THE NAVAL ARCHITECT

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Denmark / CAD/CAM update/
Heavy-lift / Inland and coastal vessels / **April 2013**

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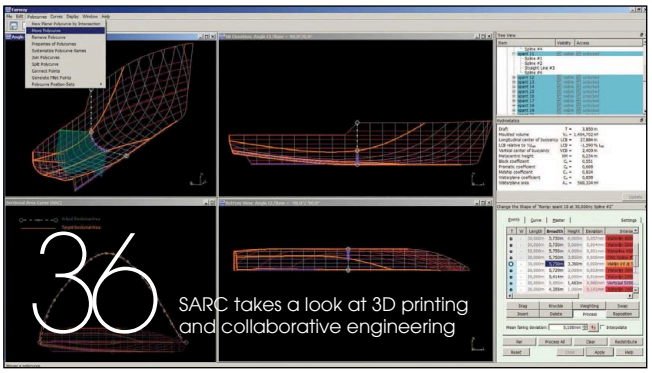

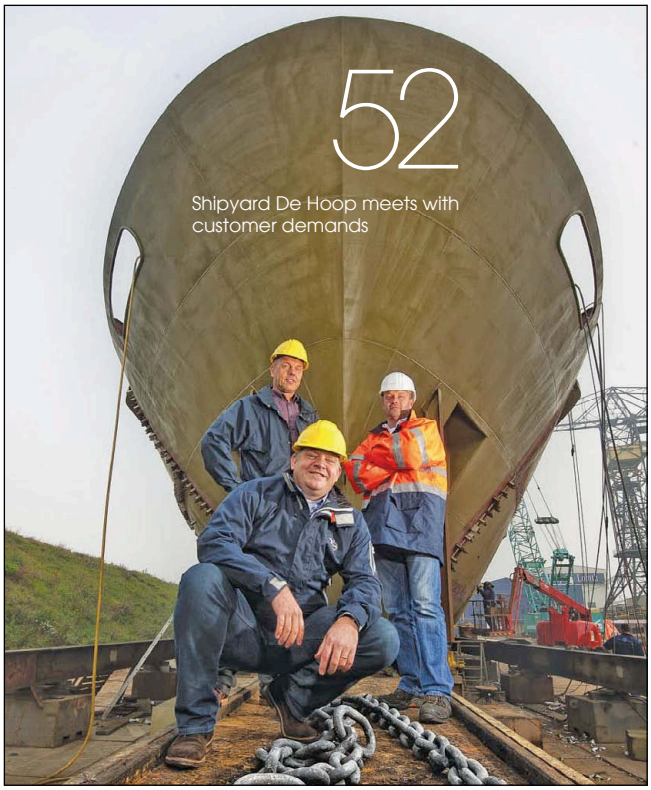

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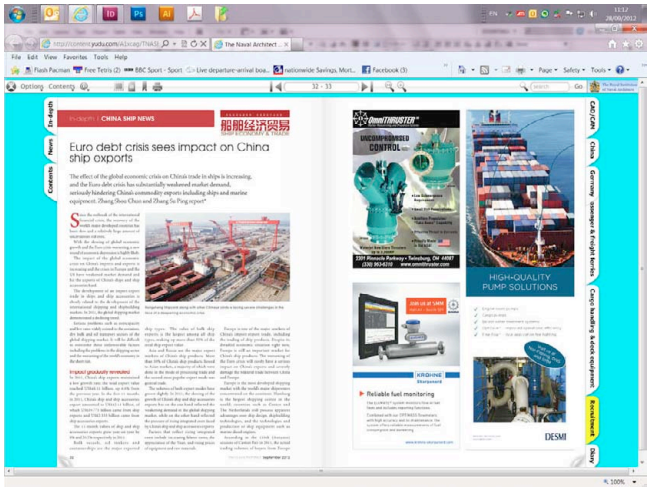

MARINE COATINGS
18th April, London

The Royal Institution of Naval Architects

2nd Notice

The marine environment has always been a harsh and unforgiving environment for both anti-fouling and corrosion control coatings systems. In the current economic climate the industry faces an even greater need to improve the performance and cost effectiveness of coatings systems. The industry is now being affected by more and more legislation on safety and environmental protection issues.

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- A NOTE ON CURRENT ANTI-FOULING ISSUES, Dr RL Townsin
- EVALUATION OF ELECTRODEPOSITED POLYANILINE ON MARINE GRADE ALUMINIUM FOR ANTIFOULING PROPERTIES, T To, University of Auckland, AUSTRALIA
- A STUDY FOR THE EFFECT OF SURFACE ROUGHNESS ON RESISTANCE CHARACTERISTICS OF FLAT PLATES, Onur Usta, Emin Korkut, Istanbul Technical University Faculty of Naval Architecture and Ocean Engineering Istanbul, Turkey
- A PARAMETRIC STUDY: HULL ROUGHNESS EFFECT ON SHIP FRICTIONAL RESISTANCE, Yigit Kemal Demirel, Osman Turan, Atilla Incecik , University of Strathclyde, UK

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Trial and error

Sabine Howaldt in the Kiel Fjord on sea trials - May 1958

Meeting the requirements of new regulations is becoming tougher as the rules themselves become more stringent. For owners buying new ships it is, therefore, essential that they know when a new vessel is delivered that it can meet the Energy Efficiency Design Index (EEDI).

As a result of these changes the ship trial process has become significantly more important process than had previously been the case. According to the Dutch tank test facility MARIN sea trials of the past used to focus on speed because schedule integrity was the most important issue. That has now changed as owners increasingly focus on fuel efficiency.

A reflection of the importance afforded sea trial information is the very fact that Nedlloyd, Shell and MARIN established a Sea Trials Analysis Joint Industry Project (STA-JIP) that was later joined by a clutch of owners from a variety of countries. At the heart of the difficulties for owners was the realisation that there were no standards for conducting sea trials for new vessels.

Research by MARIN and its STA-JIP partners means that a new industry-wide standard for sea trials has been agreed and accepted by the Marine Environment Protection Committee (MEPC) at the IMO. This means that in future there will be a measurable and pre-agreed standard by which EEDI and the new ship's performance can be measured by. In addition the STA-JIP will improve and make publicly available standard software for interpreting sea trial data.

Data from sea trials are now also being returned to test basins so that the information can be analysed and checks can be made on the extrapolations that test centres made during the design phase.

Work by MARIN and its partners will have done owners, operators and designers a great service and the development of the sea trials standard will be very welcome. However, in Denmark the maritime industry, which has also identified the sea trials period of delivery as crucial to the delivery of new vessels in the light of the introduction of the EEDI regulations.

In essence both the Southern University of Denmark and the Danish Technical University have understood that new ship designs must meet the performance standards expected of the vessels when they are on the drawing board.

Calculations made at the design stage can on occasion be inaccurate when the vessel is built and is being tested prior to delivery. As a result the universities have developed the Ship Design Model, otherwise known as SHIP-DESMO.

Having tested SHIP-DESMO on Maersk operational data the universities have established that the programme is accurate, however, this information is not for public consumption and so SHIP-DESMO's creators had to come up with a way to demonstrate its use without Maersk's input.

SHIP-DESMO is calibrated for use with the three major ship types, bulk carriers, tankers and container ships. As it happened DNV has a container ship design, the Quantum 9000 that can do the job.

According to DTU Quantum 9000 has a number of attributes that are interesting and while concept ships often use technology that can best be described as 'flaky' DNV's vessel does not fall into this category.

In using Quantum 9000 to demonstrate SHIP-DESMO, however, the universities have established a demonstration model that can never be tested. Initially users of SHIP-DESMO will simply have to take the creators' word for its accuracy.

Even so the data featured in the Danish feature this month are interesting and may convince designers that SHIP-DESMO is worth a second look. The shorter and wider Quantum vessel is compared to a standard 9,000TEU vessel in the feature and the results are shown using a standard marine diesel and a dual fuel engine.

Both of these developments demonstrate the fantastic speed with which the shipping industry is moving to cut emissions following a very slow start. Industry designers, owners and operators have understood the need for change and really grasped the nettle in an effort to meet the climate change challenge.

In the past maritime commentators have been rightly criticised for failing to understand the need for change in an industry that has a similar carbon footprint to Germany, the world's third largest industrial nation. So when Nautilus says that it is no longer adequate for those in the maritime sector to argue that we are the cleanest industry when one measures the movement of goods by the tonnes per mile. Nautilus believes that the industry must look for radical solutions to the conundrum that we face; namely reducing emissions in the face of growing demand. Meeting this challenge will, perhaps prove to be the toughest test yet. *NA*

Retrofitting

Maersk's nose for slow steaming

Maersk will give 10 of its container vessels a 'nose-job' in a change that will improve the vessels' efficiency and make them more attractive to charterers.

Some 10 Boston class ships of around 3,000TEU each will have their bulbous bows replaced in an effort to improve the hydrodynamic efficiency of the vessels' hull as they slow steam, which itself was introduced to cut fuel consumption after the financial crisis hit in 2008.

Erik Rabjerg Nielsen, Head of Maersk Line Scheduling & Deployment says: "This will basically reduce our cost base by around US$10,000/day for each ship, so the fast and efficient execution of the project has a large impact."

Five of the vessels will be chartered by Seago Line, four of which have already been delivered. The nose-jobs were performed in Qingdao, China. One of the vessels, *Maersk Brownsville*, had its new bow built in China, but the cost of transporting the vessel to China was prohibitive. As a result Maersk transported its bow to Europe where the new 200tonne bow was fitted.

A bulbous bow helps a ship to neutralise the bow waves that it generates through its own forward motion. When these waves hit the shoulder of the ship the vessel will need to use greater energy to maintain its speed. The faster the ship sails, the higher the waves and the more energy it needs to get through the waves it creates itself.

With the correct bulbous bow designed for the speed of the vessel is fitted counterwaves that neutralise the waves created by the ship sailing through the water, and thus reduce the amount of energy required to move forward, saving up to 8% in fuel costs, says Maersk.

The payback time for retro-fitting the new bulbous bows is estimated to be around three months at current HFO price levels, according to details released by Maersk.

Classification

Class on the move

The Korean Register of Shipping (KR) has announced that it has introduced a new app for executives that wish to access information regarding their vessels via their mobile phone.

According to KR the app, called SMART-Fleet, has two levels of access, a basic level which can be accessed by anyone and offers minimal information, while fleet owners and operators will be able to view the "full range of data" on their ships.

"SMART Fleet" is a unique app available on Android and iOS platforms that delivers up-to-the-minute information on vessels, fleets, surveys, audits, port state control and more," says KR.

Users will be able to access information on fleet lists, survey status, reports and schedules, a complete vessel register, classification rules, PSC detentions, checklists and reports, technical information, publications and survey guidelines.

Other useful functions incorporated in SMART-Fleet include a "push notification system" used to receive urgent messages concerning PSC detentions and technical updates as well as a "surveyor locator" which uses location based services technology to identify the KR survey office nearest to the phone user.

A bulbous bow destined for one of Maersk's Boston class vessels

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KR chairman and CEO Oh Kong-gyun says: "In today's fully wired world, the busy shipping executive expects global, anytime access to vital vessel information. This innovative new service brings KR bang up to date with the latest technology and delivers a value added service to the industry."

Container Ships

Maersk inspect *Emma* damage

Mystery still surrounds the flooding of the engine room on the *Emma Maersk*. The engine room was flooded following an accident that tore a propeller from its mountings leaving a hole in the hull plating through which sea water poured. However, Maersk cannot understand how the water continued to flood the engine room, it is expected that plating inside the compartment where the propeller was mounted should have prevented the spread of the water.

A group of experts from the owners, suppliers, including Rolls Royce who manufactured the propellers and classification society ABS along with consultants and accident investigators inspected the damage late in March following the draining of water from the engine room and the surrounding areas.

Emma Maersk is in Palermo, in Sicily Italy, following the accident and one of the items that the experts are expected to focus on is the plates behind which, the cables that run from the engine room to the space where the propellers were mounted as there is a question over whether this plating was strong enough to contain the water pressure following the flooding.

All the other seven E-Class ships have reportedly had these plates inspected, and Maersk says that it is in everyone's interest to discover what went wrong. *Emma Maersk* is expected to be out of action for another two to four months, says Maersk.

Environment

Sulphur targets are hit and miss

A report commissioned by the UK Chamber of Shipping from AMEC that was published at the end of March highlighted the possible pitfalls that lie in wait for the industry as sulphur emission controls become effective in 2015.

The report warns that the introduction of sulphur controls on shipping could result in job losses of up to 2,000 and see an increase in sulphur emissions.

"The root of problem comes in the cost – financial and environmental – of low-sulphur fuel," says the report.

In order to meet the regulations ship owners will have three options, to use low sulphur fuel which carries a financial penalty in the form of US$300/tonne extra cost over current HFO prices.

Another option is to fit scrubber technology that will reduce sulphur emissions from HFO. However, according to the AMEC report this technology "is not yet sufficiently proven for ship owners to fit them with confidence before the 2015 targets".

A third option is to use LNG as a fuel which AMEC says is impractical for most of the existing UK fleet and can only be economically viable for newbuildings.

"To cope with the major increase [in costs incurred through the sulphur regulations], operators of sea routes around the UK would need to increase ticket prices – by up to 20% for passengers and up to 29% for freight," says AMEC.

David Balston, director of safety and environment at the UK Chamber of Shipping, said: "We fully support the need to reduce sulphur emissions from ships – but we are particularly concerned that many routes will become non-viable and for those vessels operating on them we seek transitional arrangements, including very tight time limited exemptions to allow technology to catch up and provide a realistic alternative."

He added: "The wider impact is hard to quantify – but these regulations will make the UK less competitive, making us a less attractive country for international investors - at the worst possible time for the UK economy."

Engines

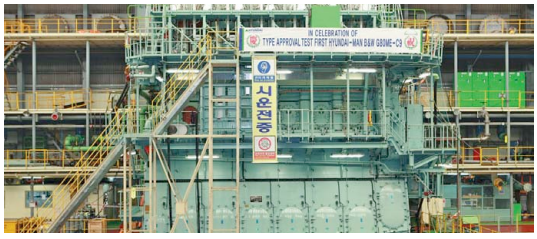
G-Type tests completed

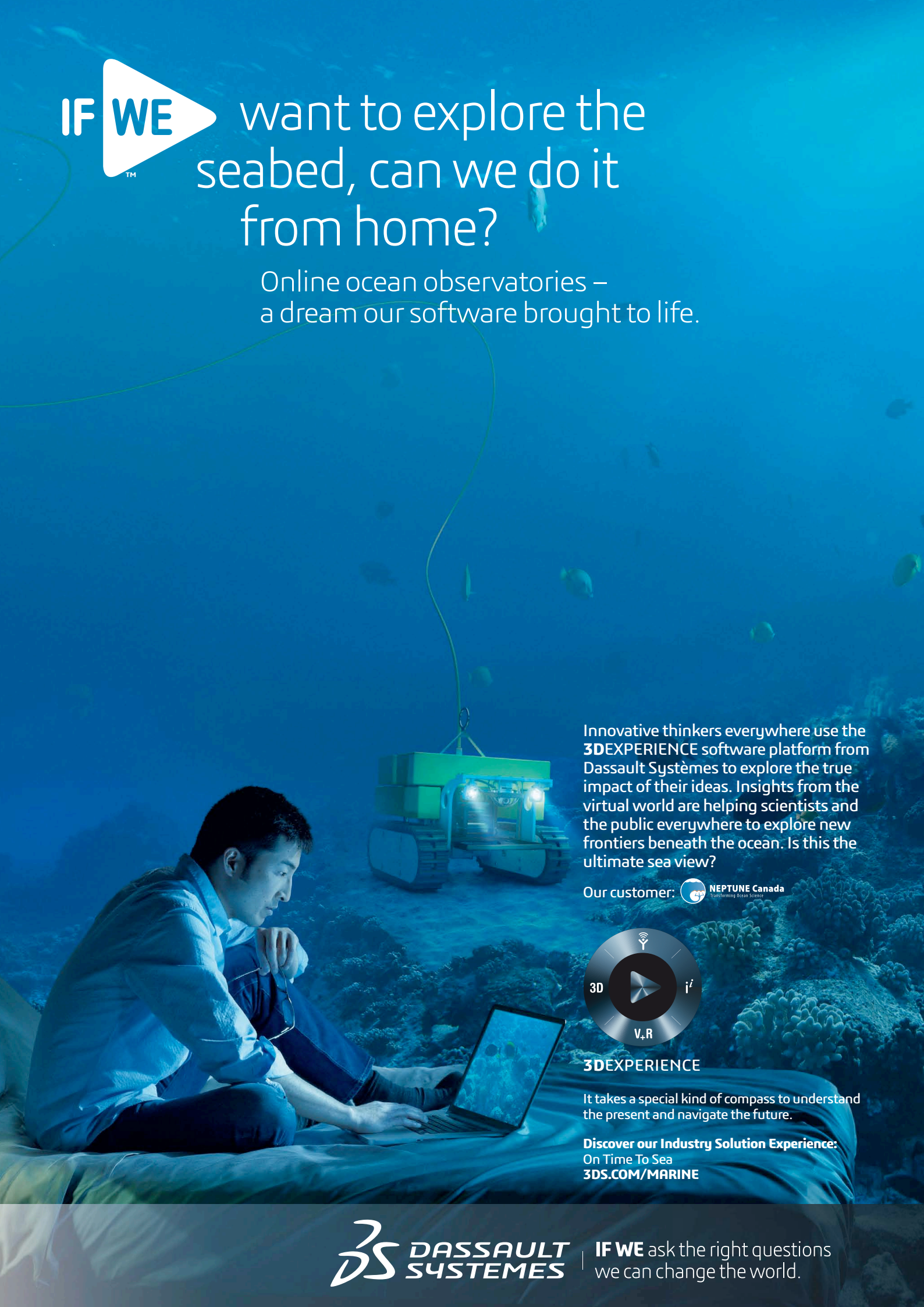
Type approval tests for MAN Diesel & Turbo's ultra-long stroke G-Type engines were completed at the end of March says Hyundai Heavy Industries (HHI), which conducted the tests and builds the Danish designed engines under licence.

Supervisors from 11 classification societies attended the tests for the 7G80ME-C9.2 at 37,900 bhp and 6G80ME-C9.2 at 38,200bhp engines which are expected to significantly reduce carbon emissions.

HHI says: "A G-type marine engine was installed on Almi Tankers' 319,000dwt VLCC and the other one is scheduled to be installed on Thenamaris Ship Management's 5,000TEU container ship. Since the G-type engines use 7% less fuel and produce 7% less emissions than engines with the same output, the G-type engine will save the respective owners about US$ 2.9 million and US$1.3 million a year."

The Hyundai-MAN B&W G80ME-C9 at its type approval test at HHI's Ulsan plant

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Revolution not elocution

A radical change in propulsion is needed to meet international reduction targets in airborne pollutants according to seafarers union Nautilus's senior national secretary Allan Graveson, *writes Sandra Speares*.

His comments followed deliberations by IMO delegations on the way forward on greenhouse gas emissions during a workshop which is due to report back to the IMO's Marine Environment Protection Committee in May.

Graveson believes that the best that can be achieved with current engine efficiency is about 30%. However, he says, world trade is growing year on year at the rate of 5% and as ships are not increasing much in size, he says "so inevitably what we save on energy we are going to lose quite quickly".

Graveson says "we need a fundamental rethink on what we are going to use at sea". He points to developments in the field of ethanol as fuel.

One example of this is the SPIRETH project, which began last year, and which aims to test the use of methanol-based fuel to power an auxiliary engine on board a Swedish ro-pax vessel.

The two main strands of the project are to develop an on board process for the conversion of methanol into a mix of methanol, water and di-methyl ether which would then be tested on the ro-pax, and adapting the marine diesel engine to run on methanol. Partners in the project include SSPA Sweden, ScandinNAOS, Stena, Haldor-Topsoe, Wartsila, Lloyd's Register and Methanex.

Methanol, Graveson says, is a "proven fuel" which, could be used through existing supply chains. "If we really want to do something we have got to think radically". A move towards cleaner fuels is possible including distillates but, "we have certainly got to get away from heavy fuel oil". Shipping, he said, quoting EU commissioner Borg was the "mobile incinerator for the oil industry".

He also raised concerns about fuel being contaminated and causing damage to the engine. While many argued that shipping was the cleanest form of transport using the tonne miles argument, in reality, he said it was not [clean] as long as it continued to burn heavy fuel oil.

Emissions have been a hot topic in recent weeks with a new report from the European Environment Agency saying that emissions of air pollutants and

Chemical and product tankers like the *Stena Penguin* (above) are already transporting methanol in large quantities, though there could be some debate about safety

greenhouse gases from the shipping sector have increased substantially in the last two decades, contributing to both climate change and air pollution problems.

"The shipping sector needs an integrated monitoring, reporting and verification system for emissions in European waters to systematically address both types of emissions together," the report says.

Meanwhile a new report by AMEC claims that the targets for shipping companies to reduce their sulphur emissions by 2015 could cause adverse environmental effects and result in a loss of 2,000 maritime services jobs, and place many more industrial jobs under threat.

The concern, according to Graveson, is whether the IMO can come up with a solution which will prevent intervention from elsewhere.

Market based measures are another hot topic, he suggests, as individual countries' approach could be politically motivated. There is a battle he says between different countries including the UK, Germany and the US on the issue of emissions trading because it "will help their trading floors in those three countries, but it won't necessarily help the environment".

He describes the process as being more like the selling of indulgences. "I've paid some money so I can burn what like". The industry, he says, wants to keep on burning heavy fuel oil as long as they can.

While LNG is an alternative propulsion method, Graveson says he wouldn't trust the industry with nuclear power. The methanol option he feels, is easier to store and to bunker. "It's got possibilities".

Europe has a lot of technological expertise in terms of engine design although production is going on in the Far East under licence, he says.

While there could be some efficiencies in routeing of vessels, emissions could be reduced by ship sailing times. "Radical change in fuel oil is necessary, but we had this scenario from sail to steam, and when we moved to coal and from coal to oil. Now if we move from oil to some other improved type of fuel, be it LNG, methanol or whatever, that is the next step along the line".

The shipping industry, he says, has to admit that it is burning a fuel oil that would not be burned in other industry. "It's an environmental issue, but it is a money issue as well and there are so many people in the industry who are not willing to say we will go for the new fuels and the new engines and we'll move ahead."

Even if owners fit scrubbers on their ships, they are still dealing "with filth" let alone the problems of retrofitting scrubbers to existing ships. "We've got to look at all the options, but we have got to get out of the way of thinking we are the cleanest industry," Graveson says.

He uses the example of a horse pulling a cart and a horse pulling a barge. The horse can pull a lot more on a barge than on a cart because of the buoyancy of the water. However, he adds, "the horse still shits doesn't it?" *NA*

Ballast water

Russia's Rosmorport Fleet selects Hyde Guardian

Hyde Marine, Inc., has announced that it has received an order for its Hyde GUARDIAN Ballast Water Treatment System (BWTS) HG600 unit that will be installed on the largest icebreaker in the FSUE "Rosmorport" fleet (22600 project), a 25mWt-power diesel vessel.

The contract is the first of its type awarded to Hyde Marine in Russia for this type of vessel construction. The 22600 project will be delivered in 2015 with the system being installed at Baltic Shipyard.

Additionally, Hyde Marine was awarded a contract in 2012 to install the Hyde GUARDIAN BWTS on two LPG tankers currently in construction at Hyundai Mipo Dockyard Co. for Russian owner Novoship (part of the Sovcomflot group). Installation is expected on the LPG vessels in 2013.

www.hydemarine.com

Paints & coatings

Non-stick ships

International Paint has introduced two new products on to the market that it claims will keep hulls cleaner. The products Intercept 8000LPP, a new patented biocidal antifouling is said to improve predictability in hull coating performance and Intersleek1100SR is claimed to be the industry's first patented biocide free slime release technology.

The products have been designed to address the issue of slime fouling on ships hulls and is said that the two new technologies are set to improve vessel operating performance, increase efficiency and help control fuel costs and emissions.

Intercept8000 LPP, is a biocidal linear polishing polymer antifouling that features the patented 'LUBYON' technology, which will give predictable long term performance for in-service periods up to 90 months, and; Intersleek1100SR, is a biocide free fouling control coating featuring unique patented slime release technology that combats micro fouling on ships hulls, maintaining performance throughout the docking cycle, highlights the company.

The LUBYON polymer technology gives the coating a 'superhydrophilic' surface. When the coating is immersed, the seawater has a lubricating effect, resulting in less friction. This reduces drag and increases vessel efficiency giving average fuel consumption and associated emissions savings of 5% annually compared to typical controlled depletion polymer antifoulings. The coating surface also swells on contact with seawater, helping to smooth out imperfections and potentially further reducing drag, highlights the company.

www.international-marine.com

Communications

NSSLGlobal launch C-Band VSAT

Global satellite communications provider NSSLGlobal has announced the addition of a Global Maritime C-Band service to its Cruise IP VSAT portfolio. The service will include seamless global coverage around the world regardless of location or weather, highlights the company.

NSSLGlobal's latest C-Band network will offer users better bandwidth with high resistance to weather such as rain fade and will give a broader coverage.

The new C-Band service is being offered alongside NSSLGlobal's existing KU Band Cruise IP service. This includes NSSLGlobal's Service Assurance package, which will now feature seamless failover between C- and Ku-Band services alongside an L-Band service, to provide customers with high-speeds.

The benefit of NSSLs new service offering is that it uses the same network, modem and Hub's as NSSLGlobal's Ku-Band service allowing the company to provide the same high speed bandwidth packages, premium voice, automatic beam switching and web and Email control services as NSSLGlobal's leading Ku-Band Cruise IP service.

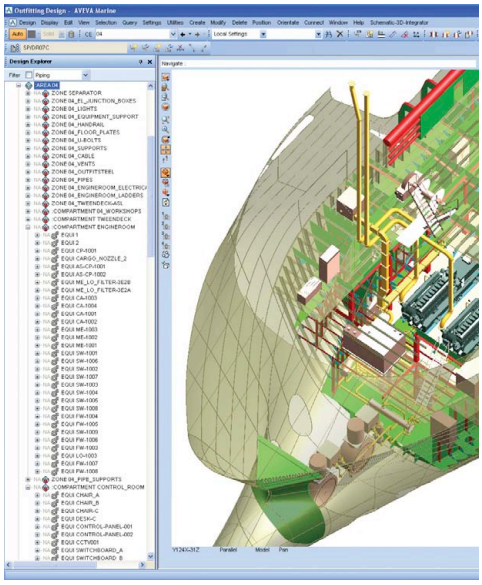
www.nsslglobal.com

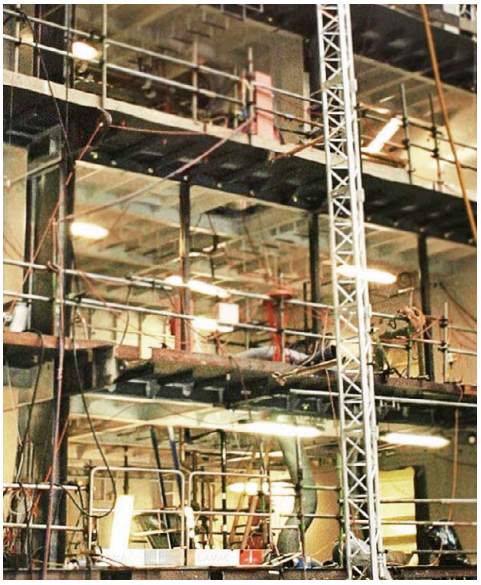
Communications

MTN links up with BATS

MTN Satellite Communications (MTN) announces BATS has entered into an exclusive partnership with MTN to market the Broadband Antenna Tracking and Stabilisation (BATS) system to the cruise, ferry and large yacht markets. This end solution is a hybrid network service, leveraging both satellite and terrestrial broadband, which BATS has already proven in the public safety, energy, military and ferry markets.

The company says the BATS system delivers high capacity throughput, enhanced optimisation, and a stronger, more stable connection at many miles





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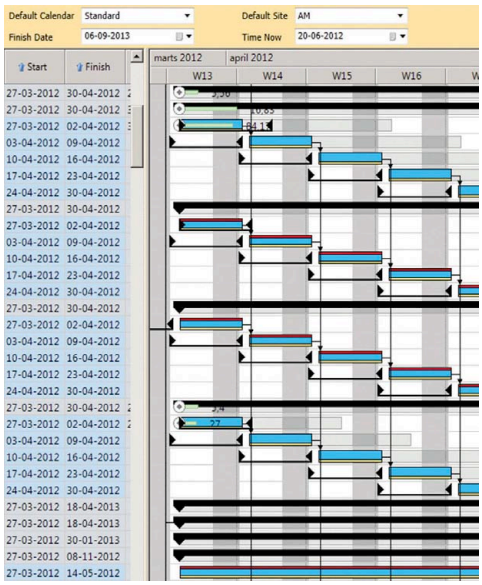

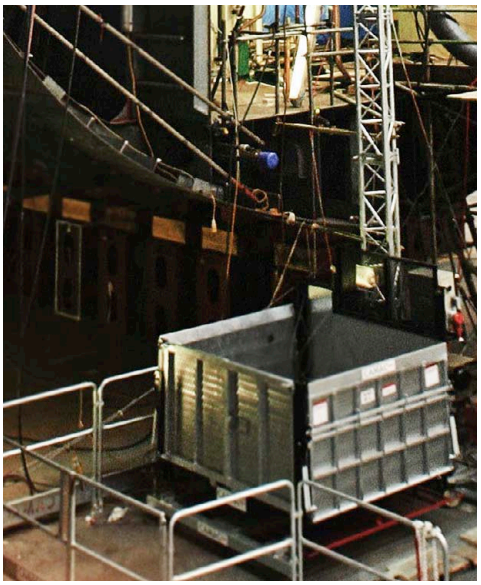

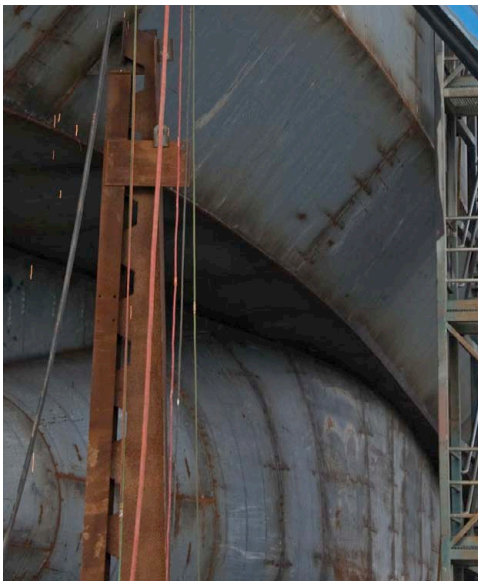

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Lifesaving

NORSOK platform davit first

Vestdavit will supply the first NORSOK compliant davit to an oil platform in the Norwegian North Sea. The Norsok R-002 2012 davit will be a part of a complete lifesaving package on a new platform. The platform is currently under construction and will be installed in the Norwegian North Sea in 2015.

Bjørnar Dahle, area sales manager, says: "The NORSOK regulations call for redundancy in all systems and have stricter safety factors and speed requirements than current davits. We are very proud that this operator has entrusted us with this first order under the new regulations. Many of our systems already met the new specifications, so it is a case of regulation catching up with the best in the business."
www.vestdavit.no

Communications

Jeppesen and Garmin expand coverage

Jeppesen will provide expanded electronic chart data through its C-Map solution to satellite navigation provider Garmin.

C-MAP by Jeppesen has expanded its partnership with Garmin, providing the satellite navigation manufacturer with additional electronic chart data for its Garmin BlueChart g2 and g2 Vision marine navigation products. Through this expanded strategic agreement, Garmin says that it will provide its customers with the latest Jeppesen charts for key regions of the Mediterranean and Indian Oceans, together with updated and enhanced coverage for the Bahamas.

As part of this partnership, marine cartography coverage for inland waterways in Germany, France and The Netherlands will now be available through Garmin. The cards include detailed mapping of inland waterways for regions EU060R - Germany Inland Waters, EU061R - France Inland Waters and EU018R - The Netherlands Inland Waters.

Garmin will also provide customers with expanded content through its C-MAP by Jeppesen partnership for Italy, India and the Bahamas. The content for Italy and India includes hundreds of updated port plans and marinas as well as thousands of high-detail charts. For the Bahamas, Garmin has replaced all existing chart coverage with Jeppesen-provided data sourced from Wavey Lines and Explorer Chartbook.
www.jeppesen.com

Communications

Merger puts Admarel on the map

The Netherlands-based Simnav has merged with the navigation and communication department of Alewijnse to form new company Admarel B.V

Admarel specialises in maritime electronics, focusing on the implementation of engineering, service, repairs and maintenance of navigation-communication products for yachts, inland ships, dredging industry, ocean-going commercial vessels and the navy. Next to navigation and communication equipment, Admarel will be a supplier of shore converters and entertainment systems for the offshore market.

"The cooperation between various disciplines at Admarel shows what we can do for our customers," says Michiel Louwerse of Admarel.

The product portfolio will consist of navigation and communication equipment for (short sea & deep sea) merchant navy, inland navigation, leisure and super-yachts. The portfolio will expand in the near future with the addition of shore converters (Atlas), onboard computers, CCTV, IT networks, security and training sessions.
www.admarel.nl

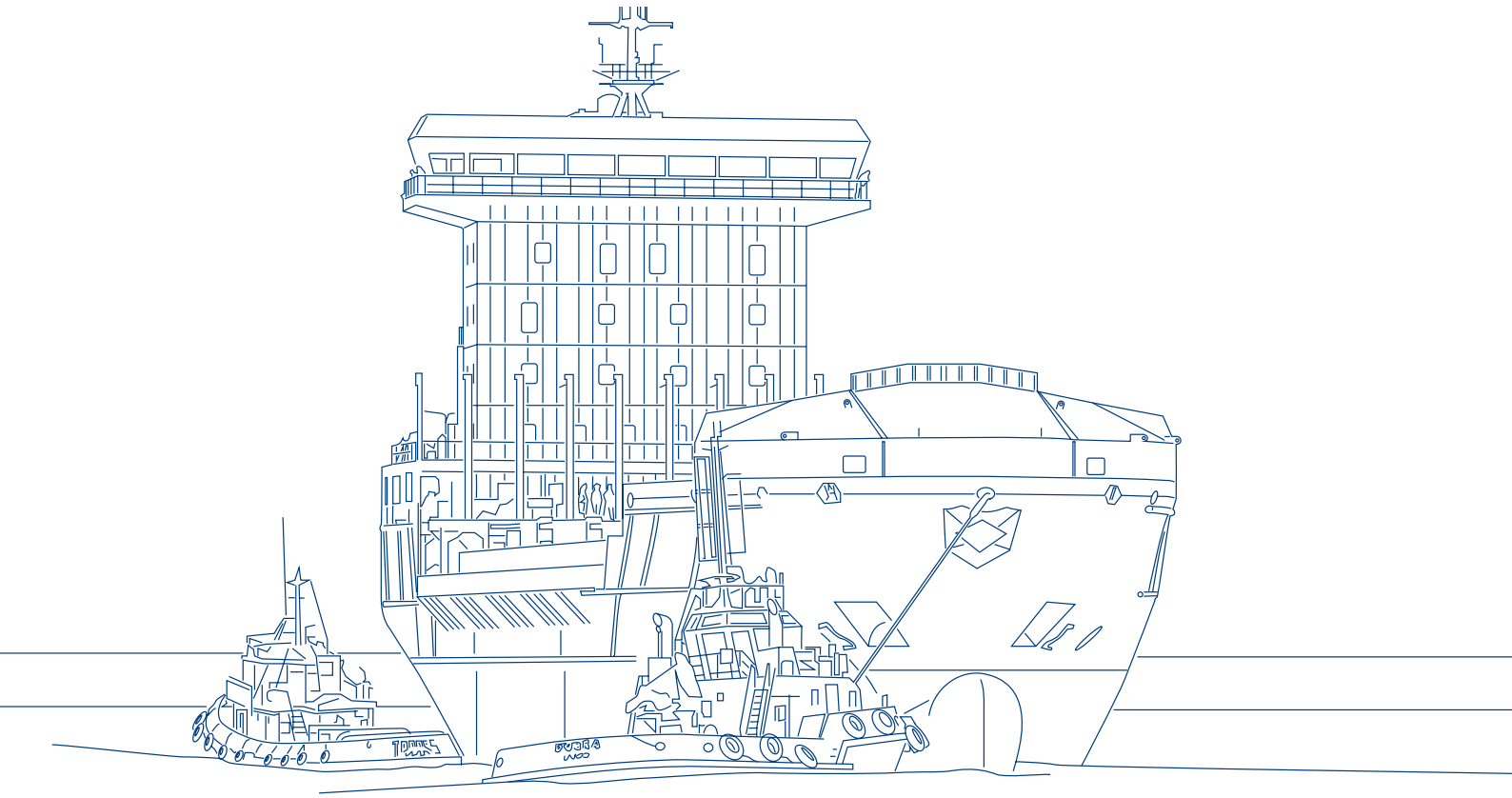
Software

Inatech launch is in the clouds

Inatech has launched its ShipTECH Shipping solution for the cloud. The solution offers shipping and cruise companies a real-time management solution that will help them enhance their fuel procurement process, reduce fuel costs and effectively manage risk.

The cloud version is easy to integrate (and scale) with other standard shipping and bunkering technology management systems and will be appealing because it enables shipping companies to move away from making old fashioned capital expenditure (CAPEX) investments in technology towards adopting an operational expenditure (OPEX) model, explained the company.

SENER



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The ShipTECH Shipping Solution is designed to help shipping companies avoid costly errors by providing a fully integrated cloud-based software solution capable of efficiently handling key processes and providing decision support via real-time data and analysis tools.

www.inatech.com

Accommodation and interiors

Bolidt fits out *Norwegian Getaway*

Full scale decking work on the luxury cruise ship *Norwegian Getaway* is underway at Meyer Werft. Deck and flooring specialist Bolidt reports a shift in its workload at the Papenburg yard after completing materials supply and installation work on *Norwegian Breakaway*.

Norwegian Breakaway was delivered to Norwegian Cruise Lines in April, with *Norwegian Getaway* to follow it into service in January 2014. The 4,000 passenger, 146,000gt vessels are a new class of cruise ships for NCL, whose design will be echoed on the larger, 164,000gt *Norwegian Breakaway Plus*, due from Meyer Werft in October 2015.

Bolidt has worked alongside Tillberg Design and SMC Design to deliver the subtle and functional surface shades required by NCL for the first pair of ships. The company is supplying 16,500m^2 of surfacing for Norwegian Getaway, including Bolideck 525, a skid resistant and shock absorbing deck covering system, and Bolideck Future Teak.

www.bolidt.com

Lifesaving

Noreq to supply DSME MARS tankers

Noreq was recently awarded the contract for delivery of the lifesaving system for four tankers currently being built by Daewoo Shipbuilding and Marine Engineering Co., Ltd. in South Korea (DSME) for the UK Royal Fleet Auxiliary (RFA). The tankers are based on the latest innovative design from the British engineering company BMT Defence Services Ltd.

For Noreq, this is a milestone achievement, not just because of the size of the order but because it will also include delivery of the Noreq Telescope Davit (NTD), highlights the company. The NTD davit is the latest development from Noreq, and has already been offered to several projects. The NTD design means that lifeboats and rescue boats can be placed where height space is very limited, giving it better versatility. In addition to the NTD, Noreq will also supply a full lifesaving package, including lifeboats, rescue boats and pertaining davits. The MARS tankers approximate measurements are length 200m and breadth 28m, and are able to carry over 100 people.

www.noreq.com

Bolidt lays the decks for *Norwegian Getaway*

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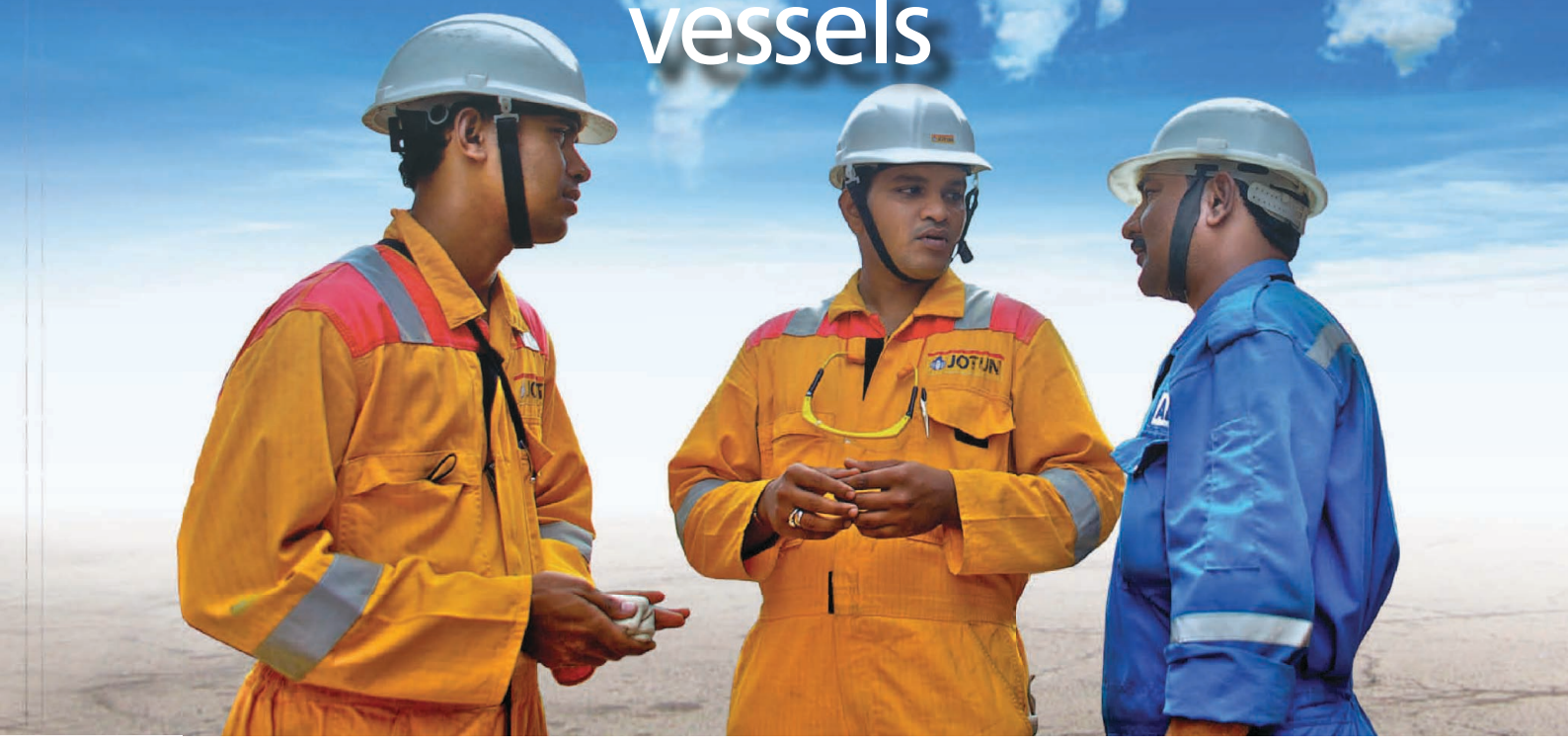

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SHIP ECONOMY & TRADE

Chinese shipbuilding holds firm in 2012

A drastic drop in orders, tight cash flow, a struggle with delivery times, increasing losses, are all realities facing China's shipbuilding industry. However, shipbuilders are upgrading operations and making technological improvements to manage the economics and to sustain market share

In 2012 the shipbuilding industry was a top focus for the Chinese Communist Party and State Councils. Party leaders and senior officials made visits to major shipbuilding enterprises and issued a series of important instructions. And, state departments concerned embarked on a variety of research on the industry's development.

Those efforts resulted in the publication of such documents as Mid- to Long-term Development Plan for Marine Engineering Manufacturing (2011-2020), "Marine Engineering Manufacturing Scientific Research Project Guide" (2012) and "Hi-technology Shipbuilding Scientific Research Project Guide for 2012", which have given the industry a major shot in the arm encouraging players to vigorously tackle challenges from the international shipping market.

In the face of adversity, Chinese shipbuilders forged ahead with ship model upgrades and adjustments to products, while directing more energy into technological improvements. These endeavours allowed the industry to maintain stable economic indices and its share in the international market.

What is more is the country's marine engineering manufacturing sector made breakthroughs and reported relatively good performance. However, problems such as the struggle to meet delivery dates, difficulty in securing orders and achieving profits continued to cause problems as the impact of the global financial crisis continued to hit the industry.

Basic industry economics

Three major industry indices dropped year-on-year (YOY). In 2012, the industry completed vessels with a total capacity of 60.21 million DWT, 21.4% less than in the previous year; the total tonnage of new orders was 20.42 million, down 43.6%, and at the year-end, orders in hand added up to 106.95 billion DWT, 28.7% decrease year-on-year.

Dalian Developer is an Ultra Deep-water Drillship built by COSCO (Dalian) Shipyard

Overall, industry output value increased slightly in 2012 with 1,647 national shipbuilding enterprises in the country with industrial output totalling RMB790.3 billion (US$127.1 billion), up by 3.4% YOY. Of that total, shipbuilders brought in RMB595.1 billion (US$95.7billion), 0.1% less, whereas auxiliary products accounted for RMB113.0 billion (US$18.1 billion), an increase of 15.1%, repair works RMB18.1 billion (US$2.9billion), up 11.6%, conversion works RMB31.7 billion (US$5.1billion), up 23.6%, and marine engineering manufacturing earned RMB28.2 billion (US$4.5billion), a 19.1% increase.

As a result exports continued to slide as the industry exported ships with a total capacity of 49.49 million DWT in 2012, 20.9% less YOY; received export orders for 14.96 million DWT, down 45.9%, and, as at year-end, had orders in hand amounting to 88.44 million DWT, 35.3% less year-on-year.

In 2012, national shipbuilding enterprises completed export deliveries with a total value of RMB268.4 billion (US$43.2billion), an 11.6% decline. Of that amount, shipbuilders earned RMB244.3 billion (US$39.29billion), 12.6% down; auxiliary products were responsible for RMB11.5 billion (US$1.8billion), up 7.5%; repair and conversion works brought in RMB4.43 billion (US$713million) and RMB2.52 billion (US$405million) respectively, 5.8% and 15.7% less. Marine engineering manufacturing earned RMB1.76 billion (US$238million), up 32.7%.

Between January and November of the year, the industry exported US$36.57 billion worth of vessels, 8.1% less than that of the same previous period. The industry exports to 177 countries and regions worldwide with key markets in Asia and Europe. Exports to Asia amounted to US$21.25 billion, 58.1% of the total, whereas Europe accounted for US$5.76 billion, 15.7% of the total.

Economic returns shrink

In the first 11 months of the year, major business returns of national shipbuilders totalled RMB61.62 billion (US$9.9billion), down 0.2% relative to the same period the previous year. Of this amount, shipbuilding brought in RMB45.68 billion (US$7.3billion), down 4.2%; whereas auxiliary products and repair works earned RMB94.9 billion (US$15.2billion) and RMB13.5 billion (US$2.17billion) respectively, up 17% and 8.7%.

In the same period, national shipbuilding enterprises all reported profits totalling RMB28.8 billion (US$4.6billion), 29.1% less than the previous year. Shipbuilding

operations contributed were 35.5% down to RMB22.5 billion (US$3.6billion); auxiliary products were up 1.8% to RMB4.43 billion (US$713million), but repair works lost RMB90 million (US$14.4million), translating into a 134% drop in profit.

Under pressure

In 2012, the global shipbuilding market was under tremendous pressure from the impact of economic development, shipping demand, carrying capacity and construction capacity, etc. According to Clarkson Research Studies statistics, vessels completed fell by 7%; new orders declined 44.6% and orders in hand were down 35.5% globally in 2012. The industry in China, however, maintained a relatively high share of the global market in terms of DWT.

In 2012, the two state-owned shipbuilding enterprises led the pack. Among the new orders received by China State Shipbuilding Corporation, specialised vessels accounted for 55.2% in terms of contract value. It secured volume orders for 174,000m^3 dual-fuel electric-propulsion LNG carriers, special 38,000-tonne double-tank stainless steel chemical carriers, 45,000-tonne ro-ro ships, 50,000-tonne chemical tankers, as well as 83,000m^3 LPG carriers.

China Shipbuilding Industry Corporation, on the other hand, stepped up research and development of vessel models and energy-efficient technologies including hull form and engine system optimisation know-how and applications, raising the technological standards of 32 vessel models and the yard completed the design and development of new ship models including [110,000-tonne icebreaking oil tanker], PCTC, wind-turbine installation vessel, offshore supply vessel, drillship and government vessels. These efforts have contributed to upgraded models and the birth of a new generation of vessels, laying the foundation for market expansion.

Sinopacific Shipbuilding Group launched three energy-efficient and environmentally-friendly bulk carriers, namely CROWN 63, CROWN MHI 82 and CROWN 121. Designed with the environment and energy saving in mind, the three models consume 20% less fuel than conventional ship designs.

In the past year the marine engineering manufacturing market has reported steady growth, with players making breakthroughs in R&D, design and construction of different products. Preliminary numbers show the global market share of Chinese-made products increased from less than 10% in 2011 to more than 15% in 2012.

Backed by the banks

In 2012, financial institutions, while continuing to be selective in directing funds, came through for major shipbuilders, driving ship exports. For example, the Export-Import Bank of China raised a total of RMB7 billion (US$1.12 billion) for domestic marine engineering equipment orders and high-tech and high value vessels for export. And the China Development Bank established a shipbuilding financing centre and underwrote credit of US$520 million worth for Yangzijiang Shipbuilding (Holdings) Ltd. to fulfil a container carrier order. The Bank of Communications and China State Shipbuilding Corporation signed a comprehensive strategic cooperation agreement promising to work closely together in areas including crediting, settlement and clearing, and supply chain, etc. aiming for mutual gain.

Adapting to a changing market, shipbuilding enterprises intensified the structural adjustments and changed their operations in 2012. The industry saw the emergence of medium shipbuilding enterprises, shrewd in product positioning, defining their niche market and developing special attributes. The advantages of different shipbuilders became more apparent allowing them to snatch bigger market shares—Guangzhou Shipyard International Company Limited, CSSC Guangzhou Huangpu Shipbuilding Co., Ltd. and Wuchang Shipbuilding Industry Company Ltd. in government vessels such as marine surveillance vessels and fishery law enforcement vessels; Huanghai Shipbuilding Co., Ltd., Qidong Daoda Marine Heavy Industry Co., Ltd. and Shandong Baibuting Shipbuilding Co., Ltd. in different long-haul fishing vessels; Sinopacific Offshore & Engineering Co., Ltd. in LPG tankers and marine engineering modules; Zhejiang Shipbuilding Co., Ltd. and Fujian Southeast Shipyard in marine engineering support vessels, and Zhejiang Fang Yuan Ship Industry in river engineering vessels.

Sustainable development

In 2012, the shipbuilding industry in China was able to proficiently meet the new Performance Standard for Protective Coating (PSPC). Having spent considerable time and effort in preparation, most shipbuilders made the bar and delivered vessels in compliance with the new standard.

A series of new international marine regulations such as the amended Code on Noise Levels On-board Ships, the Energy Efficiency Design Index (EEDI), the Harmonised Common Structural Rules (H-CSR) and the Ship Construction File (SCF) were promulgated and introduced by related departments, classification societies and industry associations.

Facing challenges

In the past few years, global demand for new ships has fallen far short of global output

An 8,500 vehicle pure car and truck carrier (PCTC) developed by XiaMen Shipbuilding Industry Co., Ltd for Hoegh Autoliners

Index/Country		Global	China	Korea	Japan
Completed vessels	Deadweight Tonnage DWT ('0,000)	14777	6021	4844	2930
	Percentage	100%	40.7%	32.8%	19.8%
	Compensated Gross Tonnes (CGT) ('0,000)	4572	1901	1356	811
	Percentage	100%	41.6%	29.7%	17.7%
New orders	DWT	4686	2041	1479	921
	Percentage	100%	43.6%	31.6%	19.7%
	CGT	2288	869	746	290
	Percentage	100%	38.0%	32.6%	12.7%
Orders in hand	DWT	25763	10695	6860	5822
	Percentage	100%	41.5%	26.6%	22.6%
	CGT	9582	3600	2851	1564
	Percentage	100%	37.6%	29.8%	16.3%

The table contains Clarkson Research Studies data with amendment based on Chinese statistics

capacity. Despite that Chinese shipbuilding enterprises were able to snatch a relatively big share of the global market in terms of orders for conventional vessel models, even so new orders have lagged deliveries for 24 consecutive months, orders in hand have dwindled quickly and the problem of idle production capacity has started to spread from small and medium shipbuilders to larger shipbuilding enterprises.

As at end of December 2010, total orders in hand for the industry fell to 106.95 million DWT, a 28.7% decrease from the beginning of the year. Based on the total annual delivery of 600 million DWT, current orders in hand will suffice for less than another two years work. Furthermore, as those orders are in the books of a small number of major enterprises, the problem of idle production capacity will be aggravated for small and medium shipbuilders.

A slack shipping market and vessel owners incurring losses persistently have made it difficult for small to medium shipbuilding enterprises to complete deliveries and major shipbuilders have also begun to feel the pressure.

More vessel owners want to change the design of their orders or contract periods, and also tighten inspections and adjust prices. These strains along with new international standards have made vessel delivery more challenging. Related statistics have orders in hand at 149.91 million DWT at the beginning of 2012 and, according to original contract terms, vessels of 89.62 million DWT in all (including deliveries postponed from 2011) were to be delivered in 2012. However, only 60.21 million DWT were actually delivered, and about 29 million DWT had their delivery dates changed or postponed or the orders cancelled.

With the market in turmoil, prices of the three main vessel models championed by the country's shipbuilders have slipped and margins severely squeezed. Costs on the other hand have risen, sending prices and costs into serious discord. Market statistics show, between January and November 2012, revenues from major businesses within the shipbuilding industry decreased slightly against the same period in the previous year when costs in these business areas went up by 0.78%, 0.99% more than the rate of revenue growth. And, the profit margin of products sold was a meagre 4.7%, down 29% period-on-period.

The number of players in the red, industry-wide, increased to 323 and their total losses soared by 158.3%. Increasingly small and medium sized shipbuilders experienced severe difficulties, forcing them to adjust production, close businesses or let workers go.

Financing pressures up

In 2012, financiers, both domestic and foreign, tagged the shipbuilding industry "high risk" and tightened credit controls, including credit volumes for related enterprises. Both the vessel rental market and stock market contracted notably, which made securing financing all the more difficult for vessel owners and shipbuilding enterprises. Rising financing costs plus a major cut in up-front payments under new contracts have deprived shipbuilders of the cash flow required to support production. Statistics indicated a marked increase in receivables, interest and financial expenses across the industry.

Forecasts

In 2013, with the global economy recovering slowly and international shipbuilding standards and regulations rolling out gradually the consistently high volumes vessels being scrapped and prices for new vessels holding steady at low rates with construction volumes down, experts expect to see a slight improvement of the global shipping market outlook compared to 2012. New vessel orders are expected to reach between 60 and 75 million DWT globally. The outlook is particularly good for chemical, LNG and LPG tankers, ro-ro vessels, passenger ships, and energy-saving models in the mainstream market.

The impact of reducing orders in hand, low prices of completed vessels and high production costs, the country's shipbuilding industry is expected to have the effect of pushing the main economic indices downwards in 2013. Chinese yards are expected to finish vessels with a total capacity of around 55 million DWT and receive slightly more new orders, whereas orders in hand will drop to below 100 million DWT. *NA*

Basic Dry Dock Training Course

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www.rina.org.uk/basic-drydock-2013.html

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Speed and power, trials and tribulations

Contractual verification of speed and power performance, as well as the new EEDI requirements now benefit from new trial guidelines, Henk van den Boom, Hans Huisman and Frits Mennen report

The speed/power characteristics of ships have always been at the core of ship design. To prove contractually agreed values, speed trials are conducted by the yard prior to delivery of the ship to the owner. In the past schedule integrity of the vessel was often the most important factor for the speed requirement. Today, owners and operators are keen to reduce fuel consumption to decrease operational costs.

So far a variety of methods for conducting and analysing speed/power trials have been used by shipyards. With the assistance of the Sea Trial Analysis-Joint Industry Project (STA-JIP) and ITTC, the new IMO EEDI rules to reduce CO_2 emissions have resulted in clear, pragmatic and transparent guidelines for the reliable speed/power assessment of ships worldwide.

Speed/power trials are conducted to establish the performance of the vessel at design draught and trim under stipulated weather conditions, usually deepwater, no wind and no waves. As the conditions encountered during the trials often deviate from the contract conditions, corrections are applied during the analysis and reporting of the trial results.

In the past, institutes such as BSRA, NSMB, SNAME and ITTC published methods for conducting and analysing speed/power trials. Shipyards "randomly" selected and developed their own "yard standard" from these methods. In 2002, the International Standard Organisation published ISO 15016, a cumbersome analysis method based on a wide choice of outdated correction methods and empirical data.

The application of this standard led to adverse experiences and to several shipowners taking delivery of ships which were unable to meet the required schedule and that burnt significantly more fuel than anticipated. In some cases the "sea margin" of 15% on power was already consumed by the new ship in calm water.

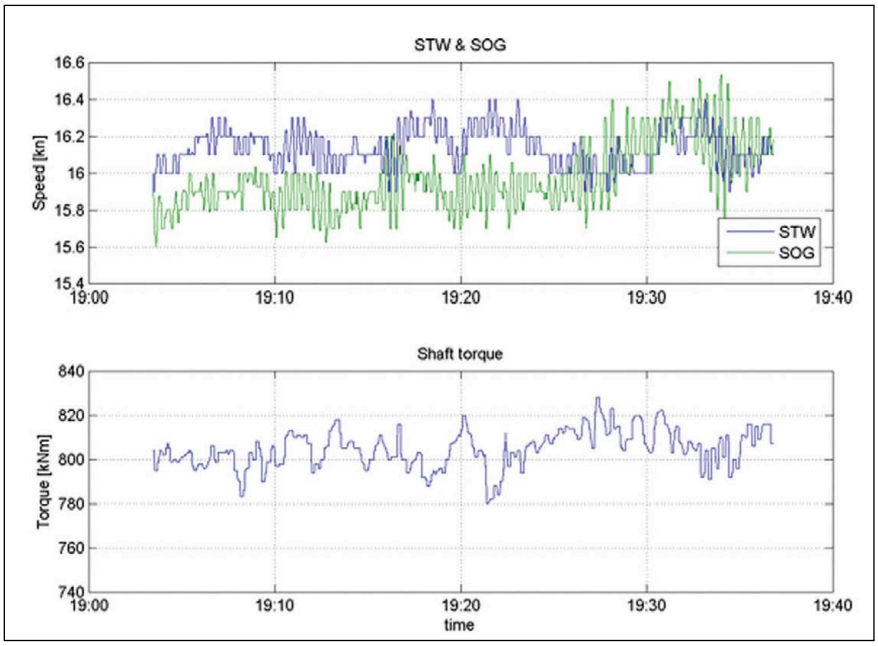

Figure 2: Speed through water and over ground and shaft torque measured on an 1,800TEU container vessel in 4m significant wave height (Courtesy; Vroon)

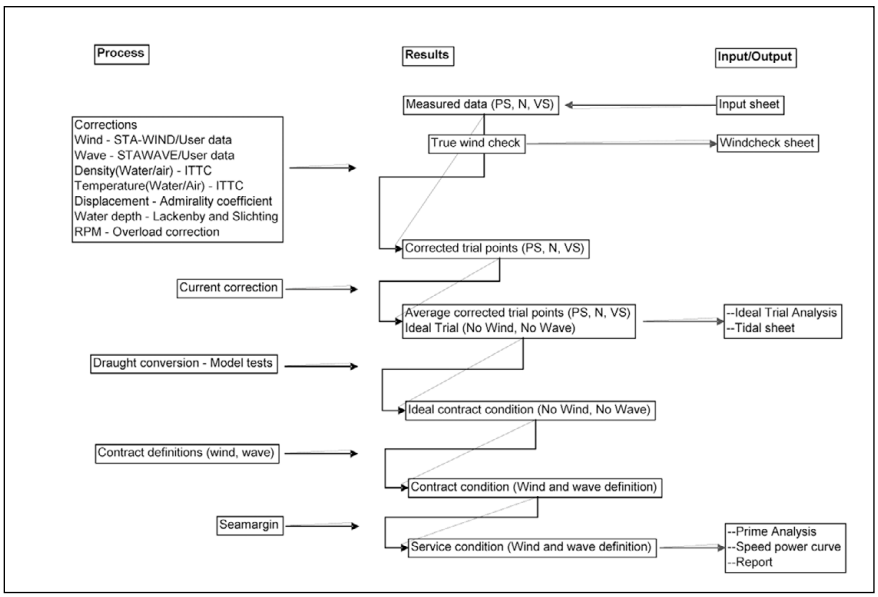

Figure 3: Flow diagram of the STA Analysis

STA-JIP

This was the reason why Shell, Nedlloyd and MARIN decided to initiate the STA-JIP in 2004. STA aimed to develop transparent, practical and reliable ***Best Practice*** for conducting and analysing speed/power

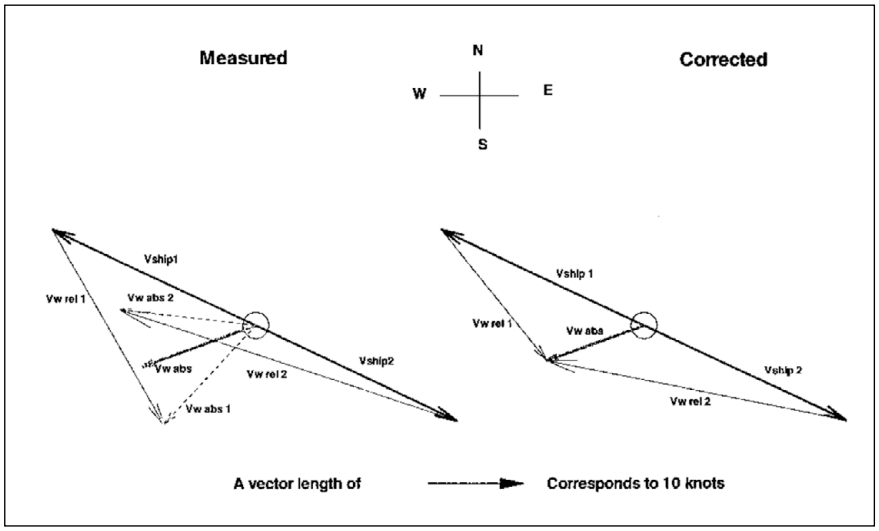

Figure 4: Averaging of measured wind vectors over two counter runs to derive the true wind vector

trials utilising present day knowledge and methods for modern ships. The speed/power trial analysis and reporting should be completed onboard within one hour after completing the speed runs. Only then can additional tests be initiated if unsatisfactory results are obtained.

Several leading shipowners from Germany, Greece, Japan, Denmark, the Netherlands, Norway and Sweden joined the STA-JIP. First of all, the speed/power results of about 30 recently delivered vessels from these owners were reanalysed. This ***gap-analysis*** showed the need to improve the basic trial procedures and method of analysis, as well as the correction methods for wind, waves and shallow water.

Particular attention was requested for the conversion of trial results at ballast draught compared to the (contract) design draught. Once the STA-JIP found its bearing and showed results from the case studies, more owners and all the major yards from Korea joined this project, which aimed to assess the ship speed within 0.1knot and the associated shaft power within 2%. To achieve these goals MARIN worked in close co-operation with all participants for three years. The most important developments are highlighted below.

Conduct & analysis method

The two basic parameters to be measured during the trials are ship speed and shaft power. By determining these parameters at different engine power settings and correcting these for non-ideal circumstances, the speed/power relation for the ship at trial draught and trim can be established.

As illustrated by Figure 2, the speed and shaft torque of a vessel in realistic weather conditions is varying constantly, both with wave frequency and with lower frequencies. It is obvious that reliable measurements and analysis methods are required and at the same time, strict limitations have to be taken into consideration during the speed/power trials such as the minimum water depth, maximum wave heights and maximum wind speed.

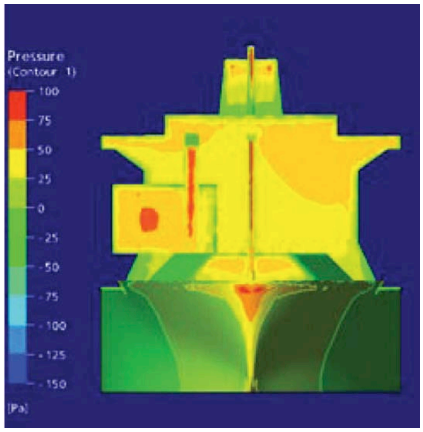

Figure 5: Wind drag pressures on a membrane type LNG carrier computed with RANS CFD for STA (BUNOVA 2005)

Although the speed log is one of the oldest sensors on board ships, it is still one of the most inaccurate instruments and it does not give the speed through water with an acceptable accuracy.

The D-GPS however, is capable of deriving the speed over ground. To eliminate the current from the speed over ground, the results of double runs (i.e. speed runs on reciprocal courses), can be averaged according to the "mean of means" method also referred to as "Pascal's triangle", which was already presented by Van Lammeren in 1939 and also recommended by the Principles of Naval Architecture [1]. To account for time varying currents such as tidal currents, two or more double runs are required for the same power setting.

The "mean of means" is applied after correcting the measured speed/power points for wind, waves and other deviations from ideal conditions except the conversion from the (ballast) trial draught to the contract design draught. All corrections for non-ideal conditions are expressed in shaft power corrections (except for shallow water) and the propeller efficiency is corrected for non-ideal loads by use of the results of load-variation model tests.

The speed over ground is derived from the end-positions of the speed run over a minimum measurement duration of 10 minutes. Each double run consists of a speed run in head waves and a counter run in following waves. The reason for this is that practical wave corrections are only available for those courses and rolling, steering and course deviations should be avoided.

The above approach is referred to as the Direct Power Method and is far more transparent, reliable and practical than the use of the propeller open water diagram proposed by Tanaguchi & Tamura in 1966 [2] and adopted by ISO 15016 (2002) [3] which is based on several physical assumptions, fairing and curve fitting. In Figure 3 a flow diagram of the STA Best Practice for speed/power trial analysis (2006) is presented.

Wind correction

The wind drag on ships increases quadratically with the relative wind speed and therefore the actual encountered wind speed and direction should be measured as accurately as possible. Wind speed read from the anemometer on top of the wheelhouse should be treated with care

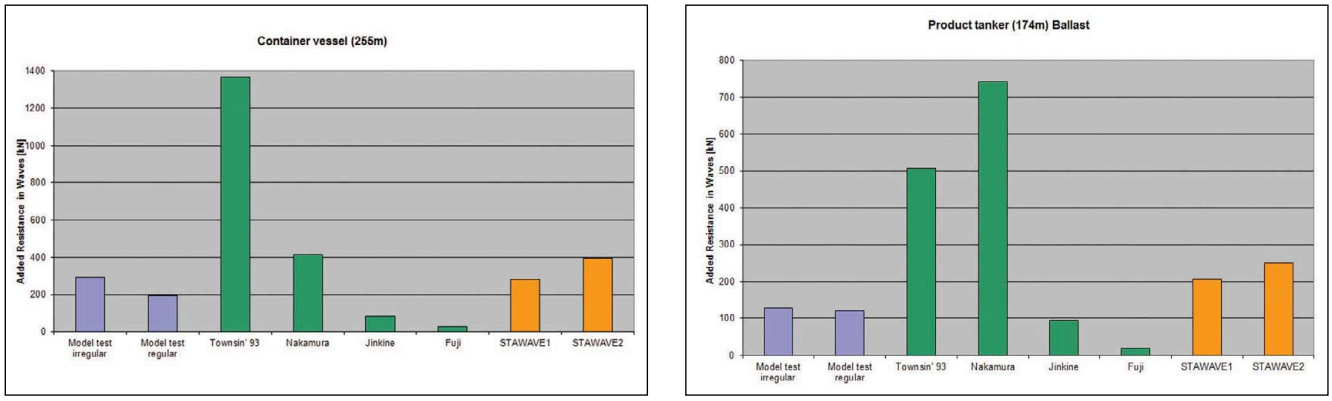

Figure 6: Commonly used empirical wave correction methods (green) compared with model test results (purple) and the new STAwave computational methods (orange) for a 174m tanker and a 255m container vessel in irregular head waves

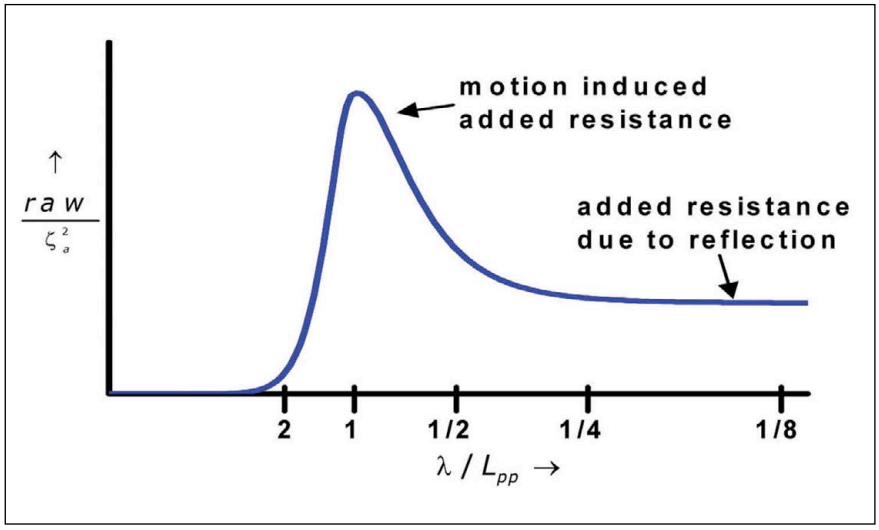

Figure 7: Added resistance in waves as function of wave length over ship length

as the wheelhouse normally generates over-speed at this location. For some wind directions the anemometer may be shielded by masts, funnels or cargo. To minimise these effects the wind vector is averaged over the results of the two counter runs in one double run set as illustrated by Figure 4.

As the ship navigates in the boundary layer of the wind over the sea, it is important to take the wind velocity profile into account. Wind speed is normally defined as the average velocity at a height of 10m above the surface. Wind drag coefficients are also normally derived in a wind profile defining the wind, speed at 10m. For this reason the wind measured by the anemometer has to be corrected for the height of this sensor. When the anemometer is located 50m above water for example, this height correction results in a 21% reduction in wind speed and 46% in wind load. When the forward speed of the ship is included, the effect on the wind load can be even larger.

Wind drag coefficients for ships have been published by many authors in the past; however, modern vessels are much larger and have a different geometry than ships used in well-known wind resistance publications. Therefore, it is important to use recent ship type and size specific data derived from proper wind tunnel measurements or validated computational tools such as LES-RANS CFD. For containerships it is crucial to distinguish the wind drag in ballast condition without containers on deck but while taking into account the lashing bridges (which are exposed to wind during trials) and the design draught case where the vessel is loaded with containers. Remarkably the wind resistance coefficient of the loaded vessel is normally smaller as the full container pack provides a better flow shape than the wheelhouse and lashing bridges!

The STA-JIP collected systematic wind tunnel data sets for various ship types and loading conditions. The group also conducted extensive CFD analysis to correlate with wind tunnel data to arrive at a solid understanding of wind drag and to establish extensive empirical data sets for wind drag correction.

Wave correction

Even within the trial limits for wave height, the added resistance due to waves can be a substantial part of the required shaft power. The added resistance in waves increases quadratically with wave height and thus even in low sea states the wave correction method should provide an accurate prediction of the added resistance for the specific ship and the actual encountered wind driven sea and swell conditions. At the same time, the method should be practical requiring limited input; today, many yards refuse to deliver the body plan to the shipowner and the encountered wave spectrum is not normally measured.

Model test results in regular and irregular head waves for 10 ship types in full load and ballast and at different speeds, were compared by MARIN against predictions in a variety of published methods (amongst others by ISO 15016:2002) and widely used wave correction methods using the ship specific geometry and the measured wave spectra.

As illustrated by Figure 6 the results were shockingly different! Therefore the STA-JIP decided that a new and more reliable method for trial wave corrections was required.

The added resistance in waves originates from two wave systems [4]; firstly the reflection of short waves on the hull and secondly, the wave induced ship motions i.e. heave and pitch. The first component is dominant in short waves: the second component contributes if the wave lengths are similar to the ship length (Figure 7). STA used the "horses for courses" approach; STAwave-1 for reflecting irregular head waves and STAwave-2 for head waves in which the vessel is pitching and heaving. If desired, other conditions model test results for the specific ship geometry can be used.

The STAwave-1 method is based on the fact that for today's large ships the head waves encountered in trial conditions are normally short compared to ship length and speed. The added resistance due to the reflection of those short head waves is mainly dependent on the shape of the waterline in the bow region. Ship displacement, draught, trim and speed play a secondary role. Actually the dominating reflection part in added resistance is a component of the second order wave forces which can be analytically found from integration over the waterline geometry [5]. For ship shapes in head waves this analytical expression was simplified for practicality to:

Where:

= Beam of the vessel on the waterline[m]

= Distance of the bow to 95% of maximum beam on the waterline [m]

= Significant wave height [m]

The above expression is particularly practical for speed/power trials as only the ships beam, the length of the bow section and the significant wave height are required as input. No other ship particulars such as parametric coefficients or bluntness factors nor ship speed or wave spectrum are required. It is simply assumed that the asymptotic short wave value of the transfer function extends over the complete range of wave frequencies and thus that the vessel is not heaving and pitching, which can be easily checked during trials.

For small and medium sized vessels or in case long swells are encountered during the trials, the vessel actually will heave and pitch and those motions will contribute to the overall resistance. For this purpose STAwave-2 was developed. This is an empirical statistical method utilising seakeeping model test results from 200 ships. The transfer function of the added resistance in head waves is parameterised to a function of seven input quantities resembling ship geometry, ship speed and wave spectrum. A spectrum shape (Pierson-Moskowitz (PM) for seas and Jonswap for swells) is assumed in this method, but both significant wave height and mean period have to be specified.

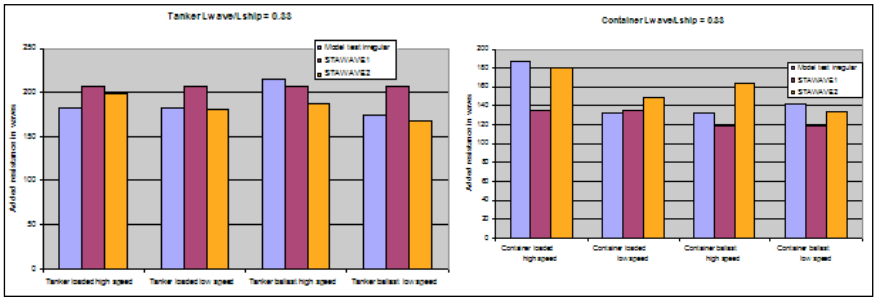

Figure 8: Added resistance in irregular head waves computed by STAwave 1 & 2 compared with results of large model tests for different speeds and loading conditions

Both STAwave methods were validated with dedicated model tests for a Panamax containership and an Aframax tanker at scale 1:38 and 1:43 respectively in MARIN's Seakeeping and Manoeuvring Basin. It should be noted that reliable added resistance measurements at model scale requires large models (typically 6 – 8m.), a dedicated test setup and sufficient run length in the basin. Only the largest seakeeping basins in the world offer this capability. As illustrated by Figure 8 both STAwave-1 and STAwave-2 show an acceptable agreement with the model test results and are far more reliable than existing empirical methods shown in Figure 6.

As reliable wave corrections can be made for head waves and if the added resistance in following waves is negligible for normal trial conditions, speed runs in head waves and following waves need to be carried out. For wave directions within the +/- 45 degr. bow sector STAwave for head waves is applied. However, if yard and owner want speed/power trials in other circumstances, they may conduct dedicated seakeeping model tests and measure the encountered wave spectrum during the speed/power tests. Measurement of the encountered wave spectrum is also required in case non-benign sea conditions are encountered during the speed/power trials.

Conversion to design draught

As several ship types such as containerships and dry cargo vessels, due to lack of cargo, cannot be subjected to speed trials at their design draught and trim during delivery trials, results of these trials have to be converted to the contractual design draught and trim conditions. This conversion is then based on the difference of calm water model test results for the trial condition and the design condition. This has proven to be one of the largest causes of deviations and discrepancies in the results of delivery speed trials.

Figure 9: 14000TEU *MSC Savona* was subjected to speed/power trials by the STA Group in both ballast draught and design draught (Courtesy: Claus Peter Offen)

Figure 10: STA Group Members

	Container vessel, 14000 TEU	140,500 m³ LNG Carrier	Container vessel, 7200 TEU		160 m Reefer cargo carrier
Loading condition on trial	Ballast	Ballast	Ballast	Laden	Ballast
Speed difference between correction methods	0.68 knots	0.40 knots	-0.07 knots	0.12 knots	1.02 knots
EEDI based on ISO 15016 [g-CO2 / ton mile]	***14.662***	***11.826***	***16.514***	***17.219***	***17.559***
EEDI based on STA [g-CO2 / ton mile]	***15.072***	***12.072***	***16.470***	***17.302***	***18.367***

Figure 11: Difference of ISO 15016 and STA analysis methods and effect on EEDI for several ships (from (8)

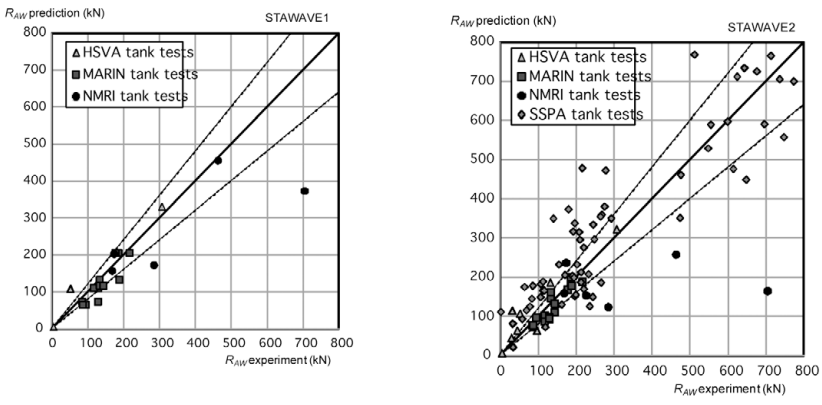

Figure 12: STAwave-1 and STAwave-2 correlated with model test results for various ship types, loading conditions and speeds in irregular head waves

Model test results are always extrapolated to full scale on the basis of scaling laws, as well as "correlation coefficients". These statistical correlation coefficients relate the scaled-up model test power to the predicted power for the actual speed/power trials with that vessel.

For a model basin with a sufficiently large trial database for the specific ship type and size, this practice has proven that it is able to deliver power predictions with acceptable accuracy over the years. Model test prediction accuracy is thus dependent on the experience of the model basin and consequently the availability of accurate speed/power trial data. For several ship types however, design draught trial results is scarce. This is a particular problem for relatively new ship types, where data related to modern speed ranges and recent sizes is often missing.

The STA-JIP conducted dedicated speed/power trials on three container vessels amongst others, in the range of 6000 to 14000TEU at design draught/trim (Figure 9) and compared the results with the results of the original delivery trials, which were also analysed according to STA. For two vessels deviations of more than 10% in shaft power were found. For this reason the STA-JIP has formulated strict guidelines for this ballast draught-design draught conversion of speed/power trial results as well as for the extrapolation of model test results towards full scale. Such guidelines are lacking in ISO 15016 and other speed/power trial methods.

STA GROUP

After three years of R&D work and collecting practical experience with owners and yards, the STA-JIP reached consensus on the new method in July 2006 and delivered the "Best Practice for Speed/Power Trials" [6] and [7] comprising a Recommended Practice and Analysis of Speed/Power Trials as well as the QSTAP software for onboard analysis and reporting.

On behalf of the owners participating in STA, the new industry standard was applied by MARIN during the delivery trials of several different ship types including general cargo ship, two LNG carriers, a car carrier, tanker and three container vessels, to make sure the new method was reliable. Results were shared with all the STA members. The participating companies then started to use STA themselves in their newbuilding projects.

At the same time, the members decided to continue as the STA Group to exchange user experiences, initiate research and to guide new developments. Over the years new owners, operators and yards but also model test basins and class societies joined the STA Group, which now comprises 35 organisations to date (Figure 10). The STA Group also remains open to new members.

IMO-EEDI

To reduce CO_2 emissions by shipping over the last few years IMO MEPC has developed the Energy Efficiency Design Index (EEDI) for new ships. The EEDI basically calculates the amount of CO_2 emissions per tonne-mile. In the formulation of the EEDI the ship's speed is a basic parameter. But, a decision had to be taken on the method to derive the reference speed of the ship.

Initially, Asian countries proposed ISO 15016:2002 for this purpose. Then in April 2011 Norway submitted a proposal to IMO to reconsider this matter on the basis of a MARIN report showing the deviations between STA and ISO 15016:2002 (see Figure 11), which leads to large differences in the EEDI for various ship types [8]. The report also explained the possibility of "free" interpretation of the outdated methods within the ISO methodology.

Subsequently the International Towing Tank Conference (ITTC) offered to formulate new guidelines for speed/power trials by June 2012, taking into account the STA achievements and this was accepted by IMO MEPC.

In 2012 the 27th ITTC Committee for Performance of Ships in Service closely co-operated with the STA Group to review and improve the speed/power trial procedures and measurements, as well as the analysis and correction methods. The IMO brief required a transparent, un-ambiguous and practical method be delivered which would be acceptable to all stakeholders and that could be used for both contractual agreements between yard and owner as well as for the assessment of the IMO EEDI for any new-built ship worldwide. At the same time, the results of the speed/power trials should be completely documented and traceable for the EEDI Verifier representing the flag state of the vessel.

The Direct Power Method was selected by the ITTC as the basic analysis method. The required number of double runs at various power settings was specified:

- two double runs at contract power;
- two double runs at EEDI power (75% MCR);
- one double run at one other power setting between 65% and 100% of MCR.

For sister ships the programme can be reduced to one double run at contract power, EEDI power at one other power setting between 65% and 100% of MCR. In adverse environmental conditions additional double runs are required. The measurements and recording of all required signals during speed runs with a minimum duration of 10 minutes have been specified in detail in these Guidelines.

Available wave correction methods were scrutinised by ITTC. Results from STAwave-1 and STAwave-2, as well as from a method developed by the national Maritime research Institute (NMRI) in Japan [9], were verified against model test

results available from the ITTC members participating.

A typical result is given in Figure 12. Based on the results of this benchmark study, it was concluded that these three methods provide estimates of similar accuracy. It is worth noting that if the NMRI method is combined with specific model tests and use of the actual measured encountered wave spectrum, its results are improved. Based on this evaluation these three wave correction methods (each for specific application) were endorsed by ITTC.

The wind correction method developed by STA has been included by ITTC and the STA wind drag coefficient sets for several ship types have been accompanied with a method published by Fujiwara [10].

The importance of the quality of model test results for the analysis of speed/power trials is now recognised by ITTC and the IMO. Strict requirements are formulated for the model test results for the trial condition, EEDI condition and contract draught and trim. It is stipulated that for all draughts and trims the same procedures and the same empirical coefficients should be used to extrapolate the model scale values to full scale. If different methods or coefficients for the various draughts are used, these should be documented in full detail including the justification by means of full-scale speed/power trial data for the specific ship type, size and loading condition.

New guidelines

In June 2012 ITTC submitted its new "2012 Guidelines for Speed and Power Trials" to IMO MEPC 64 [11]. Part II concerns the Analysis of measured speed/power trial data and was accepted by IMO MEPC 64 in September for EEDI use. Part I concerns the Preparation and Conduct of speed/power trials and was submitted to MEPC 65.

With the acceptance of these new 2012 Guidelines, STA, ITTC and the IMO have established a transparent, straightforward ***best practice*** and a ***level playing field*** for the delivery of new ships for all stakeholders. These new Guidelines will be used worldwide by yards, owners, vessel operators and EEDI verifiers to establish the vessel's speed from speed/power trials both for contractual purposes and for EEDI respectively.

Future work

Although with the IMO MEPC acceptance of the 2012 ITTC Guidelines many of the original STA-JIP objectives have materialised, the STA Group will continue its activities. To avoid multiple interpretations and various software implementations, the STA is revising the QSTAP software into the new STAIMO software for analysis and reporting in full compliance with the new IMO MEPC rules. The STAIMO software will be certified and marked for authenticity checks. Subsequently the software will be distributed to all STA Group members and a web version will be made publicly available. The STA Group will also gather feedback on the use of STAIMO, organise user training and meetings, as well as support of the software. EEDI verifiers will be actively supported by STA Group.

The STA Group will continue to conduct speed/power trials on ships at design draught to compare them with the results of the delivery trials and to provide the relevant model test basins with essential feedback for their extrapolation procedures and correlation coefficients for new ship types and sizes.

In the meantime an evaluation of the trial results of a large series of sister ships is being undertaken to achieve a better understanding of the performance differences of fleets of sister ships.

The STA is also supporting the development of the new Wageningen C/D Propeller Series JIP, which measures the thrust, torque and spindle torque characteristics of a large new systematic series of Controllable Pitch Propellers and ducted CPPs.

Another task at hand is the verification and implementation of a new correction method for shallow water. The existing Lackenby method is known for the significant over-estimation of the effect of shallow water on ship speed. This problem originates from the model test data set measured by Schlichting. This data set not only includes the effect of shallow water but also the effect of the horizontal restriction due to the basin walls.

Recently a new computational approach to correct speed/power for water depth has been developed by Raven and his co-workers [12]. In 2013 this method will be validated by full-scale trials at different water depths before proposing this new method to ITTC and the IMO MEPC. This sub-project called "Shoals Power" is supported by the NML MIIP-programme and will be conducted in close co-operation between the STA Group, owners, shipyards and MARIN Trials & Monitoring. *NA*

Authors

Henk van den Boom is Head MARIN Trials & Monitoring, Hans Huisman is Senior Director Newbuildings at MARIN and Frits Mennen is STA Group manager/ Member 27th ITTC PSS, ER-Schiffahrt/ Chairman.

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EEDI puts pressure on sea trials accuracy

Achieving an acceptable Energy Efficiency Design Index (EEDI) score at sea trials is crucial for all newbuilds. This means designers must get their sums right when calculating new vessel efficiency. SHIP-DESMO is a new software package that seeks to help designers achieve that aim. But does it work?

At a recent conference in London the former lecturer at the Danish Technical University (DTU) Hans Otto Holmegaard Kristensen, now a senior advisor for the Danish Shipowners' Association (DSA) told delegates that "future shock" an overloading of information was considered an upcoming problem 40 years ago by the writer and commentator Alvin Tofler.

Kristensen has modified Tofler's view to include the latest issues facing humanity and labelled it 'environmental future shock', which he says is particularly relevant to the maritime industry.

According to Kristensen the maritime industry is being flooded with new environmentally friendly ideas and technology, but assessing the efficacy of this technology, not only when that technology operates on its own, but when it is used with other 'green' technology, is difficult.

However, when new designs slip off the launch way they are expected to meet new environmental regulations and to meet the requirements of the EEDI. Shipowners cannot be certain that their shiny new ship will meet expectations until the vessel undergoes its sea trials. At this point if the vessel under-performs there could be some very costly modifications to be made.

It is for this reason that DTU and its partner the University of Southern Denmark developed the Ship Design Model (SHIP-DESMO). Financed by the Danish Maritime Fund the programme was developed during 2011 and 2012 to calculate the energy

Ship data (container ship)	Units	Default values	Alternative 1	Alternative 2
Container capacity	TEU	9000	9000	9000
Feeder ship - type 1 (<2900 TEU) - Panamax - type 2 (1900 - 5300 TEU) or Post Panamax - type 3 (>4000 TEU)	(-)	3	3	3
Elongation in percent	%	0	-7.2	-7.2
Length between pp	m	321.09	297.98	297.98
Length in waterline incl. bulbous bow (= 1,01 Lpp)	m	324.30	300.96	300.96
Length over all	m	337.40	313.66	313.66
Breadth mld.	m	44.21	48.00	48.00
Depth	m	26.40	26.40	26.40
Design draught	m	13.15	13.50	13.50
Maximum draught	m	14.53	15.00	15.00
Maximum draught - design draught	m	1.38	1.50	1.50
Design deadweight/Maximum deadweight	%	84	82	82
Design deadweight	tons	88676	80632	80632
Maximum deadweight	tons	105743	98618	98618
Maximum deadweight/TEU	tons/TEU	11.75	10.96	10.96
Lightweight coefficient	t/m^3	0.094	0.094	0.094
Steel weight correction	%	0	0	0
Calculated machinery weight change due to engine change	tons	0	-1374	-1374
Specified machinery weight change (= the calculated value)	tons	0	-1374	-1374
Lightweight	tons	35096	32288	32288
Displacement at design draught	tons	123772	112920	112920
Displacement at maximum draught	tons	140839	130906	130906

Table 1 shows the results from calculations done by SHIP-DESMO. The first column shows the default values calculated by the programme, these values are statistical mean values obtained from an analysis of data from the IHS Fairplay database. The second and the third column show the corrected main dimensions according to the main dimensions of Quantum 9000

DNV's Quantum 9000

consumption of Bulk carriers, tankers and container ships.

"The three ship types are treated as three generic models, so that the user need only specify the cargo capacity. The programme then calculates a set of typical dimensions and other marine technical data for the actual ship. Apart from these standard dimensions, the energy consumption and flue gas emissions are calculated. The user can then adjust the main dimensions and technical data so that an individual ship can form the basis for renewed energy and emission calculations. This implies that the developed software can also be used as part of the design process by individuals with a more specific knowledge of ships, such as marine engineers and students within the maritime industry," says Kristensen.

Block coefficient (based on Lpp) at design draught	-	0.647	0.571	0.571
Block coefficient (based on Lpp) at maximum draught	-	0.666	0.595	0.595
Lpp/Displ.vol.$^{1/3}$ at design draught	-	6.50	6.22	6.22
Lpp/Displ.vol.$^{1/3}$ at maximum draught	-	6.22	5.92	5.92
Midship section coefficient	-	0.98	0.98	0.98
Prismatic coefficient at design draught	-	0.660	0.582	0.582
Prismatic coefficient at maximum draught	-	0.680	0.607	0.607
Waterplane area coefficient based on Lpp	-	0.850	0.818	0.818
Wetted surface at design draught	m^2	17097	15750	15750
Wetted surface at maximum draught	m^2	18317	17006	17006
Service speed at design draught	knots	25.5	22.0	22.0
Froude Number at service speed	-	0.233	0.208	0.208
Scantling trial speed at 75 % MCR ('reference speed')	knots	24.9	21.4	21.4
Froude Number at 'reference speed'	-	0.227	0.203	0.203
Service allowance on resistance	pct.	15	15	15
Beaufort No.	-	0	0	0
Calculated wind speed acc. to Beaufort No.	m/s	0.0	0.0	0.0
Longitudinal wind resistance coefficient, Cx	-	0.80	0.80	0.80
Wind speed to be used for separate wind resistance	m/s	0.0	0.0	0.0
Wind resistance fraction of trial resistance	pct.	0	0	0
Transmission efficiency	pct.	98	98	98
General improved propeller efficiency	pct.	0.0	0.0	0.0
Main engine power (MCR)	kW	72656	41139	41139
Auxiliary power at sea at design draught	kW	2066	1278	1278
Propeller diameter	m	8.89	10.00	10.00
Propeller type (1 = conventional - 2 = ducted)	(-)	1	1	1
Propeller loading (MCR)	kW/m^2	1170	524	524

In table 2 specifications of design service condition including a 15% service margin and an increased propeller diameter of 10 m compared to the normal diameter of 8.9 m for a ship of this size.

ENGINE TYPE & TECHNOLOGY				
Main engine type (slow speed = 1, medium speed = 2)	(-)	1	1	1
Main engine service rating (for non derated engine only)	pct. MCR	90	90	90
Fuel type (HFO = 1, MD/GO = 2, LNG = 3, Dual fuel = 4)	-	1	1	4
Sulphur content in heavy fuel (HFO)	pct.	3.0	3.0	3.0
Sulphur content in diesel oil or gas oil (DO/GO)	pct.	3.0	3.0	3.0
Derated 2 stroke main engine? (NO = 0, YES = 1)	-	0	0	0
Fuel optimised main engine? (NO = 0, YES = 1)	-	0	0	0
TIER 1, 2 or 3 engine? (1 - 3)	-	2	2	2
Specify NOx reduction technology: EGR (Exhaust Gas Recirculation) = 1, SCR (Selective Catalyic Reduction) = 2 or other technology = 3	-	2	2	2
Use of scrubbers if oil is used (NO = 0, YES=1)	-	0	0	0
EEDI deadweight (per cent)		70	70	70
Scantling deadweight	tons	105743	98618	98618
70 % of maximum deadweight	tons	74020	69033	69033
Actual displacement	tons	109116	101320	101320
Block coefficient based on Lpp	-	0.628	0.552	0.552
Waterplane area coefficient based on Lpp	-	0.834	0.802	0.802
Actual draught	m	11.94	12.51	12.51
70 % DW trial speed at 75 % MCR ('reference speed')	knots	25.90	22.12	22.1
IMO Energy Efficiency Design Index at 70 % Dw	g/dwt/nm	16.67	11.90	8.80
Baseline Energy Efficiency Design Index at 70 % Dw	g/dwt/nm	17.03	17.27	17.27

The engine and fuel data are shown here. The third column shows the characteristics of an LNG power plant. At the bottom of the diagram you will find the calculated EEDI value for the three alternatives. You will notice an improvement of nearly 47 % by changing the design speed, the main dimensions and the engine and fuel type.

In addition the programme can calculate the EEDI value of a new design and can identify the measures taken to reduce the EEDI score, such as slow speed, changing dimensions or engine modifications.

SHIP-DESMO is also capable of making emissions calculations that account for different engine and flue-gas cleaning technologies, so that it is possible to perform impact assessments of future technology choices.

"We have tested SHIP-DESMO using different full-scale performance data and model test data, but this is restricted information, but internally it meant that I could check the validity of the software," says Kristensen, "and we were very close".

So close in fact that BIMCO is interested in using SHIP-DESMO for its members, says Kristensen.

The three different SHIP-DESMO models (tankers, bulk carriers and container ships) will soon be implemented on the open part of the web page of Danish Shiopowners' Association (www.shipowners.dk). Also the associated documentation reports for the programmes can be downloaded from the same web-page.

However, to demonstrate how the programme works the universities chose DNV's concept design the Quantum 9000 container ship to demonstrate that the SHIP-DESMO can achieve good results, close to the calculations made conventionally by other naval architects.

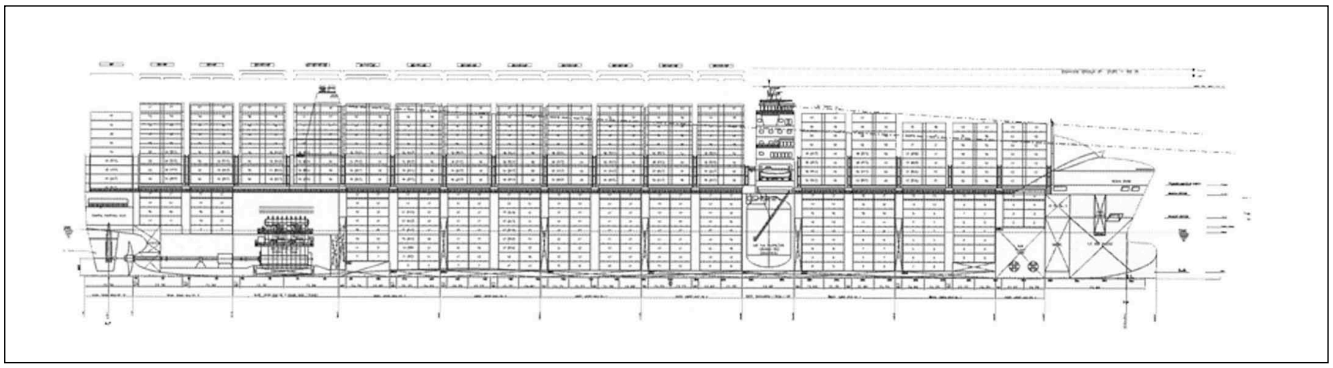
"We chose Quantum because it looked good and it has some novel features," explained Kristensen, "OK sometimes you look at such future designs and find that some things are nonsense, but Quantum looked very good and the results very reasonable."

Quantum 9000 developed by DNV in order to show how far improvements can go to decrease the fuel consumption and by that also the CO_2 emissions.

Designed by technicians at the Norwegian class society DNV Quantum 9000 is an LNG powered container ship with a maximum capacity of 9000TEU. Effectively DNV's designers shortened the vessel and increased its breadth, adding stability and reducing the ballast requirements. The ship is also designed for considerably lower speeds than a comparable container ship, reduced to 22knots compared with the 25.5knot standard speed for vessels of this size.

"The main deviations [of the Quantum 9000] compared to a more traditional design is a relatively shorter ship but with a slightly higher breadth in order to improve the stability characteristics, necessary for the higher deck loads. You will also notice a reduced design speed of 22 knots, compared to 25.5 knots which would have been the normal service speed for a ship of this size. The maximum deadweight is 98,618tonnes which is approximately 7% less than for a ship of this capacity, due to the smaller demand for water ballast." *NA*

You see here the profile of the ship with a superstructure moved forward to increase the on deck container capacity. You will also see the space allocated for LNG tanks and the main engine room



Third generation bulk carrier takes to the seas

The delivery of *Nordic Wuhan* – the third generation of the Seahorse series of ships – is another milestone in the development of green shipping as the drive to reduce emissions from the maritime industry gathers pace

Since the first Seahorse vessel was delivered on 26 August 2011 the design has been further developed and optimised by Grontmij and Schmidt Maritime. That optimisation has focused on reducing HFO consumption, to 22.6tonnes/day and 17.8tonnes/day at FCO speeds, thereby making the vessel more competitive in the market.

By introducing the latest engine designs, new advanced propeller designs and a Becker Mewis Duct, Grontmij and Schmidt Maritime have been able to reduce the main engine fuel oil consumption by 4.2 tonnes/day, which is equivalent to a 17% reduction of the vessel's daily fuel oil consumption.

On 21 February 2013, *Nordic Wuhan* was delivered from Yangzhou Guoyu Shipyard, to the owner GNS Shipping. *Nordic Wuhan* is a 35,000dwt Seahorse handysize bulk carrier designed by Grontmij in Denmark (formerly known as Carl Bro).

Although 16 Seahorse vessels have already been delivered from several other Chinese shipyards, the delivery of *Nordic Wuhan* marks an important development of the Seahorse class vessels, because it is the first delivery of the third generation of these bulk carriers.

The optimisation of the Seahorse 35 has been verified by numerous model tests. *Nordic Wuhan*'s sea trial was completed in January 2013 and the result confirmed the predicted fuel savings. With a consumption of 20.6 tonnes/day at 14knots on scantling draft (based 42.700kJ/kg) the vessel sets a benchmark for handysize vessels in service today. With its electronic main engine and optimised hull shape the vessel also operates very efficiently while slow steaming and in part load condition.

The Seahorse 35 design is under construction for a number of owners at various shipyards. The successful sea trial and delivery of *Nordic Wuhan* is a milestone for the Seahorse project verifying the performance of this modern design, says Grontmij.

The vessel is technically managed by Nordic Hamburg and on charter to Aug. Bolten for five years under the charter name *Amelie*.

Nordic Wuhan was built at Yangzhou Guoyu Shipbuilding, Jiangsu Province in China, which is situated on the north bank of the Yangtze River. GNS Shipping is a major shareholder in the Guoyu Group Hong Kong and Nordic Hamburg Shipping founded GNS in 2011 combining market access, know-how and resources in the German and Chinese markets for developing and building modern and state of the art vessels.

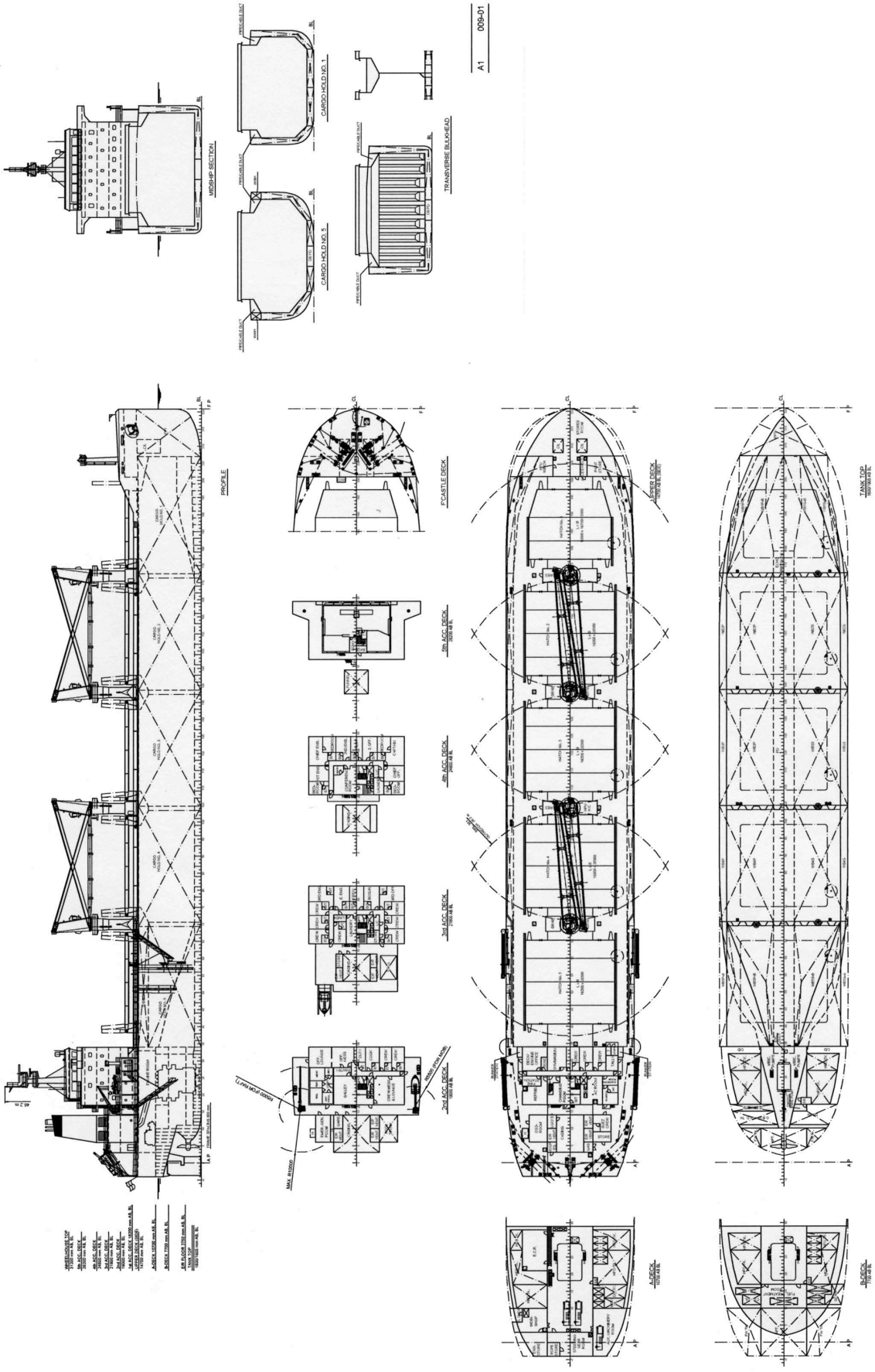
The Seahorse design now exists in several versions as follows: SEAHORSE 35 (35,000dwt), SEAHORSE 375 (37,500dwt), SEAHORSE 41 (41,000dwt) and SEAHORSE 61 (61,000dwt). *NA*

TECHNICAL PARTICULARS

NordicWuhan

Length OA, max 180.0m
Breadth 30.0m
Depth 14.7m
Scantling draft 10.1m
Gross tonnage 24,187gt
Net tonnage 11,602tonnes
Deadweight and cargo hold capacity
DWT at scantling 34,690dwt
Total cargo hold capacity, grain ..... 46,731m^3
Total cargo hold capacity, bale ..... 45,670m^3
Service speed Fully Laden 14.0knots
Main engine fuel oil consumption (MDO):
Service speed ..... 21.2 tonnes/day
ECO speed 16.8tonnes/day
IMO Energy Efficiency
Design Index: ..... EEDI 5.51g/Dwt-nm
Fuel consumption and EEDI based on actual SFOC measured at shop trial. (16.1% below base line)
Main engine WÄRTSILÄ 5RT-flex50-D Tier II
– SMCR 6,350kW
– NCR (service speed) 5,250kW
– NCR (ECO speed) 4,145kW
Aux engines ..... 3 x 600kW
Emergency generator 110kW
Ballast pumps ..... 2 x 800m^3/h
4 sets of wire-luffing deck cranes
Safe working load (SWL) 30.0tonnes
Max. outreach from CL of vessel 26.2m
Minimum outreach 4.0m
5 sets of end-folding, double-skinned, hydraulic operated steel hatch covers with grain cement feeder openings.
Cargo Equipment:
Permanent CO_2 fire-fighting system for all cargo holds.
Engine Room bulkhead A-60 fire-insulated.
Cargo hold cleaning: ..... Two portable air/water driven combi-guns and 2 portable pneumatic air driven washing water discharge pumps.
Permanent SW, FW and compressed air connections in each cargo hold at tanktop level. Permanent washing water return line connected to washing water holding tanks in each cargo hold.
Tank capacities
Heavy fuel oil ..... 1,570m^3
Diesel oil ..... 150m^3
Marine gas oil ..... 50m^3
Lube oils ..... 100m^3
Fresh water ..... 250m^3
Ballast water (excl CH3) ..... 12,800m^3
Ballast water (incl CH3) ..... 22,600m^3
Washing water holding tanks ..... 220m^3

GA for *Nordic Wuhan*



Using the right tools

At SARC, a consultancy and software house in The Netherlands, the drive to enhance and extend its *PIAS* and *Fairway* ship design software is permanent. Phd H.J Koelman, director, SARC explains some of the company's developments

The core subjects used by SARC are computer representations of the internal and external geometry of a ship, as well as the *modus operandi* they impose on the ship designer. Related subjects that are addressed in this article are 3D printing and developments in collaborative engineering.

Ship hull design and representation

In the early days of Computer Aided Ship Design (CASD) the first experiments were made with representations based on polynomials or transcendental functions, such as conics. Mostly in two dimensions, and as such, representing sections or waterlines. In the early eighties we saw the advancement of B-spline curves and surfaces, later generalised to non-uniform rational B-spline (NURBS) surfaces. This method has grown out to the de facto standard for the modelling of ship hull forms, although when applied in practice quite some disadvantages showed up. The strange contradiction is that in private communications with practical ship designers those drawbacks are commonly recognised and shared, while reports thereof in literature are only scarce. However, an early analysis of the problems was given by Koelman [1], while a recent evaluation is presented by Sharma, wan Kim, Storch, Hopman and Erikstad [2] where it is observed that NURBS surfaces suffer from a number of drawbacks, which are, summarised:

- NURBS are based on rectangular patches, which are basically not compatible with the non-rectangular topology of (parts of) a ship hull.
- In order to cope with this incompatibility, large numbers of control points are required, which leads to long computation times and limits the applicability of NURBS.
- For smoothing or fairing purposes the incorporation of physics-based or optimisation methods would be preferable. Unfortunately, this leads to high computational costs.

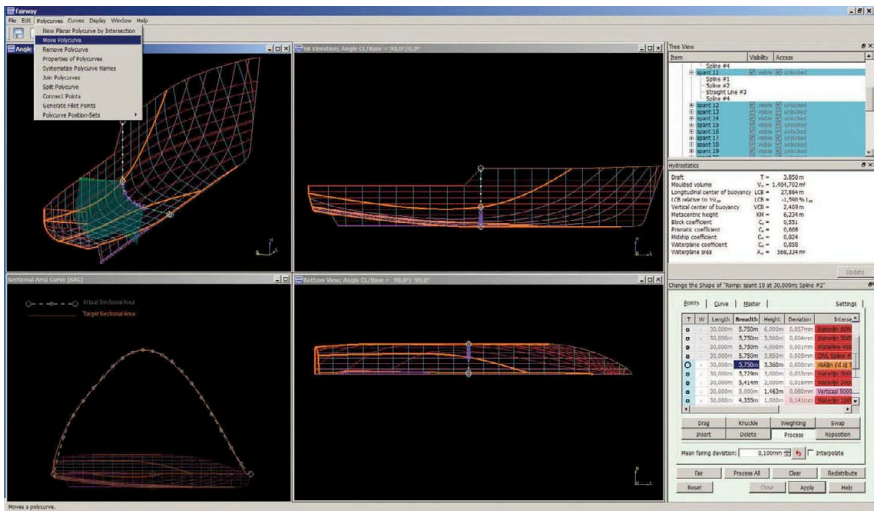


Figure 1: Screen shot of the redesigned GUI of Fairway, showing an angled view, two 2D views, the SAC curve as well as tabular detail information

However, alternatives for NURBS do exist. An overview is given by Koelman and Veelo [3] and is comprised of, for example,T-splines, subdivision surfaces and interpolating methods. In the latter a coherent network of user-defined curves is constructed and maintained, on which surfaces are interpolated, which fill the holes between the curves. To this category belongs the Fairway hull design module of the PIAS programme suite of SARC. This programme was developed in the 1990's, and was recently equipped with an entirely redesigned User-Interface - based on the latest GUI technologies - from which a screen shot is shown in figure 1. Fairway now combines a state-of-the-art GUI with the advantages that have always been implicit to its system design, such as:

- The user can work with an irregular network of connected curves and can choose exactly those ordinates, waterlines, buttocks or spatial curves that determine the particular hull shape at hand. Also partial curves, which are not running over the complete hull surface, can be used.
- The user can either work with curve vertices or with points on the curve itself. Because the curves coincide with the surface this implies direct surface control. Furthermore, because each curve has its own independent geometric representation, the number of (NURBS) vertices can be different for each curve.
- Fairing methods are incorporated, as well as a library of elementary (conical) shapes.
- At any time a closed, curved surface is available, so additional curves can be generated easily.
- Design support by hydrostatics, sectional area curve (SAC), developable surfaces etc.

Tactile modelling

These days it is hard to read a serious newspaper without being flooded by articles on 3D printing (a.k.a. rapid prototyping, layered manufacturing or other fashionable terms). In order to chart the potential when used for ship hull design, some experimenting has been done with

the Ultimaker, which is a low-cost Do It Yourself (DIY) printer, printing Fairway hull models. In figure 2 an example print is shown, while more examples can be found on http://www.sarc.nl/images/pdf/publications/dutch/2012/Ultimaker%20illustraties%20en%20links.pdf and a movie of this printer in action, producing a cargo vessel demi model, on http://youtu.be/L91vZ8iQQ50

These experiments led to the following conclusions:

- A 3D print of the hull provides a distinct view of the hull shape. Strangely, even people with experience and background of reading lines plans or rendered views see things differently with a 3D print. And obviously more natural. But, especially for other stakeholders in the design process a tactile model, no matter how small, gives natural insight in the shape.
- With about 1/5mm the accuracy of the printer is more than sufficient to transfer the (subjective) notion of shape. A pity aspect is the shrinkage strain in the polymer which causes a slight deformation.
- DIY printing is cheap on investment and material. The downside is that the prints require some fine tuning and may sometimes fail, although with the latest modifications this appears to be much improved.
- So arbitrary lines drawings or a collection of unconnected surfaces cannot be used as basis for a 3D print. The printing software requires the representation to be a genuine solid model, exactly as is provided by Fairway.

Internal ship modelling

Contrary to the outer hull, for the ship internals - such as compartments, bulkheads and decks - there is no prevailing methodology. In Ship compartment modeling based on a non-manifold polyhedron modeling kernel. Advances in Engineering Software, [4] an inventory was made where it is concluded that the methods applied so far fall in to two categories; either they model the spaces by their boundaries, or they use a wireframe model of boundaries, where essentially bulkheads and decks are modelled. However, neither of the two copes with the fact that spaces and boundaries are mutually interrelated. In order to address this problem a new method was adopted, where this duality between spaces and planes is addressed. This method essentially splits the space recursively in two, and is consequently labelled the Binary Space Subdivision (BSP) method.

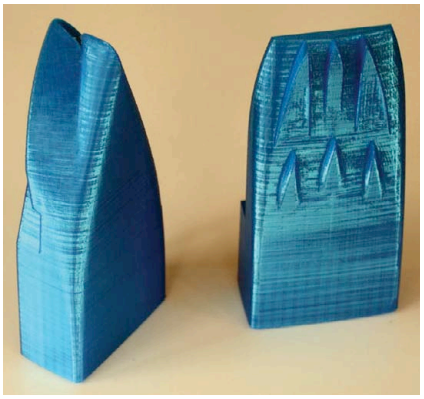
Actually the BSP as such has been known for quite some time - and applied in shooter games for example - but not used frequently for modelling purposes. It has been implemented in a new PIAS module for internal ship modelling, which is discussed in more detail in de Koningh, Koelman and Hopman [5], and from which figure 3 shows an output example. Some facilities of this program are:

- The user can either model spaces or planes, or any mixture. When modelling planes, all spaces in between are automatically created. On the other hand spaces can be converted to planes, if desired so.
- Output can be formatted to 2D drawings, e.g. to serve as tank plan or elementary general arrangement plan.
- Full-blown tank capacity calculations, tank sounding tables etc.
- Incorporated in the PIAS suite, so integrates seamlessly with e.g. probabilistic damage stability.
- Act as a server for internal geometry, as discussed in the next section.

An infrastructure for collaborative design

With ship design activities being more and more dispersed, both geographically as well as over specialised teams, the need for tools that support co-design is compelling. From experiences gained in the Dutch joint-research project *Innovero* it was learned that the most promising software model for co-design is a collection of software tools which share each others facilities by means of an Application Programming Interface (API). This matter is further discussed by Koelman [6], but summarised in this fashion the software components work on a peer-to-peer basis, without the necessity of a central server.

Figure 2: Fairway hull models printed by the Ultimaker 3D printer



The internal geometry tool of PIAS was equipped with such an API, which enables partner software not only to request data and to push new data, but also to ask *services*, such as the computation of compartment shapes, deck shapes or compartment volumes. In cooperation between software developers and ship design offices two experimental co-design systems have been configured, each consisting of PIAS' internal geometry tool and a general-purpose CAD system. With the goal to *generate* general arrangement plans and tank plans in the CAD system on the basis of the information as requested from PIAS. One step further is to modify the plan in the CAD system - e.g. by adding a bulkhead and thus splitting a compartment in two - and inform PIAS correspondingly.

This system works instantaneously, without transferring files. Although these experiments have not yet led to commercial products, the results are so promising that the concept will be developed further in a new Dutch joint-research project. *NA*

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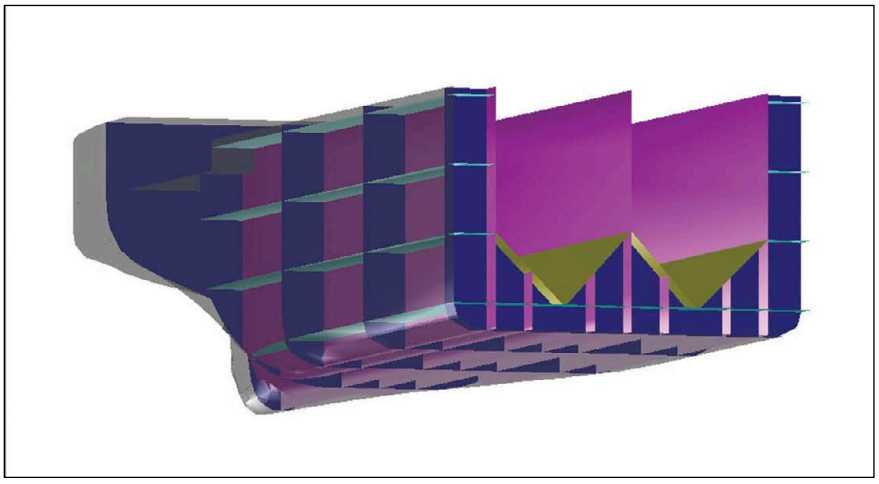


Figure 3: Internal ship layout modelled with the BSP-based PIAS module.

New system prediction from HydroComp

New features for the resistance and propulsion software HydroComp's NavCAD solution will see the software give predictions on contra-rotating Propellers

Many contemporary vessels are being outfitted with contra-rotating propellers (CRP, also called a "Counter"-Rotating Propeller), and NavCad includes new functions to model performance of CRP systems. As part of its ongoing internal R&D programme, HydroComp has evaluated a number of published studies that made a direct comparison between conventional fixed-pitch and CRP propellers. From this evaluation, a prediction methodology and set of corrections has been developed for CRP propeller types. The intent of the new CRP method is to reasonably model the overall performance of a CRP propulsor set "system" for an application. (It is not intended to provide a means to design or size the specific details of the blade rows for a CRP propulsor.)

This performance prediction method for CRPs in NavCAD is built around a simplified "system-level" model using only the definition of the forward propeller in the set (i.e., the forward blade row) to define the overall propulsor performance. The new CRP (Simple) model divides thrust and torque in half (i.e., equal division between blade rows), and includes consideration of increased induced velocity, as well as appropriate changes to open-water propeller efficiency, hull efficiency, and relative-rotative efficiency.

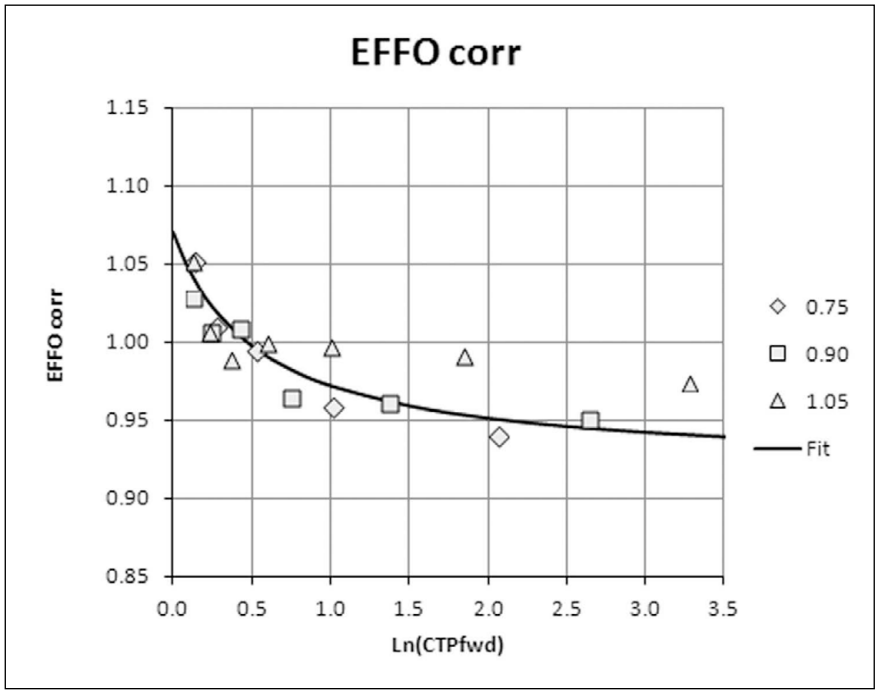
Example of a CRP propeller

Basis for CRP efficiency gains

Published comparisons of overall efficiency between standard fixed-pitch propellers (FPP) and CRP propellers typically indicate that CRPs are between 3% and 10% more efficient. It is often presumed that the efficiency gains of a CRP are due to recovery of energy lost in the rotational flow of a single propeller. While recovery of rotational energy is partially responsible for the efficiency gains with a CRP, much of the gain actually occurs due to the reduction in propeller blade loading and the corresponding change in diameter, RPM, and blade area ratio.

"CRP (Simple)" in NavCad

It is important to distinguish between the effects of propeller loading (i.e., half the total load per blade row) and those effects that are unique to a CRP if modelled with the same loading.



Propulsor efficiency correction with loading

HydroComp has evaluated a number of published studies that made direct comparison between FPP and CRP propellers. From this evaluation, a number of corrections were developed and are automatically applied to the selected systematic propeller series when a CRP (Simple) propeller type is selected.

Thrust and torque division

The total CRP system thrust and torque is assumed to be shared equally by the two blade rows, including the thrust used for cavitation prediction (and breakdown). The figures shown in NavCad for thrust and torque will be for the total CRP "system" (i.e., sum of both rows), but the cavitation figures will be for one blade row. The NavCad software assigns thrust and torque division for analysis.

KT-KQ reduction for the effect of induced velocity

Each blade row will induce acceleration of water into the other row. In other words, the defined propeller acting as half of the CRP unit will have lower blade loading as compared to itself without the other blade row (at the same nominal speed of advance and RPM, or J coefficient). The effect of induced velocity manifests itself as a reduction in KT and KQ for the comparable J coefficient. NavCad applies a correction to the prediction of KT and KQ to account for accelerated induced velocities.

Propulsion efficiency

Much of a CRP's efficiency gains are simply due to the fact that each blade row has a loading that is nominally half of its equivalent FPP. The accompanying reduction in blade area, as well as the typically lower RPM, results in notable improvements in efficiency. However, the relative efficiency improvements due to these considerations are not constant across the entire range of speed and loading. Model test data has indicated that the change in propulsor efficiency varies with thrust loading (i.e., KT/J2). It is important to note that gains in propulsor efficiency only occur at light propeller loading. Model test series data and self-propulsion tests demonstrate that CRPs actually are less efficient than FPPs when operating at high thrust loading (e.g., towing, bollard).

This change in propulsor efficiency can be reflected as a variation in either KQ or relative-rotative efficiency. Both are valid ways to describe the change in required torque that results in a change in efficiency. Relative-rotative efficiency is a measure of the torque demand for a propeller behind the hull (i.e., in a "turbulent wake field") as compared to open-water tests in a model basin. As the after blade row operates in a more uniform (i.e., less "turbulent") flow field behind the hull, it is reasonable to expect that the required torque would be reduced thereby leading to an increase in relative-rotative efficiency. Also, the recovery of the rotational losses created by the forward blade row manifests itself as a reduction in torque for the after blade row, again resulting in an increase in relative-rotative efficiency. The important result of HydroComp's evaluation was that the data from both test settings (propeller model test and self-propulsion tests) collapsed onto a narrow scatter and could be appropriately modelled by a common correction. NavCad applies a correction to the prediction of KQ (that varies with the thrust loading) to account for overall improvements in propulsor efficiency.

Hull efficiency

In most cases, vessels with CRPs show a small reduction in hull efficiency. Hull efficiency is a measure of thrust deduction to wake fraction. As a general trend, model tests have indicated that there will be no meaningful change in nominal wake fraction for vessels with CRPs. With regard to thrust deduction, changes to the pressure field on the hull may suggest a reduction in thrust deduction with a CRP. However, the straightening of the rotational flow with a CRP actually reduces the benefit derived by oblique flow across rudders and therefore increases the thrust deduction. In most test cases, thrust deduction is generally documented as larger on vessels with CRPs of the same diameter and total thrust, so there will be a modest decrease in the hull efficiency. For vessels with a rudder in the flow behind a propeller, NavCad applies a correction to the prediction of KT (that also varies with thrust loading) to account for the small reduction in hull efficiency. Otherwise, no correction is applied. *NA*

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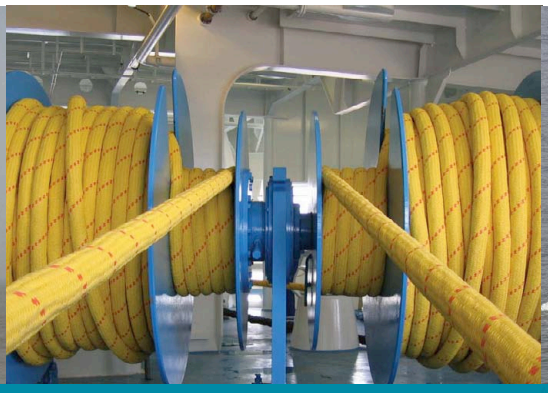

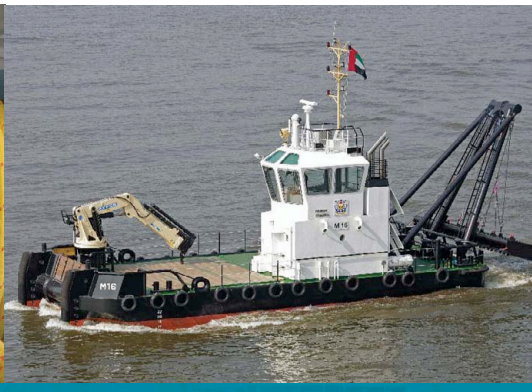

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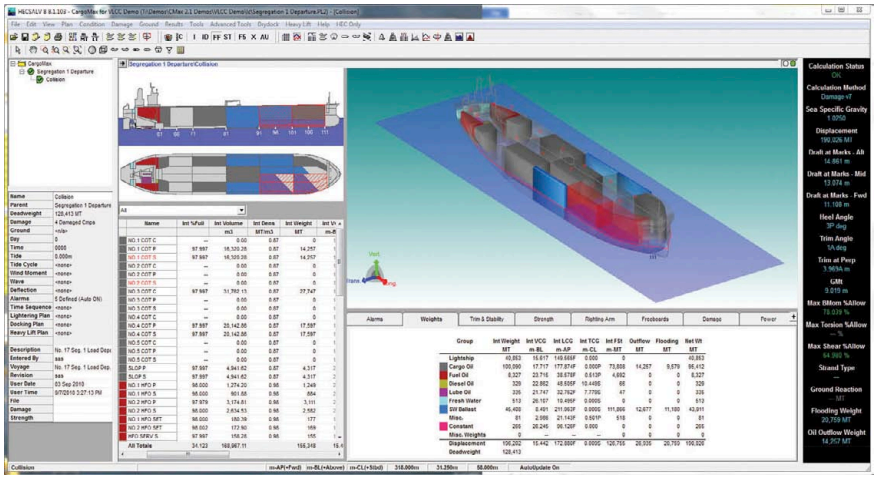
Herbert-ABS enhances safety standards

The latest version of the HECSALV damage stability software will give users greater capabilities

Herbert-ABS Software Solutions LLC has announced the launch of its HECSALV Version 8, Salvage and Emergency Response Software. HECSALV Version 8 will allow users rapid evaluation of damaged conditions for all ship types including an analysis of intact conditions, free-floating damage cases, oil outflow prediction and various types of groundings. The software caters to all types of vessels, but has traditionally been focused on ship shapes. In HECSALV Version 8 the modelling and analysis tools have been improved to support offshore vessels as well.

HECSALV Version 8 development has been driven by the need to provide users with an even more user friendly interface with improved tools for visualisation and calculation features needed for offshore analysis. "With HECSALV Version 8 we are introducing a refined application interface, more customisable features, improved 2D graphics and new 3D rendered graphics, enhanced core calculations for off-axis and past 90degs heel, and a number of enhanced analysis tools and modelling capabilities. HECSALV Version 8 is also 100% compatible with our new onboard tools CargoMax 2.x/LMP 2.x/CruiseMax2.x, allowing loading conditions from these applications to be seamlessly evaluated by on-shore support and emergency response engineers using HECSALV8", says Hendrik Bruhns, president, Herbert-ABS Software Solutions LLC



HECSALV Version 8 brings new capabilities to damage stability calculations

HECSAL allows the user to quickly collect and process the available data, define the extreme bounds of the problem and evaluate multiple scenarios for remedial action. As more information is available, the user can quickly and automatically update the entire analysis from beginning assumptions to latter stage pump allocations.

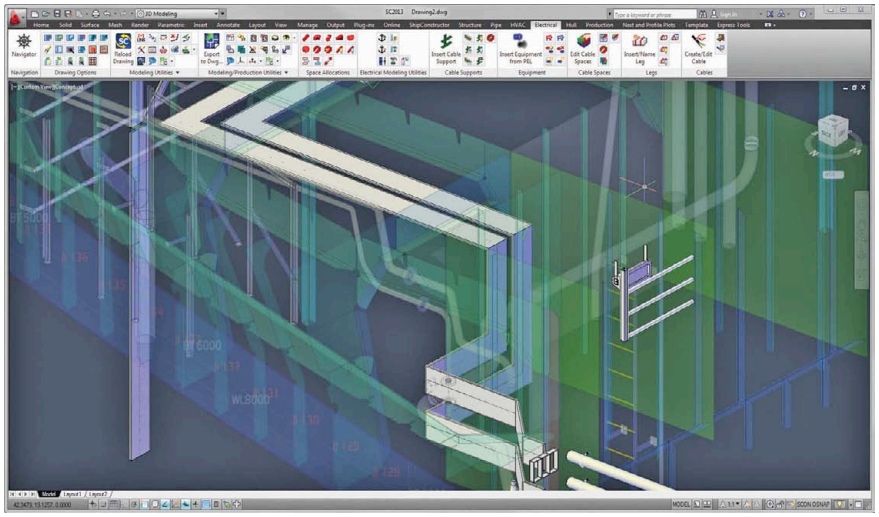
"In HECSALV Version 8 the user focusses on developing a plan that can contain a large number of loading conditions that can represent an emergency situation and what-if steps to stabilise the situation, or a general engineering analysis to evaluate a wide variety of intact and damaged conditions. The analysis of each condition is typically very fast and updates with every data entry. Some more complex analyses, for example grounding situations with a large number of grounding locations, can take longer and the program provides features to manage the update of results to make the entry of data smooth", says Bruhns.

Additionally, HECSALV Offshore, a newly added component, includes all of the features embedded in the standard HECSALV Version 8. It also addresses advanced loading capabilities for tendons, chains and risers, MODU Code stability evaluation, environmental loading (wind, current, wave) and multiple-axis stability.

ShipConstructor gets switched on

The ShipConstructor 2013 R2 release from SSI will offer users enhancements to its Electrical product

Electrical is a 3D modelling and production system for wireways, cable trays, supports, cables and transits. It features an associative 3D model connecting allocated space to individual wireways, cable trays, supports and subsequent cables. Production documentation can be generated from the model to include cable pull schedules and reports. The cables within the model are automatically routed within the ShipConstructor environment according to EMC ratings, minimum bend radius and more.



ShipConstructor 3D Electrical Product Model

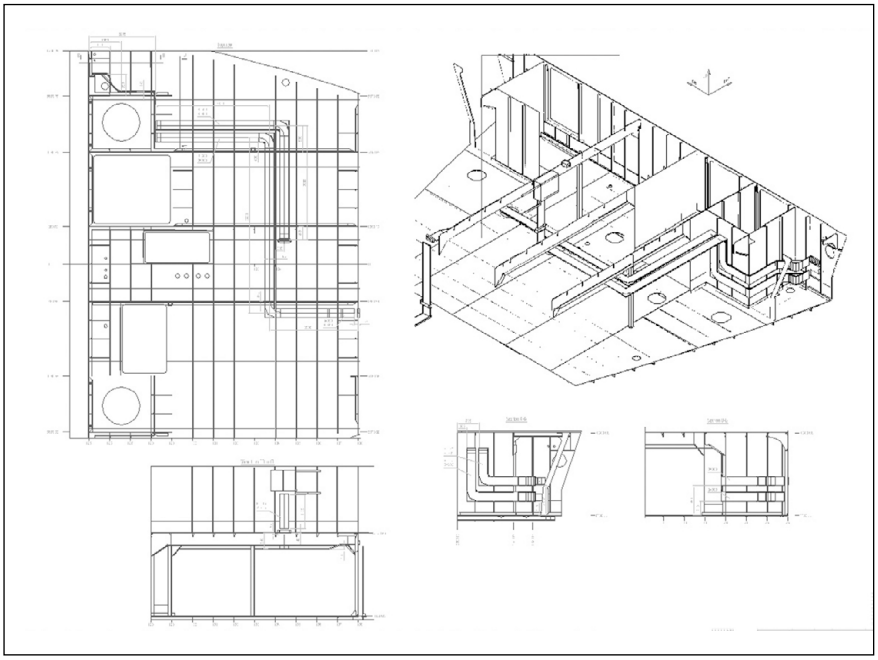
ShipConstructor latest release will have the ability to automatically route cables between junction points within a 3D environment shared by the rest of the shipbuilding engineering team, thereby reducing interferences and promoting concurrent engineering.

Electrical is often one of the last disciplines to be considered and one of the most difficult to allocate space for, highlights the company. In the latest update from ShipConstructor space can be allocated early in the design process using Space Allocations, which can be used in all interference checking against structure and other systems. These space allocations will then be used as the foundation for electrical wireways and cable supports ensuring that late issues should not arise.

Cables, wireways, cable supports and space allocations within the 3D model are associatively connected. As changes are made to space allocations the wireways, and cable lengths are automatically updated. This level of associativity in the 3D Electrical model reduces the amount of manual work, and resulting errors, that must be performed when change is required, highlights the company.

Cables are created and automatically routed in 3D resulting in more accurate cable lengths and installation information in cable pull sheets and reports. This leads to lower material handling costs and less wasted cable as it is pulled through the ship.

Features of the release also include allocate space early in the process, define a master equipment list, model electrical wireways, model standard cable supports and trays, define EMC zones, automatically route cables, update wireways and cables as systems change, create cable pull schedules and electrical arrangements, define EMC zones, automatically route cables, parametrically update wireways and cables as systems change and create cable pull schedules and electrical arrangements. *NA*



ShipConstructor Electrical Arrangement Drawing

BBC Danube completes the series

BBC Chartering's fleet rejuvenation programme reaches a milestone with the completion of one of its heavy-lift vessels that will join its project cargo fleet

BBC Chartering has one of the most recognised heavy-lift fleet modernisation programmes in the project shipping industry underway. As part of this the company announces the completion of a vessel programme, which is known as the 'BBC Congo' series.

In January the last and seventh member of this vessel series, *BBC Danube*, left the shipyard in Xingang, China and commenced service for BBC Chartering. Like its six sisters *Danube* is a 17,000dwt vessel and features two cranes with a lifting capacity of 250tonnes and one 80tonne crane. This vessel can be seen as a modernised heavy-lift successor of the popular 17,500dwt *BBC Ems* type series which featured three 80mt cranes.

BBC Danube is a multipurpose vessel with conventional design. The 143.14m long vessel has a bulbous bow, a wheelhouse in the aft and an open water type stern, single rudder and a single fixed propeller driven by a slow speed diesel engine. The vessel's cargo holds have been constructed with a double skin, a double bottom strengthened for heavy cargoes (up to 20tonnes/m^2) and side tanks. The cargo hold area is divided into two parts by a vertical HFO tank arrangement contributing to the torsional strength of the 22.8m wide hull. Cargo hold No1 is 35.00m long and has a minimum beam of 13,21m and a maximum beam of 18,60m. Cargo hold No2 is 52,50m long and 18,60m wide. Both holds are box shaped and designed to carry tween-deck hatch covers but are also laid out for the carriage of containers. The vessel is fitted for the carriage of dangerous goods of all IMO classes and also possesses ice class E3.

BBC Chartering's CEO Svend Andersen, says: "The BBC Congo type allows us to offer more tonnage in a vessel segment that combines good cargo intake capacity with heavy-lift capability up to 500mt (combined lifting mode)."

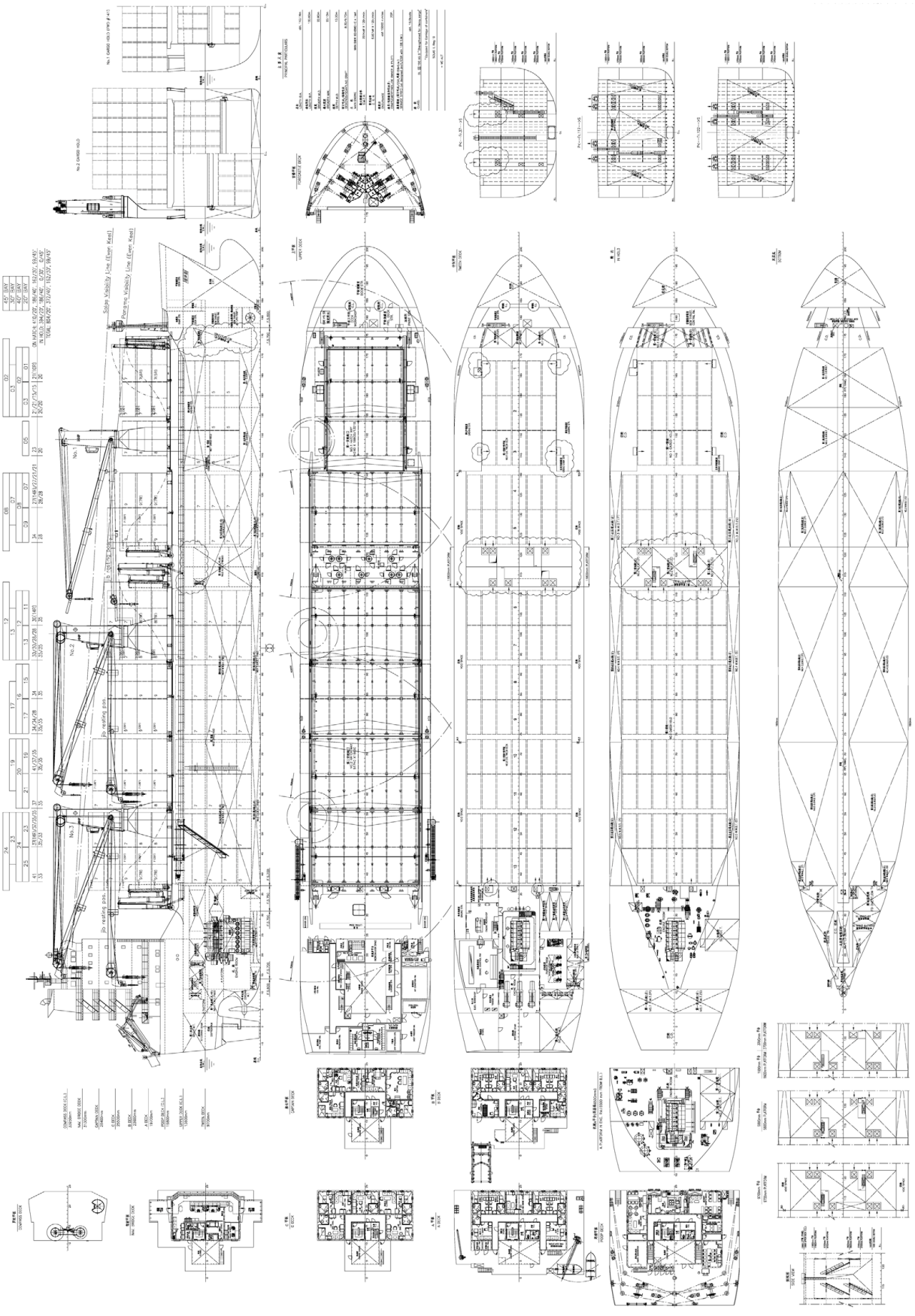
As reported last year, BBC Chartering also engages in two other new building heavy-lift fleet programmes, including the 14 unit 14,360dwt *BBC Amber* series, featuring two cranes with a 400tonne lifting capacity, and the eight unit 9,300dwt BBC Everest type with two cranes with 350mt lifting gear. Both programmes are expected to be completed in the course of 2013.

So far this year, BBC Chartering took delivery of *BBC Moonstone* in January, the ninth newbuilding of the 14 unit series, and last December of *BBC Vesuvius*, the seventh new-building of the 9,300dwt series. Meanwhile 16 of 22 vessels are operational and Andersen, states: "We are proud of our fleet and the new vessels. With them we raise the bar in a competitive industry where we help our clients with an unrivalled level of performance and tailor-made MPV / HL shipping solutions worldwide." *NA*

The 17,000dwt *BBC Nile* (a vessel of the 'BBC Congo' series) carrying seven RTG's on a shipment from Zhangzhou, China to Balboa, Panama

BBC Amber the first in a series for BBC Chartering

GA plan *BBC Danube*



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Brave new world for Fred Olsen

Keeping up with the demand for offshore installation vessels has seen the development of two new ships that have joined the Fred Olsen Windcarrier fleet

Fred Olsen has invested in its wind installation fleet in the belief that the offshore market will remain buoyant for the foreseeable future. The company has taken delivery of two wind installation vessels, *Brave Tern* and *Bold Tern* to bolster its fleet.

The jack-up vessels have been designed by Gusto MCS and customised by Fred Olsen Windcarrier based on its extensive knowledge gained from market experience, says the company. Both the installation vessels will be working in the North Sea and European offshore wind market.

The vessels are self-elevating and self-propelled and have a large open deck space to be able to accommodate various equipment arrangements on the deck that has a load capacity of 5,300tonnes. The vessels each have an 800tonne "wrap around the leg" offshore-rated crane that has been designed by Gusto MSC as well as the continuous hydraulic double acting jacking system, which has been built for daily jacking operations.

The large spudcan area minimises leg penetration in the seabed and creates a stable platform for crane operations. Water jetting systems have been fitted in the spud cans to ease leg operation. In addition, each vessel has DP2-class type dynamic positioning system and is fitted with a Voith Schneider propulsion system giving the vessels better positioning capabilities. Both ships can accommodateup to 80 persons in 56 cabins and the heli-deck facilitates transfers during offshore wind farm installations.

Brave Tern enters the wind installation market

"Everybody would state that their own design is the best. We are of the impression that our vessels are designed for an optimised marine operation in terms of vessel capabilities, transit speed, DP2 operations, fuel consumption, quality on accommodations and lodging facilities, helideck, wheelhouse etc. In addition we believe that our design with a "wrap- around" crane of 800tonnes gives some benefits regarding utilisation of the deck- area. In addition our continuous jacking system will safeguard our jacking operations", says Carl-Erik Gurrik, commercial manager, Fred Olsen Windcarriers.

Brave Tern is a GustoMSC NG-9000 design self-elevating and self-propelled offshore wind turbine installation vessel with an overall length of 131.72 metres, deck area of around 3,200m^2. The Gusto design has been modified by Fred Olsen Windcarrier to meet its needs in terms of Voith Schneider propulsion system, Helideck, accommodation standards, offices and wheelhouse. The vessels were constructed at Lamprell shipyard, UAE and delivered in 2012 and 2013 to Fred Olsen WindCarrier. *NA*

TECHNICAL PARTICULARS

Brave Tern

Length overall:	130,8m
Width overall:	39,0m
Payload:	5300tonnes
Deck area:	3,200m^2 (approx)
Classification:	DNV +1A1
Self-elevating Wind Turbine Installation and Crane Unit	
CLEAN DESIGN NAUT-OSV(A)	
OPP-F DYNPOS-AUTR EO HELDK	
Propulsion units	
Aft:	3 x Voith Schneider propellers
Fwd:	3 x tunnel thrusters
Transit speed:	12knots
Total compliment:	80 persons

Design & Construction of Super and Mega Yachts

8-9 May, Genoa, Italy

The Royal Institution of Naval Architects

2nd Notice

The Royal Institution of Naval Architects will be returning to Genoa, to host the International Conference on Super & Mega Yachts for a third edition.

Whilst we do not expect the rapid growth that the luxury yacht sector has encountered in the last decade, there is no question that the super yacht fleet will continue to grow. Even if the need for a bigger yacht seemed to have reached its peak, the complexity of the designs and the new requirements involved in custom production require innovative solutions. Papers include:

- A HUMAN FACTORS' APPROACH TO MEGA YACHT CONCEPT DESIGN, Tineke Bosma, University of Strathclyde, UK
- PLATFORM ENGINEERING FOR PRODUCTION AND SEMI-CUSTOM YACHTS, Lee Archer, James Roy, BMT Nigel Gee Ltd, UK
- NUMERICAL AND EXPERIMENTAL ANALYSIS OF THE DYNAMIC BEHAVIOUR OF LARGE YACHT SUPERTRUCTURES, Stefano Dellepiane, Cantieri Navali Benetti, ITALY, Dario Boote, Tatiana Pais, Università di Genova, ITALY
- IMPROVING THE EFFICIENCY OF THE MEGA-YACHT WORLD THROUGH FLEET MANAGEMENT SOFTWARE, Lefteris Maistralis, Regional Director, EMEA, ABS Nautical Systems
- RINA SAILING RIG GUIDELINES AND CERTIFICATION, Paolo Moretti, RINa, ITALY
- CFD MODELLING OF GREEN WATER FLOW ON MOTOR YACHT DECK IN ROUGH SEA CONDITIONS, G Redondo, Phycisist & Marine Engineer, Santiago de Compostela, SPAIN, S Bartesaghi, Mechanical Engineer & Yacht Designer, Milano, ITALY

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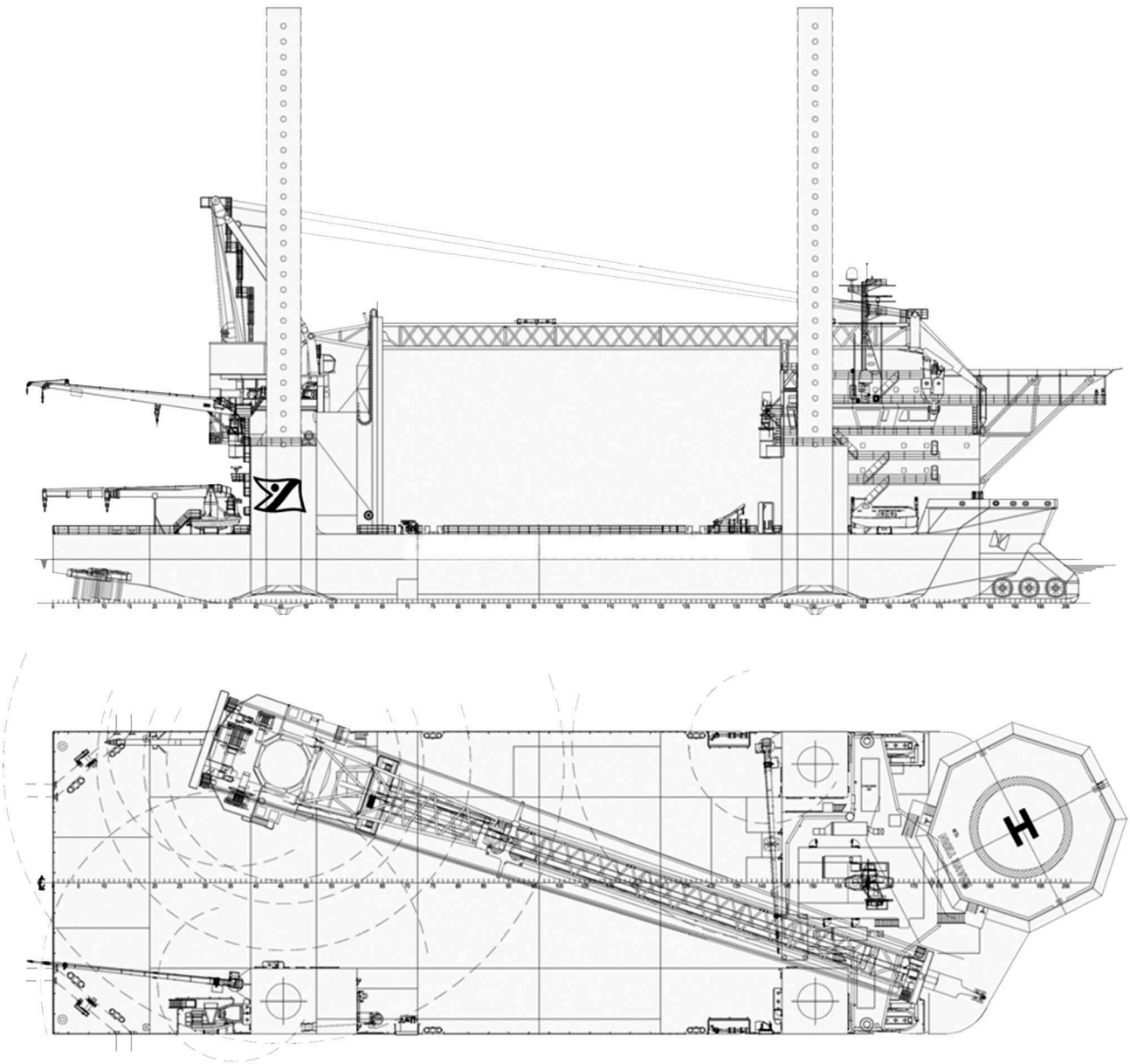
GA plan of *Brave Tern*



Shipyard De Hoop stays ahead of the game

In a time when shipyards are scrambling for contracts, The Netherlands-based Shipyard De Hoop appears to be staying buoyant in turbulent times

Last year saw the delivery of, *River Discovery II*, the first in a series of three river cruise vessels for American operator Vantage Deluxe Travel with the other two sister vessels *River Splendor* just delivered and the *River Venture* scheduled for delivery a few weeks later.

However, it doesn't stop there for De Hoop Shipyard. "We are finishing another vessel for Lueftner Cruises, *Amadeus Silver* which is a complete new design as previous vessels for this company have been 110m in length, *Amadeus Silver* will 135m and will include new features onboard. The vessel is scheduled to be delivered in April", says Patrick Janssens, chief executive officer, De Hoop Shipyard.

Furthermore, the yard is working on 12 'upgrades' and conversions of existing river cruise vessels, such as the complete interior conversion of *River Navigator* (for Vantage Travel) and the 'French Balconies' conversion of *Amadeus Classic* (for Lueftner Cruises). Next year the yard has, besides various orders for offshore vessels, recently acquired new orders to build two 135m river cruise vessels (*Riva Royale* and *Riva Princess*) for Riva Waterways and one luxury 110m river cruise vessel for Scenic Cruises.

Janssens remarks that the inland cruise market has seen substantial growth over the past couple of years, with more river cruise vessels coming onto the market. De Hoop Shipyard aims to stay ahead in today's market by keeping up with the demand for more innovative designs, which is being pushed by the growing competition in this market.

"We see that, in general, the credit crisis as well as the increasing competition have really accelerated innovation in ship design, as it's no longer a case of just copying the same designs or doing what you have always been doing. In general shipbuilding has seen many innovations in the area of propulsion, as vessels will now need to meet new regulations, such as IMO tier III (US tier III and IV). We are, for example, also looking at hybrid propulsion for other vessels that we construct where there is increasing demand for lower fuel consumption", says Janssens. He adds that there is also a lot of development in the area of waste heat and how to reuse this lost energy.

De Hoop Shipyard has had a good start to 2013. Patrick Janssens, chief executive, Fré Drenth, technical director, Johan Fasel, director of operations, (from front to back)

Also, on the rivers, competition is stronger. However, the biggest challenge at the moment is the shipowners taking up on these 'green' solutions, says Janssens. As we have seen in other areas such as the ballast water convention, shipowners are not quick to respond to installing energy efficient solutions onboard that may make their vessels greener and can save costs, but have a long payback time. Janssens explains that it is about discussing and explaining the savings with shipowners, as if they burn less fuel they will cut emissions and also save costs.

Most innovations in this market remain nevertheless focussed on bringing more comfort and more possibilities for the customers onboard.

Innovations that focus on the environment are still difficult. The rules and regulations are driving the demand for the solutions to be installed in this market. In many sectors there is demand for vessels to be more environmental, but it is not being valued by similar earning power.

Janssens also comments that in the future with all the river cruise vessels under construction, there could be over capacity in the market, as we see in other sectors. He believes that if this scenario is realised we could see river cruise operators looking to start tours in other regions. "Other rivers are opening up such as China and India. These will be a challenge as these are different rivers and the countries have different regulations", comments Janssens.

Also, De Hoop shipyard is keeping busy in other markets such as offshore, conversion and fast crew supply vessels for the Mexican Gulf. Janssens notes that in some areas the economy has picked up, but it is still hard out there for other shipyards and it is difficult to say when shipbuilding will return to the pre-2009 standards. *NA*

River Discovery II, the first in a series of three for Vantage Travel

WARSHIP 2013: Minor Warships

12-13 June, Bath, UK

The Royal Institution of Naval Architects

BMT Defence Services

"Where will our knowledge take you?"

Second Announcement

Minor warships are a category of naval vessel covering a wide range of roles, including mine counter measures, off-shore patrol and survey. These vessels may be deployed in a war role, within threat environments, but are usually small and of a specialised nature.

Traditionally, these roles have been achieved through the design of individual specialised classes of vessel. However, the emergence of new technologies, including the use of off-board, unmanned systems provides an opportunity to decrease the need for a highly specialised platforms and offers the potential of a single, re-configurable platform.

As with warships of all types, minor warships require to be affordable whilst meeting an often complex capability. Minor war vessels are often required to operate globally. The Conference icludes:

- Keynote Speech by Director Ships (MoD) Tony Graham
- THE EVOLUTION OF MINOR WARSHIPS IN THE LAST DECADE: GENERAL CONCEPTS AND PRACTICAL EXAMPLES, Serpagli S., Ferraris S., FINCANTIERI Naval Vessel Business Unit, Genoa, Italy
- HOW TO SQUARE THE CIRCLE FOR THE NEXT GENERATION OF PATROL SHIP DESIGNS, Andy Kimber, Jay Hart, BMT Defence Services, UK
- APPLICATION OF MECHANISED HANDLING SYSTEMS TO ENABLE MULTI-ROLE CAPABILITY ON MINOR WARSHIPS, Daniel Pettitt, Babcock, UK
- APPLICATION OF SLAM PRESSURE LOADS TO A QUASI-STATIC FINITE ELEMENT ANALYSIS OF A PATROL BOAT, Teresa Magoga, Seref Aksu, Terry Turner, Jenny Mathew and Stephen Kennett, Defence Science and Technology Organisation, Australia.
- LARGE UNMANNED VEHICLES AND THE MINOR WAR VESSEL, Rachel Pawling & David Andrews, Design Research Centre, UCL, UK

www.rina.org.uk/warship-2013

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BV's green intent

The market for inland waterways vessels grew globally in size during 2012. Eric Lallemand, director, Inland Navigation Management, Bureau Veritas explains how it is helping to introduce new concepts such as LNG as a fuel to the market

At the end of the year Bureau Veritas' inland fleet had grown to 1,802 vessels in class and there were a further 357 vessels on order. One clear trend throughout the year was to customise technological advances in seagoing ships for the inland vessels. As an example BV's HydroStar software was used for risk analysis verification of an investigation by the Maritime Technology Division of Ghent University into the ability of an inland waterway vessel to meet specific requirements for Belgian coastal waters.

On 1 January 2013, the revised ADN agreement covering the International Carriage of Dangerous Goods by inland waterways entered into force. It puts extra emphasis on the training and responsibilities of all parties concerned, predominately the master or the ADN specialist onboard the vessel. Bureau Veritas is working closely with tanker operators in Europe to help them meet the new rules.

Innovative projects in Europe were focussed on improving the green footprint of inland vessels. In one project BV is helping to produce an innovative passenger ferry catamaran powered by hydrogen fuel cells for the city of Nantes, France. Separately it is working with gas-fuelled projects including design approval for an inland navigation oil tanker of 2,600dwt with dual fuel engines, LNG fuel in cryogenic tanks and two separate systems and two engine rooms. Ghent-based marine engine builder ABC (Anglo Belgian Corporation) and Bureau Veritas are co-operating on a project to optimise ABC's existing dual-fuel engine range for inland vessels and marine applications.

Bureau Veritas validated a specific double bottom structure design on the cement carrier *Sandre,* which is operating on the River Seine. This vessel has been specifically designed to provide the maximum storage capacity for cement using the minimum amount of mooring space. The vessel is equipped with centralised hopper-feeds and distribution screws, facilitating a 40% loading time advantage when compared to the classic design of cement carrier. Transporting an estimated 60,000tonnes of cement per year, the vessel will save CO_2 emissions equivalent to 2,400 trucks annually.

Bureau Veritas validated a specific double bottom structure design on the cement carrier *Sandre,* which is operating on the River Seine

Bureau Veritas and the Belgian classification society EuroClass agreed to enter into a technical co-operation agreement aimed at achieving a harmonised approach to inland navigation vessels. EuroClass is recognised as a classification society by the Belgian authorities for certain types of vessels. Its register contains around one thousand inland navigation vessels, mostly dry cargo vessels operating in the Benelux countries and France. Clients of both companies will benefit from the sharing of mutual experience, and from the combining of BV's calculation tool expertise and R&D with EuroClass' practical experience in middle-sized cargo vessels.

BV also extended its cooperation with the Polish authorities with a working agreement for the technical inspection of inland navigation vessels in the southern region of the River Vistula.

Internationally Bureau Veritas was very active in Egypt with passenger vessel classification and certification. In South America demand for innovative vessels suitable for local markets and their operational conditions is generating experience with new types of design. The specific regulations governing South American markets are very different from those in Europe. BV will class a series of oil/asphalt tankers for Colombia to be built at the 3MAJ shipyard, in Rijeka, Croatia.

The 104TEU container vessel *For-Ever* was built in Romania and fitted out at Jooren Wharf in Werkendam. Designed for a fixed route with bridge height restrictions the vessel incorporates an innovative layout and accommodation design with extra ballast capacity to reduce air height when passing the low bridges. ***NA***

DIARY

April 18, 2013
Marine Coatings Conference, International conference, London, UK.
E-mail: conference@rina.org.uk
www.rina.org.uk/marine_coatings

April 22-23, 2013
Risk Based Design and Goal Based Standards, international conference, Glasgow, UK.
www.maritime-conferences.com/ASRAnet

April 24, 2013
RINA Annual Dinner, dinner, London, UK.
www.rina.org.uk

May 1-3, 2013
Ship Structural Design and Distortion Control, international conference, Glasgow, UK.
www.maritime-conferences.com/ASRAnet

May 6-9, 2013
OTC, international conference, Houston, USA.
E-mail: OTC@experient-inc.com
www.otcnet.org

May 8-9, 2013
Design and Construction of Super and Mega Yachts, international conference, Genoa, Italy.
E-mail: conference@rina.org.uk
www.rina.org.uk/super_yacht

May 11-14, 2013
IMDEX, international conference, Singapore.
www.imdexasia.com

May 15-17, 2013
Europort China, international conference, Nanjing, China.
www.china-ship.com

May 20-23, 2013
Basic Dry Dock Course, course, London, UK.
www.rina.org.uk/basic-drydock-2013

May 20-22, 2013
Offshore Floating System Design, international conference, Glasgow, UK.
www.maritime-conferences.com/ASRAnet

May 27-29, 2013
Offshore Floating System Design, international conference, Glasgow, UK.
www.maritime-conferences.com/ASRAnet

May 29-31, 2013
Contract Management for Offshore Vessel Construction, Repair & Design Course, course, Aberdeen, UK.
www.rina.org.uk/contract-management-may2013

June 3-5, 2013
Third Conference on Ship Manoeuvring in Shallow and Confined Water, international conference, Ghent, Belgium.
E-mail: conference@rina.org.uk
www.rina.org.uk/ship_manoeuvring_in_shallow_water.html

June 4-6, 2013
MAST, international conference, Gdansk, Poland.
www.mastconfex.com

June 4-7, 2013
Nor-Shipping, international conference, Oslo, Norway.
E-mail: tsc@messe.no
www. messe.no/nor-shipping/

June 5-8, 2013
MTB Superyachts, international conference, Dubrovnik, Croatia.
www.coplandevents.com

June 12-13, 2013
Warship 2013: Minor Warships, international conference, Bath, UK.
E-mail: conference@rina.org.uk
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www.maritime-conferences.com/ASRAnet

June 16-18, 2013
Gastech, international conference, Amsterdam, The Netherlands.
www.gastech.co.uk

June 24-26, 2013
Structural Integrity Analysis (Fatigue & Fracture), international conference, Glasgow, UK.
www.maritime-conferences.com/ASRAnet

June 25-27, 2013
Seawork, international conference, Southampton, UK.
E-mail: info@seawork.com
www.seawork.com

June 26-30, 2013
IMDS, international conference, St Petersburg, Russia.
www.navalshow.ru

August 13-15, 2013
Navalshore Brazil, international conference, Rio De Janeiro, Brazil.
www.ubmnavalshore.com.br

September 3-6, 2013
Offshore Europe, international conference, Aberdeen, UK.
www.offshore-europe.co.uk

September 10-12, 2013
Contract Change Management for Ship Construction, Repair & Design Course, course, London, UK.
www.rina.org.uk/conferences

September 10-13, 2013
DSEI, international conference, London, UK.
www.dsei.co.uk

September 13, 2013
Marine Coatings Course, course, London, UK.
www.rina.org.uk/conferences

September 13-22, 2013
Southampton Boatshow, international conference, Southampton, UK.
www.southamptonboatshow.com

September 17-19, 2013
IBEX 2013, international conference, Kentucky, USA.
www.ibexshow.com

September 17-19, 2013
Advanced Model Measurement Technology for the Maritime Industry, course, Gdansk, Poland.
E-mail: amt13@ncl.ac.uk
http://conferences.ncl.ac.uk/amt13

September 18-21, 2013
MTB Workboats, international conference, Athens, Greece.
www.coplandevents.com

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GRAND DAME: HOLLAND AMERICA LINE & THE S.S. ROTTERDAM
By Stephen M. Payne FRINA
Stephen Payne, Naval Architect of modern day cruise ships, fully describes the Holland America line's flagship, S.S. Rotterdam, designed and built over thirty years ago and discusses her owners in his above mentioned book. Various chapters describe the building of the ship, her construction, her technical features, her passenger accommodation, and the Holland America line transition from Atlantic ferry to cruise ship operators.
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(NOT ON AMAZON)

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Compiled By The Nautical Institute Ref: ISOD
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LAMENTABLE INTELLIGENCE FROM THE ADMIRALITY
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John Lingwood
The SD14 is almost extinct, and this book is a fitting tribute to a much-admired British designed cargo ship. Indeed, it should become the definitive history of the SD14 its derivatives. It provides a first-hand account of the SD14's conception and planning from a member of the design team, with many personal insights into the shipbuilding industry of the 1960s. Included are full career details of every SD14, the Prinasa-121s, the SD15 and the three SD18s: a total of 228 ships built wby seven yards in four countries. Every ship is illustrated, usually at several stages of its career, 99% in full colour.
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SHIPS AND SHIPBUILDERS: PIONEERS OF SHIP DESIGN AND CONSTRUCTION
By Fred Walker FRINA
Ships and Shipbuilders describes the lives and work of more than 120 great engineers, scientists, shipwrights and naval architects who shaped ship design and shipbuilding world wide. Told chronologically, such well-known names as Anthony Deane, Peter the Great, James Watt, and Isambard Kingdom Brunel share space with lesser known characters like the luckless Frederic Sauvage, a pioneer of screw propulsion who, unable to interest the French navy in his tests in the early 1830s, was bankrupted and landed in debtor's prison. With the inclusion of such names as Ben Lexcen, the Australian yacht designer who developed the controversial winged keel for the 1983 America's Cup, the story is brought right up to date.
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2012	**Historic Ships 2012** Ref: HIST12	£130	£110
	Safeguard Passenger Evacuation Seminar Ref: SAFE12	£130	£110
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