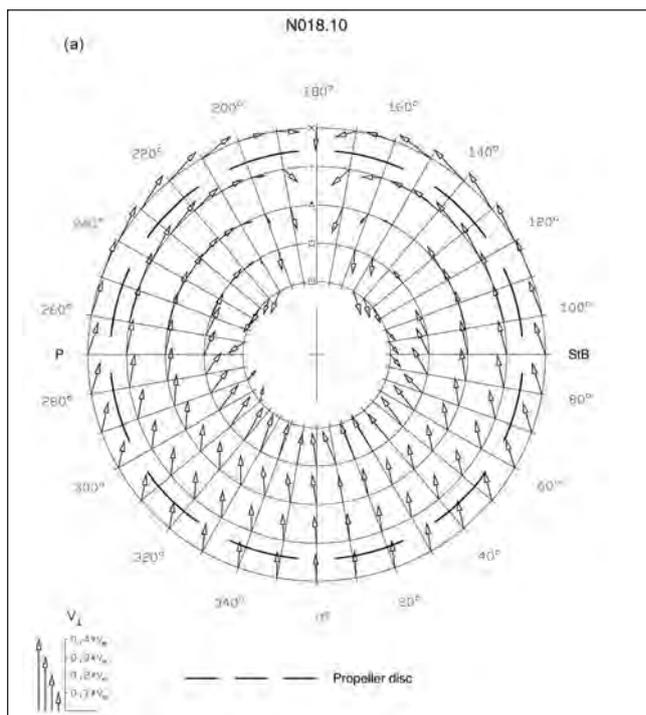
According to the analyses, 52.4% of the shaft power was usable for ship propulsion and the axial kinetic energy loss was 37.2%. Other energy losses including the friction and tangential energy loss were 13.3% and 2.83% of the shaft power respectively,

Distribution of hydrodynamic pressure coefficient,  $C_p$ , on the bare hull: (a) fore view, and (b) aft view. Contour is labelled by dynamic pressure coefficient. The dotted contour lines are for negative  $C_p$  values



Distribution of the normalised velocity magnitude ( $U/U_0$ ) at the (a) fore, and (b) aft views





Cross-flow vectors at the propeller plane: (a) Model test data, and (b) CFD results. Note that the inner circle in (a) denotes the radius of 35.7% of the propeller radius.

offset by a radial energy gain of 5.7%. Since the axial kinetic energy gain in the surrounding fluid was responsible for the primary propeller energy loss, devices that can reduce axial energy loss should be considered as the first priority.

Devices that can reduce axial kinetic energy loss such as pre-swirl fins can be used to readjust the inflow condition to reduce the propeller blade load on the starboard side while at the same time increase the load on the port side, maintaining the required thrust.

In this case, propeller efficiency can be improved by reducing the blade loading because loading reduction is equivalent to reducing the axial kinetic energy gain (propeller energy loss) behind the propeller. Another suggestion is attaching an additional thrusting fin on the rudder on the starboard side to recover the axial energy loss.

The second major energy loss is due to friction, an inevitable factor which can be reduced through optimisation of propeller designs, such as use of a smaller Expanded

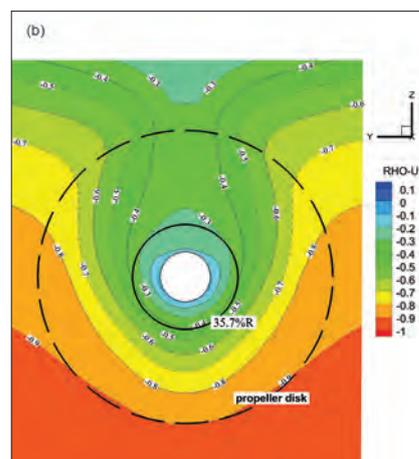
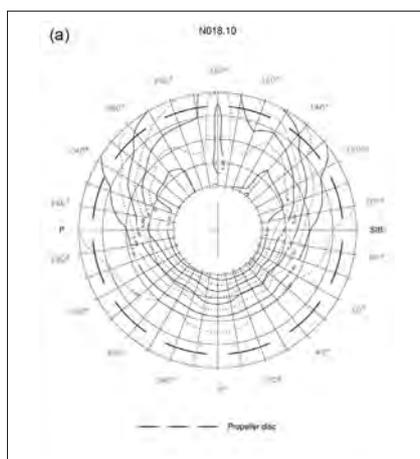
Area Ratio or larger diameter and a lower rotational speed. Energy-saving measures have a limited ability to mitigate the loss because devices used to recover the tangential kinetic energy mean that the friction loss due to the surface area of the devices usually cancels out the energy recovery.

Tangential kinetic energy loss represents only about 2.38% of the total according to the analysis and here devices such as pre-swirl fins installed on the port side behind the propeller, may recover some lost energy. However, increased friction loss from the surface area of the devices may eventually compensate for the gain of rotational energy recovery.

The analysis performed by ABS and SDARI demonstrates the suitability of CFD in examining the optimum design and positioning of energy-saving devices around the propeller of the type of cargo ships which are needed to improve performance and reduce emissions.

Because of its cost-effectiveness in obtaining comprehensive and critical flow field information, CFD opens up significant new possibilities for the future design of energy-saving devices to optimize the reutilization of lost energy and deliver tangible improvements in the efficiency of marine propulsion. *NA*

Normalized axial velocity ( $u/U_0$ ) at the propeller plane: (a) Model test data, and (b) CFD results. Note that the inner circle in (a) denotes the radius of 35.7% of the propeller radius.



# MARIN and Conoship work together on EEDI for small general cargo ships

Conoship International, a design office specialised in the design of Short Sea vessels, and MARIN, the Dutch tank test institute jointly carried out a research project concerning a fairer inclusion of small general cargo ships within the EEDI regulatory framework

The results of this project were used as the basis for the proposal by the Dutch Maritime Administration to include additional correction factors for general cargo ships below 20,000dwt, which was presented at the MEPC64 earlier this month.

## What is the EEDI?

During the 62nd session of the Marine Environment Protection Committee (MEPC) a new chapter of MARPOL ANNEX VI was adopted. This new chapter aims to reduce the emission of Greenhouse Gases by shipping and more specifically aims to reduce CO<sub>2</sub> emissions, since CO<sub>2</sub> is the most important Greenhouse Gas emitted by ships. One of the most noticeable aspects of the new regulations is the “Energy Efficiency Design Index”, or Required EEDI, which defines a minimum “energy efficiency level”, expressed in tonnes of CO<sub>2</sub> emitted per “Capacity mile”. All General cargo ships above 15,000dwt should meet the requirements from the first of January 2013, the ships between 3,000 and 15,000dwt should meet the requirements from the first of January 2015. The Required EEDI value is dependent of the deadweight of the vessel and defined based on a reference line representing the average EEDI values for a large number of vessels of a similar type. Further, for each new design above 3,000dwt the Attained EEDI has to be calculated, based on a formula prescribed by IMO. The Attained EEDI is amongst others dependent on the vessel’s deadweight, speed and installed propulsion power. The Attained EEDI has to be lower than the Required EEDI to be allowed to operate the vessel.

The Required EEDI is gradually reduced from 2013 to 2025 (phase 0, to

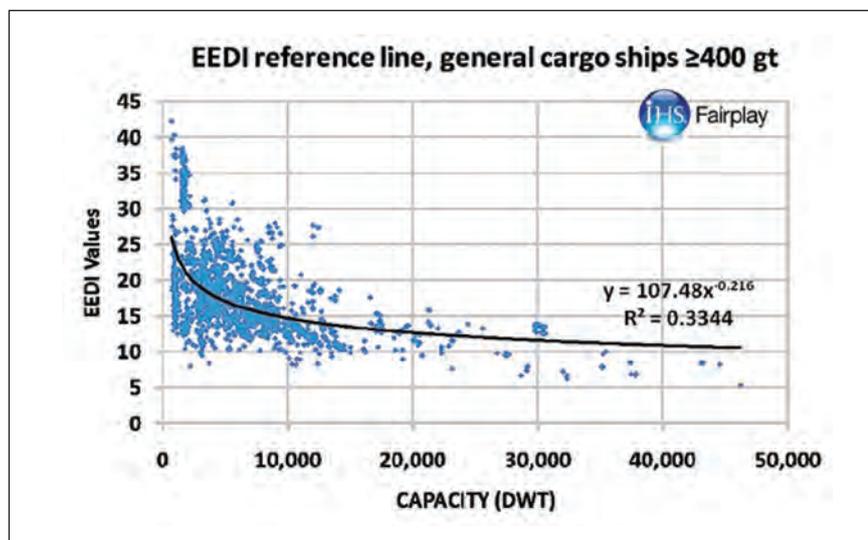


Figure 1. Reference line for General cargo ships, as defined by IMO in MEPC 62/6/4

phase 1, 2, and 3) to ensure and stimulate a continuous improvement of energy efficiency of ships, in order to reduce the overall CO<sub>2</sub> emissions by shipping.

## Unfair inclusion of small general cargo vessels

Due to difficulties in deriving a robust reference line for general cargo ships based on the available statistical data, general cargo ships below 10,000dwt are excluded from the first phase of the implementation of the EEDI regulations. However, from January 2015 also the general cargo ships between 3,000dwt and 10,000dwt have to fulfil the EEDI requirements. In the meantime IMO invited parties to propose alternative measures or methods to improve robustness of the EEDI methodology for small general cargo ships.

The data set on which the IMO reference line is based, shows a very high scatter and consequently a low

reference line correlation, especially within the deadweight range of 3,000dwt to 20,000dwt, as can be seen in figure 1.

## Investigation of the poor reference line correlation

The Dutch Shipbuilding Association and Royal Association of Netherlands Shipowners commissioned MARIN and Conoship International B.V. to further investigate the cause of the poor reference line correlation for small general cargo ships and to propose alternative measures to improve the inclusion of these vessels within the EEDI regulatory framework. The project was supervised by an industry project group consisting of shipowners, shipyards, ship designers, class societies and tank test institutes.

For this study MARIN and Conoship made a systematic assessment of the scatter as found for small general cargo ships, based on a database containing the detailed characteristics of over 70



Both ships are Conoship designed general cargo ships of about 3,500dwt and optimised with regards to energy efficiency. However, the designs vary in main dimensions, block coefficient, hold volume, cargo handling gear and additional class notation, as they are optimised for a different operational profile and sailing area

vessels. The vessels in the database are either Conoship designs and/or vessels extensively tested and optimised by MARIN. The level of detail of the characteristics in this database is much higher than the data in the IHS Fairplay database as was used by IMO and includes over 40 characteristics, such as: lightweight, weight of loading equipment, estimated weight increase for additional class notations, model test results, design restrictions due to foreseen sailing area, etc. All of the vessels in the database are built and are currently in operation.

The study shows that three key factors can be identified which cause the high scatter. The first factor is the large variety in operational profile and sailing area for small general cargo ships. The second factor is the variety in loading equipment installed, which causes deadweight variations for vessels with comparable displacements and main dimensions. The third factor is the variety in additional class notations (or structural class notations), which causes a variety in lightweight, and therefore in deadweight for vessels with comparable main dimensions and displacement.

### Proposal for a fairer inclusion

To resolve the high scatter and improve the inclusion of small general cargo vessels within the EEDI framework, it is proposed to implement three

additional correction factors for general cargo ships with a deadweight below 20,000dwt:

- Factor to account for the differences in operational profile and sailing area
- Factor to account for the differences between ships with and without cargo handling equipment
- Factor to address differences in additional class notations that can lead to a relatively higher lightweight.

Implementation of these three new correction factors is deemed to be justified as they correct for a variation that is caused in order to be able to provide essential services to the society. Further, all the proposed correction factors follow the criteria for new correction factors as stated by IMO: They are based on verifiable characteristics, provide a ship specific solution, are based on a comprehensive and transparent analysis, are clear and easy to use and do not create perverse incentives.

By applying these additional correction factors, the scatter as found for general cargo ships between 3,000dwt and 20,000dwt decreases substantially. For the vessels in the database of this study the  $R^2$  correlation coefficient, i.e. the statistical measure which indicates how close the regression line approximates the real data points, increases from 0.40 to 0.56. The resulting correlation is, however, still considerably less than the correlation

as for example found for bulk carriers or tankers.

It should be noted that including the additional correction factors does not mean that all small general cargo ships directly comply with the EEDI regulations. Conoship experience shows that application of the new correction factors for special designs only enables to meet the Required EEDI as long as they are extensively optimised to reach an energy efficiency that is as high as possible within the boundaries proposed by the special services, its operational profile and sailing area. Consequently, it can be concluded that the introduction of the proposed three additional correction factors can ensure that building and operating small general cargo ships specifically designed for special services remains possible. *NA*

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 Wieger Duursema B.M.O.,  
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# Damen aims at multi-tasking

Dutch shipyard Damen's latest design, the Damen Offshore Carrier 7500 offers a range of capabilities making the new vessels flexible offshore operators

The latest design from Damen is a multifunctional concept that will provide flexibility in heavy transport and offshore installation with reduced fuel costs, a green passport and zero dumping, says the company.

The Damen Offshore Carrier (DOC) 7500 has been specifically designed as a smaller heavy transport, offshore installation and ro-ro platform vessel suitable for multiple markets. DOC aims to provide flexibility and year-round utilisation.

Damen has developed the design in cooperation with Singapore based heavy-lift transport specialist Hans van Mameren, managing director of Ha-Ce Engineering Pte Ltd. The DOC has an endurance of 65 days, a large, flat and unobstructed deck of 2,300m<sup>2</sup>, a deck strength of 20tonnes/m<sup>2</sup> and is highly fuel-efficient.

Remko Bouma, sales manager of Damen Shipyards Bergum, says: "When we decided to realise a new design together [with Mameren], we wanted to create a vessel that was able to carry modules and cargo on an open deck over medium and long

distances, complying to the demands of today's market. I think this vessel will be 'the' alternative for the more time consuming tug and barge transportations."

Bouma also highlights that the DOC 4500 fits another niche in today's offshore transport market, where most vessels are constructed for the offshore logistics market this vessel not only has the features to transport cargoes for longer distances, but when that logistics market goes away the vessel can then be used for other markets.

The DOC is able to handle higher sea states, whilst maintaining course and speed and has reduced fuel consumption. "If you look at a tug-barge combination you are probably looking at 100tonnes a day to operate them, this is where we can make fuel savings of 70%. The DOC will operate on HFO and MDO giving better efficiency, where tugs operate on MGO and cost more."

Damen are also looking into the future use of LNG, but at the moment it says that the infrastructure is not set up for the supply and at present there is no pay back from using the fuel.

"Tug-barge combinations are not able to cope with the challenging seas so easily. Deviation from course and reduced speeds can have a great impact on the schedule", says Bouma. The DOC offers much lower fuel costs and is better able to maintain course and speed, typically averaging 10-12knots, where a tug and barge would average only 5-7 knots, says Damen.

Extensive model test programmes that have been run on the design have shown a reduction in fuel consumption of 50-75% compared to a tug-barge combination. The vessel will also be self-propelled with azimuth thrusters, which will add to the vessels efficiency.

In the design process particular attention was paid to the bow and hull form. The sleek bow and slender hull enables the vessel to sustain its speed and course in head seas, as well as helping to reduce fuel consumption. The bow design diminishes accelerations and reduces slamming to a very low level by 'cutting' through the water and improving comfort and safety for the vessel, crew and cargo.

Damen Offshore Carrier (DOC) 7500

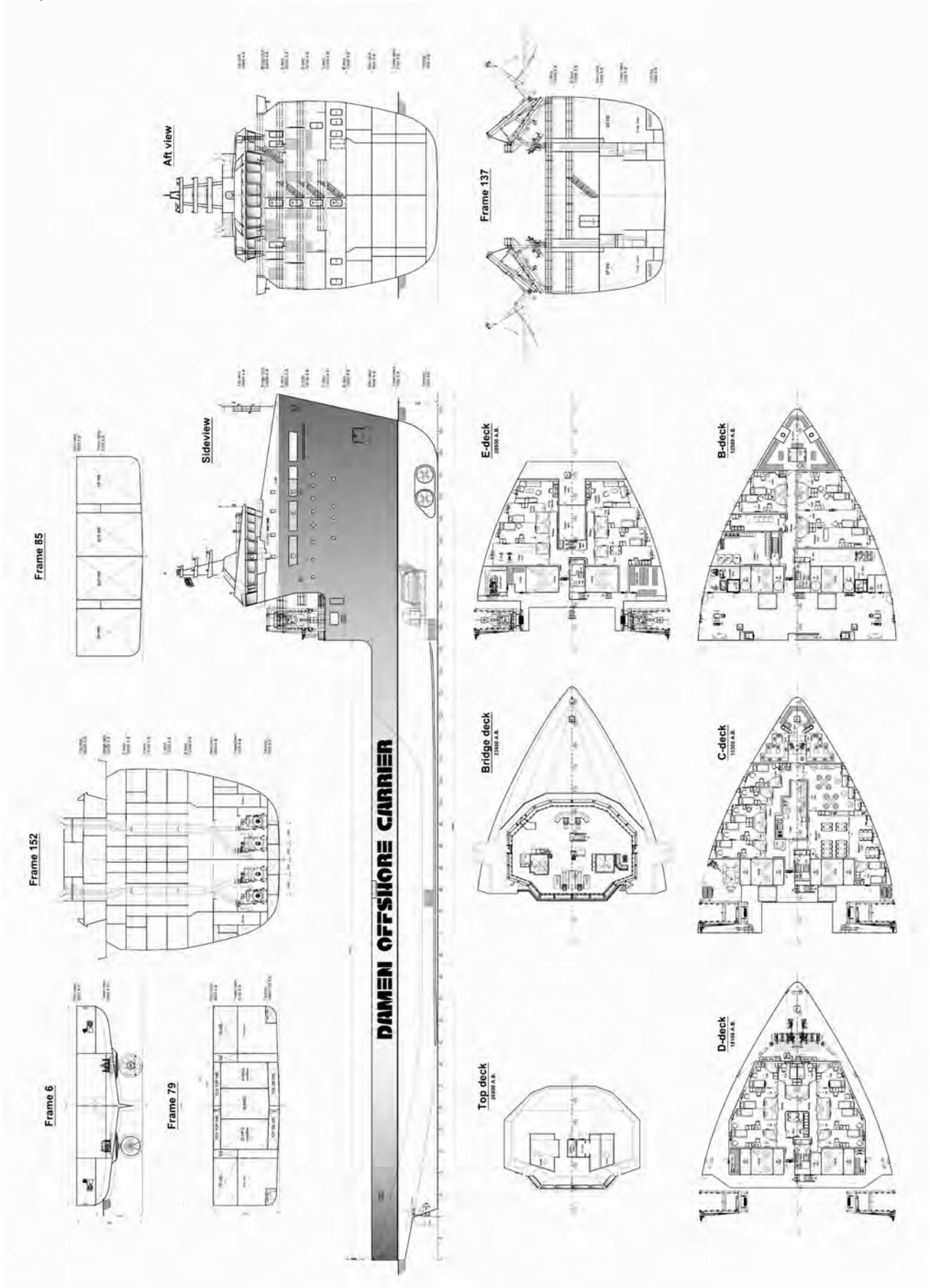


## TECHNICAL PARTICULARS

### DOC 7500

Length overall .....	119m
Length between perpendiculars.....	111m
Length cargo deck.....	85m
Breadth moulded.....	27.45m
Depth to main deck.....	9.00m
Draught design (approx).....	5.40m
Draught scantling (approx).....	5.40m
Deadweight at design	
draught (approx) .....	7,400tonnes
Gross tonnage (approx) .....	8,240gt
Trial speed at design	
draught (approx) .....	12.00km

GA plan of Damen Offshore Carrier (DOC) 7500



As part of its multifunctional ability the DOC has a large unobstructed deck that is free of any manholes, exhaust and de-aeration pipes. Ro-ro operations are unobstructed and modules can be stowed and secured anywhere on the deck. Due to the ballast system the vessel can handle ro-ro cargoes both over the stern and from the sides of the vessel.

The DOC is equipped with DP2 that will give the vessel better stability in loading/unloading operations. It can also have DP3 installed, but this would need to be stipulated early on in the design stage, says Bouma.

An added advantage of this vessel is that it can be used in a replenishment role such as for bunkering fuel and other consumables to vessels/installations working in the field, as well as for crew exchanges. It can also be used as a feeder solution for offshore wind farms, transporting nacelles, transition pieces and



The DOC 7500 will cater for a specialised market

monopiles. Its platform can be used for a wide variety of offshore installation work such as cable laying, subsea installation, reel laying, float-over installation and other methods. For these purposes the vessel can be outfitted with all necessary installation equipment. This can be either a modular solution at a particular stage in the vessel's operational life or an integral solution part of the initial shipbuilding process.

The DOC can also perform as a semi-submersible vessel, equipped with buoyancy casings. Additionally, the DOC can be fitted with a Damen Deep Dredge giving owners a deep sea dredging and mining solution of up to 200m depth.

The latest model of the DOC is 27.5m wide, but already Damen is considering a larger version with a 32.5m beam. The vessel has a Green Passport and a Zero Dumping certification and the fuel tanks are protected with cofferdams. There is accommodation onboard for 30 people that can be expanded when the vessel is in installation mode.

Damen has said that it has had interest in this design from a few clients. "People are critical when comparing it to a tug-barge combination, but they cannot deny the advantages of the design", says Bouma. He adds that the Damen are expecting that this vessel to do well in the Australian offshore market and also for offshore transport projects. The first DOC 7500 is due to be delivered in 2014. **NA**

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- Stena Drillmax Ice Meri
- Tanit
- Innovation
- Pacific Orca
- Ever Lambert
- Nord Stability
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# Vuyk Engineering explores new depths

Following the Deepwater Horizon tragedy more than two years ago, activity in the Gulf of Mexico is beginning to increase again. Alexander Bot, senior project manager, Vuyk Engineering Rotterdam explains how this growth is impacting on the offshore market

**N**ew drilling activities have started back up in the Gulf of Mexico and the need for platform assistance and accommodation is becoming more and more urgent. Not only does the Gulf of Mexico need platform support vessels, but newly developing offshore areas like Brazil and India also are starting to require platform support.

The market is showing a development and expansion of oil and gas fields further and further away from the mainland. It also shows an increase in complexity of offshore installation activities. This requires rapidly available accommodation capacity such as the use of a specialised accommodation and offshore assistance vessels that can solve many practical problems during operations.

Using a dedicated vessel which can provide accommodation for a large number of personnel and is also capable of performing lifting operations and can provide large storage facilities, will have

benefits. Not only does it provide a good hotel service for the crew, it also creates the possibility to limit the number of personnel in the potentially dangerous area of the platform and it can provide a significant reduction on transportation costs.

The above trend in the market has lead Vuyk Engineering Rotterdam to study further the typical requirements for such a vessel in order to come up with a suitable solution.

In the design of offshore vessels safety is was of paramount importance, since Deepwater Horizon the need for safe operations across the industry has intensified the issue like never before. The need to separate activities on the platform from the personnel accommodation plays an important role in this matter. If the amount of people on the platform can be restricted to the bare minimum that is required for the proper operation, the risk of casualties in the event of a major disaster

as occurred on Deepwater Horizon can be reduced considerably.

The design of an accommodation vessel should, therefore, incorporate all the relevant safety systems needed for a vessel of this type. This includes proper emergency medical facilities onboard as well as an adequate fire-fighting installation, designed and built to a high specification. Also, the vessels should be capable of transferring injured or sick personnel using a helicopter facility. Transfer to and from the platform can be arranged by means of a telescopic gangway with a swell compensation system.

However, when an accommodation vessel is located next to a platform it would be essential to make sure that this vessel is capable of assisting the platform in many different ways and not only by providing a hotel function for platform personnel. In the day to day operation a lot of hoisting activities take place on the platform. Project specific drilling equipment may need to be

Vuyk Engineering Rotterdam presents its latest platform support accommodation semi-submersible



## TECHNICAL PARTICULARS

### Platform support vessel

Length over all: .....	90.00m
Breadth over all:.....	60.00m
Pontoon length:.....	87.50m
Pontoon beam: .....	15.00m
Main deck height a.b:.....	31.00m
Transit draft:.....	8.00m
Operating draft:.....	17.00m
Operational air gap:.....	6.00m
Free deck area: .....	3,000m <sup>2</sup>
Payload at operating draft: .....	2,000tonnes
Hotel accommodation:.....	400persons
Main cranes:.....	2x 300tonnes @ 25m
Hook height: .....	60m above sea level
Installed power: .....	23,000kW



installed, spares may need to be exchanged and occasionally large equipment has to be hoisted onto the platform. The need for hoisting capacity and lifting height has increased in the last few years, the platform support vessel should be capable handling the hoisting requirements and should be able to perform lifts in a number of sea states. This requires a stable platform for heavy-lifting operations and an efficient dynamic positioning system.

A second operating requirement is related to the free deck space and payload. The vessel should be able to take large pieces of equipment or supplies from a tender vessel and should have the space to stow it on deck before it is lifted to the platform. Creating a large deck space also makes the vessel flexible during its lifetime. Not only does it provide a space to handle equipment or store large equipment or spares, it may even be considered for storage of components that may not have to be stored on the platform. Furthermore, provisions can be made to convert the vessel into a tender that can assist drilling. This directly relates to the deadweight capacity of the vessel. The operational profile and functional requirement will define the ultimate payload of the vessel.

Vuyk Engineering Rotterdam has a long track record of designing offshore vessels in a wide range of offshore related vessels such as crane vessels, pipe-laying vessels,

fall pipe vessels and semi-submersibles. Our core business is the development of concept and basic designs for complex vessels and equipment by preparing an integrated design package. Such a package contains the complete design, stability and strength of the vessel, but also the vessel system design and arrangement of all spaces. So when opportunities from renewed activities in the Gulf of Mexico were recognised, VER developed a new concept for an accommodation platform support semi-submersible which will be classed under the code for mobile offshore units.

Initially a study into the type of vessel that would be best suited to the task was performed. A mono-hull would result in a smaller vessel, which is more cost effective although the crane moments have a significant weight impact on the light ship weight. A semi-submersible however, will create a more motion friendly platform in all incoming wave directions which, will allow for lifting operations in higher sea states. This means that the operability of the vessel will be better. It also relates to the DP capability.

Providing platform assistance demands a powerful and reliable dynamic positioning installation on the vessel. A semi-submersible is more effective in providing the required thruster configuration to cope with higher sea states, especially in beam seas. This is particularly important for platform assistance

platform support accommodation semi-submersible vessels can be used more in the future for daily operations at sea

and therefore, led to a semi-submersible vessel type being chosen for the design.

The hotel vessels that have recently been delivered have had their main focus on the accommodation, but are limited in lifting capacity. The concept that Vuyk Engineering has developed not only provides accommodation for 400 persons, which generates an excellent floating hotel facility for crew to work in shifts on the platforms. It also has a strong focus on the free deck area and the lifting capacity of the cranes. The vessel is equipped with two cranes of 300tonnes each to perform single lifts or even tandem lifts up to 400tonnes to support the platform or to perform construction activities on site. A knuckle boom crane of 100tonnes is provided for handling any kind of equipment or stores.

The vessel will have a dynamic positioning system that will suit the requirements for a DP3 notation. In DP3 mode the vessel can provide assistance in close proximity to the platform up to a significant wave height of 4.5m. The main dimensions of the vessel are optimised to allow for the hoisting requirements and yet minimise the power that is needed for DP operation. With a FiFi 2 notation the vessel is fit for fire-fighting in case of any emergencies. A heave compensated telescopic gangway allows for easy access to and from the platform.

To check whether the design is adequate in terms of stability and safety regulations the concept has been reviewed by Class and was found to be fully compliant with the latest regulations. With this concept Vuyk Engineering Rotterdam has developed a versatile platform support vessel which is ready to pick up the action in the Gulf of Mexico again or to be utilised at any other location in the World. **NA**

**Author:** Alexander Bot trained at Haarlem Polytechnic for a BSc. in Maritime Technology between 1986-1990. He then went on to study an MSc in Technology and society, technical specialisation Maritime Technology at the Technical University Eindhoven between 1990-1993. Today he is the senior project manager responsible for the engineering of a variety of projects.



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# Exhausting vibrations

Dutch-based Loggers provides its Lexsys solution for bunker tankers

As part of an extensive fleet renewal programme VT Minerals built the vessel *Vorstenbosch*, which is also the largest bunker tanker constructed to date. The 147m x 22.8m x 6.4m bunker tanker has a capacity of 13,900m<sup>3</sup> and allows VT to handle and transport 30% more cargo. Due to this increased capacity the vessel can also compete with pipeline transport.

Dimensions like those of *Vorstenbosch* pose big challenges, says Loggers. Noise and vibration have a major negative impact on all the systems onboard, the crew the environment and ship itself. Therefore, special attention was needed in the area of the exhaust line, which must be able to handle the stress caused by expansions and contractions due to temperature changes. In addition, vibrations caused by the engine needed to be isolated in order to minimise the effects on the vessel and its crew.

Loggers flexible solution for exhaust lines, Lexsys, which is an advanced elastic suspension solution has been specifically developed to cope with these typical challenges, says Loggers. When the exhaust gas line is installed rigid or incorrectly into a vessel, vibrations are transmitted throughout the vessel. This influences the working conditions significantly and also shortens the lifetime of the equipment and the exhaust line itself. Moreover, the forces and stress in the



VT Minerals install Loggers Lexsys on *Vorstenbosch*

exhaust line due to ship deformations could eventually cause it to break.

The system works by elastically “decoupling” the exhaust line from the ship’s structure, so that engine-borne noise and vibration cannot travel freely through the ship’s structure. It also compensates thermal expansions and contractions in the exhaust line due to heating up and cooling down.

The system incorporates rotating flanges that make assembly quick and easy, with double-ply compensators which are flexible in all directions. The engine mounts and expansion joints cut down on vibration from the exhaust line. The percentage of noise and vibration reduction depends on the situation (engine, dimensions and the ship’s construction), says the company.

“Lexsys is much more than just mounting some compensators and vibration isolators, as this might even worsen the vibrations due to resonance when selecting the wrong

isolators. That is why Lexsys also involves calculations, engineering and of course experience in many different situations for many clients”, says Peter Berting, sales director, Loggers.

Berting adds that the Lexsys solution has been delivered to numerous other inland vessels, sea-going vessels and on offshore rigs all over the world. The Lexsys solution is part of a family of products that also includes shockproof and lightweight systems.

“However, we clearly see a trend towards our lightweight Lexsys-modular solution, as green shipping and sustainability are high on the agenda of our European clients. Compared to conventional exhaust line systems this innovative solution leads to a weight-reduction of at least 50% up to 75%, while preserving quality, lifetime and operational advantages of our regular Lexsys solution. We have strong reasons to believe that the lightweight Lexsys-modular will overtake the use of more traditional suspension solutions in the future”, says Berting.

The Lexsys-solution used on *Vorstenbosch* is the conventional solution for exhaust lines. “Even shipbuilding companies in the Far East that would normally use rigid, welded connections to the ship’s structure are now discovering the benefits of flexible exhaust lines”, he added. [NA](#)

Lexsys with engine on isolators



Lexsys brings reduced noise and vibrations



# Imtech launches Green Competence Centre

As the need for shipowners to bring their fleets up to international green standards intensifies, Imtech has launched its global Competence Centre Green Ships that is aimed at providing a service to help shipowners meet these requirements

**T**he Competence Centre based in Hamburg, Germany, will focus on developing innovative, environmentally friendly and cost-saving solutions, which will enable shipowners to operate their vessels in an energy efficient way and support them in developing green initiatives and complying with future emission rules & regulations.

The Competence Centre will look to combine the latest green technologies and will develop it further for the use of individual shipowners needs. The Competence Centre will be headed up by Stephan Claussen, who has several years of experience in developing green and energy efficient system platform concepts for the automotive and the aircraft industry.

Imtech Marine's strategy will focus on helping shipowners lower the total cost of ownership (TCO) of their ships.

Stephan Claussen, head of the Green Competence Centre, Imtech Marine, Germany.



Dennis Mol, director technology & competence development, Imtech Marine, says: "Green can sometimes be a bit of a buzzword, but in the maritime industry we need to do more to contribute to cutting down on emissions." One of the strategic priorities of Imtech Marine is to develop innovative green ship concepts.

Some current developments from Imtech Marine include hybrid propulsion and HVAC systems as well as energy efficient, low emission integrated ship architectures.

Claussen adds: "The demands from society for more sustainability are continuously rising. For the customer to contribute to a healthier environment and at the same time to improve business it is necessary to take a holistic approach to the ship. The entire vessel architecture needs to be considered – automation, electrical systems, communication/navigation, HVAC, shore connections, lighting. Imtech Marine has already 'surveyed' many state of the art ship concepts and calculated that savings of up to 60% can be made in electrical energy, depending on the size, ship type and chosen energy saving solution. Due to the application of the latest simulation tools we are able to model and to assess any complex system architecture very rapidly."

By looking at the complete vessel Imtech aims to provide its clients with a complete package that will give a shorter payback period. "Our customers will get an optimised solution even before entering the detailed design phase. This efficient first time right approach reduces cost and contributes to concept maturity and finally to lower lifecycle costs overall. Investment pay back times can be very short –sometimes within

less than two years – and they can save, depending on the solution, from thousands of Euros to an incredible one million Euros a year," says Claussen.

The modelling and the simulation of multi-disciplinary systems will be done with Dymola/Modelica and/or Matlab/Simulink, as well as overall project management if the owner wishes.

Mol highlights that the green systems that are coming on to the market are complex and need qualified people to develop this technology and this is where the Competence Centre comes into play. The centre is helping shipyards and engineering firms in the early stages of a design to integrate these systems into vessels and making sure that they operate in the most efficient way. "We have different experts in different fields. This will get more important in the future as energy efficiency will be on top of everyone's agenda", says Mol.

However, the key technology for the future is LNG, Claussen says that he believes that LNG will be the fuel of the future due to the reduction in emissions that can be gained in using it. "LNG will be the future fuel. All parameters will see this. Norway is leading in this market and running with 20 ships. LNG is not too expensive and all problems with LNG such as infrastructure are solved as the technology is there it just needs to be implemented", says Claussen.

Also, other key technologies such as hybrid power, electric generators, batteries and fuel cells are also being investigated further at the centre. "We are currently involved in a European research project looking into fuel cells for both the current market and the future. We believe that you can have an emission free ship with fuel cells, but

at the moment the technology needs to be developed”, says MOL. He adds that looking further into the future that this type of technology could be tailored to or extended with other technology such as solar energy and also configurations with batteries.

A recent example of the work being carried out by the centre is shown in a project where Imtech Marine is supplying a hybrid propulsion system to the first ever diesel electric, hybrid seagoing ferries. The low emission hybrid ferries project will see the development of the first sea going ro-ro vehicle and passenger diesel electric hybrid ferries in Scotland.

The ferries, which will be operated by the current operator of the Clyde and Hebrides Ferry Services, CalMac are designed for use on many of the short crossing routes

around the Clyde and Hebrides and will use battery banks supplying a minimum of 20% of the energy consumed onboard.

The system consists of diesel electric in combination with battery technology.

“The owner was looking for a more environmentally friendly vessel design. The vessel is a diesel electric hybrid with diesel electric generators. There is a lithium-ion battery to drive the propulsion of the vessel which can switch over to diesel when the vessel requires more power of if the battery is low on charge,” he continues “In order to optimise the energy efficiency of the battery if the vessel uses 80% of the total power and then recharges operation of the vessel is more efficient and prolongs the lifespan of the battery.”

Ferguson Shipbuilders, Port Glasgow, Scotland are working alongside Glasgow

based ship design specialists Seatec to build the vessel, with the first vessel anticipated to enter service in spring 2013.

Each ferry is designed to accommodate 150 passengers, 23 cars or two HGVs, with a service speed of 9knots and will be powered by small diesel generator sets, feeding power to a 400 volt switchboard, which will supply power to electric propulsion motors that turn the propulsion units. The two lithium-ion battery banks have a total of 700kWh and will be charged overnight from the mains.

The vessel design and power configuration will additionally realise 19-24% savings of power input to the propulsion units over a conventional diesel mechanical solution, reducing CO<sub>2</sub>, SOx and NOx emissions. **NA**

## 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 Maritime Safety Award is presented by the Institution, in association with Lloyd's Register, 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 are judged by a panel of members of the Institution and Lloyd's Register. The Award will be announced at the Institution's Annual Dinner.

Nominations are now invited for the 2012 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](http://www.rina.org.uk/MaritimeSafetyAward)

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Nominations should arrive at RINA Headquarters by 31 Dec 2012

Queries about the Award should be forwarded to the Chief Executive at [hq@rina.org.uk](mailto:hq@rina.org.uk)

## Bolidt lays new ground

Bolidt has launched its smart balcony to revive existing balconies without causing disruption for passengers

**D**utch manufacturer of synthetic products and systems, Bolidt, has introduced the smart balcony that is formed from a series of composite planks that can be interlinked and installed to cover a standard balcony in under 15 minutes, says the company. Smart balcony has been developed in response to a request from a number of cruise lines already using Bolidt decking systems.

Smart balcony is offered as an alternative to the liquid-pouring

product future teak. The balcony can be installed during a voyage either by a riding squad or by trained crew members. The materials can be carried by two men through the ship and installed while the cabin is unoccupied, for example while the passengers are on a shore visit.

Bolidt shipbuilding division global director, Jacco van Overbeek says: "Balcony renovation is a well-known problem in the cruise sector. Renewing traditional teak balconies are the

problem. Liquid pouring balconies by Bolidt are still a solid and proven system, but smart balcony offers a number of other advantages. For example it is much easier to clean and maintain than liquid systems and the crew can replace any damaged planks themselves in a matter of minutes. Smart balcony is much harder wearing than traditional systems. It is also designed to meet stringent anti-slip standards, conforming to DIN 51097 and DIN EN 13451." [NA](#)

## LNG tanker from Groot Ship Design

Groot Ship Design in close cooperation with Leissner Maritime has developed a medium sized, flexible bunker tanker for Bijlsma / VEKA

**L**NG is expected to become a significant alternative to diesel fuel. Further demanding environmental requirements in the coming years and expected rising costs for fuel oils has meant that plans to build LNG powered vessels have intensified.

Currently, LNG-powered inland vessels are bunkered by trucks, but shore bunker facilities for ships are now under development in several European countries, says Groot.

The vessel design has a flat deck that has a large working area with good accessibility, with an optimised hull form and a low main engine power. The design also features the Groot Cross-Bow. Results have shown that the vessel will give low fuel costs and better behaviour in heavy seas.

The vessel's purpose will be for bunkering and distribution of LNG, or in combination with fuel oils. The vessel is designed for operations in Western Europe, the Mediterranean and the Caribbean and has a LNG capacity range of 4,000 – 5,000m<sup>3</sup>.

There is no vessel under construction as yet. The shipyard says that it is in the

process of talking to potential buyers and chartering parties about this design. [NA](#)

Groot Ship Design's LNG tanker design



# BV demonstrates commitment to inland navigation sector

The inland vessel and coastal market is gaining strength Eric Lallemand, director, Bureau Veritas (BV) Inland Navigation Management explains the developments

A commitment to protecting the safety of people, property and the environment is as important in terms of the inland waterways sector as it is in the global shipping industry. Despite the current global economic downturn, intensive research continues into ways of harmonising the further development and technical requirements of the global and European inland navigation fleet.

New regulations have been developed, or are in the process of being introduced. For example, despite the transitional period covering existing regulations still being applicable to vessels in service, the European Union issued new technical regulations covering the construction of inland navigation vessels. These rules, however, do not override existing regulations such as the Rhine Rules and Resolution 61 of the European Economic Commission of the United Nations (UNECE).

Resolution 61 is usually applied on the Danube by countries which are not members of the European Union. The Rhine Rules govern the transportation of dangerous goods on the Rhine and are the basis for European Directive 2006/87 and ADN (UNECE), the main regulations covering vessel surveys. Collaboration between the Rhine Commission (CCNR) and the European Commission/UNECE is the subject of a joint working group on European Directive 2006/87 and the Safety Committee (WP15.AC2) for ADN issues.

As part of this collaboration, Rhine riverside countries and Belgium have actively pursued convergence of both texts in the lead-up to the entry into force of the European directive and the ADN Convention. For many years, however, Rhine regulations have continued to evolve independently through working groups for survey rules and for the transportation



BV sees a rise in newbuildings

of dangerous goods. This has created occasional small difficulties, for example discrepancies in content, which the working groups are still trying to resolve today.

Meanwhile, the end of the transitional period for European Directive 2006/87 on 1 January 2015, could require some passenger ship owners to make complex and expensive structural modifications to existing vessels. In particular, escape routes must not lead through galleys and, in addition to the main propulsion system, vessels must be equipped with a second independent propulsion system, placed in a separate engine room. Furthermore, paints, lacquers and other surface treatment products, as well as deck coverings used in rooms except engine rooms and store rooms, must be flame-retardant, and engine rooms must be fitted with a permanently fitted fire-extinguishing system.

Inland navigation is regarded as a safe and environmentally friendly method of transporting goods. But, faced with strong competition from road and rail transport, and under pressure from regulators, the inland navigation sector needs to introduce highly efficient technology which is designed to improve its environmental performance.

In the case of gaseous emissions, inland navigation is governed by much stricter emissions regulations - for example, European Directive 97/68/EC and amendments, and the Rhine Rules - than is seagoing transportation. Gaseous emissions limits are strongly linked with, among other things, engine application and engine power. In order to clarify all requirements, taking into account all relevant criteria and transitory dispositions, BV has created an information table entitled, Gaseous Emissions by Engines used in Inland Navigation.

BV has in fact developed a number of new rules and programmes to help operators stay in compliance with industry regulation. These include a vessel condition assessment programme, BV Cap Inland. Hull structure, hull fittings and machinery are the three areas covered by CAP Inland, which allocates a CAP rating related to the quality standards under class rules. It is an important tool for risk assessment, serving as a complementary supplement to class. It is a consultancy service documenting hull condition at specific times in a vessel's life.

In addition to class reports, the industry requires such information as quantitative

vessel structure ratings, photographic documentation, and - in some cases - comprehensive structural and fatigue analysis to provide supplementary risk assessment data. BV Cap Inland is aimed at improving efficiency in connection with the carriage of dangerous products by waterways to ensure safety and protection of the environment. It also seeks to ensure vessel robustness and safety as well as proper maintenance and extension of reporting credibility and transparency.

The Condition Assessment provides a thorough assessment of vessel condition and a CAP rating by combining the results of expert examination of design data with an extensive vessel structural survey for hull. For machinery, fittings and systems, meanwhile, it offers an assessment of overall maintenance condition and the actual operational condition of equipment. The scope of the vessel CAP can vary significantly, as different interested parties have different requirements, depending on vessel age, type, size and specified minimum allowable CAP ratings.

BV has also produced a new rule note dealing with thickness measurements (TMs), which will enable all parties to co-operate closely on planning and preparation, determination of extent and location, and analysis of thickness measurements.

Class surveys include visual examination of the hull, assessment of possible structural defects and, depending on vessel age and maintenance condition, TMs, in order to determine structural wastage. Analysis of the TMs allows checking of the structural member scantlings against criteria stipulating limits of associated wastage to be taken into account for reinforcement or renewal of steel structure. These criteria are associated to specific levels of permissible stress regarding local strength and pitting, global strength and buckling strength. Decisions on steel renewal are taken by the attending surveyor applying rule criteria and based on professional judgment and condition of the vessel.

BV has also participated in several meetings at which experts from traditional inland navigation states have worked together to refine and adapt European Directive 2006/87/EG and to embrace

global technical evolution. In addition, it has contributed to the improvement of the forthcoming ADN 2013.

In August this year, BV and Belgian classification society EuroClass agreed to enter into a technical co-operation agreement aimed at achieving a harmonised approach to, among other issues, European Directive 2006/87/EC dealing with inland navigation vessels. EuroClass is recognised as a classification society by the Belgian authorities for certain types of vessels, in particular those carrying cargo or passengers. Its register contains roughly one thousand inland navigation vessels, basically dry cargo vessels operated in the Benelux countries and in France.

The extended outreach of BV's inland team was confirmed by the entry into service last year of the first BV-registered inland waterways newbuilding to operate under the Indian flag. The design of a seagoing 2,400dwt double-hull bulk cargo vessel, built at the Super Services shipyard at Vasco Da Gama, was slightly modified and optimised in order to comply with the requirements of BV's Inland Navigation Rules.

In South America, new contracts were signed for the construction of vessels carrying petroleum products to operate on Amazon waterways, and a significant number of vessels are undergoing construction to BV class at Brazilian and Peruvian shipyards. In Brazil, Transpetro launched a programme for the construction by the Rio Tietê shipyard in Sao Paulo of new inland vessels to operate in the Tietê-Paraná waterways. These vessels are to be classed by Bureau Veritas.

New delegations to BV from flag administrations to carry out inspections on their behalf were granted by The Netherlands, Poland, Romania, Moldova and Serbia, and the 1,348m<sup>3</sup> tanker *Lavera* became the first vessel under the Serbian flag to have BV class and certification of compliance with ADN.

In Europe, implementation of the new ADN rules drove demand for certification. Bureau Veritas published a new and fully updated version of the BV Inland Navigation Rules NR217 to include all new European directive requirements. Also new last year was a notation covering floating establishments. This is a growing area as BV's expertise is used to ensure that floating units used as hospitals, hotels, cinemas and other services are safe. One example is *Nantilus*, a conference centre and restaurant complex which is 62m long and is moored on the Loire at Nantes, France.

Last year, BV's inland classed fleet grew to 1,845 vessels in service, with 305 vessels on order. Ninety-one newbuilding contracts were signed and almost 100 in-service vessels transferred to BV class. An example of new vessels is the 12,000m<sup>3</sup> tanker *Vinotra 10*, which is a unique Y hull design double hull bunker tanker which will operate in Rotterdam and is the largest inland tanker under BV class. And, while extending globally, the limits for BV-class inland vessels were also extended seawards. The 110m container vessel *Smack* was certified for access to Port 2000 in Le Havre and the 4,300dwt tanker *New York* became the first tanker certified for operation in restricted maritime stretches alongside the Belgian coast. **NA**



New regulations will create greener vessels sailing on the inland waterways

# Mercurius sticks with tradition

The craze for LNG has grasped many companies' attention in the industry, but Mercurius has opted to stay with its high end tanker designs for the time being

In the last few months Mercurius Shipping Group has delivered three inland chemical tankers to two owners. All three vessels have been constructed with stainless steel cargo tanks so that they can carry a wide range of chemical cargoes.

The company has not opted to look into green products for these vessels at the moment, but it says that it will look in to it. "This technology requires quite a bit of change [design of vessel]. Also, look at the finance the return on investment is almost impossible. There are too few companies that are willing to commit to this technology at the moment. It may be a plus in the market, but not in turnover", says Robert-Jan Zimmerman from Mercurius Shipping Group.

Zimmerman says that the company is not rushing into making investment decisions as they are too costly and the payback is too long. "There is some progress in bunkering. However, there is one ship running on LNG at the moment with a couple more on their way. That LNG vessel at the moment has to order its LNG bunker fuel five days in advance so that the truck that brings it has time to get where it needs to, but it does also have diesel auxiliary engines. More ships like this though will trigger bigger investment."

Two of the three vessels, *Stolt Rhine* and *Stolt Merwede*, were constructed for Stolt Tankers. Originally the designs for these vessels were based on previous Mercurius Shipping Group designs for chemical tankers, but as the client's needs became clearer Mercurius redesigned the vessels taking in the latest design specifications.

"One of the challenges was to have maximum cargo capacity. The hull has been optimised and its capacity has the largest cubic meter capacity for a 110m x 11.45m vessel. We also designed the midship higher and changed the aft ship so that it can go deeper in the water", says Zimmerman.

These vessels have been built to double hull, single screw, chemical Tanker, type C (hull), 50kPa, outfitting as Type C, and are suitable for transportation of mineral oils



*Stolt Rhine* the first in the series of chemical tankers with advanced cargo tanks

and liquid chemicals, for the transport on the West European inland waterways. They have a double bottom and double skin around the cargo area with the space between the cargo tanks and the shell that is used for ballasting.

One of the features of the vessel's design is that it has 10 separate cargo tanks that have their own heating systems allowing for the transport of different cargoes at different temperatures.

The tanker has 10 stainless steel cargo tanks and four separate slop tanks.

The 10 centre tanks are constructed from stainless steel (Duplex2205 (UNS S31803) PRE min 34) and surrounded by the side and double bottom U- shaped ballast tanks. The cargo tank bottoms have a minimum inclination of 1.5degs toward the centre line. All cargo tanks were initially approved for a maximum cargo temperature of 80°C without a reduction in filling limits. On specific request of the owner, the goal is to achieve Lloyd's Register approval for a maximum cargo temperature of 90°C. The cargo tanks are designed and approved for 50KPa over pressure. The tanks are designed for an S.G. of 1.6 tonnes/m<sup>3</sup>.

An electric driven tank cleaning pump is also located in the bow thruster room, which provided a form of booster pump. The system will be integrated in the pump system which is installed in the bow thruster area. The capacity of the pump can supply cleaning water to four tank cleaning machines, with 10bar pressure at the nozzles.

A tank cleaning heater is installed to heat the thermal oil. Capacity of each of the heaters allows the water temperature to rise to a safe level under all water conditions, with the water flow at the rated capacity of the tank cleaning pump.

The wash water heaters provided temperature control with readings of pressure for both water and Thermal Oil on both sides of each heater.

The thermal oil lines to the heater has a thermostatic and flow controlled automatic bypass valve to prevent the boiling of wash water should the wash water pump be stopped.

The tank cleaning system has independent water intake chests from other systems. A main deck line provides water capacity equal to that of any one pump.

The vessels are powered by a single main engine by ABC, 6DZC-1000-166-A. 1,325kW, 1,800hp, with 1,000rpm. The gearbox is from Masson, type MMW12000C-4, reduction 2.982:1. The flexible coupling is delivered by Stromag, a type GEF1600. The main engine and gear box are founded with Epoxy raising (Epocast 36 or equivalent).

The third vessel *Incubator* was constructed for private owners and delivered in August. This vessel design has been based on the same design as the Stolt Tankers but has been customised at the client's request. This ship has a bit lower draft, different midship and different aftship, and can carry a bit less cargo. **NA**



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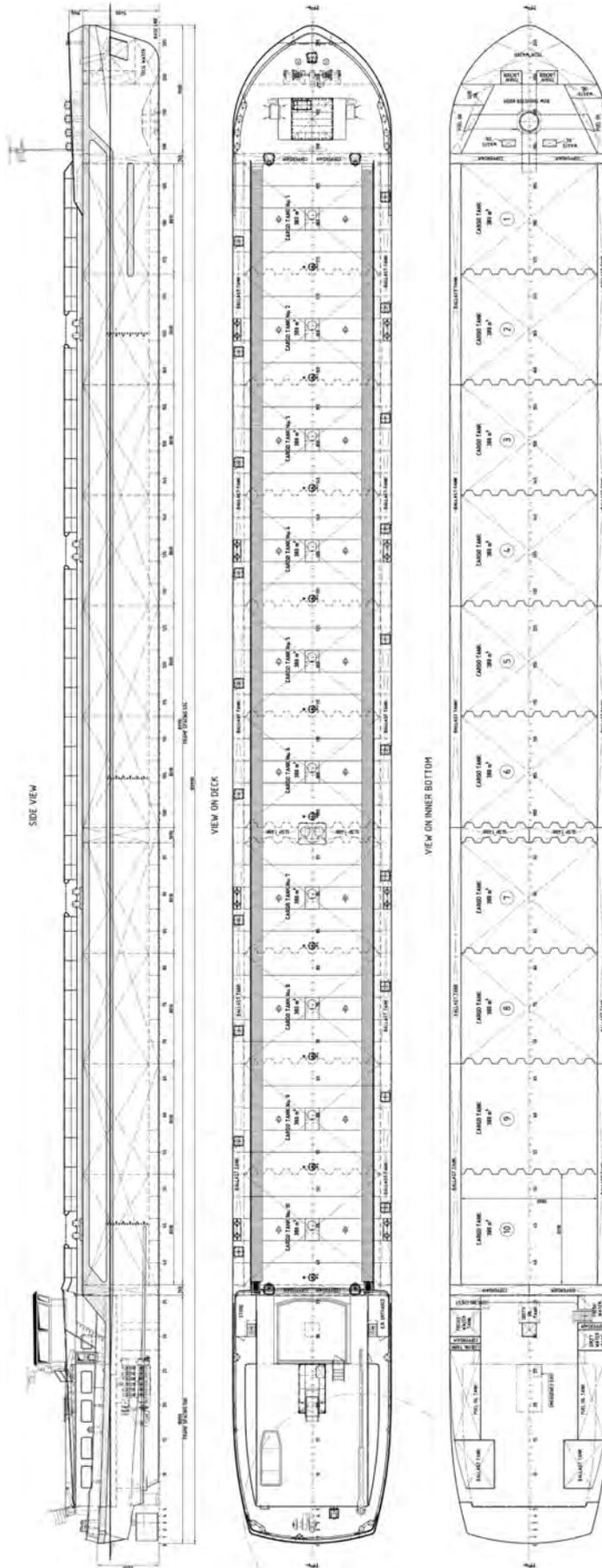


Electronic Actuator



Microprocessor

GA Plan of Incubator



## International Conference

# THE DAMAGED SHIP II

30-31 January 2013, London, UK

### Second Notice

Following on from the success of the first RINA international conference on The Damaged Ship; this event will focus on the assessment and analysis of stability, strength, sea worthiness of a ship damaged by collision, grounding, structural failure, fire or explosion. It will also consider procedures to minimise risks for passengers, crew, ship, environment and to develop safe countermeasures including sequences for transferring, offloading cargo and ballast water for salvage operations.

After any major accident it is imperative to rapidly quantify the damage, assess damage stability and the residual strength of a vessel. Damage stability appraisal should also consider the likelihood of progressive flooding, capsizing probability and effect of waves on stability. There is a need to consider both the global strength capability of the ship structure and the local residual strength of damaged and buckled plating and the effect of flooding on internal structure. Although too early to draw conclusions, the Costa Concordia accident once again reinforces the need for a better understanding of a damaged ship's behaviour.

A number of organisations already offer ship owners a range of Emergency Response Services (ERS) including shore-based expert assistance and computer-based contingency planning systems. The aim of this conference is to bring together designers, operators, classification societies and legislative government bodies to consider the present state-of-the-art and future developments. Papers are invited on all aspects of assessment and analysis of the damaged ship, including but not limited to:

- Damage assessment
- Stability and seakeeping of the damaged ship
- Global and local integrity of the damaged ship
- Modelling of the damaged ship
- Flooding simulation tools
- Stability in waves.
- Pollution mitigation
- ERS planning and decision support systems
- Regulation on damage stability
- Education and training on damage stability



Royal Institution of Naval Architects

[www.rina.org.uk/damagedship2013](http://www.rina.org.uk/damagedship2013)

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# Shell opts for LNG power

Petroleum giant Shell has announced that it will have ordered two barges from Peters Shipyards that will be run on LNG

Shell has been looking at a range of ways to improve the efficiency of its barge fleet along the Rhine. The LNG barges will be new additions to the existing shell fleet and will operate in The Netherlands, Switzerland and Germany and will carry diesel, heating oil or unleaded for its customers. The first barge is expected in early 2013 and the second one by the end of 2013.

The company says that it is focusing on making the operation of these two barges a success. From 2015 onwards, stringent environmental regulations concerning local emissions such as SOx, NOx and particulate matter will apply across the Baltics, English Channel and North Sea. Similar standards will also apply to marine traffic along the Rhine. The emission standards can be met using LNG Fuel. Shell, therefore, expects European marine LNG to be a key growth sector as



Shell gets into LNG with the delivery of two new barges that will be powered by the fuel

customers look for cleaner, cheaper fuels. LNG is a cost-competitive fuel and is expected to offer an attractive alternative for barge operators, says Shell.

“LNG is the main direction that we are heading in at the moment. We see that it

is the direction that Europe is moving in, in terms of future fuel. We are looking at other technologies, but at this time this is our main direction,” says Ross Whittam, Shell spokesperson, Shell International.

The barges will carry enough LNG to sail for up to seven days- from Rotterdam to Basel and back without refuelling. Unlike many traditional barges the bridge/wheel house is at the front of the ship, which will give better trim, more efficient movement through the water and the potential for a higher level of safety, says Shell.

The barges will be 110m long, 11,40m wide and 4,50m high (empty draft). They will have a cargo capacity of 3,130m<sup>3</sup> and an average speed of 8.6knots. Shell says that it plans to refuel the barges using trucks at the Seine harbour in Rotterdam. [NA](#)



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## HISTORIC SHIPS III



5 - 6 December 2012, London, UK

### Second Notice



[www.cuttysark.org.uk](http://www.cuttysark.org.uk)

RINA's 3rd international conference on historic ships, building on previous successful events, will explore the technical issues involved in the preservation, restoration and replication of historic vessels, including large passenger ships, warships, coastal & inland craft.

The conference will be of interest and value to members of the many organisations world wide and others who are involved or interested in the preservation of these ships for the benefit of future generations.



The conference papers include but are not limited to:

- From Couta Boat to Daring Class Destroyer - The Historic Fleet of the Australian National Maritime Museum
- The Evolution of Ship Structures From Antiquity to the Present Day
- Historic Ships in Operation; Targetting Sustainability and Safety
- Replicating Historic Vessels
- Researching, Designating and Managing England's Marine Historic Environment
- The SS United States - Hull & Superstructure Materials, Their Grades, Connection Issues and Corrosion Control.
- On Numerical Evaluation of the Sailing Performance of Historic Clipper Vessels
- Submarine Alliance Restoration
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## Slide rules

Dear Sir,

I read your September news item on marine lubricants with great interest and felt compelled to write in response to the position set out in *The Naval Architect*.

I like to think that at Castrol we say what is true and we do what is right. With that in mind I must state that the debate regarding the use of mid-range base number (BN) lubricants is not over. This is backed up by debate in many areas of the trade press, papers at marine industry. In recent months we have seen:

- Impressive sales of Cyltech 80AW, a high BN product we recently launched aimed at vessels slow steaming.
- Owners of vessels contracted to competitors using mid-range lubricants have contacted us to offer their vessels for trial. They want to see if our Cyltech 80AW product can solve corrosive wear problems that they are experiencing when using mid-range BN products and slow steaming.
- OEMs continue to issue feed-rate / BN curves, which clearly show the feed-rate benefits of using high BN products. Many of the competitor claims you reference regarding feed-rates are contradictory to current OEM guidance. Given that OEMs conduct more engine inspections than any lubricant supplier, we would not recommend our customers lubricate at feed-rates below OEM recommendations.

We advocate that each vessel should choose a cylinder lubricant based on its predominant operating condition – this will generally be a single variant of a range of cylinder oils. To be

clear, Castrol's approach is that the vessel needs only one oil and one tank – but it must be the right oil vessel's fuel and steaming regime.

Cylinder oil requires alkalinity, expressed in BN, to neutralise by-products of acidic combustion and avoid corrosion. Once, BN was the only data available to gauge oil's ability to fight acids within the cylinder—cylinder oil had to have a BN that matched a fuel's sulphur content. BN also reflects detergency, for example, the ability of the oil to keep the piston rings, lands (the part of the piston above the top ring or between ring grooves), and grooves free from deposits.

We do see a place for mid-range lubricants - we too offer a mid-range lubricant to our customers, but we only recommend this in specific operating conditions. Today, however, some lubricant manufacturers are moving toward a single product offering, effectively forcing their customers to use a mid-range lubricant. Whilst we see why mid-range lubricants may be seductive, they do not offer the best safety margins, particularly when it comes to prolonged operation in Emissions Control Areas or areas where sulphur content remains high

Slow steaming has complicated traditional assumptions concerning engine performance because marine engines are not designed to operate below 85% power for prolonged periods. That is why we advocate a range of lubricants to provide an optimum, cost effective lubricant solution. I think the term 'universal lubricant' is misleading. Lubricant choice is a compromise about what is the optimum solution for the operating conditions a vessel will encounter based on a balance of

operational complexity and engine performance. So whilst a midrange BN (50 to 60) lubricant may be the right choice for some conditions, the severity of slow steaming on higher sulphur fuels (defined as > 1.5%) means that a 50 to 60BN lubricant has insufficient BN to fully protect cylinder liners and piston rings from corrosive attack.

You quite rightly say that OEMs such as Wärtsilä and MAN Diesel have provided "no objection" letters to all the major players in the MCL industry. However, these are issued with feed-rate graphs and mid-range lubricants require significantly higher feed-rates in extreme conditions which is costly. The OEM letters of no objection you refer to were based on trial data under normal operating conditions, not slow steaming. Also, they do not mean that products were tested using the most demanding modern marine engines. By eliminating 40BN and 70BN products, suppliers remove options from owners who face extra wear in exchange for simpler operations.

Where 40BN cylinder oils may suit vessels permanently operating in ECAs, those of 80BN are better suited to vessels regularly slow steaming and on international trade, even those involved in frequent ECA transits.

I'd like to take this opportunity to invite you to contact me for comment if you are writing further articles on lubrication. I look forward to speaking to you in the future.

Yours faithfully

*Paul Lowther*  
Global Marketing Communications Manager  
Castrol Marine

## Bolder and bolderer

Dear Sir

I read with great interest the feature article 'APL's Statement of Intent' in the October issue of your magazine. It is not only the statement made by the speed of this vessel that is significant. The ship has only 5% capacity greater than could fit through the expanded Panama Canal (maximum around 13,200 TEU), but it is too large to make the

transit. Does this make any statement about the relevance of the expanded canal to container shipping?

We should keep in mind that APL showed themselves to be remarkably prescient in the construction of the first post-panamax container ships in 1988: a series of five 4,340 TEU ships delivered by Bremer Vulkan and HDW. No other post-panamax followed until the 4,734 TEU CGM Normandie, delivered

by Samsung in 1991. Are they following this up with a similarly bold statement of the changing game in container shipping?

Yours faithfully

*Paul Stott*  
Senior Lecturer  
School of Marine Science and Technology  
University of Newcastle upon Tyne

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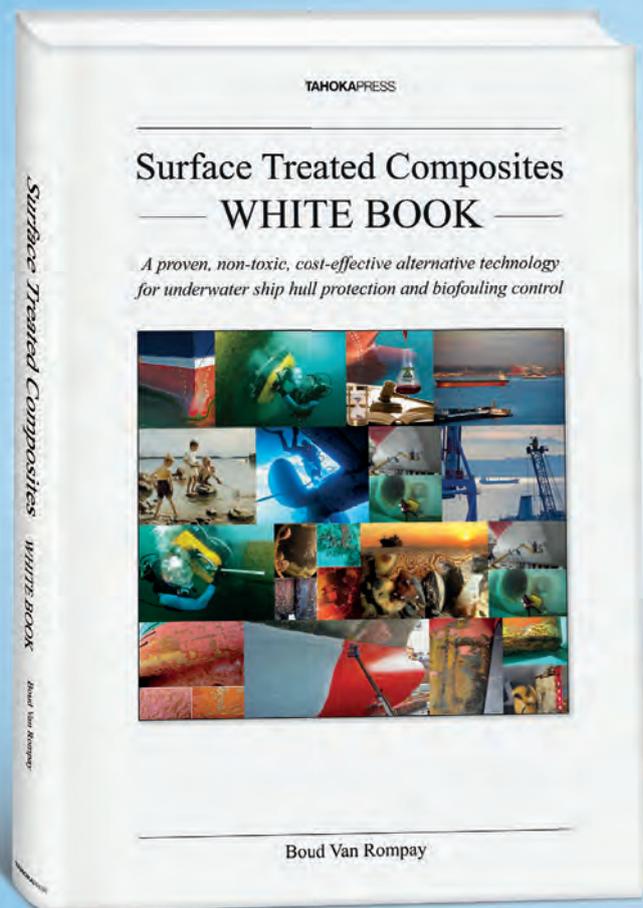
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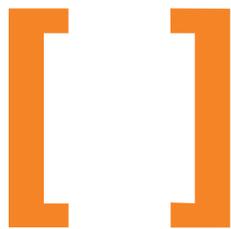
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# 1<sup>st</sup> Announcement and Call for Papers

## 3<sup>rd</sup> International Conference on Advanced Model Measurement Technology for the Maritime Industry (AMT'13)



To be held on 17-19 September 2013  
in Gdansk, Poland

Organised by Hydro-Testing Forum, HTF, ( [www.hta-forum.eu](http://www.hta-forum.eu) ) &  
Hosted jointly by Newcastle University (UK) and CTO S.A. (Poland)

This conference is of benefit to Industry, academics and students interested in advanced model and full-scale testing methodologies and measurement techniques used in the marine environment. The conference theme, like the previous AMT conferences, covers all the diverse state of the art measurement technologies in the marine environment such as: PIV/ LDA operation; High speed video; Flow data analysis and visualization; 3-D wave field measurements; Pod/Dynamic forces; Wireless data transmission; Intelligent materials and production methods; Wetted surface; Free running model and Noise technologies.

For AMT'13 there will be special emphasis placed on commercial shipping noise and its associated measurement techniques, environmental impact and related technologies. The conference will also provide a platform for reporting and collaboration between the HTF, the on-going EU FP7 and ITTC research activities in this field. In addition to the disseminations from the HTF and other participants, the conference provides a good opportunity for networking, both with delegates and invited equipment manufacturers displaying their products.

Abstracts of a maximum length of 300 words are to be submitted to [amt13@ncl.ac.uk](mailto:amt13@ncl.ac.uk) by 28 December 2012  
Conference website: <http://conferences.ncl.ac.uk/amt13> E-mail: [amt13@ncl.ac.uk](mailto:amt13@ncl.ac.uk)

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**International Workboat Show**, international conference, New Orleans, USA.  
www.workboatshow.com

## December 10-12, 2012

**Design & Analysis of Submarine Structures**, international conference, London, UK.  
www.maritime-conferences.com/asranet-  
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## December 17-19, 2012

**Structural Integrity Analysis (Fatigue & Fracture)**, international conference, London, UK.  
www.maritime-conferences.com/asranet-  
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## January 30-31, 2013

**Damaged Ship Conference II**, London, UK.  
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E-mail: marinfo@baird.com.au  
www.bairdmaritime.com

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**Cruise Shipping Miami**, international conference, Miami, USA.  
www.cruiseshippingevents.com

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E-mail: conference@rina.org.uk  
www.rina.org.uk/Surv8

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www.europort-istanbul.com

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E-mail: events@seatrade-global.com  
www.sea-asia.com

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www.rina.org.uk/materials\_conference

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www.rina.org.uk/marine\_coatings

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E-mail: OTC@experient-inc.com  
www.otcnet.org

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www.rina.org.uk/super\_yacht

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www.imdexasia.com

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E-mail: conference@rina.org.uk  
www.rina.org.uk/ship\_manoeuvring\_in-  
shallow\_water.html

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## June 4-7, 2013

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www.messe.no/nor-shipping/

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www.seawork.com

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