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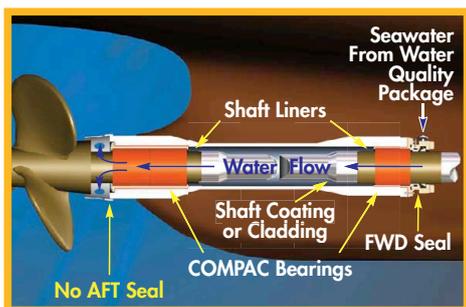
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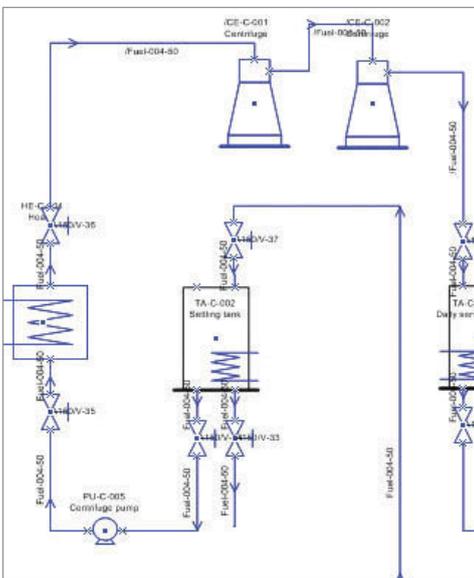
Green ships / Ice class / CAD/CAM /
January 2014



ENGINEER

DESIGN

MANAGE



Undefined	cyan
Information	yellow
OK	green
Accepted Difference	cyan
Check Required	limegreen
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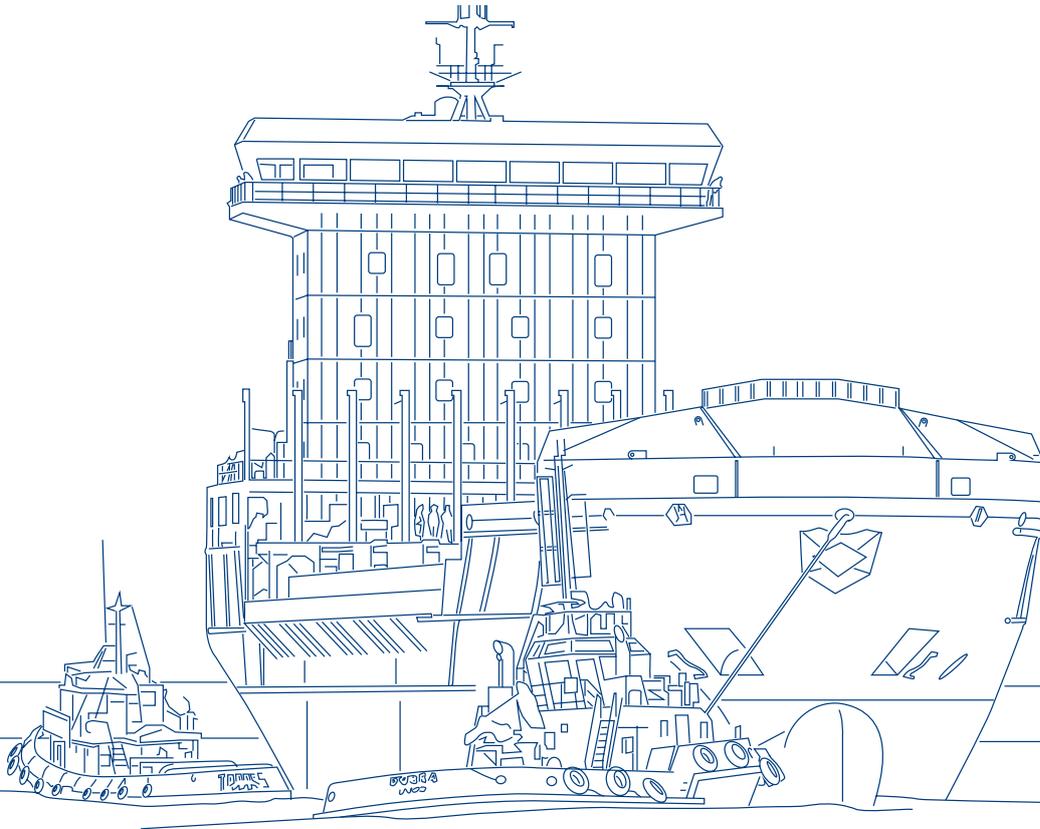
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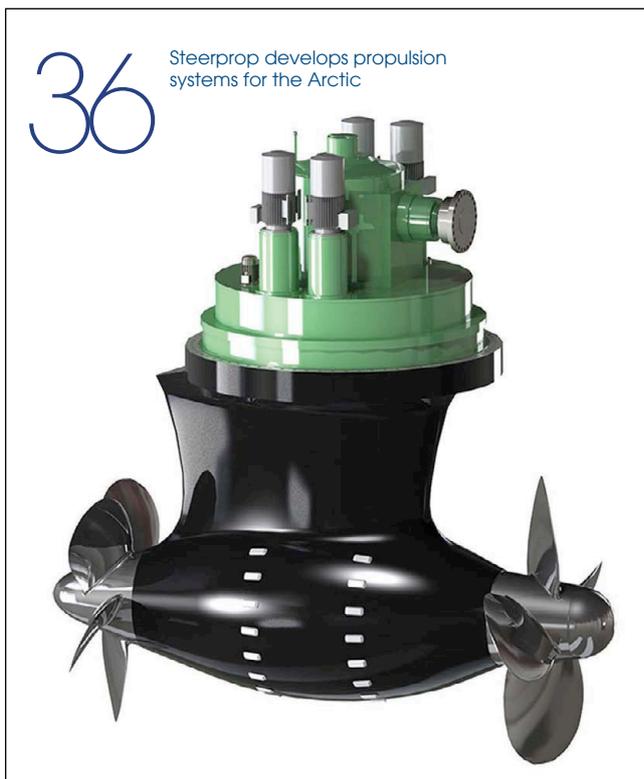
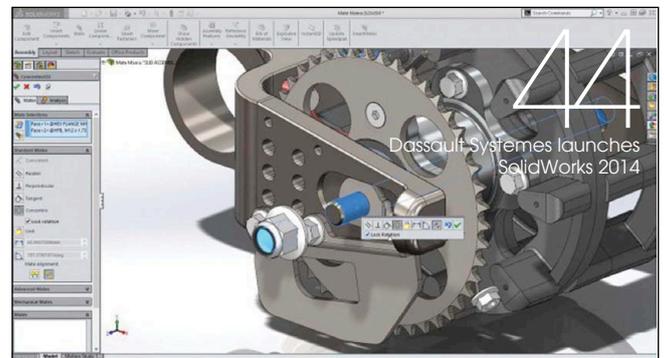
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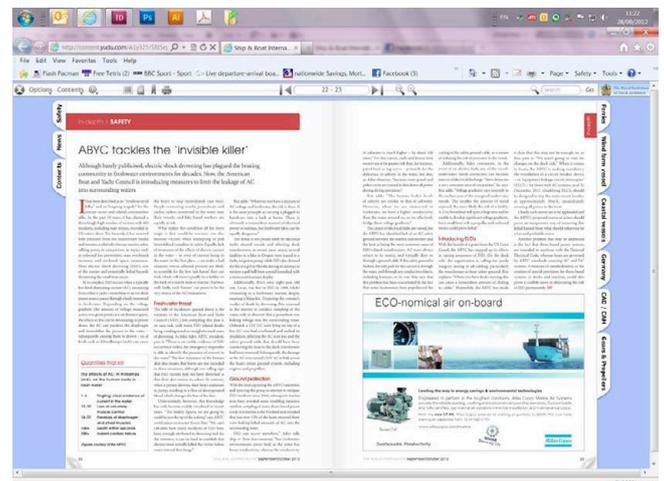
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Yours Sincerely,

Mr. Jang Seok Hyo,
President and CEO, KOGAS
Chairman, Korea Gas Union



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- The Global Gas Market: Key Developments & Updates
- Unconventional Gas: Developing the Potential
- Contracting, Pricing & Trading in Gas & LNG
- Financing, Investing & Developing Gas & LNG Projects

Technical Sessions

- **LNG & Gas Shipping & Shipbuilding**
- LNG Terminals & Plants: Engineering & Project Progress
- LNG as a Transport Fuel: with Bunkering & Infrastructure Development
- Emerging & Ground-Breaking Gas Technologies
- Contracting & Fabrication: The Greatest Challenges

LNG & Gas Shipping & Shipbuilding

- ▶ **Risk Assessment for LNG Vessel Transit in an Expanded Panama Canal**
Tamunoiyala Koko, Team Leader - Halifax, Lloyd's Register
- ▶ **The Successful Development of a New Membrane-Type Containment System for LNG Tankers**
Yung Shin, Senior Staff Consultant, ABS
K.H Joh, Principal Engineer, Samsung Heavy Industries
- ▶ **The Panama Canal and the Arctic: Transforming LNG Shipping Routes**
Paal Thorsen, Commercial Manager - Projects, Shipping, BG Group
- ▶ **Understanding the new IMO Energy Efficiency Design Index for Gas Carriers**
Richard Boudiette, Technical Adviser, SIGTTO
- ▶ **Hybrid FGS System with Partial Re-Liquefaction Unit for ME-GI Propelled LNG Carriers**
Jeheon Jung, Research Engineer, Daewoo Shipbuilding & Marine Engineering
- ▶ **SSRC: A Robust, Low-Cost Liquefied Gas Containment System**
John Holland, Managing Director, Carbonshipping GmbH

For further information on delegate registration, please email marketing@gastech.co.uk



Evolution, revolution and pollution

Beijing requires a clear vision to deal with yard over-capacity and mushrooming industrial pollution

Amid the ballyhoo surrounding this year's mega-event, Marintec in Shanghai, China, was this year's most talked about issue at the show; it wasn't the new low pressure LNG unit from Wärtsilä, or the latest delivery from Chengxi the B.Delta 37, but it was the choking smog that delegates were drowning in.

Shanghai has long had a pollution problem, as has much of industrial China caused largely by the coal fired power stations and other industry that churn out acrid suffocating fumes into the atmosphere.

At its peak the pollution levels reached more than 600PM_{2.5} micrograms (μg) particles/ m^3 , that is particulate matter (PM), that is 2.5 μg in size and smaller, which can enter the human lungs and cause damage. According to the local press the national limit for particles of PM_{2.5} and below is 75 PM_{2.5}/ m^3 .

Interestingly the World Health Organisation (WHO) uses these values as guides to safer limits of PM, PM_{2.5} 10 $\mu\text{g}/\text{m}^3$ annual mean; 25 $\mu\text{g}/\text{m}^3$ 24-hour mean; PM₁₀ 20 $\mu\text{g}/\text{m}^3$ annual mean; 50 $\mu\text{g}/\text{m}^3$ 24-hour mean.

The WHO also says: "There are serious risks to health from exposure to PM... It is possible to derive a quantitative relationship between the pollution levels and specific health outcomes (increased mortality or morbidity). This allows invaluable insights into the health improvements that could be expected if air pollution is reduced."

Finally the WHO says: "Even relatively low concentrations of air pollutants have been related to a range of adverse health effects."

Today, shipping and its assorted linked industries are one of the many major sources

of PM in China and the locals are calling for controls, on pollution rather than shipping. Beijing has responded and is now trying to clean up industry and this is expected by local maritime insiders to have a major impact on the shipbuilding industry in particular.

One member of the maritime community told *The Naval Architect* that new regulation was a game changer. It appears that the Beijing Government has, indeed, produced a regulation that could see many yards close while others will be forced into consolidation in order to survive.

The word 'could' is the operative word in this last paragraph, because the obvious aim of the newly adopted regulation, Issue 55 which came into force on 1 December 2013, is to reduce the number of yards, thereby, at least partially, dealing with the overcapacity problem that exists in the shipbuilding industry in this part of the world. Another clear aim is to clean up the industry by forcing industry, in this case the shipbuilding sector to be far more efficient about its use of energy.

As such Issue 55 published by China's Ministry of Industry and Information Technology states that yards will only be able to use 0.2tonnes of coal for every RMB10,000 (US\$1,645) of revenue that it makes.

Given all of the above, the statistics on pollution, the reality of pollution and the game changing legislation brought in to deal with this pollution, at least in part, one would imagine that the Chinese shipbuilding industry is right behind this legislation.

In fact the response that I received when I asked Chinese yards and shipbuilding

industry people about this directive, in what was an admittedly limited survey of the industry here, was a surprise. Mostly no-one had heard of the regulation; either by its bland name or when I described the nature of the rule.

Perhaps more surprising than that one yard asked how the government expected to enforce such a regulation, a pretty fair question to which I had no answer, except to say that Issue 55 stipulates that yards who do not meet the new standards will have financial support withdrawn.

In what was clearly a moment of rebellious free-market zeal the yard representative said, then there is no problem, 90% of our funding comes from our shareholders.

For once I have to admit I was at a loss for what to say. Should I emphasise the public duty companies have to clean up their act, point out that the government have a large army of enforcers who may not take kindly to this revolt, or merely applaud the single minded individualism that was refusing to be quelled by an oppressive force.

Not one course of action was worth the bother, because the reality is that if Beijing wants to implement change in the behaviour of its citizens and its companies the simple truth is that it has to tell people. Communication is everything in this context and if the Government wish to move through the various stages of development, past revolution and pollution to the promised land of plenty then communicating new regulations would appear to be critical to that journey. Otherwise we will all remain in the fog. *NA*

Shipyards

Beijing moves to reduce yard overcapacity

In a move that is seen as a direct attempt to redress the yard overcapacity issue in China the Beijing Government has issued a directive, unremarkably labelled Issue 55 from the Ministry of Industry and Information Technology, that will drive some yards out of business say experts.

The directive came into force on 1 December last year and is set to impact on the small and medium sized yards disproportionately. The yard insiders said that the Notice will mean that the yards will have to make “serious and strict” upgrades to their facilities in order to meet the requirements of the new rules.

“This will kill many yards and it will influence the direction of many yards and the whole of Chinese shipbuilding for many years to come,” say Chinese shipbuilding industry insiders.

The rules will limit the amount of energy that yards can consume to 0.2tonnes of standard coal for every RMB10,000 (US\$1,645) earned and new and strict environmental and safety standards will mean the investment required by Chinese yards will have an impact on their viability.

“A few good yards are full, but many state owned, low standard low tech’ yards, will struggle to survive,” say the yard representatives.

In addition to the energy efficiency, safety and social responsibility costs government will require yards to invest “not less than 2% of their revenue” into technological development. In effect the Beijing Government is seeking to improve the industry’s research and development record in an effort to make up ground on its direct competitors.

Overall the desired effect is to drastically reduce the number of yards, but also to “make the industry more efficient, green and creative”.

Financial support for yards that cannot meet the new rules will be withdrawn and with the banks not lending to the yards they will in effect be closing them down, say the experts.

This process has already begun with the consolidation of the state owned yards at Jiangdong and Jiangzhou Union. “These yards have been very good at producing dry cargo vessels in the past,” explained the yard insiders, but merger was their only chance to survive.

Good yards have seen a steady increase in orders, but state owned yards have little chance of surviving and will either have to close or merge their operations with other yards.

Private yards could be in for an even tougher ride than their state owned cousins as finding the financial support from either the state or financial institutions will be very difficult. “Many yards in Jiangsu Province have already closed,” said the expert.

More details on Issue 55 will be published in the February China feature.

Engines

Wärtsilä launch low pressure LNG unit

Solving the low pressure LNG conundrum took Wärtsilä a year, according to Ingemar Nylund, director, dual fuel technology.

Nylund says the mixture of air and gas in the combustion chamber was the biggest challenge that the Wärtsilä engineers had to overcome in designing the 50DF low pressure dual fuel unit.

“The mechanical side was simple, but with the dual fuel engine integration [of the fuel] is the key thing,” Nylund explained.

In order to raise the efficiency of the engine Wärtsilä redesigned the combustion chamber with the gas injectors at the midway point in the cylinder rather than at the top as is the case with diesel engines, this gives the fuel and air time to mix more thoroughly and reduces methane slip, the expelling of fuel that did not burn with the exhaust gases.

“Solving this problem took a year,” said Nylund, the company used CFD to simulate the air and gas flow and then “it takes time to modify the automation system.

Most other key elements of the engine remain the same as engines currently in use today, the pilot fuel system for the low pressure 50DF is a copy of the four-stroke system, he says.



Wärtsilä is keen to showcase its latest LNG technology, due to be installed on the Crowley container ro-ro vessels to be built in the US

Rolf Stiefel, Wärtsilä’s director of sales for ship power, explained that all engines that operate on hydrocarbons have a “hydrocarbon slip”. However, while diesels add the fuel into the combustion chamber at a late stage of the cycle, giving diesels a very high efficiency the Otto cycle DF50 adds the fuel earlier and this meant that Wärtsilä had to find a solution to the methane slip problem.

“We have designed the combustion chamber to reduce the areas where fuel remains unburnt; that includes the

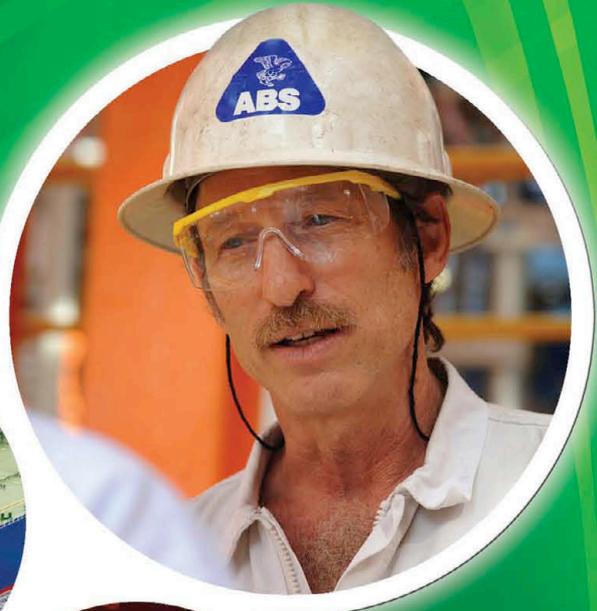
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Marine Design

3-4 September 2014, Coventry, UK



First Notice & Call for Papers

RINA Marine Design 2014 will provide a forum for reporting and discussing the design practice and technical issues associated with aesthetic design. The full spectrum of marine design from small craft to super yachts, including commercial and specialist vessels, will be examined.

An exhibition celebrating the 30th year of boat design at Coventry University will be opened at the end of the conference, which will include a virtual 3D exhibition of Coventry University students' design work. This will show the breadth of capability within the department of Industrial Design including automotive, transport and boat design.

The conference will present technical papers on a number of aspects of aesthetic marine design, including:

- **Design Visualisation** (including design methodologies, design practice, innovative concepts, design analysis tools, Computer Aided Design, TOI (Transfer of Innovation) from other industry sectors).
- **Human System Integration** (including HFE (Human Factors Engineering), Maritime Security, UCD (User Centred Design) methodologies, Emotional Design methodologies, Empathic Design methodologies, 'Ageing in Place', TOI from other industry sectors).
- **Sustainability in construction** (including one-off construction and series production issues, facility design, materials, joining technologies, reconstructions and rebuilds of historic craft, results of simulation).
- **Sustainability in operation** (including, equipment, results of sea trials, results of instrumentation, results of simulation, TOI from other industry sectors).
- **Implementation of regulations** in the design process (including international, national, and regional regulatory frameworks, classification, codes of practice, rating rules).
- **Virtual work/learning environments** (including, CPD for marine designers, networking opportunities for innovation and exchange, virtual work environments to facilitate multi-disciplinary, multinational teams).

www.rina.org.uk/marine_design2014

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Designing the stress out of salvage

Demanding new environmental legislation, rising costs for salvage operations and wreck removal and new generation mega ships are just some of the drivers behind the concept of the salvage friendly ship, writes *Sandra Speares*.

As Gilles Longuève president of the Maritime Passive Safety Association explained at the Salvage and Wreck conference in London in December, today's salvors face a number of challenges, including the fact that they may be operating in sensitive and remote environments, working under the scrutiny of local authorities and insurers, and potentially dealing with hazardous cargo or giant ships.

The conference, organised by Informa Maritime Events included a number of presentations on the cost of salvage and wreck removal operations, most notably in cases like *Costa Concordia* and perhaps more alarmingly *Rena*, given the size of the vessel in proportion to the costs of the salvage and wreck removal operation, which is still on-going more than two years after the casualty.

Longuève described the salvage-friendly ship as "a ship with permanently installed onboard solutions to help stop leakages from the tanks, keep the pollutants inside the ship and facilitate the recovery and evacuation of these pollutants by salvors".

The Maritime Passive Safety Association was set up in 2010 based on the premise that ships were not designed to prevent pollution in the event of an accident, and this despite the innovative technologies available.

According to Longuève, challenges expressed by salvors included the prevention of leaks, ensuring integrity of tanks, permanent access to cargo and bunker tanks in order to make it easier to offload pollutants and the need for a greater degree of information being provided to salvors involved in an operation.

Maritime passive safety solutions that can be installed ahead of an incident, or deployed by the crew during one, include leak prevention valves fitted to cargo tank or bunker ventilation systems to allow water to enter in the event of immersion but stopping fuel from leaking from the ship.

Crew members could also deploy magnetic or non-magnetic patches to stop water ingress or prevent fuel leaking, or fast oil recovery systems which research

has shown can speed up the salvage operation by a substantial amount. "If we manage to extend the time period before oil gets in the waters and enable a smoother and faster salvage operation, then half the battle is won," Longuève said in his presentation.

A study conducted jointly by JMLD Ecologic Group – which develops maritime passive safety systems and the Maritime Passive Safety Association concluded that if a FOR system had been installed on *Rena*, the costs of cleaning up the resultant pollution could have been cut by 50%.

The study also said that salvage use of the FOR system could speed up the salvage operation and mitigate the risks to exhausted salvors who might be working round the clock on a stressed hull.

The salvage industry has repeatedly raised concerns about salvage operations involving the new generation of mega container ships, not to mention cruise ships that could be carrying as many as 8,000 people onboard. As Graeme Bowles, partner at Brookes Bell put it at the conference: "the bigger the ship, the more enormous the problem".

The demands of offloading containers from ships during a salvage operation has led a number of salvage companies to begin

developing their own systems although concerns were raised by some of those present at the conference over the duplication of activity and whether demand for the systems would justify having several of them available. Similar arguments were raised about the availability of equipment used in salvage operations, and whether there was an over-concentration of similar equipment in centres like Singapore.

Coastal states and local authorities are becoming increasingly demanding as far as salvage and wreck removal operations are concerned, both in terms of the removal of bunkers from the casualty and the removal of the wreck itself. Conference delegates repeatedly urged the benefits of cooperation between salvors, masters and local authorities to ensure that all parties understood each other's concerns. While much can be done to improve the salvage friendliness of ships, a lack of progress on the issue of places of refuge is at the top of the International Salvage Union agenda going forward. *NA*

"Longuève described the salvage-friendly ship as "a ship with permanently installed onboard solutions to help stop leakages from the tanks"



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Bridge & communication systems

Kongsberg integrates boxships

Kongsberg Maritime has secured contracts with a value of NOK150 million (US\$24 million) to deliver fully integrated navigation and automation systems for a series of 10 container vessels ordered by United Arab Shipping Company (UASC).

The five 14,000TEU class and five 18,800TEU class vessels are scheduled for delivery from Hyundai Heavy Industries (HHI) during the first half of 2015. UASC has an option for seven more vessels to the same specification under its contract with HHI.

Kongsberg Maritime will deliver its 'Full picture' integrated vessel control systems including navigation, communication, and automation for machinery and propulsion systems. Included in the Kongsberg scope of supply is also its, Vessel Performance System, which monitors and provides decision support advice for operators regarding energy efficiency, fuel usage and optimal sailing.

The K-Chief automation system and vessel performance system integrate with the electronically-controlled main engines, which will help reduce noise, vibration and carbon emissions by automatically controlling fuel consumption to suit sailing speed and sea conditions.

www.km.kongsberg.com

Paints & coatings

Sherwin-Williams launches SeaGuard App

Sherwin-Williams Protective & Marine Coatings has launched SeaGuard, an app that provides users with protective coating recommendations for VLCC/VLBCs, chemical tankers and OSV/PSVs. The app is optimised for both iOS and Android technology.

The app is designed to help port engineers and fleet managers' access accurate and up-to-date coatings information via mobile technology. Sherwin-Williams said that if a new product is introduced, or an old product is no longer manufactured, SeaGuard will update the information, so that all data will be current.

SeaGuard's home screen allows the user to select the type of vessel in need of coating. Once the vessel has been selected, labelled areas of the vessel appear. The SeaGuard app then recommends a coating system for each area.

The recommendation includes both a primary and alternative system, providing information on the generic coating system (primer, intermediate and top coat),



Sherwin-Williams' latest app helps port engineers and fleet managers choose correct coatings with less paperwork

stripe coat (if needed), dry film thickness for each coat and total millimetres for the system. Surface preparation and application equipment tips are included in the recommendation. Clicking on a product name brings up a detailed product data sheet.

www.sherwin-williams.com

Ancillary equipment

SmartLoad lightens the load

Scotload has launched its latest product for safe lifting, the SmartLoad. The system's data recording ability will offer the industry increased safety and data verification during lifting operations, simple logging facility offering fleet and asset management, and providing a correct log of all operations carried out, the company has said. Providing this data will decrease the risk of any potential overloading during operation.

SmartLoad has a variety of features including an internal transportable memory, which records usage and an internal event logger which stamps date, time and any overload event. Multiple units can be displayed on one handset with both sum and average loads displayed, making it ideal for multi-point load testing.

SmartLoad can suit any custom application as new software can be transferred to the unit.

www.scotload.com

Propulsion

Shear spacers for turbo drives

Power Transmission Solutions has launched its Kop-Flex high-speed shear spacer coupling that uses a patented double-tube design, which has precision machining and bearings, and special metal treatments to help provide predictable shear during torque overloads on turbo

drivetrains, allowing safe coast down of systems turning at up to 20,000rpm.

It has been developed to protect gas-turbine-powered generator drives during electrical faults; the shear spacer can also be used for drives on compressors, pumps, fans and trains subject to shock torques. The patented shear cartridge uses special bearings between two tubes to maintain concentricity and overall centring after high-speed separation. The double-bearing design, precision grooving, shot peening and a corrosion resistant coating combine to increase fatigue resistance and promote reliable operation over the life of the coupling, the company said. The high-speed shear spacers are available in all catalogue coupling sizes and are capable of handling speeds up to 20,000rpm and millions of inch-pounds (or Newton-meters) of torque, the company said.

www.PowerTransmissionSolutions.com

Ballast water treatment systems

Clean Marine supplies EGCS to HHI

Clean Marine has been selected by Hyundai Heavy Industries (HHI) in South Korea to supply exhaust gas cleaning systems (EGCS) for a Very Large Gas Carrier (VLGC) being built for Dorian LPG Ltd.

Dorian LPG has ordered three fuel-efficient VLGC newbuildings from HHI with deliveries in 2014 and holds an option for three additional ECO VLGCs. These vessels are designed with the highest fuel efficiency available and will have ME-G type engines.

Clean Marine has developed an EGCS based on the Advanced Vortex Chamber technology that provides unique particulate matter trapping efficiency. The system supplied to Dorian LPG is a hybrid system that allows the vessel to operate seamlessly in all types of water (including low alkaline and saline water) without loss of efficiency.

www.cleanmarine.no

Environmental equipment

ABB wins orders for 14 container ships

ABB has won two orders to provide its waste heat recovery systems, each powered by a power turbine generator (PTG), for fourteen 8,800TEU container vessels which will be delivered in 2015 and 2016. The company has said that by supplementing a ship's main propulsion plant with a waste heat recovery solution, up to 4% of the lost fuel energy can be recovered and converted into electricity.

ABB's scope of supply will see it deliver the waste heat recovery system PTG that consists of a PTL 3200 exhaust power turbine with control valves, alternator,

reduction gear and dynamic compensator consisting of an ACS800 drive with a (step down) feed transformer and a breaking resistor bank. The package also includes two A185-L turbochargers. The electrical output of the system is 1.65MW.

www.abb.com

Bridge & communication systems

Imtech extends its reach

Imtech Marine and Danelec Marine have announced an extension of the sophisticated remote access service that was developed by the Imtech Marine 24/7 GTAC, Global Technical Assistance Centre, which will include data from Danelec Marine voyage data recorder (VDR) systems. The service provides significant advantages for the ship manager in terms of control, safety as well as optimisation and cost. An extensive joint development effort between Imtech Marine and Danelec Marine, ensures efficient remote access solution of VDR data, the company said.

www.imtech.com

Bridge & communication systems

Weathering the journey

The Dutch weather routing software supplier Meteo Consult and Amarcon, have received an order from Maersk Line to equip a minimum of 110 Maersk Line container vessels with its SPOS Seakeeping software. The Seakeeping plug-in is a feature within Meteo Consults weather routing software SPOS. With this plug-in the user can define vessel loading conditions and motion threshold values based on the input of Amarcon's OCTOPUS-Onboard.

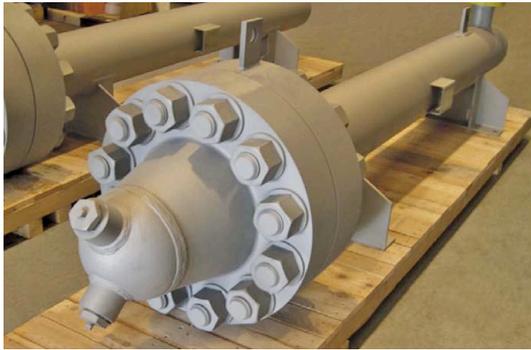
In the SPOS Seakeeping chart, areas can be displayed where motions are expected to exceed the threshold values. In the route optimisation, the motions are also calculated and the route optimisation will automatically avoid areas where maximum motions will be exceeded.

www.amarcon.com

Ancillary equipment

GEA scrubs up

GEA Heat Exchangers has presented its series of GEA Bloksma-Fryer NHP shell and tube heat exchangers that was developed to meet the requirements encountered in the cleaning of 25tonne tank containers. These heat exchangers are designed for pressures of up to 300bar, and can be used with steam, overheated water, or thermal oil. GEA has said that the models from the HNP series can be easily uninstalled, which means easy access for service and cleaning staff. As a result, the heat-exchange surface



A GEA Blokma-Fryer NHP shell and tube heat exchanger

can be mechanically cleaned, which extensively eliminates the need for chemical cleaning.

The individual units are produced from standard components, according to customer specifications, for output from approximately 100 to 2,500kW. The great number of standardised elements used includes components with standardised pipe sizes, diameters, and intervals; case cross-sections; covering elements; and operator-control components. The six available sizes of shell diameters lie between 168 and 406mm. In addition to standard lengths of 1,200 and 2,500mm, special dimensions are also available.

www.gea.com

Bridge & communications

Seagull launches new eLearning titles

Training provider, Seagull, has announced the release of nine new eLearning titles. The fourth quarter release includes titles covering Electrical safety, Galley operations: nutrition, Nutrition and well-being: awareness, Electric propulsion: electrical machines, Electric propulsion: power electronics, Electric propulsion: electric propulsion systems for ships, Marine environmental awareness: sustainable shipping, Enclosed space entry: awareness and Shore based assessment. In addition to the nine new titles, 16 titles have been revised.

Seagull has also developed a new awareness module building on the existing version whose objectives are to enable the learner to become aware of and avoid the dangers of enclosed spaces onboard ship and prepare them to take part in enclosed space entry and rescue. The module identifies the hazards likely to be faced during entry into enclosed spaces and the precautions that must be taken before entry, recognises the signs of adverse health effects caused by exposure to hazards in enclosed spaces and the additional precautions required when the atmosphere in an enclosed space is either known or suspected to be unsafe.

www.seagull.no

Bridge & communications

Transas Marine goes Italia

Transas Marine has won the Italian tender of Consorzio degli armatori del mediterraneo for supply of navigation equipment for 64 vessels.

“Consorzio degli armatori del mediterraneo” is the Italian Shipowners Research Consortium, which consists of six shipowners (Augusta Due, Marnavi, L.G.R. di Navigazione, Gestioni Armatoriali, Elbana di Navigazione, Perseveranza). According to the contract, Transas dual Navi-Sailor 4000 ECDIS Premium systems will be installed onboard of 64 oil/chemical tanker and bulk carrier vessel. Members of the Consorzio will also have options to order official charts through Transas Admiralty Data Service TADS, service and maintenance, and receive ECDIS generic and type-specific training from Transas. The supply and installations will run to the end of 2015.

www.transas.com

Ancillary equipment

Unique System supplies monitoring systems to ADOC

Unique System FZE, a Unique Maritime Group company, has engineered and supplied a monitoring system that will provide the Abu Dhabi Oil Company Ltd. (Japan) with meteorological and oceanographic data to aide operational decision-making for mooring and filling of oil tankers.

The system is installed at a Single Point Mooring (SPM) buoy, a large buoy at sea for mooring and filling oil tankers over the course of several days.

The meteorological sensors are installed in a new mast which is bolted to the deck of the buoy. Accurate wave and current information is gathered by an acoustic Doppler current profiler (ADCP). This unit is mounted in a ballasted stainless steel frame and will be placed on the sea bed near to the buoy. The data from weather sensors and ADCP is collected by a data logger located in the central compartment of the SPM buoy. From there the data is transmitted to Mubarras Island through GPRS telemetry. The entire system will have its own, independent power supply. To this end, a solar panel will also be mounted on the deck, near the mast, while an extra battery will be placed in the buoys dedicated battery room. Cabling between the locations will pass through existing cable transits that still have spare capacity.

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Liaoning shipbuilders shape up through innovation

The global shipbuilding industry is still in a slump and shipbuilders in Liaoning face risks brought by such problems as excess production capacity. They are banking on innovation to transform their operations with new products and new business opportunities

In 2013, Dalian Shipbuilding Industry Co., Ltd. insisted on “strengthening innovation, speeding up structural adjustment, improving management and furthering scientific development” in steering its business. Changes were made on six aspects of production.

Two new warships were added to the yard’s portfolio and merchant ship production steadily slowed to a halt. The yard introduced a number of new models to its merchant ship product lines and began works on new and high-tech products at the same time instead of offering merely low price vessels, it sold a complementary mix of high and low price products; offshore projects were expanded from building merely jack-up rigs to covering three production lines—jack-up rigs plus the company’s own drilling vessels, drilling barges, and FPSO construction and repair plus conversion of vessels for shipping companies. And for heavy industrial production, it shifted from making traditional steel structures to taking contracts for new product assembly and [fixed-price/lump sum] contracts.

These changes brought to light a host of issues like the increased number of new products and technically complex products it was to turn out, the squeeze on time to prepare for production, many products were subject to external constraints, many were low price products, uneven loads on production lines and difficulties in coordinating production.

Facing these harsh realities, the company laid down an overall direction, which was: to forcefully defend naval production, improve management, continue to innovate and steadily transform its operations.

In adjusting its operations, the company pushed forward with coordinated efforts to achieve balanced development of its five business lines. For naval products, it focused on planning, whereas for merchant ships, the aim was to lead market demand, it developed



In May 2011, a 12,000tonne container carrier built by (Dalian Lushun Binhai Shipbuilding Co., Ltd.) was launched

new products and at the same time improved production procedures of proven key lines.

With offshore projects the yard wanted to boost its “single expertise” to being “a master of three specialties”, the company stepped up planning and organisation of projects already in hand and market development. For repair/dismantle works, other than investing in operational infrastructure, it also enhanced its system and market development that it might scale up capacity and capabilities sooner rather than later.

COSCO Shipyard

In 2013, COSCO Shipyard continued to follow the “three operating factors and seven enhancements” it laid down for itself.

Factor One: Keep tabs on order taking. To make sure that production is sustainable, the company stresses the need

to strengthen collaboration and motivate sales and marketing staff to gain orders for mature vessel types, specialised merchant ships and products for offshore projects. With marketing as the engine, customer needs as the guide and a concerted effort from all staff, the company will push to secure more orders.

Factor Two: Keep tabs on capital flow. Firstly, to step up financing for offshore projects making sure their capital requirements are met; secondly, to more fully exploit information technology for budgeting and capital management thereby ensure budgets are timely and accurate.

Thirdly, tighten control on the speed of “cash in and out”; fourthly, to explore with banks different ways to meet the company’s financing needs such as raising funds overseas and insurance financing.

Factor Three: Keep tabs on risks. Keeping an eye on firstly, the risk of delivery delays; secondly, receivable risks; thirdly, the risk of labour related disputes involving contractors or on-site staff; fourthly, the legal problems arising out of corporate behaviour.

It is in this context that COSCO Shipyard drew up its 12th Five Year Plan that builds on its scale and competence and focuses on “seven enhancement areas”. By laying down a guiding action plan, the company hopes to achieve development that is safe, scientific and sustainable.

Area One: Work safety management. Firstly, to optimise its safety management system, speed up setting of work standards, draw up clear safety requirements for different work processes, strengthen work safety education for staff in different posts and types of work, and enhance the safety awareness of individual workers and turn work safety into a personal pursuit.

Secondly, to strengthen the sense of safety of its teams by introducing assessments for safety management personnel, technical training courses for relevant staff and back-up safety managers, etc., thus assure gradually that its safety management staff are equipped to oversee the safety requirements of the company’s three main businesses, namely ship repairing, shipbuilding and offshore projects.

Area two: Production management. For repair and conversion works, its focus will be on specialised vessels and offshore projects, improving control on building and docking schedules and raising the management standards of repair and conversion works; for shipbuilding, it will push ahead towards the goal of becoming a modern shipbuilder capable of shipbuilding modules that boast enhanced efficiency, support from a streamlined workforce and low cost; as for offshore projects, with their

special management requirements in mind, the company will devise a comprehensive project planning management system and [combine] jack-up rig projects and FPSO modules on hand, to allow testing, reviewing and perfecting of the system in practice.

Area Three: Human resources management. Firstly, to comb through the current manpower—postings and duties and responsibilities—setup to enable merging and streamlining; secondly, push forward with adjusting the structure of core talent teams and provide focused training, and build a data base that can help groom such talents and also support its development plan for offshore projects. The company is targeting an expansion of staff, including professionals in R&D, project management and resource management within a year to support development of offshore projects.

Thirdly, to perfect the system for selecting, appointing, training and assessment of outstanding shift supervisors. Fourthly, to establish standardised high-tech work teams and, lastly, to trim labour costs by strengthening salary control.

Area Four: Outsourcing management. Firstly, continue to assess and streamline outsourced labour, strictly apply vetting standards and the withdrawal system to cap the outsourced workforce. Secondly, to change the outsourcing pricing method and improve related budget management, thus help “trim hands as well as costs”.

Area Five: Materials management. Firstly, to strengthen control and ensure meeting of cost targets and dig deep for breakthroughs in lowering procurement expenses. Secondly, to reduce stacking of materials by the rapid application to the production process and timely handling of scrap materials.

Thirdly, to use the optimised integrated warehousing solution for tasks such as termination of warehouse leases and removal

hence enhance the efficiency and quality of materials management and delivery and ultimately lower logistic expenses. Fourthly, to perfect the procurement cost management system, tighten the grip on pre-payments following the “fast cash-in, slow cash-out” principle to lower capital costs.

Fifth, to make “marrying of” technology, materials and production a norm and build a system to track and evaluate how “this marriage of three” works by the month. Sixthly, to work in-sync with the roll out of the trial steel materials FRID computerised storage management project online and seventhly, to conduct random checks on and audits of materials to make sure of access to cogent data at all times.

Area Six: Technology management. Firstly, to integrate designs work of [the technology centre of COSCO headquarters with the company’s own] to realise centralised management and improve the company’s design expertise; secondly, to speed up training of talents strewed in both technology and operation, hence build stronger technology teams which are capable of products that blend shipowners’ requirements with design concepts and are ready to put out diverse products.

Area Seven: Keep enhancing quality management. Firstly, continue to build quality assurance modules, focusing mainly on setting up and application of the software platform for offshore project management, thus raising the level of computerised management on related projects. Secondly, through clearly defining and perfecting of critical links in work processes, draw up scientific exemption of inspection plans for work processes and modules and continue to expand coverage of the plan and boost the practical effect of authorised exemptions.

The production base of Dalian Shipbuilding Industry Co., Ltd





In early 2013, Dalian Shipbuilding Industry and the UK-based international oil company BP signed a (fixed-price/lump sum) contract for the construction of 3+3 seventh generation Frigstad D90 semi-submerged super deep sea oil rigs

Thirdly, to strictly administer quick reporting of problems and quality issues in production, hence speed up investigation, analysis and resolution of them. Fourthly, to strengthen closed-loop management of after-sale quality issues and incidents, upholding the principle of “four no compromise” in investigating, analysing and correcting those quality issues and incidents.

BSHIC has innovation at heart

The primary work goal of Bhai Shipbuilding Heavy Industry Co., Ltd. has been to keep all its economic indicators climbing, speed up development and lower costs in firm strides, be open to innovation and to adjust its structure on the back of improving management, all done to aid the development of synergies in its three main businesses.

To maintain steady growth of its merchant ship business, BSHIC has expanded its mainstream vessel portfolio embracing R&D and the upgrade of outstanding vessel models and high value-added vessels, and bettered its planning and construction capabilities to ensure delivery of major undertakings. Aiming for growth that is “balanced and disciplined, smooth and fast, punctual

and effective, and always improving”, it has built a “module transformation” platform and sorted through processes of major operations from design and materials to production and management to boost overall effectiveness.

Its second plan has been to raise the overall management standards including stepping up building of internal control mechanisms, perfecting its policies and construction of organisational systems, strengthening budget management, expanding budget coverage, to strictly control cost, and setting up an integrated material allocation management system that can ensure ships are built efficiently.

With a clear grasp of its operational goals, BSHIC has actively rolled out efforts related to R&D management, new production techniques, R&D of new products and commercialisation of innovative achievements, and reported results.

To start with, the company has shaped up its R&D management system. It completed 80 R&D undertakings in 2011 and, in 2012, 70% of the more than the 50 on the project list. The company has improved its R&D system and mechanisms benefiting from R&D in practice commanding clear and precise planning, tracking and grasping of

issues and resolution of problems. It has also put in place a tendering system for technical jobs, a procurement system based on comparing prices and [a manpower allocation system for technical projects], and added new rules governing the internal and preliminary [vetting of tenders].

The company has completed the welding technique documentation system for optimised vessel models of 4.5, 20.3 and 32 million tonnes, and non-marine tasks including repair of jack-up rigs and [berthing pontoons], etc. It has rendered welding technology support to LNG carriers, marine surveillance vessels and salvage vessels.

In 2013, observing the standards required of modern shipbuilding enterprises, the company made manpower reforms, breaking down the wall long-standing between management departments and moving from independent project management to integrated management that rallies synergies, collaboration and team efforts. Furthermore, in building merchant ships, the company continued to uphold the production philosophy of “balanced and disciplined, smooth and fast, punctual and effective, and always improving” in its bid to raise its capability. **NA**

RINA-QinetiQ Maritime Innovation Award

Innovation is key to success in all sectors of the maritime industry, and such innovation will stem from the development of research carried out by engineers and scientists in universities and industry, pushing forward the boundaries of design, construction and operation of marine vessels and structures.

The Royal Institution of Naval Architects – QinetiQ Maritime Innovation Award seeks to encourage such innovation by recognising outstanding scientific or technological research in the areas of hydrodynamics, propulsion, structures and material which has the potential to make a significant improvement in the design, construction and operation of marine vessels and structures.

The Award is made annually to either an individual or an organisation, in any country. Nominations for the Award may be made by any member of the global maritime community, and are judged by a panel of members of the Institution and QinetiQ. The Award will be announced at the Institution's Annual Dinner (tbc).

Nominations are now invited for the 2013 Maritime Innovation Award. Individuals may not nominate themselves, although employees may nominate their company or organisation.



QinetiQ

- Nominations may be up to **750 words** and should describe the research and its potential contribution to improving the design, construction and operation of maritime vessels and structures,
- Nominations may be forwarded online at www.rina.org.uk/MaritimeInnovationAward or by email to MaritimeInnovationAward@rina.org.uk
- Nominations should arrive at RINA Headquarters by **31 January 2014**
- Queries about the award should be forwarded to the Chief Executive at hq@rina.org.uk

RINA - Lloyd's Register Maritime Safety Award

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

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

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

Nominations are now invited for the 2013 Maritime Safety Award. Individuals may not nominate themselves, although employees may nominate their company or organisation.



- Nominations may be up to 750 words and should describe the technological contribution which the individual, company or organisation has made in the field of design, construction and operation of maritime vessels and structures,
- Nominations may be forwarded online at www.rina.org.uk/MaritimeSafetyAward or by email to MaritimeSafetyAward@rina.org.uk
- Nominations should arrive at RINA Headquarters by 30 Jan 2014
- Queries about the Award should be forwarded to the Chief Executive at hq@rina.org.uk

Fuel efficient designs take a bow

A number of new ship designs have been realised over the last year with significant fuel savings for owners and reductions in emissions. Sandra Speares reports

Tough market conditions coupled with the demands of new environmental legislation have meant that shipowners' and shipyards' attention have increasingly focused on new ship designs and equipment that both meet the new environmental requirements which at the same time being energy efficient.

One example is bulk carriers, which have been attracting a lot of interest in terms of new designs, which combine low fuel oil consumption with low emissions.

China Navigation Company recently took delivery of *Wuchang*, first of the 39,000 dwt B.Delta37 bulk carriers of Deltamarin design built to Lloyd's Register's standards at Chengxi Shipyard in China.

Deltamarin's B.Delta37 design achieved best in class performance for the handysize segment, for low fuel oil consumption, low emissions, the Energy Efficiency Design Index, deadweight intake and lightweight particulars. The vessel has an optimised and energy efficient design, with particular focus on optimal hydrodynamic performance and lowest possible lightweight, without compromising either the cargo intake or the hull structural integrity, according to Lloyd's Register (LR).

Wuchang has been built in accordance with the common structural rules for bulk carriers and although the vessel was ordered ahead of the EEDI requirements coming into force on 1 January, after tests the derived EEDI value is confirmed to be over 20% below the applicable baseline for bulk carriers, LR said.

Another new design initiative coming off the blocks is the Green Dolphin 575 which has resulted from long term cooperation between DNV GL and Shanghai-based Ship Design and Research Institute (SDARI). The new handymax bulk carrier concept builds on the Green Dolphin 38 design.

According to DNV GL, the decision on the vessel size was taken after extensive market research and input from owners and operators which found that the handymax bulker's ability to carry a range of major and



Green Dolphin handymax bulk carrier design developed by DNL and SDARI

minor cargoes and its port access capability meant there was likely to be a stable demand for this type of vessel and it was well suited to meet growing demand for regional transport, particularly in Asia.

Similar to the Green Dolphin 38, the hull is designed to achieve optimal fuel efficiency without compromising on strength and operational flexibility DNV GL explains. "New for this project is that performance in waves has also been addressed – through model testing and calculations of the added resistance on a given trade route."

Fitted with an efficient Tier II long-stroke low-speed main engine, the Green Dolphin 575 is designed to comply with current and future expected local and global emission regulations, such as those relevant for IMO Tier III, Emission Control Areas, California and EU ports, through different alternatives: a switch to low-sulphur fuels, the installation of exhaust-gas cleaning systems or dual fuel operation with LNG.

Features of the ship include: hull lines optimised for an operating profile including ballast, design and scantling draughts and speeds in the range of 10-15knots; resistance

calculations performed by full-scale RANS CFD simulations; added resistance in waves calculated numerically and compared to tank test results; no-bulb concept for a flexible design with improved overall performance, including operation in realistic sea states; a main engine (long-stroke and low revolution) with economical fuel consumption over the entire operating range; a large-diameter slow-rotating propeller improved propulsion efficiency through energy-efficiency devices; a duct in front of the propeller for improved propeller inflow and propeller capfins to reduce the propeller hub vortex.

Main engine fuel consumption is estimated at about 22.8tonnes/day at continuous service rating (CSR) conditions with 15% sea margin and the design can fulfil the EEDI phase 2 requirement - 20% below the IMO reference line for bulk carriers. It is prepared for shaft torque and fuel consumption monitoring systems to facilitate performance monitoring and support the implementation of SEEMP and EEOI.

During the Green Dolphin 575's performance assessment, the Green Dolphin 575 was compared to the existing SDARI

Dolphin 57 hull, which has similar main dimensions. An operating profile consisting of two loading conditions and two speeds was considered - full load and ballast conditions at service and slow-steaming speeds. The performances of the two designs were compared along a typical triangular handymax trade route.

The Green Dolphin 575 is available as both a single-hull standard bulk carrier and a double-hull open-hatch bulkcarrier.

Classification society Bureau Veritas has also been collaborating closely with SDARI on eco ship designs including the Dolphin 57, and more recently the Green Dolphin 64 and Green Dolphin 38. According to SDARI president Hu Jin-Tao, interviewed in BV's VeriSTAR publication, the Dolphin 57 has proved a great success and more than 400 have been built, half of them to BV class.

Meanwhile engine manufacturer Wärtsilä launched its 2-stroke, low-speed, dual-fuel (DF) engine technology in November meaning that the low pressure, dual-fuel

benefits that are already available to 4-stroke engines, can now be applied to 2-stroke engines as well.

Wärtsilä's low pressure DF engine is NOx compliant with the IMO's Tier III regulations without secondary measures when running on LNG. There are no sulphur emissions and close to zero particulate emissions, while the pilot fuel consumption is extremely low at just one per cent of the fuel used. Furthermore, the technology enables LNG fuel to be used at all engine loads, so there is no need to switch to diesel at low loads - when manoeuvring or in port - as is the case with other DF technologies. This has an obvious impact on the vessel's exhaust emissions, as well as on operating costs, the company says.

As in gas mode these engines are Tier III compliant, there are no investments needed in exhaust gas cleaning systems. Additionally, with Wärtsilä's technology, the LNG gas handling system is far simpler and less expensive than that of alternative technologies.

Studies have shown that Wärtsilä's low pressure DF engines offer capital expenditure reductions of 15-20%, the company says. Thus, the low pressure gas engine and its associated systems deliver the smallest ecological footprint, with less consumption of energy and resources, and the least production of emissions.

Customer Pontus Berg, general manager of Greenship Gas was quoted at the launch as saying: "This offers an attractive option for all ships, not just LNG carriers. The market has been waiting for a simpler solution than that provided by high pressure DF technology because high pressure systems demand specialised crew training, whereas Wärtsilä's low pressure engines seem easier to operate."

Martin von Sydow, vice president Ship Design for Wallenius Marine AB, was equally upbeat. "LNG is definitely the most attractive alternative fuel today and it fits well our company policy. Wärtsilä's low pressure DF technology for 2-stroke engines will be very welcomed by the industry".



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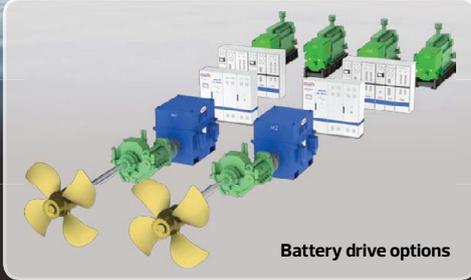
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ABB has been selected to contribute its contra-rotating Azipod solution to the Green Ferry of the Future. The selection is included in the finalised concept of the new ro-pax vessel from Green Ship of the Future, the initiative involving 14 organisations from the Danish maritime industry.

Green Ship of the Future's guiding principle is how best to strike the balance between the environmentally sustainable and the commercially feasible.

The study investigated the potential to reduce ro-pax ferries' emissions and fuel consumption, focusing on technical and logistical ingredients that included machinery, propulsion techniques, alternative fuels and light-weight materials.

The Green Ferry of the Future is expected to deliver 98% lower SOx emissions, a 93% reduction in NOx and a 39% cut in CO₂ when compared to a conventional ferry. In part, these gains will come from the use of liquefied natural gas (or alternatively methanol) as a fuel, but designers also considered energy efficiency to be critical, applying a demanding five-year pay back.

In fact, the concept targets a 23% fuel saving over a conventional ship, making the selection of ABB's CRP Azipod a key technical choice designed to convert the target into reality. The concept study indicates that 12.7% of the projected fuel saving will be due to the combination of a CRP of 15MW -20MW with optimised hull and wake field lines.

Use of alternative fuels like LNG and methanol has been widely debated recently. Both fuels are among the options for the Green Ship of the Future. Emissions and fuel reductions are being benchmarked against operational data from Destination Gotland's *Visby* on service in the Baltic.

As DNV business & product development manager Claus Winter Graugaard revealed at the Interferry conference in October, potential emissions savings are almost 100% for SOx, more than 90% for NOx and 35% for CO₂ – while fuel bills could be cut by 23%.

Per Egil Vedlog, design manager at the Rolls-Royce merchant ship technology centre in Norway, outlined his company's Enviroship design agreement with Italy's Lauro Shipping at the conference. The concept features a wave-piercing bow design producing 10% less resistance, a hybrid shaft generator and gas engines to reduce fuel consumption and

an integrated propeller/rudder system that improves propeller efficiency by 4-8% and reduces hull pressure through added lift. The combination was said to reduce CO₂ emissions by some 40%.

Scandlines technical and operations VP Claus Nikolajsen told Interferry delegates that a scrubber and battery solution on four diesel-electric ships had reduced fuel consumption by 15% and, in effect, paid for the scrubbers – while allowing their capacity to be cut from an estimated 10.5MW to just 3.5MW.

ABB's new integrated waste heat recovery system is expected to make a significant impact on the market after it gained its first orders for 14, 8,000TEU newbuildings worth US\$23 million.

The first seven post-panamax vessels will be built at Dalian Shipbuilding Industry and the other seven vessels at New Times Shipbuilding, for China International Marine Containers Group Co and Mediterranean Shipping Co. When delivered, in 2015 and 2016, the ships will serve under a long-term charter agreement to MSC.

A significant portion of the energy generated by the large two-stroke engines commonly used in today's large container vessels of 8,000TEU and above is lost through the dissipation of the exhaust gases. Some estimates suggest this loss can be as high as 25%, greatly diminishing overall efficiency levels.

Modern container ships also tend to have a significant number of slots for refrigerated containers, with a correspondingly high demand for electric power. This is usually produced by three or four powerful diesel generator sets.

This combination of large main engine size and high onboard electricity requirement makes container vessels particularly well suited for waste heat recovery system (WHRS) technology, as it presents greater opportunities for efficiency gains. As a result, while WHRS can be used on tankers and bulk carriers, for example, technology take-up to date has been centred primarily on larger size box ships.

A WHRS uses the heat from the main engine's exhaust gases to generate steam, which is channelled to the turbo generator where the power for the vessel is produced. The recovered energy is then available for distribution via the ship's main electrical grid.

Essentially, the WHRS allows a vessel to produce more power without using any more fuel or expelling additional harmful emissions into the atmosphere. As Klaus Vanska, manager, ABB Technology, points out: "With WHRS you can provide power at very low cost - more or less free in fact - simply by harnessing the excess power provided by the container vessel's main engines."

Through the WHRS, recovered energy, which typically amounts to about 10% of the main propulsion shaft's power output, is converted back for mechanical work. If the WHRS is provided with a propeller shaft generator or motor a further saving can be made by improving the main engine's loading condition at various points within the ship's operating profile.

At times when the WHRS generates more electricity than the vessel can consume, or if the main engines require extra power, the system operates in Power Take-In (PTI) mode, feeding electricity into the vessel's propulsion system. When demand for onboard electricity rises it switches automatically to Power Take-Out (PTO) mode, feeding power to the onboard grid.

Tom Sand, ABB vice president global sales, says: "Our WHRS technology provides tremendous opportunities for commercial and environmental gains to be made by container ship operators. The energy-smart solutions we offer promise shipping lines not only significant emission reductions but millions of dollars in annual fuel savings."

ABB is offering its WHRS within a single integrated package that also includes turbochargers. As a result the functionality of the complete system can be optimised at the design phase. The operation of the WHRS after start up is controlled by local and centralised automation systems, while the loading of the units is controlled and adjusted automatically by the power management system.

In principle ABB's WHRS can be applied to any container vessel. However, as Vanska points out: "There is a clear economy of scale here as the bigger the output of the main engine, the more waste heat can be recovered. We generally recommend that it is economically feasible to use WHRS onboard containerships with main propulsion plant with an output of 20MW or higher. The payback times vary according to the operational profile of the vessel and the price

of fuel, but we think the investment will be paid back typically within 2-4 years.”

ABB’s scope of supply for the WHRS includes a PTL exhaust power turbine with control valves, alternators, reduction gear and a dynamic compensator consisting of an ACS800 drive with a step down feeder transformer and a breaking resistor bank. The package, which further includes two A185-L turbochargers, provides a total electrical output of the system is 1.65MW.

Sand says: “Up to now we have not had a major presence in this niche in the container vessel segment, and this is our first WHRS order, so it is an important breakthrough for the company on two levels. It sends an important message that we are active in these markets and have a product that is technologically advanced, and at the same time is aligned with our broader strategy on energy efficiency.”

ABB business unit Marine & Cranes and Turbocharging will work together on the newbuilding project. “The efficiency of ABB’s turbochargers not only gives the option of having WHRS in the first place, but also the



Wuchang, the first of Deltamarin’s BDelta37 class, achieved best in class for the handysize ship sector

possibility of using the system at lower loads,” suggests Oliver Riemenschneider, head of ABB’s turbocharging business. Vanska agrees that the fact that ABB is delivering the turbochargers for the main engines is a vital factor allowing high levels of efficiency to be achieved over the complete system.

He adds: “Bringing together our Marine and Turbocharger expertise has helped produce a highly efficient, integrated solution. For example to optimise the dimension of the WHRS it helps greatly to know precisely the functionality of the turbocharger.” **NA**

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Fins can only get better

Azimuth thrusters supplying propulsion to offshore vessels working at high loads and in harsh environments cause problems for the offshore industry. Caterpillar Propulsion (formerly BERG Propulsion) naval architects Grontmij and the Scandinavian Marine Group (SMG) have designed a more reliable solution with uses that could extend beyond offshore

Discussions between the three collaborators concluded in agreement that the Flex90, a new arctic offshore support vessel design, originally fitted with fully rotatable azimuth thrusters used for steering as well as power, was far too vulnerable to damage, particularly in harsh conditions such as the Arctic regions.

Damage to thrusters is especially a problem in remote areas as the vessel must be drydocked to make repairs on the propulsion system. However, offshore owners preferred the thruster solution for propulsion as it provides the manoeuvrability without cramping the cargo space.

Azimuthing thrusters, say the companies, “Eliminate the need for rudders and stern tunnel thrusters, but make the vessel more vulnerable due to angle gears and other mechanical parts not being accessible from inside the vessel. Further, exploration in Arctic areas calls for fuel efficient systems capable of withstanding ice forces and performing ice breaking duties.”

The challenge for the three companies was then to provide a robust propulsion system that did not reduce the cargo area, was easy to maintain and did not compromise the vessel’s manoeuvrability. The Twin Fin system, for which there is a patent pending, was the result of this collaboration and Grontmij senior project manager and naval architect Bjorn Moving says the results were better than they had originally expected.

“The Twin Fin is a bullet proof solution,” explains Caterpillar sales manager and naval architect Mattias Hansson, “it is compact with a robust gearbox, sleeve bearing which is



The Flex90 offshore support vessel design

almost maintenance free and a short drive shaft with a large slow rotating propeller.”

Essentially the system is two hull integrated pods attached to the underside and aft of the vessel housing containing an electric motor and gearbox with the drive shaft for the propeller directly linked to the gearbox as in standard propulsion systems, except with the Twin Fin system the shaft is only about 4m long and all of the machinery is accessible from inside the vessel making maintenance a far easier affair. The Twin Fin is a compact and robust propulsion system that can be easily maintained should the need arise.

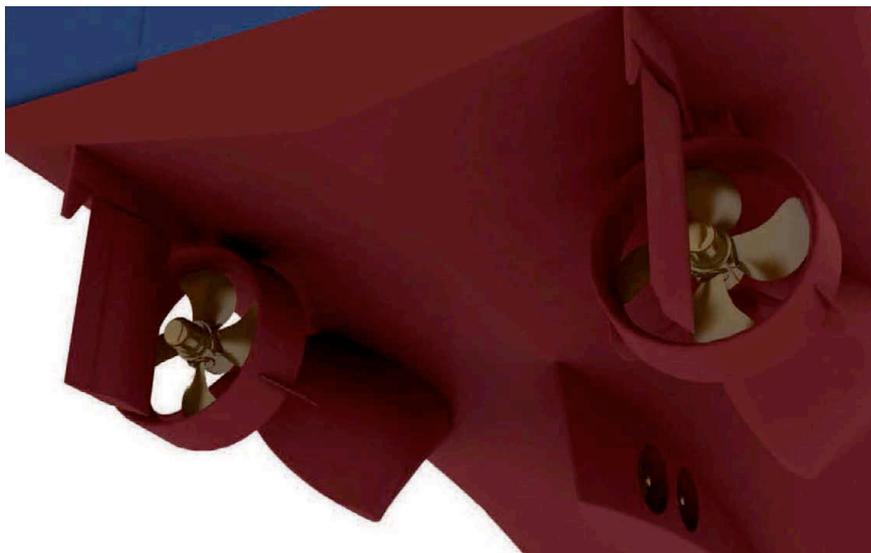
In designing the Twin Fin the group wanted a system that could be used on new builds and could also be retrofitted. It also needed to be compact so essentially they housed the electric motor in a fin with the gearbox next to it, the short drive shaft means that the gearing involved with

Azimuth thrusters, which costs around 6% in efficiency is replaced with a simple horizontal drive shaft from the gearbox.

Removing the angle gears involved in driving an azimuth thruster reduces the mechanical efficiency loss through the gearing system. “Mechanical efficiency loss in the gears has been reduced to less than 1% and the efficiency loss through the shaft is less than 1%,” explains Hansson.

In addition, the system has a seawater lubricated shaft, which in turn means that there can be no pollution in sensitive environmental regions from shaft lubricants. The system allowed the team to select a propeller that rotates below the baseline where shallow water operation is not required.

Moving adds: “We realised that this system could use any propeller because it was so robust, we could use a very large propeller with a slow RPM and further increase the total propulsive



Grontmij enhances propulsion efficiencies through its Twin Fin system

efficiency significantly. This also creates less noise to the surroundings which can be important for seismic vessels and for areas where external noise radiation can harm sea mammal's navigation."

Furthermore, tunnel thrusters can be added to the fins or to the central skeg running between the fins depending on the particular design of the system and the application that the system is designed for e.g. if dynamic positioning ability is required.

In addition as the electric motor and gears are contained in the fin, the system allows for an extra 100dwt in the cargo area making it the most compact system to date for offshore vessels.

Although the Twin Fin system was originally designed to fit the Flex90 offshore service vessel which has a diesel electric propulsion system using Azimuth thrusters, the team realised that the Twin Fin solution is suitable for a number of other applications including seismic research vessels where fuel saving in bollard pull operations of between 30% and 40% can be expected compared to an azimuth thruster solution and cruise ships looking for a reliable and low noise system.

Hansson, however, cautions that each pair of fins must be designed specifically to suit the vessel they will be fitted on. "CFD shows us the importance of designing the correct shape of fin and of positioning the fins properly for each

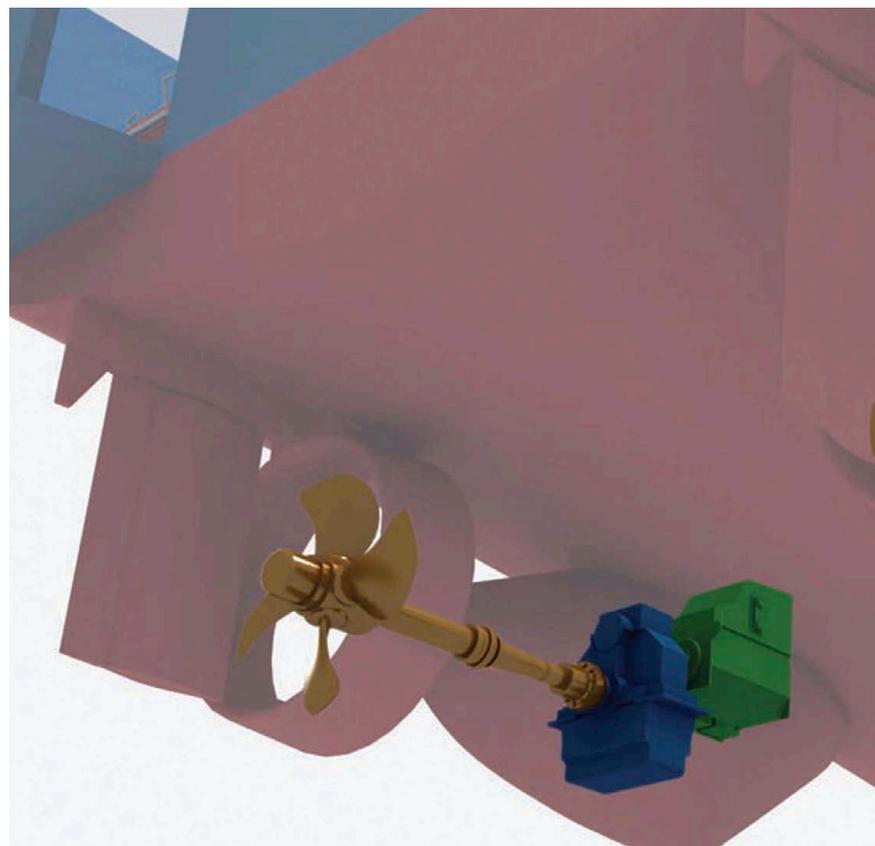
application in order to get the greatest efficiencies from the system."

Perhaps, however, the most impressive aspect of the Twin Fin system is that all the technology it uses is already in use and is therefore tried and tested.

Development of the Fin concept started in September 2012 and the first

order was placed by Seismic operator Polarcus DMCC on conversion of the Ulstein SX124 to be fitted with the present system. Fins will be prefabricated making the yard stay very short and the first vessel is expected on the water with the new system by the end of March 2014. [NA](#)

BERG feathering CP propellers mounted in high efficiency nozzles



New benchmark design for handysize bulkers

Foreship BlueTech Ltd from Finland has developed an environmentally friendly handysize bulker design, Bluetech 42, with increased earning capacity for vessels of its class. Managing director Petri Hakulinen, explains the designs features

Development of the Bluetech 42 bulk carrier design was started in 2012 with the aims of being the most fuel efficient in its class, having the best earning capacity in its class, low costs and a robust design.

In other words, the design had to achieve its performance without any expensive “gimmicks” such as high-tech paint, necessity to grind all transverse seams, exceptional building tolerances.

Extensive CFD-analyses were performed to systematically improve the hull in order to minimise hull resistance and maximise the hull hydrodynamic efficiency. Model tests were carried out at HSVA and the tests confirmed the results indicated by simulations, the hull performed extremely well. In fact the model produced hardly any aft wave; as illustrated in figure 1 a run done at 14knots, at design draught.

Furthermore, according to an extract from the HSVA database, when



Figure 1: Picture taken at model tests at HSVA, at 14knot speed. Virtually no aft waves are produced

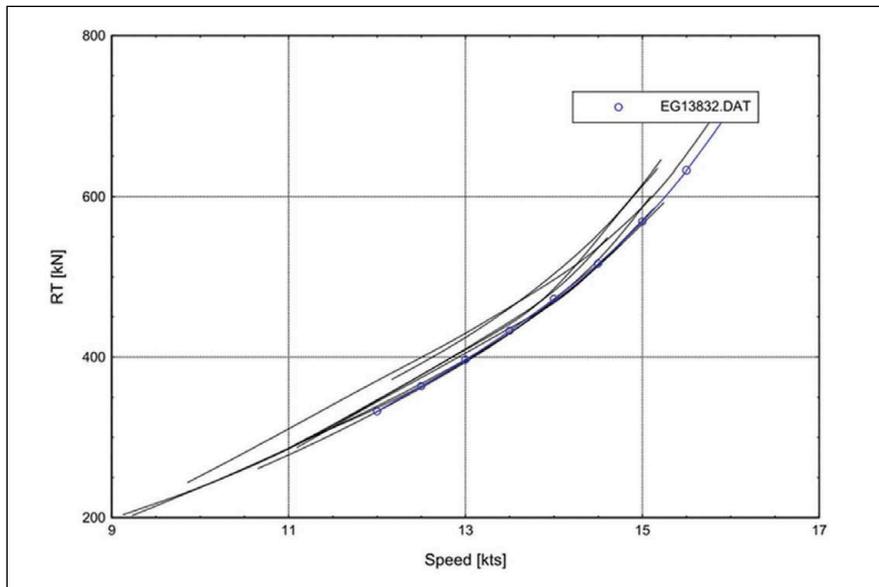


Figure 2: Measured resistance compared to the best references of HSVA database. Tested Bluetech 42 hull presented in blue. All ships have been corrected to the same displacement

TECHNICAL PARTICULARS	
<i>Bluetech 42</i>	
Length over all:	185m
Beam:.....	31.0m
Service speed:	14knots
Draught design/scantling:	9.5m/10.5m
Depth at side:.....	15.9m
Deadweight design	
/scantling:	36,900dwt/42,300dwt
Cargo hold volume:	58,000m ³
Main engine:	MAN 5G50
MEiB92 NCR:.....	4,900kW at 87rpm
Fuel consumption:.....	18.4tonnes/day
	at T _{design} and service speed*
*Including 15% sea margin, ISO condition	

compared against their best bulker and tanker references, the Bluetech 42 hull performed best on the whole speed range (see figure 2), this was relative to the low speeds and 2 knots service speed. Indications from the first model tests showed that when the scantling draught was measured, it is such that the increase

in resistance in the scantling draught compared to design draught is smaller than in competing designs.

As can be seen from Table 1, the Bluetech 42 fuel consumption per deadweight tonne is 2.5-6% smaller than the other vessel designs. When compared against the cargo hold volume, the difference is

	A		B		C		A/B * 10 ⁴		A/C * 10 ⁴	
	FO cons*		dwt*		Cargo hold		Consumption/dwt		Consumption/volume	
	[t/d]	[t]	Δ	[m3]	Δ		Δ		Δ	
BLUETECH 42	18,4	36900	10,5 %	58000	14,9%	4,99	-5,9 %	3,17	-9,5 %	
B-Delta37	17,9	35000	4,8 %	50000	-1,0%	5,11	-3,5 %	3,58	2,1%	
Green Dolphin	17,7	33400	ref	50500	ref	5,30	ref	3,50	ref	

*) at T_design

Table 1: Comparison of Bluetech 42 main features with latest competing designs

even bigger, 9.5-11.5%. When comparing the earning capacity, it can be seen that the Bluetech 42 has approximately 6-10% more deadweight and approximately 15% more cargo hold volume.

With the figures above the design targets were achieved for the design. Bluetech 42 offers an alternative for owners to obtain better earnings with smaller costs has in reality been created, especially as these figures should be relatively more favourable at slow speeds and at scantling draught.

The main reasons for these figures are the following:

- extensive, long lasting and systematic hydrodynamic analysis of all parts of the hull, using latest CFD tools and huge number-crunching computing power offered by a Swedish computer cluster plant
- pre-swirl stators are used to improve the wake field, combined with a rudder bulb
- innovative “bluetech”-notch incorporated into the vertical stem, improving the bow performance
- high block coefficient hull, giving high

displacement and thus high deadweight for given main dimensions

- new engine type with better SFOC (156.7g/kWh)
- slower engine speed, enabling a bigger propeller; as a result propulsion efficiency is improved
- increased depth, giving a bigger cargo hold capacity and allow for a draught of up to 10.8m, giving almost 44,000dwt if required by owners.

Otherwise the design has been based on good shipbuilding practice, where all structures are regularly spaced and well aligned, minimising extra structures and thus weight. The base version has conventional hopper tanks, upper wing tanks and double sides, but a box hold version has been developed as well. The profile and transverse section are shown in figure 3.

Minimising corridor lengths and other non-efficient use of space has also been an important aspect of the design, drawing experience from the cruise industry where layout efficiency is of primary importance. This has

also enabled designers to make the deck house narrower and improving the wind resistance of the ship and in particular improving its performance in head winds.

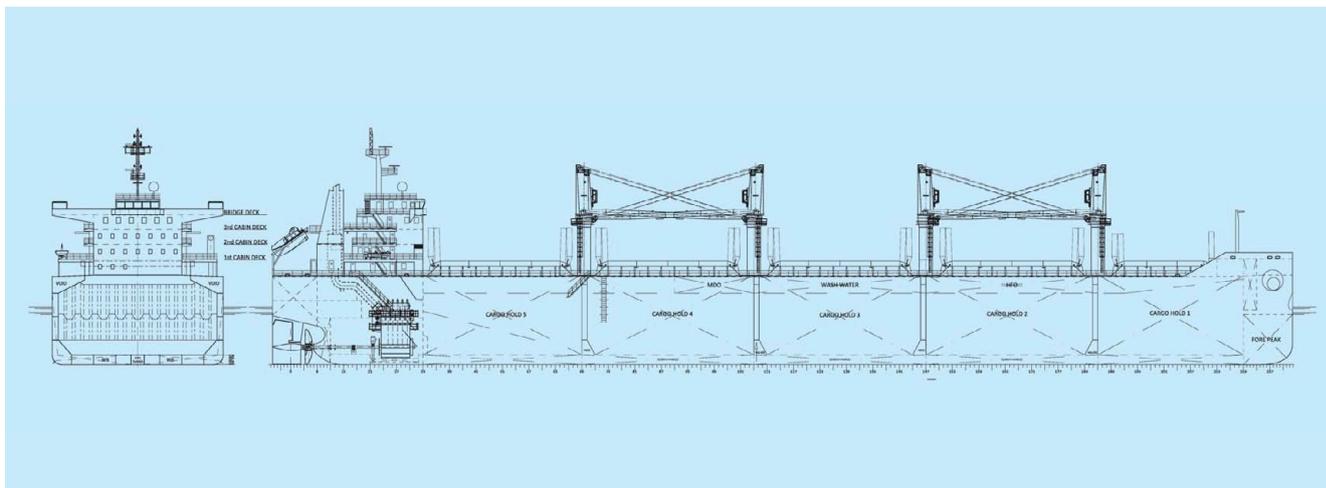
Considering performance in adverse weather, the engine SMCR is 6,650kW, which is higher than in the other modern designs. This is partly due to the engine tuning at the design point, but it is felt that it is good practice to provide some power margin for heavy weather.

The design is being marketed by RS Platou (newbuilding department in Oslo), who has also been providing valuable feedback from selected owners throughout the design phase. An agreement has also been signed with DNV, who has shared its expertise by reviewing the main drawings and specifications, throughout the design phase.

The design is also available as a 180m long version, but so far the 185m version has drawn more interest. A length limit of 180m for handysized bulkers is no longer such a strict limit since there are very few ports that impose this restriction in today's market. It could be said, then, that the Bluetech 42 is pushing the boundaries of the handy size class, not only for performance but for the length as well.

Foreship BlueTech is currently developing an Ultramax (Bluetech 64) and a Kamsarmax (Bluetech 82) design. Since the work is based on the same principles as the Bluetech 42, expectations are that vessel efficiencies of a similar order will be made in these designs as well. **NA**

Figure 3: Profile and transverse section of the Bluetech 42



Yamal order sets maritime tongues wagging

This summer, Daewoo Shipbuilding & Marine Engineering (DSME) won a fiercely contested tender to build two ice-class gas tankers for Yamal LNG, revealing the tip of an iceberg of orders that could eventually see as many as 32 ships built to transport gas from fields in northwest Russia. Mark Vassell reports

Despite the potential magnitude of the Yamal order, it is the technical specifications for what will be the world's first icebreaking LNG carriers that has the maritime community buzzing.

The 170,000m³ capacity LNG carriers will be the first built to an icebreaker configuration with steel weights, propulsion systems and design assumptions that will propel merchant shipping into uncharted waters.

In addition to the 16 icebreaking ships ordered at DSME, the Yamal LNG consortium has also indicated to interested shipyards and shipowners that a similar number of conventional hull form ice-strengthened LNG trans-shipment vessels will have to be built to transport the estimated 16 million metric tonnes of natural gas that is expected to move annually from fields around the Yamal Peninsula by 2018.

At today's prices, the 32-ship fleet could cost about US\$8.3 billion based on prices presently quoted by DSME for Atlantic-max LNG carriers and estimates of a 45-50% premium for the icebreaking LNG carriers.

According to experts with knowledge of the tendering process that DSME won in July, Yamal LNG's specification for the ships calls for triple-pod propulsion systems with a modest ice bow which, will allow them to transit through 1.5m of ice bow-first at 2knots, and 5knots stern first.

The ships are designed to operate independently until they reach the entrance of Ob Bay, where they will be supported by three or four icebreakers.

In open water, the tender requires the tri-azipod propulsion system to maintain 19.5knots. However, ice-going performance requirements have dominated the specification of the propulsion system and it is thought the first deliveries may feature three 15MW pods, giving the ships' unprecedented power for their size and cargo-carrying capacity.

With design points requiring operation in temperatures of up to -50°C and through



Yamal Peninsula - a region of strategic interest for Gazprom

1.5m ice floes, engineers say the ships' historically conservative specifications will require more than 5,000tonnes of steel for their ice-belts alone.

Efforts were made to limit the weight's impact on fuel efficiency by using very high strength, higher tensile steel, so some modest reductions – in the area of 5% - in the ultimate weight of the ice-belt may be achieved, technical experts say.

“Polar icebreakers have been using 500MPa steel for years, but high-strength steels will only take us so far,” said one expert. “Eventually, we are going to have to look at new materials”

Part of the challenge with the design of these new ships is that the existing rules for Arctic ice-breaking cargo ships were created using experience from much smaller ships of around 20,000tonnes displacement deadweight. The initial Yamal LNG ships will be much more than double the size of previous Arctic ice-breaking cargo ships and, from the consequent extrapolation, are expected to

feature a conservative design which is suitable for ice operations, but much less efficient in open water.

“It is quite a step up in size and ice-conditions at the same time. It is a chicken and egg scenario; to calibrate the rules, you need full-scale data and experience from ships in service. But, unless you have accumulated experience with ships this size operating in the Arctic, you can't get the data,” our expert said. “So the first ships may possibly be conservatively over-dimensioned. As we learn more from these ships in service, it is reasonable to expect the rules may be re-calibrated.”

The ships will have four LNG tanks, revised down from the five-tank, 205,000m³ capacity ships originally floated in Yamal LNG's 2011 prospectus to the London Stock Exchange.

Likewise, the unprecedented triple-pod propulsion system specified in their design, has raised some questions about how they will operate in ice. Triple-pod propulsion has

been utilised on some cruise ships but, to date, no ice-breaking cargo ships have been built to these specifications.

Clearly, the learning curve will be steep for these precedent-breaking ships; and the delivery schedule is such that lessons will have to be learned and adopted quickly.

Yamal LNG – whose partners include Russia's Novatek (60%), French Oil major Total (20%) and the China National Petroleum Corporation (CNPC, 20%) – is committed to developing three LNG trains capable of producing 5.5mmtpa (million metric tonnes per annum).

The first train is expected to come on stream in 2016, and the next two in 2017 and 2018.

Each train will require four to five ice-breaking LNG carriers, a requirement that played into the hands of Korean shipyards. Korea's top yards can deliver an Atlantic-max LNG ship in about 16 months, whereas the earliest delivery slot at Hudong Zhonghua, China's only yard with LNG experience and whose orderbook currently features 10 LNG ships for Chinese and Japanese interests, was 2016.

However, with CNPC's stake in Yamal LNG expected to be finalised last month, Chinese yards are strongly favoured to leverage those relationships to win contracts to build some, if not all, of the trans-shipment vessels.

Likewise, the Russian state shipowner Sovcomflot is tipped to be the owner/operator of the first two LNG icebreakers on order at DSME.

As of 18 November, there were 109 LNG ships on order at the world's shipyards, according to Clarksons data, 102 of which had design capacities which exceeded 150,000m³.

Some experts have questioned the wisdom and necessity of conservative specifications such as being required to operate in -50°C temperatures at a time when a general global warming is eroding the world's polar ice caps.

"These ships may well be designed for the lowest temperature in which commercial ships have ever operated," said a marine engineer, who added that the lowest specifications for current LNG ships is -25°C for the vessels serving terminals at Sakhalin Island in the Russian Far East.

"You will be very unlikely to ever see ships specified to these levels again. Nobody has ever designed an LNG ship for operations in [-50°C]. Yamal LNG have taken the absolute minimum for the design

point," he said. "Extreme temperatures can be adopted for topside equipment but, for operability, usually the average is taken at -26°C [the average] would cover you for 99.99% of your operations."

Senior finance and communications executives at Novatek and Yamal LNG did not respond to requests for confirmation of individual ship costs or design specifications. A spokesman at DSME declined to comment.

Essentially, the experts concur, the Yamal LNG fleet will be an expensive series of ocean-going ships whose predominant design configuration is for operation in ice; in all likelihood, they will only ever be suitable to ply one trade.

Despite the historically high price for Atlantic-max LNG ships, one analyst said that Yamal LNG may have capitalised on the present shipbuilding downturn to minimise the unit cost for high-spec ships that would have brought almost US\$400 million had they been ordered at the top of the market in 2007.

This, he said, also may be why Yamal LNG opted for such conservative, and expensive, specifications in the first place.

None of this, however, has deterred some of the world's top LNG shipping firms from submitting bids in the hopes of becoming one of the 2-3 carriers chosen to move the cargo from Yamal LNG's integrated gas treatment and liquefaction facilities at Sabetta, along the long, narrow reaches of Russia's Ob Bay.

Sovcomflot, Mitsui OSK, NYK, Stena LNG, Teekay and Greece's Dynagas are all thought to have pre-qualified for a short list from which the winning firms will be chosen in January.

Teekay confirmed its presence on the short list, while the other carriers either declined to comment or did not respond to queries.

In awarding the contract to DSME agreement in July, Yamal LNG said the agreement contained options to build, launch, equip, complete and deliver up to 16 ships, had established their preliminary prices, the timing of their launch and delivery, and allowed for the transfer of rights to finance their construction to third parties.

DSME also reportedly agreed to help train a Russian shipyard, specified by Yamal LNG, with the competencies for the ships' construction, including, but not limited to, the transfer of project and other documentation, ensuring the training of Russian engineers and staff and to subcontract part of the construction works to a Russian producer.

The Yamal project is at the forefront of Russia's drive to capture a bigger proportion of the global LNG market. Ultimately, Novatek is expected to reduce its share of Yamal LNG to 51%. An Indian consortium led by the state energy giant ONGC and a Japanese consortium led by divisions of Mitsui and Mitsubishi are reportedly the forerunners for the remaining 9% stake.

Novatek is said to be favouring partnerships with companies that are not only interested in producing LNG, but purchasing it as well. **NA**

Defender Pipe-laying vessel in operation in the Baidarata Bay



The Royal Institution of Naval Architects

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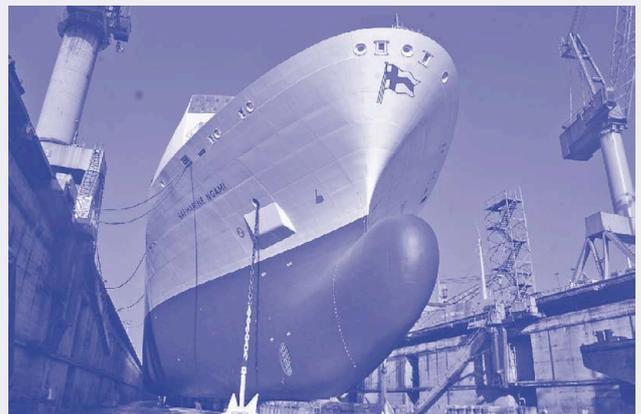
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Goal based rules offer cold comfort

The shift from prescriptive regulation to goal based rules is slowly taking hold within the shipping industry. Mark Vassell charts the latest moves at the IMO to produce a workable Polar Code

Members of the IMO's Polar Code Working Group have been quietly making progress on a new set of mandatory regulations for arctic shipping. But, the complex nature of the negotiations may push final agreement well into 2014, several months later than the IMO executive had hoped.

The Polar Code, which will cover design, construction, equipment, operational, training, search and rescue and environmental-protection issues for ships operating in the waters around the two poles, is being developed to supplement existing treaties that address maritime safety, including the SOLAS and MARPOL conventions.

However, it is being developed to achieve goal-based standards, meaning it is likely to be considerably less prescriptive than most IMO regulations.

As the draft presently stands, shipowners and operators will still be given some prescriptive requirements for 'winterising' the ship; most of the goals and prescriptive requirements for winterisation we still be able to be addressed by using a class society's related notation.

Because the Polar Code will be goal-based, the hazards for specific ship-type and environmental conditions, etc., have been identified along with the goals to mitigate the risks presented by those hazards. Functional requirements to achieve the goals – often supported by some degree of prescriptive regulation – have been defined, but then the onus will be on the designer, builder or owner to demonstrate how the goals and functional requirements have been met.

In its present draft form, the new approach would bring a more flexible method of achieving goals, without technical or safety compromises.

"Some of the more interesting parts of the Polar Code will be what it doesn't say. It is not prescriptive, so there are

not very many 'thou shall' or 'thou shall not' clauses," says Rob Hindley, lead specialist, Arctic Technology for Lloyd's Register and IACS's representative on the Polar Code Working Group. "The Code will be more operationally focused. In future, there will be a lot more demand on the owners to document, to have undertaken risk assessments that establish what procedures and equipment they need to operate in polar waters, rather than just checking lists that require lifeboats, or whatever. There will be a need for the industry to do their homework on the procedures and risk-management practices, because that is what the Code will require."

A prompt agreement on the Code would be well-timed, with merchant vessel owners and operators already eagerly exploring newly opened arctic passages that can shave 4,000-6,000 nautical miles from journeys between Asia and Europe.

Traffic on the Northern Sea Route (NSR) was further boosted last year when Russia lowered the technical requirements for ships applying to navigate the Arctic's melting ice floes in its waters.

As of 31 October 60 ships had completed the voyage this year, according to the NSR Information Office, compared with 46 for all of 2012.

Voluntary notations for winterisation began emerging about five years ago to incorporate best practice into a set of rules so that new owners and shipyards, who may have limited or no experience with shipping in cold environments, could have a basic rubric to build on operational requirements to their vessels.

However, as industry experience has grown with time and the opening of new polar routes, a less rigid method of achieving similar goals is increasingly required; this aligns with the Polar Code's goal-based approach.

"Now that we have gone through a couple of projects where we applied winterisation Rules, we've learned that the prescriptive way of forming them is helpful to inform shipyards and owners who are not very experienced in cold environments," says Hindley. "But, once you get to implementing the Rules with the growing number of experienced yards and owners, there needs to be a bit more of a balance between what the Rules say – the prescriptive, 'this is what you should do' – and what is practical in any given shipping environment."

The draft framework for the Polar Code uses Polar Class Rules, with provisions for alternative Rule sets to be used, provided an equivalent level of safety can be demonstrated.

"We haven't arrived yet at how we assess that equivalent level of safety," says Hindley.

Formation of the Code is being driven at the IMO by the coastal and flag states. But, class is also playing a role and is no stranger to the challenge of gaining consensus on equivalency and mutual recognition.

When Hindley first joined the Working Group he says he would have picked gaining "equivalency between ice classes" as the biggest obstacle to forging an agreement. But, that has been quietly resolved.

"I think the biggest obstacle now will be the question about what parts of the Code will apply only to new ships, or to existing ships. This is only now being raised because we have been waiting for a suitably refined draft to go through line by line and identify if [those lines] are applicable to new ships, existing ships, or both. The existing ship question is likely to be the biggest obstacle – for the obvious reason that there is a significant amount of tonnage that could be affected, or restricted in operation, by the decisions that are reached." **NA**

Russia braces for Arctic chill

Further exploration in to the Arctic has prompted both shipbuilders and owners to take a closer a look at the technology that is being developed for harsh climates

At a conference held by the Russian maritime Register of Shipping (RS) it was noted that the need for year-round efficient and safe shipping in hard to reach Arctic areas has given a great impulse on the development of knowledge and technologies aimed at ensuring a high safety level of the transport solutions in this region. RS says that the international maritime community is focusing on the Northern Sea Route (NSR) as a measure to reduce the costs as well as time of cargo transportation, the latter resulting in the reduction of CO₂ emissions. At the same time the safety of a ship in the harsh ice conditions and protection of the fragile Arctic eco systems remain the major challenges the industry is facing.

During the conference possible technical solutions were discussed as well as regulatory standpoints. The economic prerequisites for the development of the Arctic include hydrocarbon extraction in the region as well as economically efficient commodities and other cargo transportation along the NSR. Some 22% of all as yet undiscovered oil and gas deposits are thought to be in the Arctic says the classification society.

A report from Sovcomflot Group explains that more than 70% of transit cargoes in the Arctic are hydrocarbons carried by vessels of 50,000dwt and over. According to Igor Pankov, Advisor on the development of Arctic projects, OAO Sovcomflot, *SCF Baltica* had its sailing time cut by 40% compared to

that of transiting the Suez Canal and saved 800tonnes of fuel while cutting 300tonnes of CO₂ emissions.

Despite so many prerequisites, such as safety and ship design and propulsion, for the further development of the Arctic shipping the international community has expressed much concern for the fragile environment of the Arctic as well as for the safety and security of the ships. According to deputy director, Department of State Policy for Maritime and River Transport, RF Ministry of transport, Vitaliy Klyev, the goals of the regulatory work include:

- maximum level of shipping safety
- full security of shipping
- efficient maritime activity
- minimisation of the impact on the environment.

What is still required:

- adoption and further implementation of the Polar Code
- compliance of national regulations and international requirements.

Other goals of the regulatory work mentioned were safety of ships as regards accidents and their security against the illegal acts.

But, still there are several issues to be solved, e. g. how to consider icebreakers. "So far the draft code has no regulations covering icebreaker operations, as many people understood icebreaker operations to be emergency cases, but it is not

like that. Icebreakers are operating in normal regular conditions, not only for emergencies", said Klyev.

Despite the dangers imposed by the harsh Arctic conditions, such as low air temperatures, long period of darkness, ice covered waters with ridges that may grow in density; stamukhas (ice blocks), icebergs, hummocks (mounds of ice), compacting ice and other ice formations dangerous for shipping, the technical progress has enabled the creation of an efficient arctic fleet.

"Development of the technologies has led to the development of the Arctic shipping" said Victor Olerskiy, deputy minister of Transport, Russian Federation. "There is an increase in a number of requests to pass along the NSR during the last four years. The trend is also for the size of the vessels to increase. An Aframax ship has recently passed along the NSR, a fact which 10 years ago would have sounded unbelievable."

Technical experts, from shipping companies operating in the Arctic and the yards that are constructing these vessels, have noted the technical development in this field. They have explained the special features of the ice class ships, such as safe dimensions and structural safety, extra steel to hull and minimal protection against damage. The Arctic areas differ as per specific ice conditions, therefore, "Icebreakers shall be designed for real operational conditions, not to a particular "ice class", says Mikko Niini, president of Aker Arctic Technology.

The latest ice classed containership design from Nordic Yards maintains its development in Arctic design



The most common accidents with ice operations include collisions with icebreakers or other ships in the channel, grounding, icing, propeller / rudder damage, lower bow dents in ridges, stern shoulder damage below the ice belt. Also, low ice class ships may be trapped in ice.

The state-of-the-art solutions in icebreaking ships' hull design and propulsion has seen the development of an oblique icebreaker's design, an LNG-fuelled icebreaker for Finland, and possibilities for a double acting feature of the future Yamal LNG Arctic gas carriers and other innovations.

"Normally merchant ships need to be assisted through ice barriers. This is, however, a very expensive and slow way to operate, which has been seen now several times in the approach to Primorsk, noted Niini. Moreover, "Due to the collision risks in ice navigation independent cargo ships bring an improved safety level into Arctic shipping," he concluded.

According to Niini, ice class vessels have extra steel in the hull, typically 2% to 20% more depending on the ice classification of the vessel and also stronger propellers, rudders and thrusters. Further features of ice class vessel operations include:

- Good protection against structural damage
- Today only double hull solutions are accepted
- Traffic restrictions are set by national authorities
- Collisions and groundings are still the biggest risk.

He adds that ice class gives minimum protection against dangerous damage, it is acceptable that damage still occurs, an icebreaking vessel shall always be designed to the real operational conditions and receive a suitable class notation. According to Niini many alternatives and new technologies have been studied and developed for the Yamal LNG project.

Aker Arctic, has carried out performance tests on a 170,000m³ vessel for the Arctic. The work has included detailed comparisons of various propulsion systems and operational modes. Based on the stern-first-working DAS (double acting ships) principle Arctic LNG transports are safe and competitive.



Mikko Niini, president of Aker Arctic
Technology highlights design points for future Arctic vessels



Igor Pankov, advisor on development of Arctic projects, OAO Sovcomflot talks of the trade through the Arctic

Nordic yards has seen further development in the area of ice class vessels with an enhanced project for icebreaking double acting Arctic containerships, which will have Ice class Arc8 and increased cargo capacity from 18,000dwt to 27,000dwt. The vessel design has been optimised to have an icebreaking capability of up to 2m level ice and be able to perform icebreaking in both directions, overcome large ridges either in regular ramming ahead or backwards milling, have adequate manoeuvrability, good open water performance and reasonable sea-keeping behaviour.

The propulsion for the vessel will have the highest degree of redundancy (GL RP50) and will be system and room related. It has a twin Azipod configuration due to narrow and shallow passages and will be powered by a diesel-electric propulsion plant.

"The unique feature of the ships is their propulsion unit and the hull design that are the essential components for safe operations in the harsh climate of the Arctic. The high ice strengthening category Arc8 enables the vessels to move independently in heavy ice conditions, that means independence from icebreaker assistance. The 13MW Azipod thrusters along with the 'double acting' concept of the ship means that it is capable of proceeding stern first in heavy ice conditions. The results of the ice trials as well as operational results proved the reliability of such ships. These ship designs enable year-round independent navigation in the Arctic", notes RS, COO, Pavel Shikhov.

R&D is the core business for RS, with the developments in the Arctic enabling new technology to be developed. "The enhancement of the requirements for ice class ships and icebreakers have always been the focus of our R&D programme", said Shikhov. Due to the growing interest to hydrocarbon extraction in the Arctic (and not only the commodities transportation), the issues such as safe operation of offshore facilities (floating and fixed platforms, offloading terminals, etc.) in ice conditions also became important areas for research. The research is performed in cooperation with the leading scientific centres of Russia: Krylov State Scientific Centre, CNIIMF, CNII Prometey, State University of Sea And River Fleet (Makarov University), St Petersburg State Marine Technical University, St Petersburg State Polytechnic University.

"I hope everyone agrees that there is an urgent need for a modern, balanced regulatory base setting reasonable standards of safety", says Shikhov. "This base should apply to the offshore field development facilities including those for the Arctic. The RS rules have a significant benefit in this regard, as the system of ship admittance to the Northern Sea Route is developed with due regard to the RS rules' requirements. The criteria set out by the Administration of the NSR fully correlates with the RS ice class requirements." **NA**

Ice management

With ships navigating more in Arctic conditions ice class propulsion development has started to pick up. Markus Niemi, marketing and communications assistant, Steerprop, highlights its developments for ice class propulsion

The Finnish company Steerprop Ltd. possesses comprehensive experience and expertise with azimuth propulsion for ice-going vessels due in part to the company's northern location.

Steerprop has extensive references for the main propulsion for ice-classified vessels which include the 8,200kW SP 4.0 ARC azimuth propulsors in the RMRS Icebreaker 6 ice-class installed onto the Baltic icebreakers *Moskva* and *Sankt Petersburg* and the record-breaking 8,400kW SP 4.5 ARC azimuth propulsors in the RMRS Icebreaker 7 ice-class on the Arctic icebreaker *Varandey*.

Azimuth propulsion systems are second to none when it comes to manoeuvring and operating in the Arctic. Long experience with mechanical propulsors has proven their reliability even in the demanding conditions of the Arctic Ocean. The capability to direct the propeller's thrust in any direction of the full 360deg's gives the operator of a vessel with azimuth propulsion better manoeuvrability that few propulsion systems are able to match.

Additionally, the capability to project a slipstream in any desired direction is a most potent tool for ice-management. The propulsors themselves can be used to widen fairways as the vessel moves along the fairway, blow away or break up ice ridges, or relieve ice-pressure from Arctic offshore installations. In addition to these slipstream based ice management abilities, an icebreaking vessel with azimuth propulsors is also capable of more "traditional" icebreaking methods, including such as ice-milling. The propulsors' manoeuvrability has also enabled new types of vessels – such as tankers or cargo vessels to achieve stern-first icebreaking.

As the natural resources of the Arctic become even more important and the



SP 120 CRP ECO has been developed for Arctic conditions

Varandey a RMRS Icebreaker 7 ice-class is equipped with two 8,400kW SP 4.5 ARC



Northern Sea Route (NSR) becomes more navigable, the need for different kinds of ice-going vessels will only increase. The Arctic offshore fields will require supply vessels reinforced against the ice, icebreakers and dedicated ice-management vessels to enable the fields to be worked even in icy conditions. As the NSR becomes more accessible cargo vessels, tankers and LNG carriers capable of operating efficiently in both open water and icy conditions on their journeys between Europe and Asia will be needed. Azimuth propulsors with their manoeuvrability and ice-management abilities are powerful tools for any of these vessels, but different propeller configurations on azimuth propulsors offer different advantages, some of which may be more beneficial to certain types of vessels.

The most traditional type of propeller on azimuth propulsors is the pushing open propeller – a single propeller behind the underwater propulsor's body. A relatively simple, robust construction, these rugged propulsors combine a compact construction – and thus a relatively light weight – with the manoeuvrability and ice-management capabilities of azimuth propulsors. These propulsors are currently used in a variety of Arctic offshore vessels such as the icebreaking supply ship *Toboy* (equipped with two 5,200kW SP 4.0 ARC Steerprop Azimuth Propulsors in the RMRS ARC 7 ice-class) or the Arctic multi-purpose icebreaker *Varandey* (equipped with two 8,400kW SP 4.5 ARC Steerprop Azimuth Propulsors in the RMRS Icebreaker 7 ice-class).

The second traditional propeller type is the ducted propeller. Equipped with a high efficiency nozzle, these propulsors offer high bollard pull without compromising free-running efficiency. Because of this, these propulsors are particularly suitable for applications such as Arctic tugs or AHTS vessels that require powerful bollard pull without compromising open water efficiency. The focused slipstream also enhances the ice-management abilities of the propulsors – though the usage of a nozzle in ice-going applications comes

with certain limitations and downsides that the operator and owner should be aware of. A particular limitation is that the nozzle may be blocked by large pieces of ice in harsher ice conditions.

Where open water efficiency is paramount or the ability to ice-mill is deemed beneficial, such as with Arctic tankers that have their bows optimised for open water efficiency and afts for breaking through the ice, a propulsor with a pulling propeller has strong potential. By positioning a pulling propeller in the front of the propulsor's underwater body, the propeller has



SP110 ARC a pushing type propulsor

constant access to undisturbed water flow. This considerably improves the propulsors' open water and free running efficiency. Unfortunately, the ice-management abilities of the pulling propeller are somewhat compromised due to the propulsors body's location directly in the slipstream.

Mechanical propulsors with pulling propellers were selected for the world's first oblique icebreaker – the icebreaking oil-recovery vessel currently under construction at the Arctech Helsinki Shipyard. Three

2,500kW SP 60 PULL Steerprop Azimuth Propulsors in the RMRS Icebreaker 6 ice-class will manoeuvre the vessel. In addition, two 9,000kW SP 110 PULL ARC Steerprop Azimuth Propulsors in the RMRS Icebreaker 7 ice-classes will be installed into each of the new LK18 icebreakers, due to be built at Vyborg shipyard for Rosmorport.

While all of the above single propeller configurations have their advantages, they also all have some disadvantages. For that reason, to develop a powerful azimuth propulsor that would combine unsurpassed propulsive efficiency with excellent manoeuvrability and potent ice-management abilities, the Steerprop Push-Pull Contra-Rotating Propellers (CRP) configuration was further developed in theoretical studies and ice basin tests. By combining the ice-management abilities of a pushing propeller with the ice-milling abilities of a pulling propeller, the CRP offers the best ice management abilities of both configurations without any of the disadvantages. The ice-management abilities of the CRP are further enhanced by the powerful slipstream of the CR Propellers that has been noted to be particularly effective. The result of this R&D programme was the SP CRP ECO azimuth propulsors.

SP 120 CRP ECO azimuth propulsors with 6,000kW for the RMRS Arc 4 ice-class will be delivered to a Russian supply vessel to be built at Severnaya Verf in Russia. SP 120 CRP ECO propulsors with 7,000kW in the FSICR 1A Super ice-class will be delivered to a Canadian Ro-Pax passenger ferry to be built at Fincantieri in Italy. Both orders will be delivered in early 2014.

As the utilisation of the Arctic resources and the Northern Sea Route increases, a new generation of efficient, ice-classified vessels capable of working in the harshest operating conditions on Earth will be required. As with other vessel types, all these ships will be different and require different things from their systems, though the requirement for extreme reliability will remain the same. [NA](#)



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Planning in 4D

Claire Bouvet, Siemens PLM Software France, explains how 4D planning is simplifying the design process by eradicating the need to rework designs

The ability to eliminate reworking processes during onboard and on-block outfitting has been realised with the development of 4D Planning.

A large part of rework is due to the unexpected lack of space in crowded compartments in which outfitting work has already started. Disassembly work causes costly delays. Getting a compartment directly outfitted in the right sequence keeps you closer to the initial budget dedicated to outfitting.

In the Maritime Reporter, Andrew Safer says that: “having detailed instructions for each shipbuilding task and precise sequencing of the workflow is creating efficiencies and reducing rework at shipyards on the east and west coasts of the U.S.”

With 4D Planning you visualise the outfitting progress in advance and define a collision-free assembly sequence.

Outfitting planning challenges

Because of transformations going on in some industry sectors, the demand for multi-purpose vessels with new kinds of equipment has grown during the last 10 years. In the energy sector, for example, climate change and the demand for higher usage of renewable energy in overall production provide new opportunities for shipbuilders. As Paul Garrett wrote in Wind Power Monthly in November 2011: “The availability of offshore installation vessels in particular has become a key concern for the European wind power industry, and a debate is ongoing about whether to turn to the new multi-functional ships, or continue to use different vessels for different needs.”

This brings another level of uncertainty to outfitting. First, because the increasing number of onboard systems complicates build sequence feasibility. Second, because dimensions, characteristics and even sometimes prices of new equipment are not fully mastered at the beginning of ship production. In a 2009 report, the United States Government Accountability

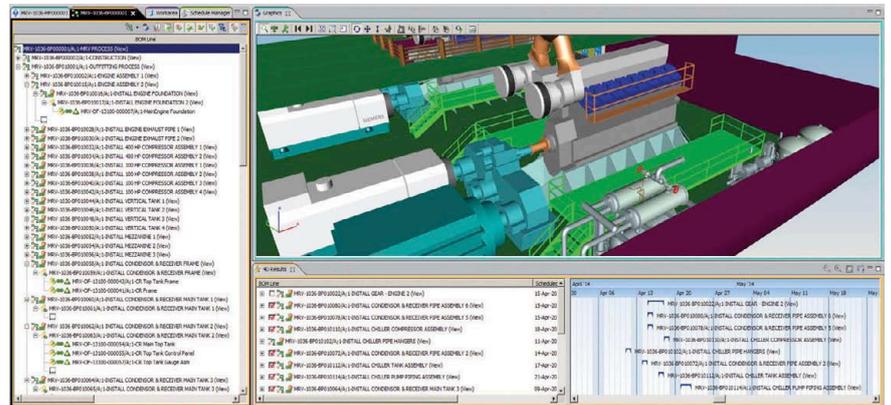


Figure 1: Schedule is linked to 3D lightweight representations of the parts so that a planner can ask for outfitting status at any time

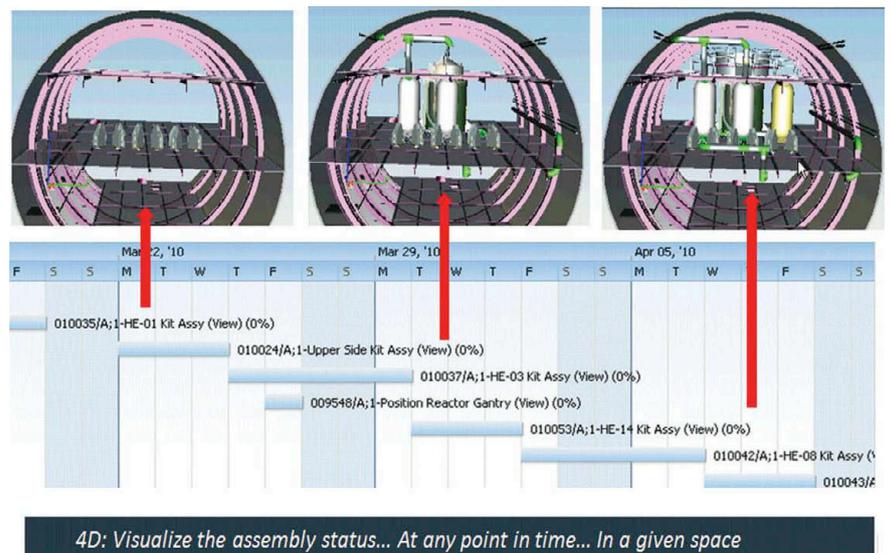


Figure 2: 4D Planning to roll-up outfitting progress over time in a compartment

Office (GAO), pointed out that late design changes on complex equipment could disrupt not only the design, but also the construction of the vessel.

Late modifications

Planning is difficult during the early phases. It is not possible to wait until the design is fully completed to start planning. This is why many design changes must be expected which will consistently modify the build sequence.

RAND Corporation performed advanced research to understand the

reasons for shipbuilders to deviate from the initial delivery schedule of a ship. RAND found that late product definition, changes in requirements and lack of technical information from suppliers have a significant impact on the expected delivery date.

Commercial shipyards are more likely than military shipyards to refuse contract changes once production has started. Indeed, late changes are extremely difficult and costly to manage, and this is also true from a production point of view.

A reason for slipping in out-of-sequence work is due to lack of visibility, especially concerning the impact of a change on the overall outfitting process. Deborah Clark, Donna Howell and Charles Wilson make the following statement in their thesis published in September 2007: “If design changes are required, a stop work order should be put in place immediately to prevent the cascading effect of rework, waste and out-of-sequence work however, “the production support system should provide the means to anticipate and manage out-of-sequence work.”

How should the outfitting continue if a piece of equipment is missing? To make the right decision early, you need a combined view of the outfitting-in-progress over a certain period of time and of the space that is progressively locked-up.

Delays in equipment delivery

In the EU Shipbuilding Industry Investment and Business Guide published in 2007: “it is assessed that 50-70% of the value-added comes from external subcontractors and suppliers, whereas for more complex ships this can be as high as 70-80%.” One challenge is sharing reliable high-level planning early on with suppliers. Another is efficiently managing delivery delays that arise. Decisions can hardly be made without carefully checking the impact on the build sequence over a period of several weeks.

Capacity utilisation

Simulation tools take into account the layout of the shipyard and the planned resources. Simulation runs virtually the ship production and recalculates lead time and utilisation rates. You want to perform those kinds of analysis and adjust your outfitting planning accordingly.

Furthermore, production does often not flow as expected. Recording as-built status on the shop floor and updating the build sequence accordingly brings more accuracy to outfitting scheduling. As-built status is used more and more by shipyards, often not primarily for updating production schedules, but rather for preparing a consistent framework for testing and maintenance. However, this trend can be leveraged in the planners’ best interests.

4D Planning

One target of 4D Planning is to move the overall outfitting scheduling process towards more agile automation. 4D planning will facilitate an outfitting sequence update after a change. This allows you to pay more attention to other aspects, such as sequence validation.

As the reliability of your planning improves, your outfitting productivity goes up as well, because it avoids unnecessary disassembling steps that would otherwise slow down the overall process. It also facilitates communication with suppliers by means of a tighter management of the outfitting logistics chain.

This is also linked to predictability at an early stage. When a commercial shipyard agrees on a delivery date for a ship, it also bases its decision on deviations from the schedules that were noticed for previous ships. Getting a reliable build plan avoids adding unnecessary margins.

4D Planning main values

Getting a more flexible outfitting schedule that automatically incorporates basic changes along the whole outfitting process, while at the same time facilitating sequence 3D validation, is possible with 4D Planning.

Creation of dependencies

Constraint-based scheduling consists of setting the right logical dependencies between outfitting activities. Dependencies are consistent with outfitting progress and will apply even if some activities are re-scheduled, while the start and finish dates of each construction step are very likely to change.

Along the outfitting progress, most of the constraints are due to space shortage: constraints are not recurrent and can only be defined case-by-case, based on 4D analysis.

While some outfitting activities are being shifted over the timeline, planners can rely on agile rescheduling and focus on the key visual aspect.

Decision-making support

4D Planning displays the parts to be fitted at a specific point in time, in a specific compartment and in the context of the overall outfitting progress. As a planner, you are then able to virtually roll-up the outfitting progress and analyse the possible room shortage issues.

4D Planning in context of a collaboration platform

Many stakeholders directly impact the outfitting schedule, or are directly impacted by a change. 4D Planning makes a lot of sense on top of an integrated collaboration platform

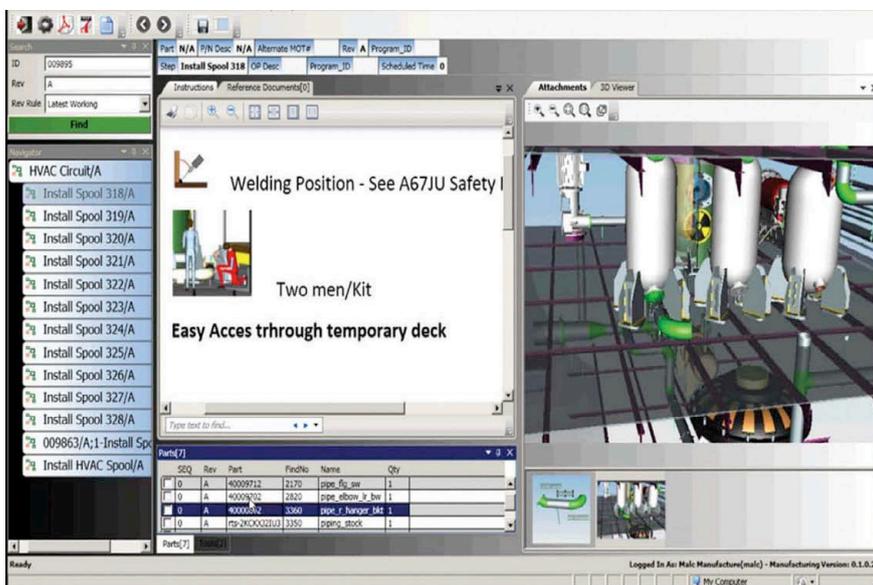


Figure 3: Electronic Work Instruction visualised on the shop-floor by foremen and workers

including planners, designers, foremen, workers and suppliers.

Tablet PCs are starting to emerge in shipyards to allow workers to directly connect to the database containing up-to-date 2D Drawings, 3D part representations and build sequences. Time spent searching for information goes down dramatically.

Alignment to as-built helps keep an up-to-date and accurate outfitting schedule. Completion of some activities can be reported and traced back in 4D Planning.

4D Planning supports shipyards in moving toward digital ship construction. Today, this is an important aspect in product lifecycle management (PLM) for shipbuilding because it addresses the needs of planners and workers. Significant productivity gains can be achieved. **NA**

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CD-Adapco develops its CAE tool

CD-Adapco has launched the latest edition of its CAE software tool, STAR-CCM V8.06 that offers greater integration and better work flow for users

The launch of CD-Adapco's STAR-CCM+ v8.06, sees the third release in 2013 of their flagship simulation tool. The latest developments in the software have focused on key areas such as user experience, turnaround times and enhanced design tools.

"A significant challenge for simulation engineers lies in ensuring consistency of processes across large organisations or geographically dispersed teams," says senior VP of Product Management, Jean-Claude Ercolanelli. "To address this, we are offering the Simulation Assistant, an interactive user interface that allows users to reproduce best practices and deploy them across the whole organisation, ensuring repeatability of processes and enforcing consistency of results."

In the area of user experience new features such as simulation assistant, bi-directional CAD Clients and STAR - Space Claim have been added. The

STAR-Space Claim sees a new CAD Client join the software for further integration of the software. The CAE tool will now enable users to transfer native models from STAR-Space Claim to STAR CCM+, the benefit of which means that the user no longer has to rely on other conversion software. The latest development also lets the user make changes to the native Space Claim parameter modifications, which will automatically transfer over the STAR CCM+ version.

Optimate and Optimate+ are two features that have been added to help speed up the design process for the design. Optimate and Optimate+ can drive important parameters via bi-directional geometry transfer from within STAR CCM+ and modify data in the native CAD software.

"Being able to simulate only part of a problem is not enough," says Ercolanelli. "We are engaged in allowing our users to 'simulate systems' in their full complexity. Part of that commitment

includes improving solver performance so that users can simulate phenomena that occur on an industrial scale and in an acceptable amount of time."

Product development within the software sees the new and enhanced methods and solvers such as adjoint-based morphing, Reynolds stress Model in Eulerian multiphase (used for modelling of cyclone shapes) and shell surface-to-surface radiation (modelling of thinner surface forms).

The company says that users of Discrete Element Method (DEM) will notice substantial performance improvements in STAR-CCM+ v8.06, with simulations taking as little as 30% of the time taken in previous versions. Central to these improvements have been optimisations to the core DEM algorithms and a new "skinning" option to avoid repeated contact detection. The introduction of a new parallel trimmer will allow the faster creation of larger meshes, thus increasing overall productivity. **NA**

FORAN embraces early integration philosophy

The design, production and operation of ships needs to be understood as an integrated and complex business right from the very beginning, when crucial design decisions are made. Sener has developed its FORAN software to meet this need for detailed early stage design

Many of the design, production and operation decisions are the result of estimates or based on known data from previous projects. The more accurate these estimations are, the better the results obtained in terms of operational costs for owners.

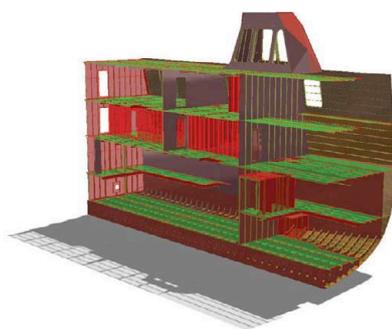
If it is possible to have the aid of tools to create the ships 3D model at early design stages, simple but accurate models, benefits will be accrued downstream.

SENER has provided FORAN, its shipbuilding CAD/CAM system, with the necessary capabilities to ensure its efficient use at early design stages. Some of its capabilities are based on the total integration between all ship design stages and disciplines, the use of topology and tools to facilitate seamless transition to the detailed design stage. The benefits are an evaluation of design alternatives, management of modifications, full control of the integrity of the information and quality, all in a collaborative design environment.

The FORAN solution is based on the integration of all the design stages and disciplines, through the use of a single database, which permits the implementation of collaborative engineering and guarantees information integrity.

The main advantage of the topological definition, where geometrical data is not stored but calculated online, is that changes in the main hull surfaces are automatically incorporated into the modified elements, just by reprocessing them.

The solution delivered by FORAN includes tools that facilitate the direct transition from basic to detailed design, by means of simple operations that include block splitting, the assignment of parts to blocks and the completion of the model with attributes for the manufacturing phase.



The interior of the ship is made visible by use of a clip plane in FORAN FVIEWER

Basic design process

The basic design process in FORAN begins with the forms file definition, hydrostatic calculations, definition of volumes, characterisation of the intact and damage stability conditions and other naval architecture concepts. Later on it is necessary to define the material catalogues describing the plates and profiles to be used in the design.

Once the hull forms, decks, bulkheads and other surfaces are created, the hull structure module is used to create the major openings in all surfaces, the scantling of the main surfaces for plates and profiles as well as the main structural elements.

Surface definition and naval architecture calculations

FORAN has two complementary tools for surface definition, including the external hull forms, decks, bulkheads, appendages and superstructures. The surfaces can be imported from files using different generic formats.

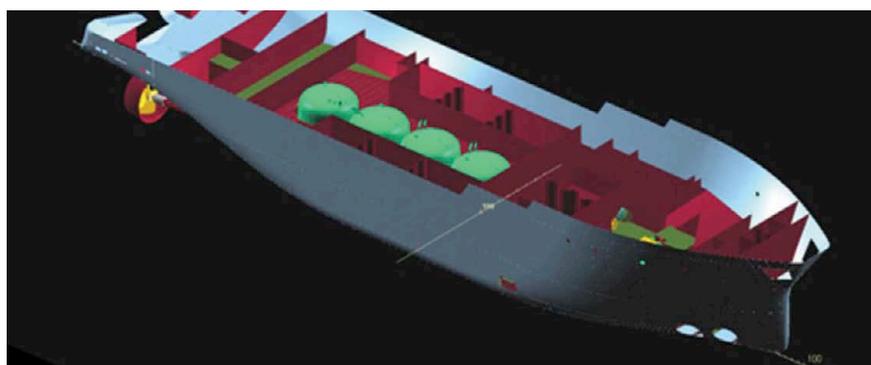
The use of topology makes possible the automatic recalculation of all elements when a modification is performed, producing important time savings.

Once the surfaces have been defined, it is possible to analyse the hydrostatic and stability calculations. SENER has developed a new module called FBASIC that groups in a single solution the former modules.

Volume definition

The module FGA (FORAN General Arrangement) deals with the definition of the compartments and arrangement of a ship. A 3D model of the spaces will be generated and taken as reference for the surfaces of the ship as well as auxiliary planes. It is also possible to create the definition of spaces from a 2D drawing in a specific environment. Compartment arrangement defined on FGA will be available in an FBASIC module for hydrostatic and stability calculations.

General Arrangement of a ship in FORAN



Early 3D model of structure

The hull structure definition at the early design stage is made in the same environment in FORAN that will be used later for the detailed design stage.

High productivity tools allows the efficient definition of the hull structure model, like one-click plate definition, reduction to the minimum of the auxiliary geometry and join and split functions for plates and profiles.

There is a context for the generation of 3D curved surfaces, allowing the quick definition of plates, profiles and holes.

The definition of the shell and deck plating can start in the early stages of the design, even with a preliminary definition of the hull and decks. Flat and curved plates are represented as solids (including thickness) and the information for plate pre-development is automatically generated allowing an early material take-off list.

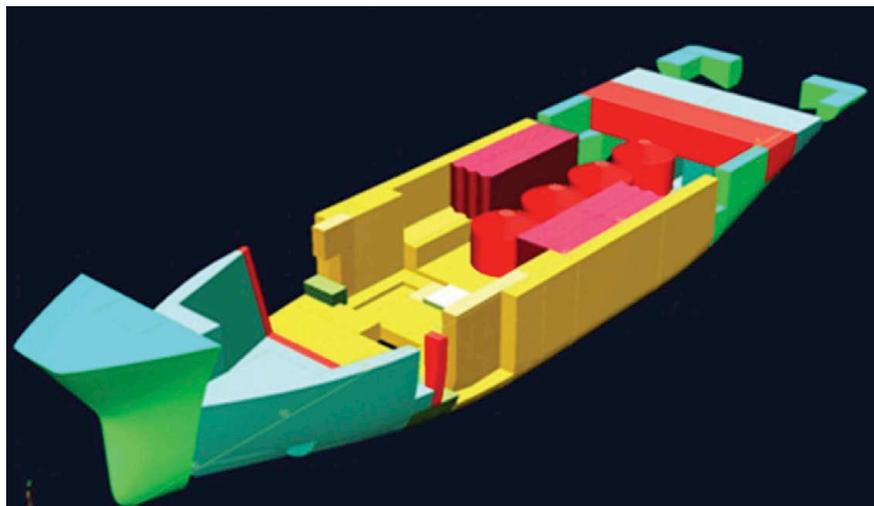
Profile definition is mainly based on topological references to already existing structural elements, as well as to auxiliary concepts used in the early stage of the design (longitudinal spacing, frame system, other profiles, etc). The user can easily assign different attributes such as material, scantling and web and thickness orientation. These basic attributes can be completed by adding constructive attributes (parametric web, flange end cuts, etc) at any time of the design process. The profiles can be split up in profile parts later. Profiles crossing other profiles will automatically generate the necessary cut-outs and scallops.

Another context in FORAN allows the internal structure definition. This environment provides a set of advanced functions for the easy definition and modification of plates (flat, flanged and corrugated), straight and curved stiffeners, holes, face bars, standard plates, on and off plane brackets, collars and others.

It is possible to have several sections in memory making easy operations, like copy or multiple editions of elements in different sections.

Outfitting & electrical design

Consisting of two parallel processes completely linked one to each other; the



Definition of spaces in FGA

initial definition of the main systems as logical diagrams, for piping and for electrical connections, and the positioning of the most relevant items within the 3D model of the ship.

In both cases and applying the same principle, the items can be defined once in the design but, can be repeated several times. Items like equipment, fittings, pipes, cables etc, they are all added to their corresponding project master list, with all the necessary data, from where they are retrieved later to be part of a diagram (as a symbol) or part of the model. Weight, power demand, volume, connections and other attributes are there to get any kind of report and calculation. Logically any update in the attributes is propagated downstream to the diagrams, the 3D model, the material reports and the calculations.

The spatial positioning of the equipment can be referred to the initial surfaces and to the frame system, so further modifications on such entities (foreseen at this early stage) would affect to the equipment in the diagram automatically. Once again the topology allows a fast generation of different alternatives regarding the ship's arrangement.

Generation of outputs from the 3D Model

The drawing generation in FORAN is managed by a single module, which covers the output drawings of all design disciplines and is completely user configurable. Drawings are generated

directly from the 3D product model. The 2D entities that represent the product model are linked to the 3D elements and are always updated with the latest version.

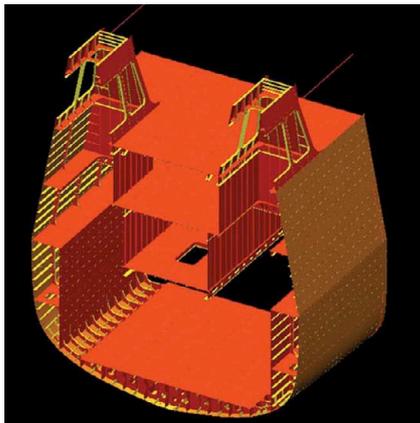
The possibility to reprocess the drawing after changes in the model is very useful, while at the same time keeping any manual modifications introduced by the user in the drawing.

Classification drawings for approval are the main outputs that can be extracted from an early ship 3D model. Other important reports that can be obtained are weights and centre of gravity, painted areas, material take off lists, bill of materials and welding lengths.

FORAN has incorporated a link that makes possible to export a simplified ship model, using its topological characteristics. Functional algorithms allow the generation of an intelligent model, simplifying, filtering and deleting unnecessary data to guarantee the quality of the model transferred.

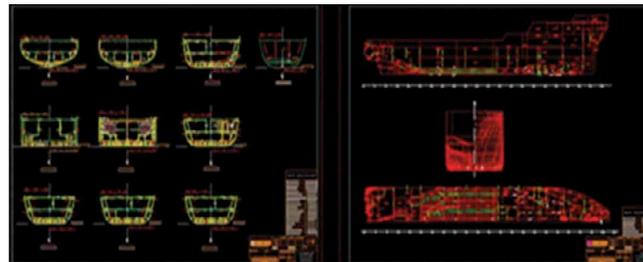
The reuse of information is critical in the process. FORAN allows a smooth transition to detailed design, providing tools for subdividing and joining plates and profiles, and also features additional attributes for detailed design such as bevelling, construction margins and shrinkage factors, and also for defining parts that are not relevant during the basic design stages.

The level of detail not only concerns



3D model of one block in FORAN

geometry, but also attributes. Part attributes irrelevant in conceptual stages become critical in detail design. In order to provide a smooth transition, tools to modify, check and copy attributes of large groups of pieces are provided.



The Drawing function for Foran

The block subdivision is perhaps one of the most critical points in ship design regarding the transition between design stages. Although split and refinement tools can be used for block subdivision, some specific tools are provided in order to perform automatic recalculation of parts when the block butts are modified. Assignment of parts to units can be done at any time by means of a powerful graphical selection tool.

As a summary, benefits for the

early generation of a ship 3D model in FORAN are: shorter evaluation of different design alternatives, early estimation of materials and weights, including welding and painting, less risk of inconsistencies, easier link with analysis and calculation tool, quick position of the most relevant equipment and seamless transition to detail design based in the reuse of data which reduces the design time and simplifies the overall process. [NA](#)

Siemens goes back to basics

Siemens has launched its NX 9 design software aimed at improving 2D design facilities

While 3D modelling has become the preferred choice for designers, 2D drawings and 2D product data is still an important part of the design process. The latest version of Siemens NX has focused more on this preliminary design stage and now includes Synchronous technology, so the tool understands the geometric relationships within 2D drawings and allows designers to apply assumptions for modifications. NX 9 improves the capacity to work with multi-CAD 2D files up to five times faster, without the need for translating the data into a useable format.

Jan Larsson, senior marketing director EMEA, Siemens PLM Software says: “We have added these new features to the latest release of NX because they make the software more relevant to the current requirements of its users. We understand that our customers’ needs are always changing, and as such our product team maintain regular contact

to ensure that our products evolve accordingly.”

The update also introduces fourth generation design (4GD) technology, enabling collaboration to improve design productivity for massive assemblies. The inclusion of NX Realize Shape software combines flexible tools for performing freeform design, with a CAD/CAM/CAE software package. NX 9 also includes tighter product lifecycle management (PLM) integration through Siemens’ Active Workspace environment, as well as multiple enhancements throughout the integrated CAD/CAM/CAE solution.

“NX is used across a range of industries and the latest release delivers targeted enhancements for all of them – it is not a ‘one size fits all’ solution. These new features were developed to facilitate and enhance workflows in response to specific industry needs. For example, engineers in the shipping industry have to deal with vast numbers and types of design objects

– for large ships, these can run into millions. To counter this challenge, the Siemens product team developed 4GD, a collaborative platform that breaks down large ship designs into individual, partitioned elements. This enables engineers to access the data that they need at any one time without being inundated with data for the entire project”, says Larsson.

The software is ‘open’ to all systems, meaning that it is fully compatible and able to communicate with other software. Additionally, it is compatible with all previous and future versions of NX. Larsson says: “NX 9 uses the Siemens’ JT data format, which has been approved by the International Organization for Standardisation as an international standard. JT enables manufacturers to move 3D product data seamlessly among the many CAD and PLM software applications that support the standard, making it easy to collaborate both within the business and externally with suppliers.” [NA](#)



Autodesk® based Shipbuilding & Offshore Solutions

Makers of



SSI develops ShipConstructor®, an AutoCAD based CAD/CAM software suite that leverages the world's most popular CAD platform. SSI applies information technology expertise to address industry specific challenges including sharing engineering data with other business processes and applications such as MRP, ERP and PLM tools.

ShipConstructor's AutoCAD foundation provides a user environment that is a globally recognized CAD/CAM standard. This results in an existing labor pool of expertise, a common DWG format for sharing information with other applications, and a portfolio of complementary Autodesk products.

www.SSI-corporate.com

HydroComp launches PropExpert 2013

HydroComp introduces its user-driven update for the industry standard propeller-sizing tool

The latest 2013 release of PropExpert, the application sizing and performance assessment tool for marine propellers, engines and transmissions, has incorporated some of the interface framework recently established for HydroComp's NavCad software, and includes new technical features that are critical to proper propeller sizing and analysis for contemporary high-power vessels.

HydroComp has an active internal research and development programme with the objective of delivering new capabilities for PropExpert and its other software products. The company says that many of the R&D projects that it works on are in direct response to end-user requests or its own assessment of new industry requirements.

For this most recent upgrade, the focus has been on improving prediction accuracy for Gawn-style propellers. Supported by a small core of users, HydroComp undertook the development of an improved algorithm for the GawnAEW propeller series that affects high-BAR five-bladed propellers. This new algorithm allows users to employ any propeller sizing software for vessels running high-powered engines with shaft-driven propellers.

"The new algorithm update is a good example of how we insure that our design tools are the best they can be for a broad range of users", noted Donald MacPherson, technical director, HydroComp. "Our PropExpert users are the front line of shaft-driven propeller applications for work and pleasure craft, and we serve this group not only by creating capable tools, but by conducting unique 'behind the scenes' in-house research to improve them."

Furthermore, PropExpert has been given a more modern look-and-feel, with user-definable page sizes and theme colours. The software supports the same file format as prior versions, so historical data integrity is maintained and the calculation process has not changed, so existing users can begin new work immediately.

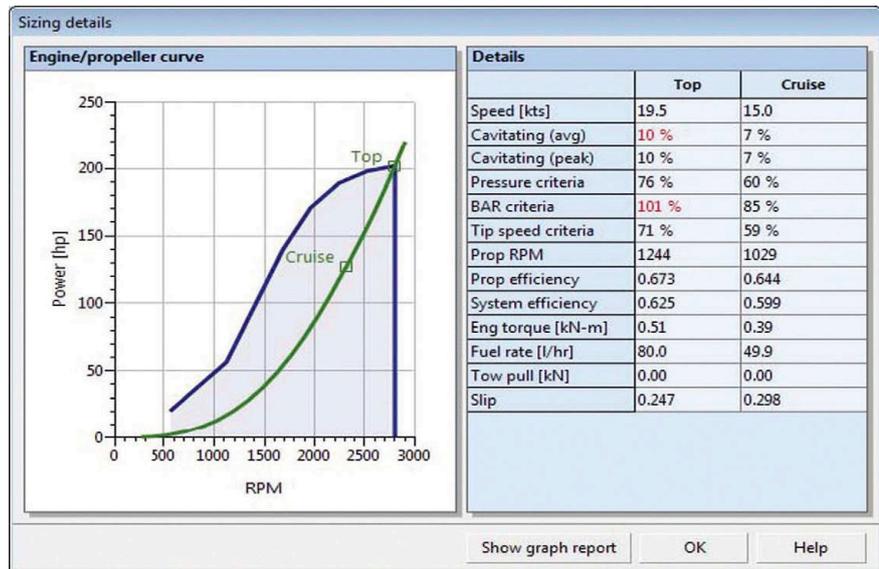


Figure 1: Sizing and analysis details summary

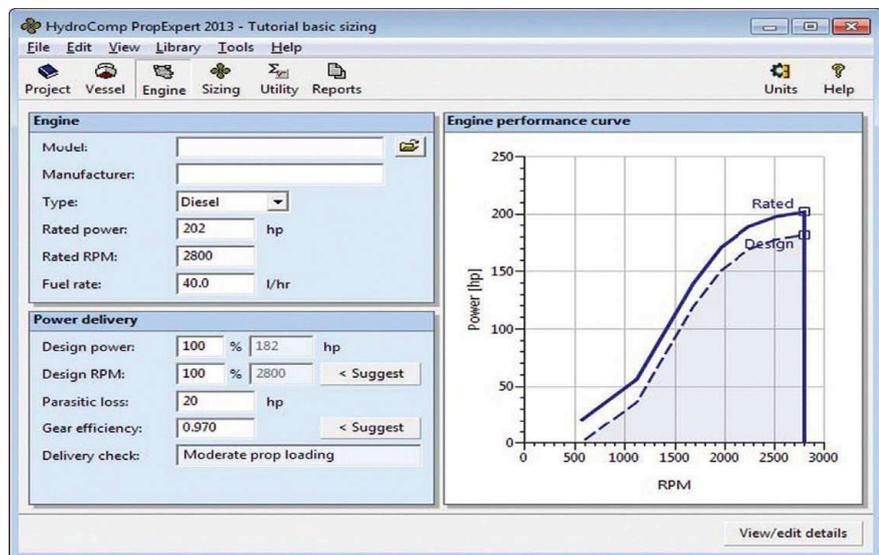


Figure 2: HydroComp PropExpert 2013 interface

"In this particular case, we found that a small set of moderate-to-high blade area propellers with low-to-moderate pitch were overly optimistic. Using a variety of model test results along with our more advanced tools – such as our PropElements detail design code – we developed a new correction to the popular GawnAEW prediction algorithms that insures the highest reliability for system

level propeller sizing and analysis", MacPherson adds.

In addition to the technical improvements for this newest version, recent updates for PropExpert include features for high-efficiency cruising and support for new vessel types – Catamarans and Riverboats; electric motor propulsion; enhanced Sailboat features (including "folding" propellers); expanded scope for ducted propellers. [NA](#)

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Solutions for Marine Networks



XBow model courtesy of Ulstein Group ASA

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Nupas-Cadmatic's latest software version, V6.1, is an extremely powerful 3D CAD/CAE/CAM system designed specifically for shipbuilding and off-shore industries. **Nupas-Cadmatic** is an innovative solution that simplifies the entire building cycle from the design phase all the way up to the vessel launch. The system saves design time, production time and materials throughout all the ship creation phases: from basic structural design, preliminary design of engine rooms and piping systems to detailed engineering and production information.

Nupas-Cadmatic is a concurrent engineering tool for ship hull, piping, outfitting, HVAC, cable tray and electrical engineering. Powerful 3D modeling in conjunction with advanced production modules significantly improve the quality of production and greatly shorten construction times.

Nupas-Cadmatic is represented globally by a network of 21 sales and support partners. Our unified goal is to keep our more than 400 Nupas-Cadmatic clients one step ahead of the competition in continuously changing market conditions.

Some V6.1 Highlights

- New Ribbon User Interface
- High Level Topology
- Copy Manager
- Improved Hull Viewer
- Enhanced support for Unicode
- Renewed HVAC routing
- 3D spaces and compartments
- Improved Shell Views
- New Diagram – 3D Model Integration
- Electrical Cable Router
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- Enhanced hole management

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Dassault launches Solidworks 2014

Dassault Systemes Solidworks 2014 software brings new features that improves its capabilities for users

Last year Dassault Systemes announced that it was overhauling its design packages to give its customers better performance from the software across all sectors. One of the spin-offs from this has been the development of its Solidworks 2014 package that has been improved with more features added and better functionality for the user.

The company says that the integrated Solidworks 2014 product portfolio includes new tools and enhancements to shorten the design process, enhance collaboration and increase productivity across four key areas; design tools, integrated workflows, performance increases and enhanced visualisation for better collaboration. The company has also added mobility support for Android and iOS devices that will allow the more than 2.1 million Solidworks users to connect to the new 3D designs anywhere and at anytime.

Design tools

The package now includes in the design tools area advanced shape control, a new style spline functionality, automatic sketch picture scaling and conic fillet controls which allow users to create complex surfaces and organic shapes faster and with more precise control.

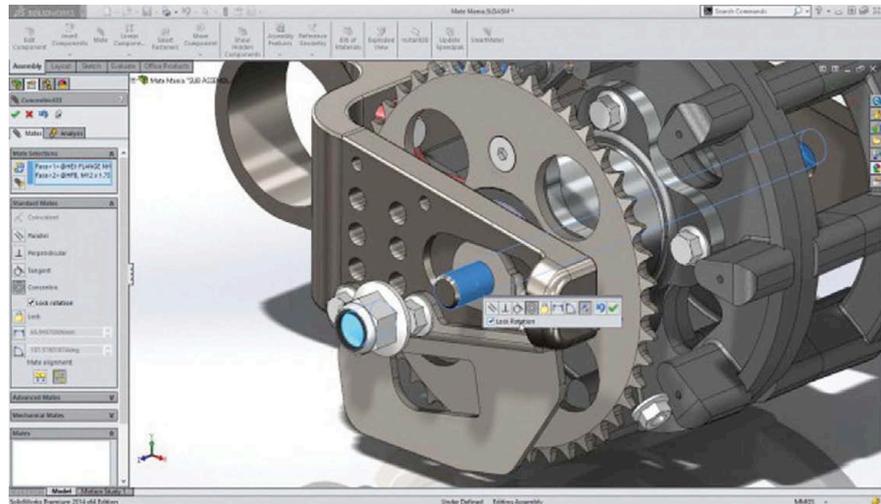
Design tools has also developed its automated drawing detailing allowing for faster drawing.

A new sheet metal feature enables faster creation of sheet metal geometry and improved data output for manufacturing. The company has said that users gain improved control over corner treatments, the ability to create stiffening ribs such as the indented design seen on mounting brackets used to reinforce the weight and force placed on the part.

Integrated workflows

Solidworks Enterprise PDM Streamlined Workflow can now easily manage more data with the new Microsoft Office integration and enhanced Web Client with graphic preview.

The Solidworks Electrical has improved integration and performance through enhanced integration with Solidworks Enterprise PDM and eDrawings, which allows users to optimise, share and track electrical designs more easily for improved project collaboration.



Solidworks 2014 gives designers better control over smaller parts

Increased productivity

Design communication and collaboration has been further developed with new support for Android devices, mobile users can expand their viewing choice beyond iOS mobile devices.

Solidworks has streamlined cost estimating and reporting, where users are able to cost parts faster with less setup, then share cost data more effectively with their partners. For example, key product development data for assembly can now be sent to Microsoft Excel allowing for easy sharing with departments such as manufacturing and purchasing.

Enhanced visualisation

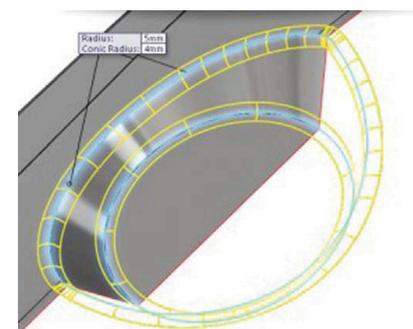
Dassault Systemes has enhanced the visualisation of Solidworks by streamlining the simulation setup. Solidworks Simulation automatically accesses engineering data for re-use in simulations, eliminating the duplication of effort and improving design collaboration.

Another improvement has been in the assembly performance and visualisation, where users can more readily create assemblies with the new in-context Quick Mate tool bar and Slot Mate. For assembly in section views, users can include or exclude selected components allowing for a fast creation of more impressive section views.

The updates in Solidworks 2014 has been developed to allow its users to transfer their creative ideas from design sketches and images into 3D models faster than before, while expanding the set of design tools that allow them to spread out into other markets.

A shipyard in Spain has recently swapped over to the Dassault Solidworks software due to the speed and efficiency of the product. Pol Montolio, director tècnic, Enginyer Naval has said that the software has allowed his yard to move into other markets as the software is flexible enough to adapt to what the designer needs. He also said that the company can then present this latest design in just one step. **NA**

The conic fillet function allows designers to shape and size fillets easier





Design & Operation of Container Ships

21-22 May, 2014, London, UK



Call for Papers

The recent period of increase in the size of container ships presents unique challenges for owners, designers, operators and classification societies. This has been coupled with persistent economic uncertainty and new legislation which has created an emerging need for more energy efficient vessels. These, almost opposing trends, are driving innovation within the industry.



With the increase in size, the geographical constraints placed on draft and beam, and the calculation of the vessels dynamic structural response, including whipping and spring, become ever more important. Cost efficiency, flexibility, optimum speed, stability, and energy efficiency, must all be addressed in the new generation of container ships. Recent innovative technologies have been the result of environmental issues and the need to reduce energy consumption and atmospheric emissions.



To further investigate this aspect of the industry, RINA invites papers from naval architects, class societies, operators, researchers, and builders on all related topics, including:

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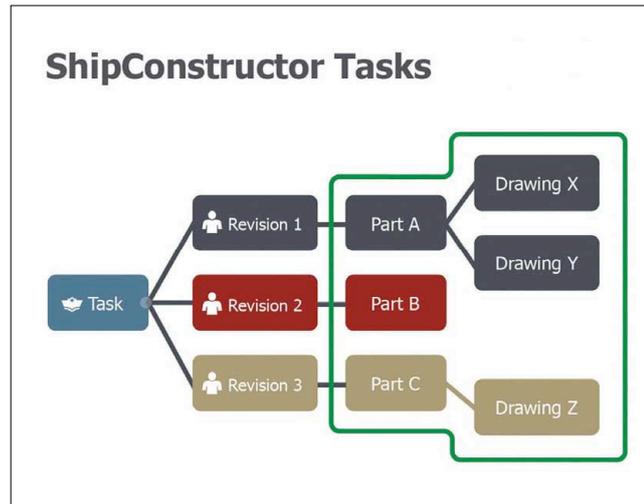
ShipConstructor keeps the work flowing

SSI has extended its change management capabilities in its software with the introduction of ShipConstructor Tasks

The company's goal with its latest development is to create a more seamless workflow than is currently standard in the CAD/CAM field. This latest update addresses a number of challenges encountered when trying to manage the constant change typical in the shipbuilding and offshore industries. The two most significant of these challenges the company highlights are the size and complexity in shipbuilding and offshore projects that is encountered in few other industries and collaboration between departments as few changes require input from only a single user, department, or discipline.

“The way to solve these problems is to find a way to replace the traditional ‘check-in/check-out’ process that the manufacturing industry generally uses for managing engineering and design work. Using a typical check-in/check-out system, members of an engineering team have to check-out all items, drawings and models that they think will be affected when making a particular change but unfortunately, often users will miss items, with the size of shipbuilding projects it is almost impossible to know the effects of every change,” says Mark Waldie, PR coordinator, SSI.

For instance, if the size of a pump is modified, many other changes need to be made. The user will need to know in advance which of the connected piping and electrical systems needs to be altered and also if changes will be required to the supporting structure. Additionally, every associated drawing would also have to be checked out



ShipConstructor tasks looks to speed up work flow

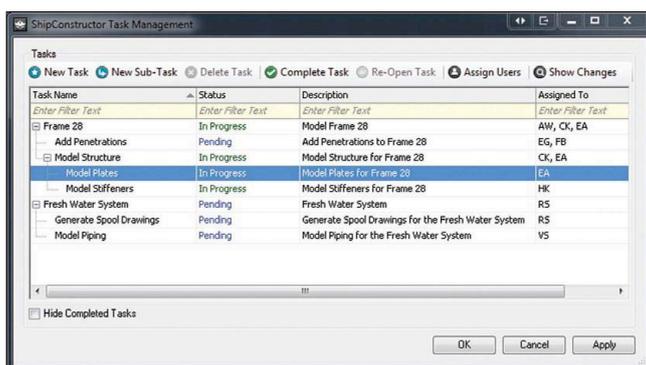
and modified. Compounding the problem is the fact that several different users or disciplines would be involved in this single modification. Therefore, when considering all these factors, accurately predicting the scope of the change in advance becomes more problematic.

Waldie says: “The standard attempt to address these challenges involves time-consuming bureaucracy and strict procedures for recording what work has been done. But, this takes the focus away from real engineering work. A better solution is to apply intelligent software to reduce unneeded bureaucracy.”

SSI says that it has solved this problem through the associativity built into its Marine Information Modelling (MIM) system. When a user makes a modification in the

model, ShipConstructor automatically knows every area that is affected, right down to the DWG-based drawing level. The MIM approach has been improved through the introduction of ShipConstructor Tasks. It provides a non-disruptive, nonintrusive system that accommodates a users’ natural workflow and saves time while providing a wealth of information available for analysis and other software systems.

When using ShipConstructor Tasks, the process starts by having tasks initiated within engineering for a specific goal. For example, a task could be to design a particular portion of a ship or to complete an Engineering Change Order (ECO). Each task entails many actions such as creation, deletion or modification of items in the product model which are then tracked using ShipConstructor’s revision management and tracking capability. To utilise this function, all a user does after they start ShipConstructor is to select the task they are working on. The tracking of their work is then done in the background without any extra steps. After a task is finished, a user simply indicates that the task is complete. The context of the changes (The ShipConstructor Task) is then available for others to see along with information as to what has been modified. [NA](#)



Using the Task’s interface users will be able to track their work and see the development of a project



Marine Design

3-4 September 2014, Coventry, UK



First Notice & Call for Papers

RINA Marine Design 2014 will provide a forum for reporting and discussing the design practice and technical issues associated with aesthetic design. The full spectrum of marine design from small craft to super yachts, including commercial and specialist vessels, will be examined.

An exhibition celebrating the 30th year of boat design at Coventry University will be opened at the end of the conference, which will include a virtual 3D exhibition of Coventry University students' design work. This will show the breadth of capability within the department of Industrial Design including automotive, transport and boat design.

The conference will present technical papers on a number of aspects of aesthetic marine design, including:

- **Design Visualisation** (including design methodologies, design practice, innovative concepts, design analysis tools, Computer Aided Design, TOI (Transfer of Innovation) from other industry sectors).
- **Human System Integration** (including HFE (Human Factors Engineering), Maritime Security, UCD (User Centred Design) methodologies, Emotional Design methodologies, Empathic Design methodologies, 'Ageing in Place', TOI from other industry sectors).
- **Sustainability in construction** (including one-off construction and series production issues, facility design, materials, joining technologies, reconstructions and rebuilds of historic craft, results of simulation).
- **Sustainability in operation** (including, equipment, results of sea trials, results of instrumentation, results of simulation, TOI from other industry sectors).
- **Implementation of regulations** in the design process (including international, national, and regional regulatory frameworks, classification, codes of practice, rating rules).
- **Virtual work/learning environments** (including, CPD for marine designers, networking opportunities for innovation and exchange, virtual work environments to facilitate multi-disciplinary, multinational teams).

www.rina.org.uk/marine_design2014

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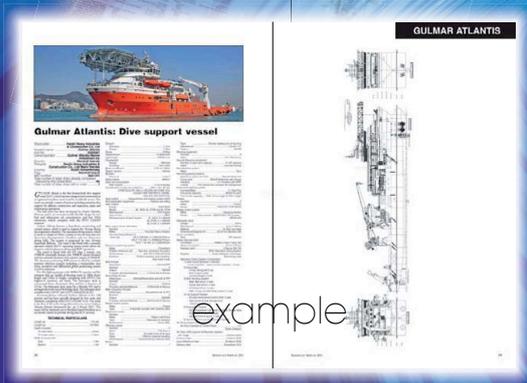
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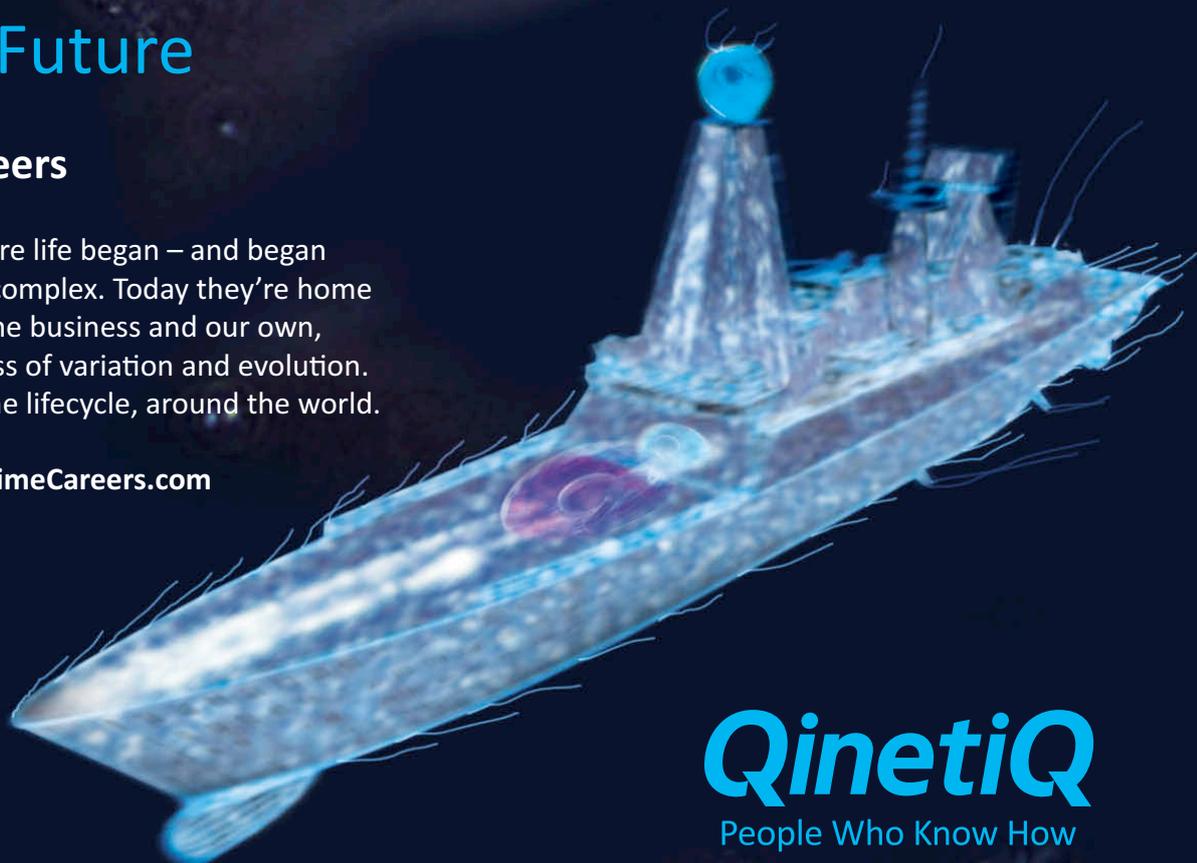
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Fire at Sea

26-27 March 2014, London, UK



Call for Papers

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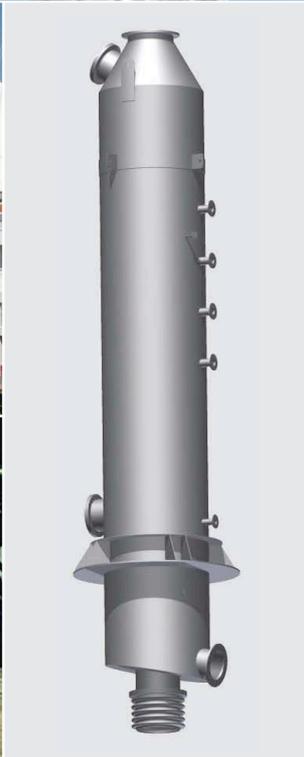
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