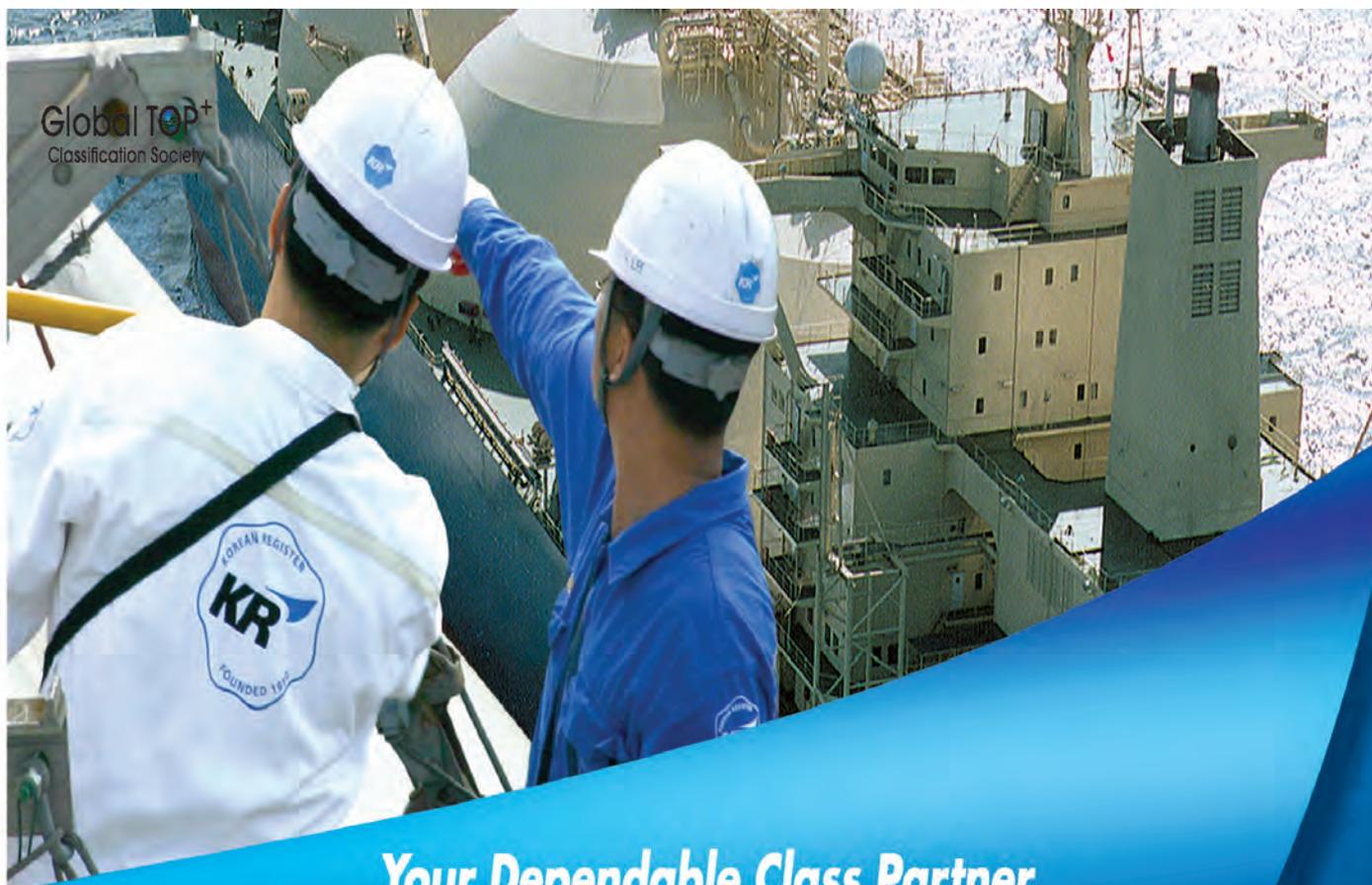




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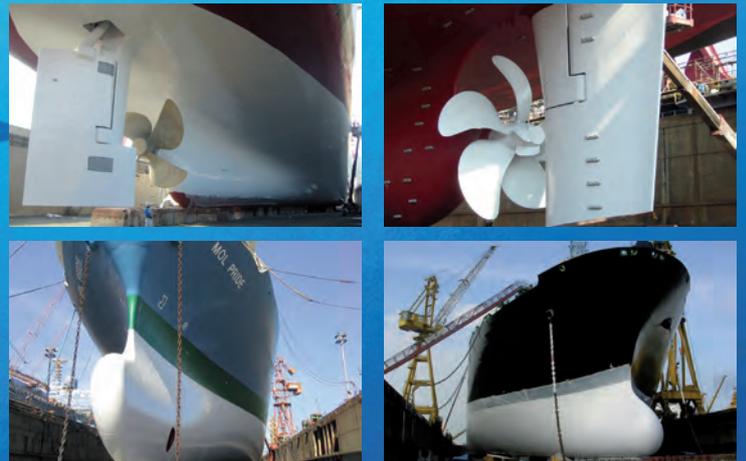
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Cruiseship technology / Finland's marine industries
Gas tankers / Cranes and cargo handling / **February 2008**



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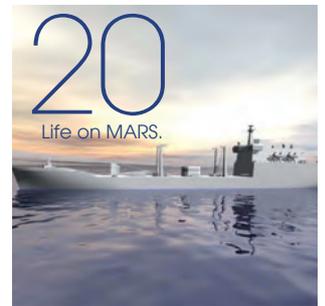
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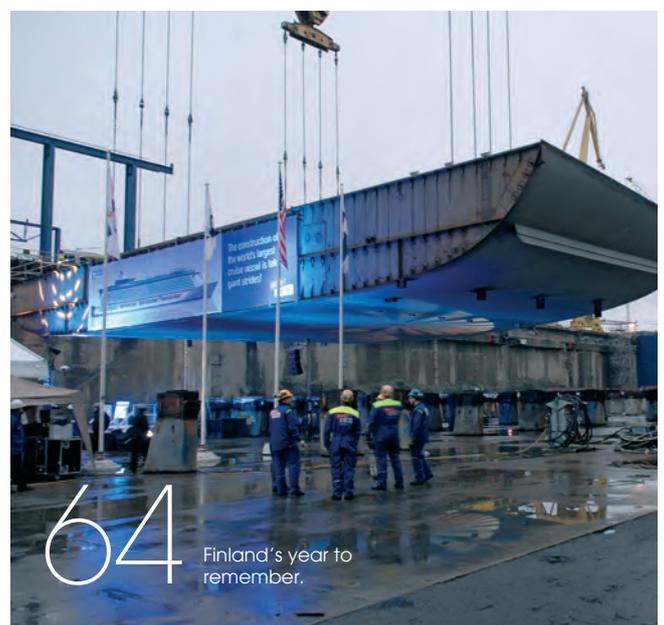
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Addressing the stack weight issue

Container crushed in the stack, from the shortsea containership *Annabella*.

New rules are needed demanding that all containers are weighed before stowage to validate their declared load and allowable stack weight, in order to avoid the potential for stacks collapsing onboard ship.

This was the consensus view emerging from 'Learning from *Annabella*', a one day conference staged at London's Museum in Docklands in late January. The event used as its starting point the UK Marine Accident Investigation Branch (MAIB) into an incident onboard the 868TEU UK-flag container vessel *Annabella* in February 2007.

On a voyage from Rotterdam and Antwerp to Helsinki, a stack of seven 30ft containers stowed in *Annabella's* no 3 hold collapsed. While little damage was done and no-one suffered injuries, the outcome could have been catastrophic given that the top three containers in the stack were carrying Butylene Gas.

Annabella is a modern ship, built by one of Germany's leading shipbuilders and managed by a highly professional ship management company.

Stephen Clinch, deputy chief inspector of MAIB said that the investigation had established that 30ft containers had been treated as though they were 40footers, and that the loading computer had not recognised 30ft containers. One of the principal causes of the stack collapse was that the two containers stowed at the bottom of the stack of seven containers were crushed by the weight of the containers loaded above them.

The recipe for disaster was leavened as planners failed to act on previous alerts from sister vessels, there were no lashings

in the stack, and the cargo securing manual was found to be ambiguous. Add to this an inexperienced chief officer with no previous experience of 30ft containers, commercial pressures that meant there was little time for checking, and a computer system that did not include lashing requirements for in-hold containers, and *Annabella* was an accident waiting to happen.

MAIB recommended to owners that manning should be increased aboard the ship, and that its loading programme should be rectified so that 30ft containers were recognised. It told the ship's charterer that 30ft containers should only ever be stacked three high. It recommended to the International Chamber of Shipping that it work with industry to develop, then promote adherence to, a best practice safety code.

But is this enough? While the misdeclaration of container weights was not identified as an issue by MAIB, conference organiser, David Cheslin, pointed out that it was known that shippers misdeclared the contents of containers and their weight. It was also known that crews, particularly onboard shortsea vessels, were over-worked.

Fred Kamperman, of Polish terminal operator DCT Gdańsk, said all full containers should be weighed as a standard container terminal practice, in order to avoid the potential for misdeclaration. Such information should be included in the terminal operating system, with weight alarms in the control room. Permissible stack weights should be introduced into the EDI system, calling for full cooperation from all parties when cargo was booked. A communication channel needed to

be established to the cargo owner/shipper to avoid indecision and procrastination.

Richard Willis, application consultant at Jade Software Corp said that not enough important data was received or processed on vessel

“Containers should be weighed as a standard practice”

structure stack weights and container allowable stack weights. Data that was received could be interpreted wrongly. Terminals provided an erroneous stow plan that shipboard software did not correct. Allowable stack weight (ASW) could easily be attached and recorded permanently in the terminal operating system, taken from a central global database. Vessel planning modules could include the ASW limit calculations on every stack and provide warnings.

To develop ASW calculations, what was needed was agreement between suppliers on formats and interface with the database. Expansion of vessel stack weight tools for terminal planners required cooperation with vessel operators, and possibly joint funding. A statutory deadline was required.

And the technology to weigh containers is already available. Beat Zwygart, of Lemantec International presented the 'Twistlock load sensing and control system for container handling equipment', which measures container weight and determines load eccentricity without interrupting the loading cycle. *NA*

Safety

Erika blame apportioned

In a landmark ruling covering the responsibilities of owners, class, and charterers in the case of accidents, and indeed the reach of the Marpol Convention, oil giant Total and class body RINA have been found culpable for the 1999 sinking of the oil tanker *Erika*, along with shipowner Giuseppe Savarese and technical manager Antonio Pollaro.

A French court ruled that Total SA had responsibility for the accident, and ordered that it and RINA pay maximum fines of €375,000 each, with the owner and technical manager ordered to pay \$75,000 each. In addition, all were required to contribute to the €192 million in pollution damages awarded to civil parties, including the French state.

The ruling, which has been appealed by Total, leaves the oil company exposed to separate lawsuits from local bodies for the environmental impact of the spill.

Erika broke in two and sank in heavy seas in the Bay of Biscay 70km off the French coast in December 1999, spilling 20,000 tonnes of fuel oil into the sea. The sinking directly brought about the tightening of rules covering tanker construction, persuading the IMO to accelerate the phasing out of single hull tankers.

Total was found negligent for failing to investigate the condition of the 23-year old ship and of not acting quickly enough when the accident happened.

Judge Jean-Baptiste Parlos found the oil company guilty of 'imprudence' in accepting *Erika* as a ship worthy of carrying highly pollutant heavy fuel oil. He said Total must have known the vessel's age and its

pedigree, *Erika* having frequently changed hands, flags, and classification societies. He also rejected RINA's claim that it should remain immune from prosecution, as representative of the tanker's flag state, Malta, and said that it too had been guilty of imprudence in renewing the vessel's class certification, after an inspection in November 1999 discovered extensive corrosion in number two ballast tank.

Environment

Seaway tough on ballast

The US Saint Lawrence Seaway Development Corp has proposed new regulations to prevent the introduction of invasive species via ships' ballast water.

SLSDC administrator Collister Johnson, Jr said the new proposal would require vessels to flush ballast tanks containing only small amounts of water or sediment with saltwater in an area 200nm from any North American shore before entering the Seaway.

The proposal would involve an increase in the number of ship inspections for ocean-going vessels performed in Montreal by inspectors from the US-Canadian Seaway Corps, the US Coast Guard, and Transport Canada. The Seaway will also measure the salinity levels of tanks to assure that there is a sufficiently high concentration of salt in the ballast water to kill invasive species.

Administrator Johnson noted that since 2006 Canada has required that similar vessels transiting the Seaway bound for Canadian ports conduct saltwater flushing. The proposed US rules will ensure that vessels destined for American ports do the same.

Under the proposed rules, ships that fail to saltwater flush may either return to the open ocean to conduct a ballast water exchange or must retain the ballast in their onboard tanks. Non-compliant ships could be fined up to \$36,625 per incident by the SLSDC.

A final rule will be published in late March, prior to the start of the 2008 navigation season.

Containerships

KR joins ultra class

Korean Register (KR) is to class three new-build ultra-large containerships. The 10,100TEU vessels, ordered by Danaos Corp, are to be built by Hyundai Samho Heavy Industries and will be delivered in 2011.

This is the first time that Danaos has chosen KR as its class partner.

Danaos president Dr John Coustas said: 'KR has very strong technical ties with the major Korean shipyards and I'm also aware of their finely honed technical



Erika sinks in the Bay of Biscay, 12 December 1999.



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competence and survey capabilities. I am confident that they will provide the high quality of service required for the safe and robust construction of these three new additions to our fleet.'

KR chairman, Oh Kong-gyun commented: 'We have worked hard over the past few years to raise the profile of our technical skills across the globe and the decision by Danaos demonstrates that KR is a player on the world stage.'

Technical teams from Danaos have already visited KR's head office to familiarise themselves with a series of shipbuilding software developed by KR, which will be used to build the new additions to their fleet.

The enhanced international profile of KR has been further demonstrated recently by the wide adoption of its SeaTrust-CSR software, which governs newbuildings of tankers and bulkships under the Common Structural Rules. This software package is now being used by the major Korean shipyards.

Industry

Dutch interests merge

A new marine industries association has emerged, in the shape of the 'Scheepsbouw Nederland' (Holland Shipbuilding Association). The new body is the result of the merger of interests previously represented by VNSI (Netherlands' Shipbuilding Industry Association) and HME (Holland Marine Equipment). The new combination has been established at FME in Zoetermeer, The Netherlands.

The Holland Shipbuilding Association represents about 400 members with a total maritime turnover of €6 billion, an export volume of €3.5 billion, and a combined direct workforce of over 25,000 people.

Fred van der Wal has been appointed as chairman of the Association and Martin Bloem as general director.

Design

Aker breaks ice in Estonia

The Estonian Maritime Administration has awarded a contract to Aker Arctic Technology Inc, Helsinki, Finland to design a new multi-purpose icebreaker, in a deal worth close to €6 million.

The agreement includes the development of the conceptual design, the basic design, preparation of the tender documents needed for a public procurement for building the ship, and construction supervision.

'Aker Yards has built more than 60% of the icebreakers in the world. This design contract demonstrates that Aker Yards maintains its historical position as the leading designer of icebreakers in the world,' said Aker

Arctic executive vice president projects and technology, Oddvar Slettevold.

The company said the technical solution proposed represented the latest development in modern icebreaker technology. The new generation multi-purpose icebreaker for Estonia would be 108m long, have a breadth of 28m, and would be able to break 1.2m thick level ice forward and astern at a continuous speed of 3knots, as well as move smoothly through heavy ice ridges due to her novel stern design.

The vessel's twin azimuthing drives would have a total shaft power of 17MW. The vessel will be fitted with the equipment needed for oil combating, fire-fighting, and towing and, in order to perform multiple service tasks in ice-free periods, offshore equipment will also be installed.

The public procurement for building the vessel will be announced in May 2008, and the final costs as well as the deadline for completing the construction works will be known in autumn 2008, after receiving bids from invited shipyards. It is expected that the new multi-purpose vessel would enter service in the 2010/2011 icebreaking season.

CAD/CAM

Aveva bags Hanjin

Hanjin Heavy Industries & Construction-Tech, has signed a multi-million US dollar agreement with Aveva to equip its new shipyard in The Philippines with Aveva Marine solutions and Aveva NET.

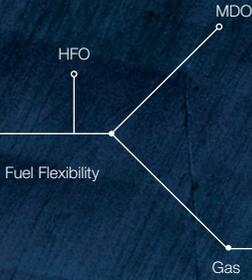
Hanjin has invested US\$720 million constructing the shipyard in Subic Bay, The Philippines. Phase One of the Subic Dockyard includes a 1000m assembly line; two ultra-huge gantry cranes and 1.6km of quay wall have been completed. Total shipbuilding capacity for this phase is 220,000tonnes/year. Phase Two, due for completion in the second half of 2008, will boost capacity by an extra 450,000tonnes per year.

ChoonBae Jeon, manager of technical team, Hanjin Heavy Industries & Construction-Tech, Inc, said: 'The new shipyard in The Philippines is based on our strategy to overcome growth limits because of limited space in our local shipyards. We will be adopting Aveva Marine solutions and Aveva NET which are effectively in use in our Youngdo, Ulsan, and Masan shipyards in South Korea.'

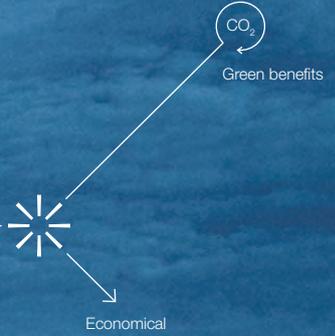
CAD/CAM

Foran for BAE

Spanish company Sener Ingeniería y Sistemas S A has signed a new contract with BAE Systems, licencing the shipbuilder to use the FORAN CAD/CAM System on a wider basis. According to the contract, FORAN can be implemented in any BAE Systems Group company, any member of the Aircraft Carrier Alliance, as well as in



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any subcontractor.

FORAN is currently implemented at BAE Systems Submarine Solutions, Barrow-in-Furness and at BAE Systems Surface Fleet Solutions, Scotstoun, Glasgow.

BAE Systems will use the FORAN System as a strategic business application for support and further improvement of the ship design, construction, and integration activities at its shipbuilding sites in UK. Sener said efficiencies gained by using FORAN in the design and manufacturing processes will result in costs savings and improved planning and product quality.

As a first result of the contract, about 200 licences have been installed at both sites. These licences are currently being used for developing the different stages of the CVF project as well as for internal training.

Other services to be provided by Sener include training, customisation, on-site and remote technical assistance, as well as the development of interfaces between FORAN and existing Business Systems.

Propulsion

China MAN expansion...

MAN Diesel has added another member to its two-stroke licensee family with the signing of a contract with Zhenjiang CME Co (ZJCME), the Chinese engine manufacturer. The new licensee is a subsidiary of the giant, state-owned China State Shipbuilding Corp (CSSC) industrial conglomerate.

ZJCME already holds a four-stroke licence with MAN Diesel for the building of generating sets. It signed the new, two-stroke agreement on 16 January at a ceremony ratified by CSSC, and intends to build engines up to 50cm bore.

The agreement means that MAN Diesel now has a total of seven two-stroke licences in China. Klaus Engberg, senior vice president for MAN Diesel two-stroke licencing said: 'At the moment, we are seeing an unprecedented boom in the contracting of ships, particularly in China. However, although engine production is also on the increase, China is still experiencing a shortage of engines. We therefore warmly welcome the decision of CSSC and ZJCME to produce our two-stroke engines.'

Propulsion

...Poland MAN addition

H. Cegielski - Poznan successfully tested its first MAN B&W ME-engine on 7 January.

The unit, a 7S60ME-C7 main engine, has been ordered by Gdynia Shipyard S A for installation aboard a pure car and truck carrier (PCTC) with a capacity of 6600 car equivalent units.

The vessel (newbuilding no 8168) is currently under



Latest MAN B&W engine from licensee H. Cegielski - Poznan.

construction and constitutes the 20th in a large series of 26 contracted vessels ordered by Ray Car Carriers, of Douglas, Isle of Man.

Earlier ships in the series, (numbers 8168/8 - 19) are powered by MAN B&W 7S60MC-C7 main engines with Holeby generating sets. However, from 8168/20 on, the 7S60ME-C7 is being used as main propulsion. The expectation is that the series will be extended in the future.

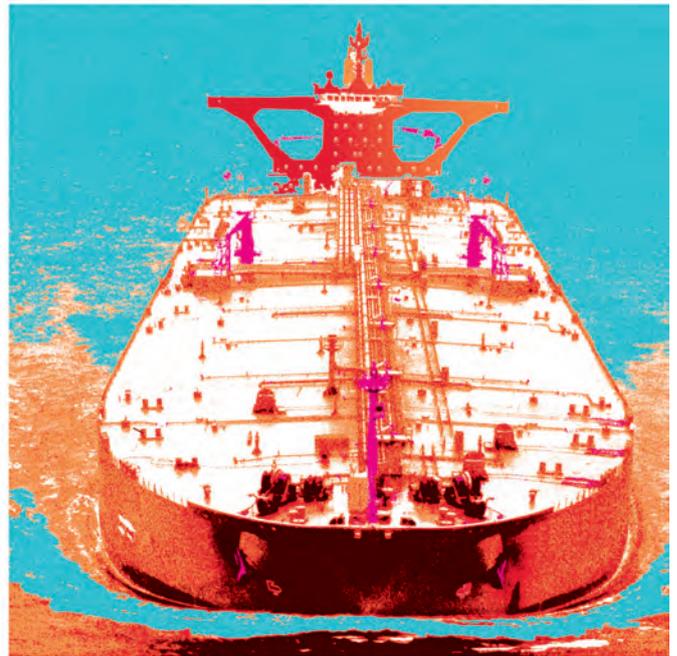
Classification

GL signs with Harbin

Germanischer Lloyd and North China's Harbin Engineering University have signed a cooperation agreement covering engineering training, including acoustics and fluid dynamics. The partners said they would jointly work on science and industry projects and organise an exchange of lecturers and trainers.

Germanischer Lloyd's GL Academy will provide assistance selecting diploma theses and dissertations. Harbin Engineering University will be host to colloquiums, workshops, and conferences with GL participation. The classification society is also donating eight scholarships for undergraduate and graduate students with excellent academic credentials in shipbuilding and ocean engineering.

'We are interested to offer university graduates the opportunity to hear from naval architects and marine engineers about real life practical questions,' said Dr Hermann J Klein, member of the executive board of Germanischer Lloyd. [NA](#)



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Coatings

PPG now covers SigmaKalon

PPG has acquired coatings firm SigmaKalon, in a total transaction worth €2.2 billion, including assumed debt. Three quarters of the new company's sales from continuing operations will now come from its coatings, optical, and speciality products businesses.

The acquisition is expected to expand PPG's geographic footprint, extend its market presence, and increase the proportion of sales coming from architectural or decorative coatings. SigmaKalon operates 22 major manufacturing facilities across Europe.

Contact PPG, One PPG Place, Pittsburgh, Pennsylvania 15272, USA

Tel +1 412 434 3131

www.ppg.com

Coatings

Rolls-Royce keeps coatings in check

A US\$7 million US Navy research contract has been awarded to Rolls-Royce for the evaluation of UCT Coatings Inc's UltraCem nickel boron coatings on naval propulsion systems such as propellers and waterjets.

UCT has granted Rolls-Royce a long term exclusive licence to use this technology for a wide range of commercial and naval marine equipment.

The coatings have the capability to change the hydrodynamic performance, cavitation characteristics, and sea-growth fouling of propulsion machinery. Performance, reliability, and time between repairs of marine equipment can also be increased by reduced friction and wear.

Contact Rolls-Royce Naval Marine Inc, 110 Norfolk Street, Walpole, MA 02081, USA

Tel +1 508 668 9610

Fax +1 508 660 6152

www.rolls-royce.com

Technology

Panama goes electronic

Kongsberg's K-Log is now authorised for use on Panama-flagged vessels, following authorisation of all electronic logbooks from the Panamanian flag state administration. K-Log is already installed on several vessels and approved by IMO and SOLAS.

Electronic logbooks are already accepted by Norway, Sweden, UK, Bahamas, Singapore, Isle of Man, Marshall

Islands, and Malta. With Panamanian approval, a large proportion of the world's merchant fleet is now able to make use of this technology.

The electronic format of K-Log enables some reporting to be carried out automatically, by integrating



Kongsberg's K-Log electronic logbook is now authorised for use on Panama-flagged vessels.

ships' instrument data into the system. Available software includes logbooks for dynamic positioning, engines, oil records, operations, and radios.

Due to a recent legislative amendment, an e-licence is required in order to use electronic logbooks onboard any ship. Users can obtain a single annual e-licence rather than buying each of the traditional printed logbooks used onboard during a year.

Contact Kongsberg Maritime, Kirkegårdsveien 45, PO Box 483, NO-3601 Kongsberg, Norway

Tel +47 32 28 50 00

www.kongsberg.com

Propulsion

Wärtsilä propels into China

Joint venture propeller manufacturer Wärtsilä CME Zhenjiang Propeller Co Ltd has signed contracts to deliver a total of 72 fixed pitch propellers at a value of approximately €30 million. The company will provide the propellers on behalf of six of China's leading shipbuilders for vessels due to be delivered between 2009 and 2011.

The nickel-aluminium bronze propellers, totalling over 2700 tonnes with diameters ranging from 6.1m to 8.2m, will be installed aboard different types of vessels, including oil tankers, containerships, and bulk carriers. Wärtsilä CME's facility in Zhenjiang, Jiangsu Province, will deliver the propellers to Chinese shipyards

comprising Guangzhou Longxue & Wenchong, Jiangsu RongSheng & Yangzijiang, Yangzhou Dayang, and Taizhou Kouan.

Contact Wärttilä Corp, John Stenbergin rantaa 2, PO Box 196, FIN-00531 Helsinki, Finland

Tel +358 10 709 0000

Fax +358 10 709 5700

www.wartsila.com

Adhesives

Bonding with spray

Adhesive manufacturer Sta-Put has launched Sta-Put 2006M, a range which will bond textiles, polyurethane foams, expanded polystyrene, and other sensitive substrates. The new formation is claimed to have a short tack time of three to seven minutes, which would mean the bond can be made quicker. It also has a long working time of up to one hour.

The product complements the original Sta-Put SPH adhesive, covering the bonding of every substrate encountered in the marine industry, among other sectors. It is sprayed from a self-contained canister, making the system light and portable, and compared with brush and trowel-applied contact adhesives, it is claimed to be much cleaner, faster to use, and stronger, at 120Nm bond strength.

In most applications, extraction is not necessary, with just a small amount of ventilation required to disperse the CFC-free propellant. The 2006M's spray gun allows for narrow or wide spray patterns to be applied to the substrate, and its formula combines the benefits of fast solvent flash-off and long working time.

To simplify adhesive choice, a product selector chart is available, to ensure that the correct type is chosen for each job.

Contact ITW Performance Polymers Europe, Unit 3, Shipton Way, Express Business Park, Northampton Road, Rushden, Northamptonshire NN10 6GL, UK

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Fax +44 870 458 9077

www.staput.co.uk

Equipment

Scope for boring accurately

The Gradient Lens Corp (GLC) has introduced a long Hawkeye Pro SuperSlim borescope, designed to inspect defects in deep bores and narrow tubes. The scopes are available in lengths of 25cm, 35cm, and 43cm, and are said to give sharp, clear views of deep, very narrow bores in machined parts, fuel and hydraulic systems, castings, and tubing.

With an outside diameter of 2.8mm, the scopes can inspect bores as small as 3mm, and use GLC's endoGRINs lens system, allowing them to relay images at a long distance while maintaining image quality. It is said that users will be able to clearly see surface finishes and defects like burrs in deep bores and cross-holes.

The scopes feature a 0° direction of view, a 40° field of view, and offer a rotating 90° direction of view with a mirror tube attachment.

Contact Gradient Lens Corp, 207 Tremont Street, Rochester, NY 14608, New York, USA

Tel +1 585 235 2620

Fax +1 585 235 6645

E-mail info@gradientlens.com

www.gradientlens.com

Construction

Haki supports ships

A new scaffolding system has been introduced by Sweden-based Haki that is reckoned to be lightweight yet safe, comfortable, and efficient. The scaffolding is suitable for the marine industry and is used by many leading shipyards in Europe and UAE.

All beams and guardrails are supplied with spring locking catches and are made of high-tensile steel, resulting in up to a 20% lower weight for the same strength. The weight savings on the staintower components are also significant: 30% of the weight could be saved here, due to an innovative design and



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The scaffolding can be suspended and connected anywhere and in any direction, providing flexibility. The design allows for an increase in the speed of erection as well as a reduced call on dockside support, said to result in cost effectiveness and flexibility for shipyards.

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Tel +46 044 494 13

Fax +46 044 494 72

www.haki.se

Propulsion

Combined turbines supplied until 2012

Tognum subsidiary MTU and Georgia, USA-based Vericor Power Systems have signed a new contract for the supply of gas turbines to be used in complete MTU marine propulsion systems, to run until 2012. This deal extends the current contract from three to five years.

The TF 50 gas turbines will be used in combination with MTU diesel engines and marine electronics, as complete propulsion systems in ships, with one of the main applications being for fast ferries. The turbines deliver a power output of 4118kW, and these combined diesel and gas turbine systems are said to offer the advantages of both types of propulsion system.

With longer routes or at lower speeds, the diesel engine is the sole propulsion, whereas at maximum speeds, the gas turbine is switched on as well. At the signing of the contract, Rainer Breidenbach, Tognum executive board member for sales, commented: 'This contract with Vericor will help us to secure our leading position in the development and production of complete propulsion packages in the market for state-of-the-art marine systems.'

Contact Tognum AG, Maybachplatz 1, 88045 Freidrichshafen, Germany

Tel +49 75 4190 91

Fax +49 75 4190 97

www.tognum.com

Software

Strong sales for Autohydro

Canada-based Autoship Systems Corp (ASC) has seen its Autohydro program become a leading player in the marine software industry. The technology is used to analyse hydrostatics, stability, and longitudinal strength for both intact and damaged cases.

Its graphical user interface is said to transform what could be a very complicated process into a user-friendly desktop experience.

Some of the orders are ASC's existing clients adding a second or third licence of the program, others are new installations, and the rest are upgrading from older-style

programs that are being phased out. Autohydro is intended to improve the speed and quality of marine engineering projects while lowering the cost, and it meets all Class requirements.

Contact Autoship Systems Corp, Suite 1451, 409 Granville Street, Vancouver, BC V6C 1T2, Canada

Tel +1 604 254 4171

Fax +1 604 254 5171

E-mail sales@autoship.com

www.autoship.com

Ancillary equipment

AMOT gains orders

AMOT has secured orders to supply 30 of its G series temperature control valves to 156,000dwt crude oil tankers being built in China by Jiangsu Rongsheng Heavy Industries, through its new regional distributor, Ninghai Equipment & Engineering Ltd.

The temperature valves are reckoned to have proven high repeatability for accurate control and are used for different types of vessels in Chinese shipyards. Valve size matched to pipe size is said to reduce installation time and costs, ports are configurable to suit each installation, and low pressure drop allows the use of a smaller valve size while manual hand-wheel valve adjustment simplifies set-up and maintenance.

A further contract with AMOT was placed by Hapag Lloyd, for an XTS-W Bearing Condition Monitoring System which was installed aboard newbuild *Hanover Express*. The 8749TEU containership was built by Hyundai, and the installation is the first XTS-W system to accompany the fitting of an electronic MAN engine, type 12K98 ME.

The system provides real time monitoring of the crank train bearings in large two-stroke diesel engines, providing an early warning of bearing wear and avoiding failures. It can also eliminate the need for open out inspections, which are both costly and a major cause of crank train bearing failures, and it assess bearing rate of degradation to allow for corrective action.

Contact AMOT, Western Way, Bury St Edmunds, Suffolk IP33 3SZ, UK

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AMOT's XTS-W Bearing Condition Monitoring System, installed aboard containership *Hanover Express*.





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(Image courtesy of Daewoo-Mangalia Heavy Industries)

a toilet! On *Explorer*, this was located away from the Muster station and meant that, until expedition staff instigated an escort system, some people left the Muster area without any tally system to ensure they had returned safely.

When the power failed, all lights in the cabin went out, and we were fortunate that we were well acquainted with the cabin and, in the Austral summer, there was just sufficient light coming through to enable us to see.

Once the order to abandon ship had been given there was considerable confusion over which lifeboat to enter. We had been given a safety briefing on day one of the cruise and had been taken to our lifeboat, which was on the starboard side. We were now on day 12 and had not had another abandon ship drill. The first day of the cruise was packed with large amounts of information and, although I could remember it was on the starboard side, I was not sure which lifeboat to enter.

In the event we boarded lifeboat No 3, starboard aft. At one point a crew man gestured for us to leave the lifeboat and get back on the ship. We stayed where we were.

When we entered the lifeboat there was a rope stretched athwartships hindering us moving to the bow. When we had gone back to our cabin I had decided to ditch the large foam lifejackets in favour of the inflatable lifejackets provided for Zodiac excursions. I took the view that mobility was key to our survival and this was an important factor in being able to move past the obstructions.

Confusion reigns

The ship, under the Liberian flag, was equipped with four lifeboats. The aft pair mounted port and starboard had a capacity of 59 persons each, whilst the forward pair, mounted port and starboard, had a capacity of 39 persons each. In addition the ship carried four liferafts of 25/20/16/10 capacity. The ship also carried 10 6.0m Zodiac inflatable boats powered by 50hp four-stroke outboard motors. These were manned by expedition staff to transfer passengers to and from the ship during the cruise. Although not officially part of the lifesaving appliances they would play a crucial role in the incident.

The confusion over which lifeboat to use caused considerable delays to the launch of the lifeboat. I saw the crew members counting passenger numbers at least three times. At the abandon ship drill we had not



Explorer goes down.



Chilean Navy photo - *Explorer* passengers arrive at Fildes bay on King George Island, Antarctica on Friday, 23 November 2007.

seen the lifeboat swung away from the side of the ship, nor seen it launched, so there was considerable apprehension, as we waited, as to what would happen next. I felt at the time that the delays and lack of understanding of the process caused the real potential for panic amongst the passengers.

That no panic occurred is largely due to the passengers response and also the relatively benign incident (the rate at which the list increased was very gradual).

The lifeboats were not fitted with on-load release and I turned to help the crew man wrestle with the forward hook release. I estimated the waves were 4ft to 6ft maximum with the occasional wave lipping over into a white horse. Winds were around 15knots maximum. Relatively benign conditions for Antarctica. I would expect in rougher conditions that it would have been a much more difficult task to release the hook.

The lifeboat engine did not start and this meant we could not move quickly away from the side of the ship or the swinging falls block. We drifted under the forward lifeboat, which if released, would have come down on top of us. No-one seemed to be in charge of the lifeboats and it was

very much left to the passengers to work out what to do.

I grabbed an oar and, with another passenger, pushed against the side of the ship. The oar snapped. From the size of timber I would not have expected this to happen, which would indicate some rot within the timber. Again no-one seemed in charge and it was left to the passengers to work out what to do.

We managed to get enough separation from the side of the ship for us to start rowing, but the lack of command and restricted space onboard the lifeboat meant that not all oars were put into service.

The crew were unable to find a sea anchor to stream and, with the engine not working, the lifeboat took up a beam on attitude to the seas and started to roll, such that on occasions the gunwhales just rolled under. The lifeboats were open and it would not have taken much worse conditions for the lifeboat to have been swamped.

In conversation with a number of passengers immediately after the rescue I learned that only one lifeboat out of four had a functioning engine. I believe all 10 Zodiacs were launched and they moved in to assist by picking up a tow or helping manoeuvre the lifeboats, which were now drifting down onto the ice that had most likely damaged *Explorer*. We were the first to launch and the closest to the ice when the Zodiac that had picked up our tow managed to sort out how to tow us and in the right direction. I estimate we were within 10 minutes of coming into contact with the ice.

In our area of the lifeboat sat six people. At some point after the launch we were handed a plastic packet containing the TPAs [thermal protection aids]. Again no-one seemed in charge and no instructions were given as to what these were for, or how they should be fitted. Of the six in our area only four were operational. At least two had their zips corroded when the plastic packet was opened. I ripped my TPA open and wore it as best I could. As we were sitting right in the bow we were starting to ship water as the Zodiac took up the tow into wind and waves. I found a spray dodger and wrapped it round four of us to provide extra protection.

Out of our group of six, four people were seasick - one almost continuously, which incapacitated him. Again no-one seemed in charge or handed out any of the seasickness tablets, which according to the ship safety

booklets were carried aboard the lifeboat.

At the safety drill at the start of the cruise we had been briefed by one of the expedition staff that he would be present with us on the lifeboat and that there would be an officer in charge. In the event the expedition staff member left the lifeboat to help drive a Zodiac and there appeared to be no-one in charge. This caused several problems.

- The lifeboat was listing to port: in rougher seas this would have become a problem and passengers needed to have been redistributed to correct the list
- Passengers were not organised to row the lifeboat in the event that the tow failed
- No information was given to passengers as to the need to conserve heat to help with survival times in cold weather
- No information was clearly given as to the likely time we would be in the lifeboat

Our lifeboat was approved to carry 59 passengers. After the incident, from a photo taken, I estimate she carried only 35 people. Other lifeboats offloaded some of their passengers into the Zodiacs. Wearing bulky cold weather gear and bulky lifejackets, it is difficult to imagine that our lifeboat could have carried an additional 24 people without further increasing the possibility of swamping in anything other than calm conditions; nor being able to use the oars or move around the lifeboat to find the emergency stores that we were unable to locate.

Timely rescue

MS *NordNorge* arrived about five hours after we abandoned ship. The Captain provided a lee from the worsening conditions and a combination of the *NordNorge* rescue boats and the Zodiacs transferred passengers out of the lifeboats and then onto the *NordNorge* port lifeboat, which was used to lift passengers aboard or to a hatch which was opened close to the waterline. Without the Zodiacs this would have taken considerably longer or would have required the lifeboats being brought alongside the *NordNorge* lifeboats. Again, it would not have taken much worse conditions for this to have become considerably more difficult.

It is my opinion that the survival of every person aboard *Explorer* was down to a combination of factors:-

- Timely evacuation: The Captain recognised the problems posed by the ice

and ordered the ship to be abandoned. In view of our experience of being within minutes of coming onto the ice, that decision was made at the right time

- Expedition ship: All the passengers had to take the itinerary to their doctor and get approval that they were fit to travel on such a trip to Antarctica. We had to be able to scramble in and out of small boats. We had 10 Zodiacs with good drivers to get on and off the ship, they were to play a vital role in helping us survive
- Small ship: With less than 100 passengers, passengers got to know the ship. When the lights went out we could find our way around. It made it easy for the Captain and crew to address us at one Muster station
- 11 days into the trip: We had got to know each other. We could assess which people needed some support and it was given. We looked out for each other. We had become a team
- We were lucky: The weather was benign. The next day a ship in the same area reported Force 8 winds and blizzards. The damage to the ship meant that the list increased gradually, allowing time for evacuation. There was also a ship close by, which meant we were not exposed in the lifeboats long enough to cause fatalities due to hypothermia. We were in open water when we abandoned ship having managed to push out of the dense drift ice that had most probably caused the damage to *Explorer*

Even so, the sinking raises a number of issues related to shipboard safety, particularly in Antarctic waters:-

- Train hard, fight easy is a military adage that applies to civilian life. The abandon ship drill at the outset of the cruise was cursory and came at a time when there were a number of other distractions. SOLAS calls for an abandon ship drill every week. This was not carried out on *Explorer*
- Small ships also have small crews. This compromised the ability to have sufficient crew able to command each lifeboat. Again SOLAS recognises this and requires someone clearly in command and also a second in command
- Inspection by Port State Control and Classification. In 2007 the ship had undergone inspection by the MCA in the

UK and also by classification authorities after refit. The problems with the TPAs and potential lifeboat engine problems were not identified

Outstanding questions

What would have been the outcome if the ship had to be abandoned when surrounded by dense drift ice? Rather than just meeting the current SOLAS regulations should cruise companies not carry out a safety case analysis based on the reality of working in these harsh waters? Such a safety case could use the presence of expedition gear such as Zodiacs to justify operations in such an area.

With increasing reliance on inflatable liferafts, how would they cope in sea conditions in the presence of ice? Considering the potential for damage to lifeboats from icebergs when the ship has lost propulsion and is drifting out of control, is there not a case for passenger ships operating in Antarctica to be equipped with 100% capacity on each side? Such lifeboats should be conventional covered lifeboats to the latest standard, irrespective of the age of the ship (on 28 December 2007 such an incident occurred to MS *Fram*. With engine failure she drifted into an iceberg which damaged a starboard lifeboat).

Such lifeboats should be designed to a higher passenger weight (75kg) and ship width (430mm) than is currently required by SOLAS?

Is it appropriate that passengers on ships operating in Antarctica should be denied the benefit of immersion suits?

Should such passengers, already encumbered by heavy clothing, be further restricted by existing conventional lifejackets?

Is it appropriate that vessels carrying thousands of passengers operate in these waters, when the likely size of vessel available to respond to a Mayday coupled with the size of land-based refuge, is taken into account?

I believe that passenger operations in Antarctica have a useful role in educating people especially with regards to global warming and the need for change, but just as *Explorer* helped start this process, her demise also provides a stark warning for ships operating in this area. If not heeded there exists the very real possibility that next time it will be a disaster rather than an adventure that is reported in the media. **NA**



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There is life on MARS

Expressions of interest have finally been invited from potential builders of the new generation of tankers set to fulfil the Royal Fleet Auxiliary's future Military Afloat Reach and Sustainability (MARS) programme.

The Ministry of Defence's Abbey Wood, Bristol branch has posted an invitation in the Supplement to the Official Journal of the European Union covering the design, build, outfit, and delivery of up to six fleet tankers.

The tanker programme is being given priority over separate schemes to build a 'Fleet Solid Support' ship for the RFA (for munitions, victuals, and general stores underway replenishment) and a Joint Sea-Based Logistics (JSBL) vessel configured to support amphibious operations.

As part of the initial tanker construction project, the MARS integrated project team (IPT) is also seeking the provision of support information including drawings, computer models (including CAD models), and operation and maintenance manuals, as well as training media and the initial training for ship staff.

Those attracted to the project are also being asked to list and present the items and spares to support the first two years worth of maintenance requirements, including overhauls.

Placing the invitation in the Official Journal confirms that no favours will be given to UK shipbuilding in assessing offers, as the MARS tankers are not considered to be 'grey' ships. The announcement is clear

in its quest for competitive prices and the pursuit of 'reduced whole life cost by exploiting commercial best practice and with designs that can demonstrate cost benefits throughout 25 years of service life'.

The fleet tankers will replace current RFA platforms and comply with the emerging International Maritime Organization (IMO) requirements for double-hulled tanker operation. They will need to be able to operate globally, with the ability to out load from secure ports, in the UK, consolidate cargo in commercial ports, and to use drydock and repair facilities within the UK.

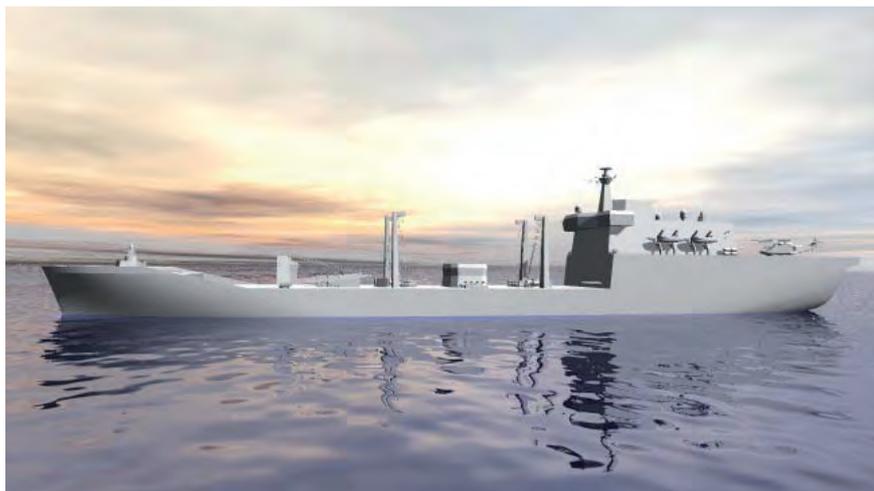
The MARS IPT has specified that fleet tankers must be constructed with quality equipment and material of proven reliability and be:

- a. Interoperable to NATO standards and with NATO assets
- b. Designed to maximise reliability, facilitate ease of maintenance, repair, or replacement and minimise through life costs
- c. Designed with open architectures that facilitate support and readily enable future capability upgrades and incorporation of emerging technologies
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4. The ability to operate at sustained speeds of 15knots in Sea State 5; offering a range of 7000nm
5. The ability to replenish at sea rigs to include three abeam tensioned jackstay rigs, one astern fuelling reel, single buoy mooring point
6. A helicopter deck and facilities for maintenance and refuelling
7. Accommodation for up to 100 persons of mixed gender to UK Flag merchant standards
8. OCIMF compliance
9. Classification to Lloyd's Register Naval Ship Rules with Naval Ship Auxiliary notation
10. Medium-speed diesel propulsion operating on MGO fuel
11. Passage through Panama and Suez canals, maximum draught of 11m, maximum air draught of 39m, maximum length of 220m

The MARS IPT is looking for expressions of interest from a minimum of three and a maximum of six potential bidders. The deadline for expressions of interest is given as 15 February 2008. **NA**



Computer generated image from 'Concepts for a fleet tanker: an exploration into options and pricing', by S L Cooper, Ministry of Defence, D P G Burger, Graphics Research Corp, T P McDonald, University College London, UK, presented to RINA's Military Support Ships conference, 13-14 November 2007.

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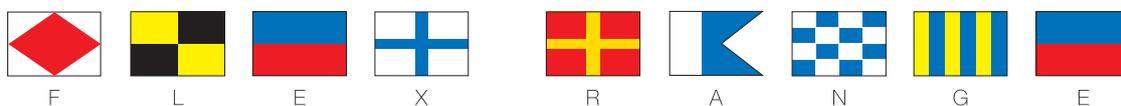


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Chugoku sets sights on silicone

Chugoku Marine Paints has launched what it is terming a 'second-generation' silicone-based foul-release product for vessel hulls.

Chugoku Marine Paints is emphasising its balanced portfolio of antifouling coatings, after adding an upgraded version of its low surface energy silicone-based fouling-release coating to a range that also includes tbt-free self-polishing copolymers and copper free self-polishing copolymers.

Its latest product is an advanced version of the CMP Bioclean HB, which the supplier says is the result of over 20 years experience with silicone technologies in the industrial field, where it has supplied 1.5 million m² of paints, and know how gained from supplying CMP Bioclean HB products to marine customers over the last decade.

'CMP Bioclean HB provides a surface on the underwater hull which when compared to existing silicones is ultra smooth, arising from a more open and even surface,' according to the company.

This feature results in:

- Improving smoothness by 25%
- Further reducing adhesion of fouling
- Enhancing reductions in fuel consumption
- Minimising CO₂ emissions

The product is said to be environmentally friendly, as a result of being biocide free, and emits very low levels of volatile organic compounds (VOC). In addition: "The system consists of fewer coats than has been required in the past, consequently reducing the costs in the dock."

The manufacturer has also introduced a version of CMP Bioclean HB specifically developed for rudders and propellers. CMP Bioclean R provides 'outstanding levels of performance in this difficult and aggressive area of the vessel when in service,' according to the supplier.

'Both of these developments demonstrate Chugoku Marine Paints' commitment to invest in the development of coating systems providing environmental and economic benefits,' the supplier says. **NA**



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Cruiseship safety forum launched

December saw the first steering group meeting of a new pan-cruise industry consortium, which has come together to advance cruiseship safety in a coordinated and focused manner.

The newly constituted Cruise Ship Safety Forum includes leading cruise ship operators, classification societies, and shipyards with a keen interest in the cruise sector, as well as the Cruise Lines International Association. It is the result of an idea first proposed by Hari Kulovaara, senior vice president, operations, Royal Caribbean International.

Alongside RCI, the steering committee includes Carnival Corp and Norwegian Cruise Lines, class bodies Lloyd's Register, Det Norske Veritas, and RINA, and cruise shipyards Fincantieri, Aker, and Meyer Werft.

Former International Maritime Organization Maritime Safety Committee chairman Tom Allan is chairing the steering group. Its remit is to provide direction for the embryonic forum, which is expected to attract wider representation from the cruise industry, and will be open to all CLIA members and, by invitation, to their technical consultants.

With senior representation from 'all three sides' of the industry, Mr Allan said that the Forum had been set up 'to develop and promote a unified strategic direction for advancing cruiseship safety issues in their broadest sense; to include, for example, security, health, and environmental matters.' He said the body would 'proactively address issues as they relate to the future of the industry, as they pertain to the design and construction and operation of

new cruiseships and modification of existing cruiseships'. It would also provide a forum to consider regulatory and other safety initiatives and develop and pursue 'a coordinated position to external bodies such as IMO, the EU, and the wider shipping community'.

Given the *Explorer* sinking, some may feel the launch of the CSSF is timely, although Mr Allan emphasised that CSSF's initiation long preceded the event. 'There are cases where we may need to react to accidents that provide lessons for the industry. But what we are trying to do is to make sure that such accidents don't happen in the first place.'

Already, five issues have been identified for immediate consideration.

Two relate to ships returning to port in the case of an accident. Mr Allan said the CSSF would look to develop clarificatory, unified interpretations of ship safety regulations, in a discussion that would likely lead to joint IACS/CLIA submissions to the IMO aimed at ensuring that operators can establish that they will comply with future regulation. The second strand, here, would address survivability, to establish clearcut guidelines for masters involved in accidents, as to whether they should return to port, stay where they are, or abandon ship. Class societies would take the lead role in this area.

On the operational side, where cruiseship companies would take the lead, the CSSF

would develop advice concerning the operation of watertight doors. Mr Allan said a number of accidents had been exacerbated by 'confusion over whether watertight doors should be open or closed. The cruiseship industry needs advice here, developed in conjunction with [IMO] Member States.'

Another area for review concerned hull underside surveys, where the Safety of Life at Sea Convention is mute over whether such surveys are done in or out of the water. The CSSF would develop proposals for the IMO to standardise surveys carried out underwater.

A fifth issue, driven by the US Access Board but still developing, related to visual emergency alarms designed to protect the hard of hearing, but which are not confusing for other passengers.

Mr Allan said that the self-funding Safety Forum's future meetings would coincide with industry gatherings, with a meeting planned for Seatrade, Miami, and another for May's MSC.

Indicating that the Cruise Ship Safety Forum was at just the start of its work, as issues on the current agenda are dealt with, new matters will take their place. Issues for future steering group consideration include bridge navigation systems, the human element in general, search and rescue, lifesaving and evacuation, smoke management and, in a first environmental topic, 'the carbon footprint'. **NA**



Timely action?
The heavily listing
Explorer in the
Bransfield Strait on
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The second largest Cunarder ever built, *Queen Victoria*, entered service at the end of 2007. Clare Nicholls profiles the vessel.

Now in service, *Queen Victoria* is of a grand scale, being one of the largest Panamax cruiseships built to date. At 90,049gt she is 294m long, with a main hull breadth of 32.25m, and a design draught of 7.9m.

As is widely known, however, at its

TECHNICAL PARTICULARS

Queen Victoria

Length, oa	294m
Length, bp	265m
Breadth, moulded, main hull	32.25m
Draught, design	7.9m
Gross	90,049gt
Deadweight, design	7685dwt
Main engines.....	4 x 11,520MW/ 514 rev/min; 2 x 8640MW/ 514rev/min
Speed, service, 90% MCR.....	21.7knots
Passengers.....	2014
Number of cabins.....	1007
Classification	Lloyd's Register

initial design stage the famous ship was not conceived as a 'Cunarder'. Rather, Carnival Corp had booked a slot for a Vista class cruiseship from Fincantieri, envisaging a sister for Holland America Line's vessel *Oosterdam*. Changes in the group's operations saw that contract transferred to Carnival's Cunard division with the intended name *Queen Victoria*. The basic HAL design was modified, with 11m added to the length and trademark 'Cunard-style' features incorporated which had proved successful with *Queen Mary 2*.

At the same time, the 'original' slot booked with Fincantieri for *Queen Victoria* was transferred to P&O Cruises, following a further management change, and the ship that duly emerged, in 2005, was *Arcadia*.

Queen Victoria was christened in Southampton by the Duchess of Cornwall on 10 December 2007 - the champagne bottle failing to smash against the bow.

Externally, *Queen Victoria* follows the Holland America Vista class profile, but

additional strengthening has been included to suit Atlantic weather conditions, including thicker bow plating.

Twelve decks provide accommodation for 2014 passengers in lower berths, in 1007 cabins, 718 of which have balconies. There are eight different types of cabins: Grand Suites, Master Suites, Penthouses, Queen's Suites, Princess Suites, Balcony, Inside, and Outside.

The interior design of the cruiseship is striking, spearheaded by the three-storey-high Grand Lobby, which features a dramatic staircase and exclusive works of art. Other focal points include three stair towers arranged along the length of the ship, each also incorporating four 18-person lifts. Also utilising the three-storey height created by the lobby is the Royal Court theatre with 830 seats, reckoned to be the only ship-borne theatre to have private boxes.

Restaurant facilities comprise the exclusive 150-seat Queens and Princess Grill, the Britannia Restaurant with 900 seats, the Todd English with a small 100-

At 90,049gt, *Queen Victoria* is one of the largest Panamax ships built to date.



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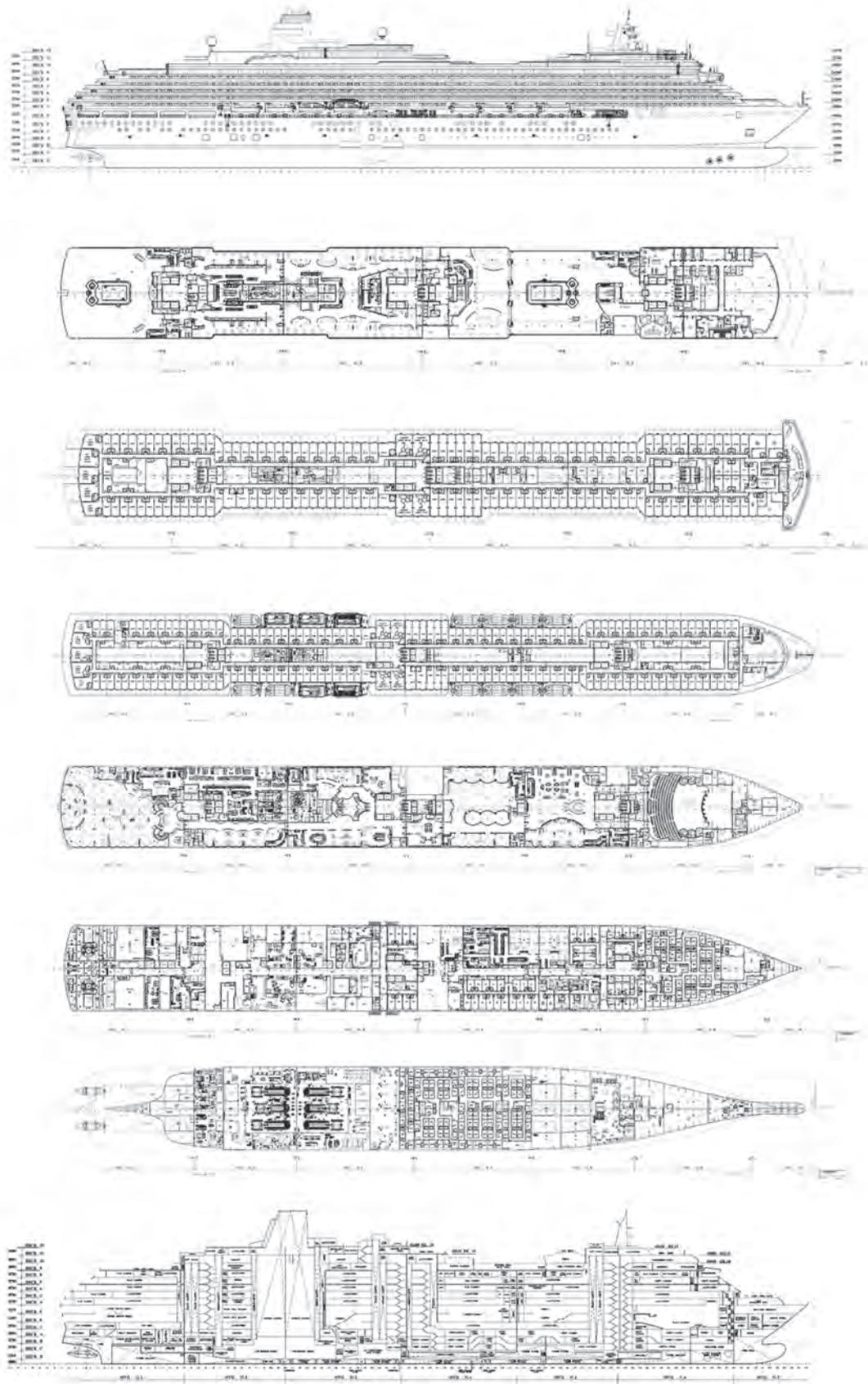
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General arrangement plan
of *Queen Victoria*.





Faster and further with Ecospeed

Ecospeed is an extremely durable hull coating that will save on fuel costs and give increased speeds. It is expected to last for up to 25 years and is guaranteed for 10.

Amongst recent applications are a 275 metre, 5000 TEU container ship, several ice-class cargo vessels and a major cruise liner—with more of each category planned for the near future.

The Belgian Navy have been using Ecospeed on a number of their vessels since 2004 and have committed to applying it on the remainder of their fleet as the time comes for repainting.

The growing appeal of Ecospeed comes down to a number of key factors.

The final hull surface has very low roughness levels. This, together with its corrugated surface, gives fuel savings through reduced consumption and increased speed.

The strength and impermeability of the coating provides a very high degree of protection against mechanical impact and corrosion. The endless cycle of hull repainting every two to five years can therefore be dispensed with. Even after being tested under extreme Baltic winter and ice conditions it has proven to

be an effective protection against mechanical impact.

In addition, the coating has no adverse effect on the environment as it is entirely toxic-free.

Ecospeed can be used on most ships, offshore vessels and structures. It has proven to be ideally suited for fast moving container and cargo ships, cruise vessels and ice-going ships. Its use can remove major headaches for ship superintendents. With no repainting necessary, yet protecting the hull surface against corrosion, there will be many additional advantages such as significant savings on repair and maintenance costs.

seat capacity, and the informal Lido buffet with a capacity of 450. The Golden Lion pub also offers traditional English food for lunch.

At the top of the ship is Hemispheres, an observational lounge with 270deg views which doubles as a lecture room by day and a nightclub in the evening. Queens Room is a two-deck high ballroom, and the Commodore Club observation lounge features a full bar and offers sweeping views over the bow.

The ship's machinery installation repeats that of *Arcadia*, utilising a diesel-electric system driven by six Sulzer ZAV40S main engines manufactured by Wärtsilä.

Four of these diesel engines have 16 cylinders, developing 11,520MW at 514rev/min each, with the other two having 12 cylinders giving 8640MW at 514rev/min each. The vessel is propelled by two ABB Azipod propulsors positioned under the stern, each with a fixed pitch Zvyozdochka propeller. Combining varying the speed of the propellers with the ability to rotate the pods independently through 360degs provides both steering and manoeuvrability.

Each engine is connected to an alternator, again of ABB manufacture, which supplies both the domestic load and two 17.6MW propulsion motors, resulting in a service speed of 21.7knots at 90% MCR. Tanks forward and aft control heel, and a pair of active, retractable fin stabilisers reduces roll.

Queen Victoria is additionally fitted with three Fincantieri bow thrusters with an output of 2200kW each. The vessel is



The retractable glass roof of the Winter Garden Lounge being constructed.

able to carry bunkers of 3380m³ of heavy oil and 235m³ of marine gas oil, with a water ballast capacity of 4900m³.

The vessel is staffed by a compliment of 154 officers and 287 crew. A SAM Atlas NACOS bridge control system, along with four SAM Series 1029 radars help to steer the ship.

13,500m² of exterior glass was treated with ClearShield glass surface protection from Ritec, providing a barrier to contaminants such as sea water deposits, weathering, and engine exhaust.

Hamworthy has supplied the membrane bioreactor sewage treatment plant, as well as a desalination plant comprising multi-stage flash evaporators. Waste compactors and shredders were manufactured by

Deerberg, and a Scanship incinerator is also fitted.

Safety features include 16 lifeboats, able to carry up to 150 persons each. Five of the lifeboats will be used as tenders to transfer passengers from the ship to shore. Navalimpianti manufactured the davits, combining a telescopic solution for the tenderboats, with *Queen Victoria* said to be the only cruiseship in the world to feature this system, and a semi-gravity solution for the lifeboats.

Consilium provided its NS AC 1 fire detection systems, and Marioff supplied Hi-fog fire extinguishing systems.

The vessel is classed to Lloyd's Register, + 100A1, + LMC, UMS, Passenger Ship, Unrestricted Service, UWS standards. **NA**

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New power for the Millennium

Celebrity Cruises' Millennium class vessels have each had a diesel generator plant fitted in a bid to reduce annual fuel consumption.

The four vessels in Celebrity Cruises' Millennium class are among the most technologically advanced in the company's fleet, with each having been delivered since 2000. They were the first passenger ships to be powered solely by gas turbines but rapid rises in the cost of the fuel in recent years took their toll on the ships' profitability.

Therefore, in 2007, a project was initiated to install diesel-electric power to complement the gas turbines, intended to save an estimated US\$6 million annually in fuel per ship by using less expensive diesel fuel. With each ship weighing in at 91,000gt, and the space constraints that accompany attempting to cram an 11.3MW-producing diesel-electric generator into an engine room already filled with gas turbines, it was clear that the installation would require a great deal of planning.

The work was project managed by Aker Yards Lifecycle Services, under the supervision of Celebrity Cruises and Lloyd's Register, and each vessel underwent or is due to undergo a 17-day drydock programme at Sobrena shiprepair yard in Brest, France. Collaboration between the three companies started 12 months before work began, which helped to ensure that the proposed

modifications to the ships' structures were fully appraised and that any issues were resolved beforehand.

The appraisal covered, for example, the necessary marine gas oil to heavy fuel oil tank modifications, the electrical system integration, vibration simulation, sea and fresh water cooling upgrades, steam power plant calculations, and the ships' revised safety and fire-fighting control plans. Additional crew members also pried out and moved equipment, laid piping, and carved out space for the new engines, in order to further decrease the time needed for the retrofit.

'There was close cooperation between all three parties throughout, and this all proved worthwhile when the vessels departed drydock after 17 days with all engineering work complete and without unexpected technical surprises,' commented Richard Goodwin, manager, passenger ships, at Lloyd's Register.

The higher efficiency of the diesel generators should enable each ship to reduce its overall fuel consumption by approximately 3600tonnes a year. The generators will provide base load power, covering the hotel functions such as lighting, air, and galley operations while the ships are in port, as well as propulsion at low speeds. At intermediate

speeds, they will operate in parallel with one of the existing gas turbines when cruising speeds reach at least 7knots, and the turbines will now only take over completely at high speeds.

The project required more than 4miles of additional piping and two new boilers, a new fuel treatment plant, fuel tank conversions, and other modifications.

An integral part of the new installation on each ship was a pre-fabricated 200tonne double bottom hull segment, which replaced the part of the hull that was removed to make the modifications possible, and which formed the foundation for the diesel generator plant itself. Lloyd's Register integrated closely with the onsite teams so that classification could proceed quickly and without difficulty, minimising disruption to the schedules of the Millennium class cruiseships.

'Cruise line operators operate their vessels to unyielding time schedules,' says John Kroussouloudis, senior vice president marine operations, Celebrity Cruises. 'When it is necessary for ships to be removed temporarily from service, we expect a trouble-free project. With such a tight timeframe on this occasion, Lloyd's Register's assistance has been invaluable.'

Celebrity Millennium had its refit in April 2007, followed by *Celebrity Constellation* in May. Both ships are back in service, and the generators are providing the fuel economy benefits anticipated by Celebrity, as well as demonstrating excellent noise and vibration behaviour, says the company.

Similar installations are due during the drydocking of six other ships, comprising *Celebrity Summit* and Royal Caribbean International's four Radiance class ships, then concluding with *Celebrity Infinity* in November 2008. **NA**



A hydraulic lift boosts a prefabricated diesel-electric engine block into place on the starboard side aft of *Celebrity Millennium* during an April drydock.

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Wastewater regs ripple through

Hamworthy and Aker are among those already outfitting cruiseships with water treatment systems complying with IMO wastewater discharge regulations that affect new ships built after 2009. Clare Nicholls reports.

New maritime wastewater rules are being introduced which apply to ships with keels due to be laid on or after 1 January 2010 that follow the IMO jurisdiction. MEPC 159(55), 'revised guidelines on implementation of effluent standards and performance tests for sewage treatment plants', specifies that the following effluent standards should be met for treated black water:

- Bacteria: 100 faecal coliforms per 100ml
- Total suspended solids: 35milligrams per litre
- Organic matter measured as biological oxygen demand (BOD5): 25milligrams per litre as a mean value
- Organic matter measured as chemical oxygen demand (COD): 125milligrams per litre
- A pH level of 5 to 8.5
- No visible floating solids or discolouration of the surrounding water of the vessel

IMO does not regulate dumping of untreated wastewater into the ocean outside of 12nm from shore, but local regulations may prohibit such discharges. These local regulations are in many cases stricter than the new IMO rules anyway, and will supersede the new IMO wastewater discharge standards. The stringent discharge rules in Alaska, USA, which may become even stricter in the near future, represent one such example.

Stricter rules also apply in the rest of the waters surrounding the USA, where US Coast Guard (33 CFR 159, USCG MSD regulation) prevails for US-flagged ships. Foreign ships with IMO-approved sewage systems will, however, be exempt from these rules.

Traditional marine sanitary devices built to the previous Annex IV standard will not meet MEPC 159(55), and may fail to meet most MEPC 159(55)-regulated parameters. However, Aker Yards' Advanced Wastewater



The membrane arrangement of the MBR onboard *Queen Victoria*.

Purification Plant (AWP) does meet the requirements, and has also been designed to meet the rigorous Alaska-Murkowski standards.

Aker's Scanship AWP system is now being installed aboard cruiseships built at the company's St Nazaire yard in France.

The plant is said to have proven its reliability and satisfied performance criteria, and can increase the operational flexibility of a ship, opening up new sailing routes, simplifying onboard water logistics, and ensuring compliance with local and international regulations.

Another firm which is preparing for the enforcement of MEPC 159(55) is Hamworthy Water Systems. Its Membrane BioReactor (MBR) meets the IMO regulations and also satisfies Alaskan standard 33CFR159.309.

The MBRs utilise a combination of biological treatment and side stream crossflow membrane technology. A 3m/s crossflow is maintained to eliminate blockage and to keep the membrane surface clean for good permeate production.

The system uses no chemicals for the main process, and the membrane modules are readily accessible and may be easily and quickly cleaned in place. Side stream, low-pressure tubular membranes can achieve much higher flux rates than submerged membrane systems, resulting in a smaller membrane area and allowing independent location of the membranes from the process tank.

Hamworthy's ongoing product development over the last six years has produced the Mk II and Mk III MRB systems, which are reckoned to have achieved around a 20% to 25% saving on energy consumption and a greater saving on operational man-hours. MBR has so far been fitted to 17 cruiseships, comprising both retrofits and newbuildings.

During 2007, Hamworthy completed *AIDAdiva's* system installation at Meyer Werft, encompassing two MBR600 Mk III units treating black water and all grey waters, including waste food water. The plants are equipped with a satellite communication system to facilitate technical support and service.

In addition to three repeat shipsets for Aida Cruises, Hamworthy is supplying two MBR 140s to T Mariotti for each of the 450-passenger ultra-luxury cruise vessels for The Yachts of Seabourn. Working in partnership with the builder, Hamworthy designed the process tanks for local manufacture, and the modular design of the associated equipment endows flexibility to the plant configuration.

The Mk II variants of the MBR supplied to Seabourn will treat all black and grey water onboard the ships. The equipment for the first of the vessels, *Seabourn Odyssey*, was delivered in December 2007 for installation during 2008.

Hamworthy engineers are also fitting two

MBR240 Mk III type plants on *Eurodam*, being built by Fincantieri on behalf of Holland America Line. Commissioning and handover will be during the summer of 2008.

Victorian excellence

Cunard Line's cruiseship *Queen Victoria* has also had two MBR320 Mk III units installed, each capable of processing up to 320m³/day of black and grey water. Crew training and plant familiarisation was undertaken during the maiden voyage on 11 December 2007 with a full complement of 3000 passengers and crew.

The MBR project for this vessel was unusual because of the ship's construction schedule, said Allan Bentley, managing director, Hamworthy. When Fincantieri received the newbuilding order, the shipyard had a slot available to build one module, which was then 'mothballed' for a year until work started on the rest of the ship. 'Half of the MBR's main process tank is located in that module,' Mr Bentley said. 'About two years elapsed between delivering the first part of the plant and commissioning the complete system once the other half had been installed in the adjacent ship section.'

The MBR was not the only water system Hamworthy supplied for *Queen Victoria*. Three Serck Como multi-stage flash (MSF) evaporators were also fitted, producing fresh water for the cruiseship. Two of the MSF evaporators have a capacity of 650m³/day and the other produces 400m³/day.

For the MSF evaporator, steam, engine jacket water, or a combination of the two can be used for heating. Seawater is first pumped through a cascade of condensers for heat recovery, and then a heat exchanger.

After heating to a specific temperature, which is typically 80°C, all energy required for evaporation is stored in this stream of hot seawater. Once this has been injected into stage one, evaporation takes place through stepped pressure and temperature drops in the flash evaporation stages, without further heat transfer.

Wei Chen, research and development manager, Hamworthy, commented: 'There have been two distinctive operational requirements and system configurations in terms of black and grey water treatment on



The mezzanine deck of the Hamworthy MBR *AIDAdiva* installation, showing the membranes below and the main control panels above.

large cruiseships. One is "full treatment", ie to treat all the wastewater, including black water, accommodation grey water, laundry water, galley water, and in particular waste food water. This incurs a greater amount of residuals generated from the wastewater treatment processes, which often requires the residuals to be dewatered, dried, and incinerated onboard where permitted.

'The other configuration is "partial treatment" ie to treat all black water and partial grey water. This configuration also satisfies regulatory requirements and environmental compliance by balancing the wastewater treatment capacity and ship holding capacity according to the ship itinerary.

'With this configuration, there are much less residuals from the treatment processes, and therefore they can be managed without the additional resources and the environmental concerns associated with the thermal drying and destruction of the solid wastes. The MBR systems for a "partial treatment" configuration are also smaller due to reduced capacity requirement. Hamworthy has MBR systems serving both configurations.' **NA**

An Odyssey in luxury

The Yachts of Seabourn has recently added a third ship to its order of two ultra luxury cruiseships.

A year after Seabourn, a division of Carnival Corp, announced that it was contracting T Mariotti of Genoa, Italy, to build two new ultra luxury ships scheduled for delivery in 2009 and 2010, the company has exercised the option for a third ship for delivery in spring 2011. The total cost for the three sister ships amounts to €550 million.

‘Our decision to order a third ship is based partly on the enthusiasm we have already seen for our new ship design,’ said Seabourn president and chief executive, Pamela Conover. Marco Bisagno, president of T Mariotti, noted: ‘It has become increasingly clear that this design is the perfect balance of intimacy and amenities that foretells the future for ultra luxury cruising vessels.’

The eagerness to extend the contract follows a successful advanced booking period for cruises aboard the first ship in the series, *Seabourn Odyssey*.

At 32,000gt, these vessels will be able to accommodate 450 guests in 225 luxury suites, claimed to be one of the highest space-per-guest ratios in the industry. The ships are specifically designed by Yran & Storbraaten to balance luxury and elegance with advanced technologies and

new materials. The design also considers Seabourn’s small ship signatures, such as its personalised service and fine dining, with the added spaciousness, features, and amenities that a larger vessel will allow.

According to Micky Arison, chairman of Carnival Corp: ‘This new trio of beautiful, yacht-like ships will maintain Seabourn’s role as the leader in the ultra luxury segment, and position the company to satisfy the growing demand among affluent travellers for more ultra luxury cruising options.’

The cruiseships will be around 198m long, with a beam of 25m, and a draught of 6m. Two fully independent engine rooms for diesel-electric generation will be employed, along with two fully independent propulsion compartments which contain the electrical propulsion motors and associated control and propeller shafting for twin screw propellers. Service speed is 19knots, and the electrical generators are four Wärtsilä 12V32 type at 5/760kW each.

The electrical propulsion system is by SAM Electronics, and the vessels will also be equipped with two bow thrusters and two stabilisers to enhance manoeuvrability. Steering gear and rudders will be supplied by Rolls-Royce.

A ‘green’ theme is also very much in evidence with the addition of two independent Hamworthy advanced wastewater systems, and fancoil assisted air conditioning, reducing the consumption of fuel for cooling. A new design for food waste handling will greatly reduce the consumption of water in the galleys, and the ships will qualify for Green Ship, Clean Sea, and Clean Air standards.

The series has also attained Green Star status, the highest rating for ships employing advanced wastewater treatment technology to minimise pollution and protect the air and sea environment.

The ships will be fully compliant with new IMO safety standards, even though two of the vessels will begin construction before the implementation of the requirements. An advanced safety management system will integrate all safety systems and provide computerised decision support and dynamic monitoring of damages and water ingress in an emergency. The HI-FOG fire-fighting system for all accommodation and service areas gives total and local protection of machinery spaces in compliance with SOLAS regulations. **NA**



A rendering of the final design of *Seabourn Odyssey*, the first ship in Seabourn’s ultra luxury cruiseship series.

Converteam leads by example

A new electrical control system for NCL cruiseships.

Work is progressing on the cruiseship industry's first commitment to Converteam's new advanced digital electrical control system, with the installation of high-torque density induction motors onboard two new 4200 passenger capacity vessels under construction for NCL at Aker's St Nazaire yard.

Including MV7000 converters, the contract also specifies 12 generators (six per ship) with a total power of 160MW, to be supplied by Converteam Ltd (UK), and 12 electric motors for thrusters (six per ship) with a total power of 30MW, to be manufactured at Converteam Motors' Nancy plant (France).

The first 325m long, 150,000gt vessel will be delivered at the end of 2009 and the second in 2010. An option exists for a third ship.

Each vessel will be powered by two shaftlines, directly driven by two 24MW slow-speed induction motors. Supplied through four MV7000 converters using press-pack IGBT (Insulated Gate Bipolar Transistor) technology, Converteam says these motors will help make propulsion more reliable, more efficient, and more compact. The induction motor rotor has no components, such as insulated windings, exciter, rotating diodes, or permanent magnets. Rather, it only has copper bars short-circuited by rings. Thus, the reliability and the availability of induction motors are naturally increased.

Furthermore, the induction motor has a reduced acoustic noise and vibration level, improving passenger comfort, and its simplicity reduces maintenance time and cost.

Converteam has designed a dedicated marine HTD (High Torque Density) induction motor with optimised cooling, a large air gap, a low resistance rotor cage to decrease rotor losses, and a low frequency machine with a dedicated number of poles.

The PWM MV7000 converter allows electrical energy to be converted from one level of voltage/current/frequency to another by using high level switching components: the press-pack IGBT. The ability to adjust, automatically and during operation, both PWM patterns and frequency allows the control to keep drive output active power constant, regardless of the motor power factor

variation. Thus, no converter oversizing is required linked to motor power factor design.

Propulsion plant efficiency is high (around 94%) and no harmonic filters are necessary to be compliant with the maximum Total Harmonic Distortion (THD) allowed by classification societies. In addition, generator sizes are reduced (power factor up to 0.9). **NA**



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Liberty has designs on *Independence*

Royal Caribbean has employed designers on both sides of the Atlantic to give its Freedom class vessels a distinctive feel, writes Clare Nicholls.

Independence of the Seas is the last in Royal Caribbean International's Freedom class series, and at 160,000gt and 339m long, is a sizeable undertaking in design and architecture. The same format has been used on all three Freedom class vessels, starting with the 2006 delivery *Freedom of the Seas* through to 2007's *Liberty of the Seas*, with *Independence of the Seas* due to embark on its maiden voyage in May 2008, and using many of the same contractors as the previous builds.

Independence is currently being constructed at Aker Kvaerner's yard in Turku, Finland. It has four bow thrusters fitted, and a cruising speed of 21.6knots. 15 passenger decks accommodate 3634 guests utilising double occupancy, and 4375 guests in total. The ship will be manned by 1360 Norwegian and international crew.

Royal Caribbean Cruise Lines' in-house design team, the Newbuilding & Fleet Design Group based in Florida, USA, was responsible for the arrangement of the crew areas, suites, and various public areas aboard all vessels in class. Tillberg Design AB of Sweden provided the design of the three tier main dining rooms, using rich, vibrant colours and deep wood tones.

American company RTKL undertook interior architecture and design services for the vessels' Photo Gallery, Jazz Club, Diamond Club Members Lounge, Conference Centre, Business Services, and the Casino Royale. However, the 'Gambling with the Stars' artwork aboard *Liberty's* Casino Royale boasts a notably different theme from *Freedom's* 'Great Gatsby'.

London, UK-based design team Ltd's involvement in *Liberty's* design comprised The Sphinx Show Lounge, Connoisseur Club, shops, the Royal Promenade four-storey mall, The Catacombs Night Club, library and Internet lounge, and art gallery. The art onboard *Liberty* was



Independence of the Seas is the last of Royal Caribbean International's Freedom class series.

provided by International Corporate Art of Florida, USA, with the company envisioning a unifying and exciting concept of 'illusion versus reality'.

For the whole class, Sweden's Arkitektbyran AB was responsible for the architecture and design of the youth areas, the sports deck, solarium, pool deck, and the Flowrider onboard surf park. The Shipshape Spa and Fitness area onboard each vessel was designed by Stephenjohn Design Ltd of the UK.

Six spaces aboard *Liberty* were designed by USA-based Morris Nathanson Design Inc, consisting of Vintages wine bar, Sorrento's pizzeria, English-style pub Hoof & Claw, Ben & Jerry's ice-cream parlour, and Café Promenade. The 1350-seat Platinum Theatre, the On Air Lounge karaoke club, and Studio B ice rink and performance studio designs were provided by Wilson

Butler Architects in the USA.

English company Project International Ltd collaborated with Royal Caribbean's in-house design team to produce the architectural lighting systems onboard the entire class. Significant advances in lighting technology were used to compliment and define architectural features, as well as providing contrasting effects for the evening operation of the spaces.

Another Royal Caribbean collaboration took place with Tom Graboski Associates Inc (TGA) of the USA, this one for the design of the environmental graphics and signage on every ship across the fleet. TGA completed the primary branding and identity signage for all public room areas onboard, including directional and way-finding signs for guests and crew members. **NA**

First newbuilding for Intersleek 900

MSC Cruises is the world's first company to apply International Paint's new biocide free foul-release coatings system, Intersleek 900, on a cruiseship newbuilding.

The application on the underwater hull of the latest Intersleek 900 foul-release coating on the 23knot, 92,400gt *MSC Poesia*, scheduled to debut in March 2008, was carried out at pre-delivery drydocking of the vessel in St Nazaire, France in early January 2008 by Aker Yards.

Introduced in February 2007, Intersleek 900 is a new and patented, biocide-free fluoropolymer foul-release coating.

The product exhibits a smooth finish, with what the coatings supplier terms 'unprecedented low levels of average hull roughness combined with excellent foul-release capabilities and good resistance to mechanical damage.'

In terms of reduced CO₂ emissions and improved fuel efficiency, Intersleek 900 offers predicted savings claimed to be 6% in comparison to biocide-containing SPC (self polishing copolymer) antifoulings, although in-service experience on a range of vessel types has shown savings considerably higher than this, according to International. The supplier said the potential existed for even greater savings in comparison to controlled depletion antifoulings. Other claimed benefits of Intersleek 900 include no leaching of biocides into the sea, and reduced paint consumption at the next docking.

For the shipyard the Intersleek 900 system on *MSC Poesia* was applied over Intersleek 717 Link Coat, a product especially designed to be

MSC Poesia - a first newbuilding contract for Intersleek 900.



applied to SPC antifoulings in good condition, eliminating the need for grit blasting and specialist waste disposal further reducing the environmental impact of the Intersleek coating process.

John Willsher, Intersleek business development manager, EMEA said: 'With Intersleek 900 quickly building a track record of 90 vessels, it is clear that operators are attracted by the potential benefits on offer.' *NA*

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BMT brings a systematic approach

BMT Defence Services has been engaged in support of Carnival's shipbuilding specification processes for automation systems, working in close collaboration with the cruise giant's newbuild organisation.

When Carnival Corp appointed BMT Defence Services Ltd as a 'Gold Carnival UK Accredited Supplier' last year, few realised the full significance of what has been developing as a unique relationship between customer and contractor, coinciding with the wider BMT Group's launch of the 'Services to Passenger Shipping' initiative.

The contractor has been working on a series of projects for Carnival, helping to refine the technical definition and management of cruiseship systems during both the design and in-service phases. Keith Maidment, a systems engineering manager at BMT Defence Services said that the approach had been devised to review and refine the options for automation as new construction projects move towards the build phase, where the mitigation of risk becomes more difficult. 'At a practical level,' he said, 'we check that the automation system configuration can be traced back to a structured set of requirements, with every element fully justified and matched to the crew profile.'

This project has evolved from a starting point which saw Carnival bring in BMT to advise on concerns over alarm management. Operators have long complained that they are rapidly saturated with redundant alarms when an emergency occurs.

Assessing user needs for forthcoming newbuilds, BMT Defence Services conducted functional analysis of the automation system and its interfaces with power management, HVAC, steering, and other systems shipwide. In essence, the BMT approach identifies and defines the many interfaces between systems and sub-systems so that the number of signals, and thus costs, can be controlled. For example, the interface between diesel generator systems and sub-systems is linked to a signal list that forms part of a highly prescriptive specification which potential suppliers can respond to. The number of required signals is defined and questions can be asked if suppliers



Carnival Cruise Lines vessel under construction at Fincantieri. Image © BMT Defence Services.

recommend any alternatives.

Roger Cooper, managing director at BMT Defence Services, said that the significant progress in the level of assurance had been introduced to 'help Carnival develop sustainable improvements in the way that specifications are produced and placed on their shipbuilders.'

Coral Princess has been used as the 'baseline' in all of these calculations, but the approach has now been successfully

modelled for adaptation to other ships. Carnival staff themselves hold the master model and manage the contents of the database to keep track of any shipboard system.

Currently the analysis is centred on the automation system, but BMT Defence Services has also been working on the Safety Management System and envisages being able to extend the model across the whole vessel. [NA](#)

KONE lifted by new contracts

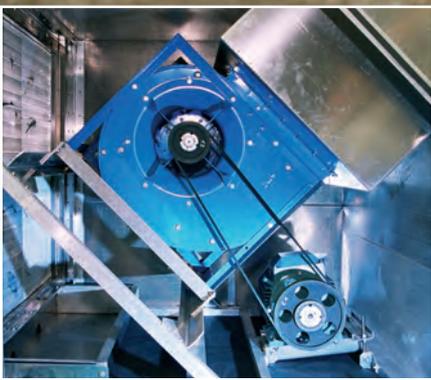
Aker Yards has placed two contracts with KONE for the supply and installation of all elevators aboard Royal Caribbean International's *Genesis 2* cruiseship, and Tallink's *Cruise 5* ferry ship. In total, the orders comprise 53 custom designed elevators, worth approximately €15 million.

Genesis 2 will equal the size of the first *Genesis* luxury cruiseship, claimed to be the largest ever built, at 360m long, with accommodation for up to 5400 passengers. It is scheduled for completion in 2010.

The *Cruise 5* ship from Tallink will be the third in a series of cruise ferries for the Baltic Sea and is due completion in 2009. Both ships will be built in Finland.



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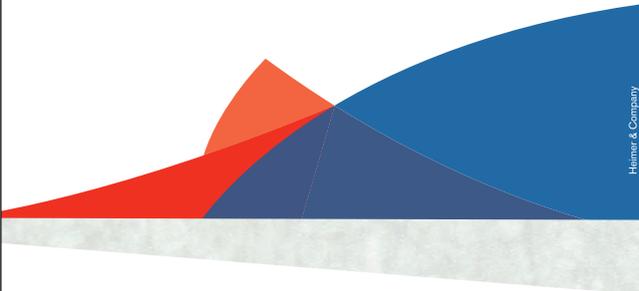




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Constant cruise connectivity

Navitas Telecom is offering a service that enables those aboard cruise vessels to use their mobile phones, whenever and wherever they are at sea, reports Clare Nicholls.

Passengers and crew aboard cruiseships can now take advantage of technology which ensures they are never out of touch with family, friends, or business associates, with users utilising their own mobile phones to make and receive calls and text messages.

Navitas Telecom, part of Jersey Telecom, completed the operational launch of its network in 2007, with a number of cruiseships and ferries already implementing its installation.

Norwegian Cruise Lines' Star Cruises brand is one enterprise which has had the technology fitted on some of its vessels. Four of its cruiseships have so far been equipped with the Navitas network, with a fifth planned for the first quarter 2008.

The first Star Cruises vessel fitted with the system was the 76,800tonne *SuperStar Virgo*, which carries 2500 passengers around the straits of Malacca between Singapore and Phuket. The installation was completed in 2006 over a period of just two days, and comprised a network of 18 base-stations.

The system can be retrofitted, as was the case with *SuperStar Virgo*, using the existing network cabling onboard, which is reckoned to reduce both time needed and cost of deployment. Other contracts for Navitas have included installations aboard three



SuperStar Virgo was the first Star Cruises vessel to have the Navitas network installed onboard.

Tallink ferries, and the cruiseship *Thomson Celebration*.

Navitas' mobile service allows subscribers to roam at sea in the same way they roam internationally. Previously, the only telecommunications available for passengers were satellite telephones, which are said to be considerably less flexible and more expensive to use.

The Navitas system functions by creating and interconnecting an onboard mobile network with traditional land-based networks via a dedicated satellite connection which is provided by partner company SatPoint.

The network is based on Internet Protocol (IP) equipment provided by UK-based Zynetix, and takes advantage of a vessel's existing local area network. The IP-architecture

means the system is much more scalable than some conventional technologies, and can be specifically tailored for the type and size of a vessel.

Travellers and crew members can make and receive calls and text messages either by using their own mobile SIM cards, or by purchasing pre-paid and top-up SIM cards onboard. Roaming with users' own SIM cards enables each caller to be treated as a 'guest' on the onboard network, and calls made onboard are treated exactly like calls made while roaming abroad: callers retain their own number, and roaming charges show up on the caller's mobile bill.

Pre-paid Navitas Freedom SIM cards are claimed to be more suitable for regular users onboard cruiseships, with subscribers able to purchase cards that have an individual phone number for use onboard. By signing up to this service, users can check their credit at any time and top up while at sea, rather than having to wait until the vessel docks.

Callers gain access to a greatly reduced cost structure without roaming charges, with simple control of their expenditure. Top-up cards are available in units of 500, 250, and 100. Call costs depend upon where the phone is used, with charges of between three and nine units per minute, and permanent text message costs of one unit per text message. *NA*



The central network controller, part of the IP equipment provided by Zynetix to enable the Navitas network to function at sea.

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Fincantieri surges on

Two more cruiseships join the crowded orderbook of the Italian yard.

The next few years will continue to be very busy for Fincantieri. Among its latest contracts is a deal with Costa Crociere, the Italian subsidiary of Carnival Corp, to build two new 114,200tonne cruiseships due delivery in 2011 and 2012. The construction of the two vessels is worth a total of around €1 billion, and they will be built at Fincantieri's Marghera shipyard.

These cruiseships will bring Costa's fleet to 17 ships, with five of those currently on order from Fincantieri. The two new ships will be sister ships to *Costa Concordia*, *Costa Serena*, and *Costa Pacifica*, the latter of which is now being built at Fincantieri's Sestri Ponente shipyard.

The new agreement means that, over the course of the last year, Fincantieri's cruise sector orders alone have been extended by 12 ships, of which two are options, with new orders worth over €5 billion.

The two new ships will each be able to accommodate 3780 passengers in total, or 3012 guests based on double occupancy, in 1506 cabins, six more than the other Concordia class ships. Cabins will feature direct access to a restaurant and a 23,000ft² Samsara spa.

Other facilities available for passengers include two swimming pools with retractable magrodomes, with the central one equipped with a giant film screen and racing car driving simulators, plus upgrades to onboard entertainment.

Another success for Fincantieri is the launch of Tallink's *Superstar* cruiseship,



Costa Concordia is a sister ship to two 114,200tonne cruiseships which will be built by Fincantieri at its Marghera shipyard, on behalf of Costa Crociere.

which is building at the Ancona shipyard and is due delivery in early 2008. At 175m long and 27m wide, the vessel has a gross tonnage of 36,000tonnes, a loading capacity of 5000tonnes, and a draught of 7m.

Drawing on an installed propulsion power of 50,400kW, the ferry will be able to reach a speed of approximately 28knots. When the ship enters service, she will have a passenger capacity of 2080 and a crew of 120, with over 240 cabins fitted.

Superstar will operate on the Helsinki-Tallink route and encompasses 9000m² of public areas, a theatre, a show lounge, shops,

two self-service and one à la carte restaurant, and a number of bars. In addition, she will also have a fully equipped business room for passengers who need to work during the voyage.

Other Fincantieri contracts include the construction of a super luxury cruiseship for the Italian owner SilverSea, to be built at Ancona, and the €500 million agreement to build *Queen Elizabeth* for Cunard Line. *Queen Elizabeth* will have a passenger capacity of 2092 and will be built at Monfalcone shipyard for delivery in autumn 2010. **NA**



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More cruiseships join AIDA's club

AIDA expands its club resort concept with an order for two 71,000tonne newbuilds.

Part of Carnival Corp, the AIDA cruiseship brand is undergoing rapid growth with a contract which will triple its total fleet capacity to 16,384 berths by May 2012. The company has signed an agreement with German shipyard Meyer Werft to build two 71,000tonne cruiseships, with the two vessels costing €380 million and €385 million respectively.

These two newbuilds bring to six the new ships that the German cruise operator has ordered within three years. They will be part of the informal club resort concept and are due to be delivered in April 2011 and May 2012.

Additionally, the fourth vessel in the series is being enlarged to make it a sister ship to the two newbuilds at 71,000tonnes; once again Meyer Werft is the contractor. The passenger capacity will now be 2174, and the total cost has risen from €335 million to €350 million.

These vessels will join the 68,500tonne *AIDAbella*, set to debut in April 2008, and an as-yet unnamed sister ship in April 2009.

AIDAbella is currently under construction at the Meyer Werft shipyard in Papenburg, Germany, at a total cost of €315 million. It will be 252m long, with a beam of 32.2m, and a total of 1025 cabins.

The first vessel in the series, *AIDAdiva*, was introduced in 2007 and was also constructed by Meyer Werft. Like



AIDAbella, part of the club resort series, under construction at Meyer Werft's Papenburg shipyard.

AIDAbella, it is 252m long, but with a gross tonnage of 69,200tonnes. Four diesel engines of 36,000kW, two electric engines of 12,400kW, and two propellers give a speed of 22knots.

The ship is fitted with two full balanced twisted rudders, two bow thrusters of

2300kW, and two 1500kW stern thrusters. It is classed by Germanischer Lloyd to 100 A 5 E1 IW Passenger Ship MC AUT RP3 50%/Environmental Passport standards. A maximum of 2500 passengers and 646 crew can be carried onboard *AIDAdiva*, in 1025 cabins. **NA**

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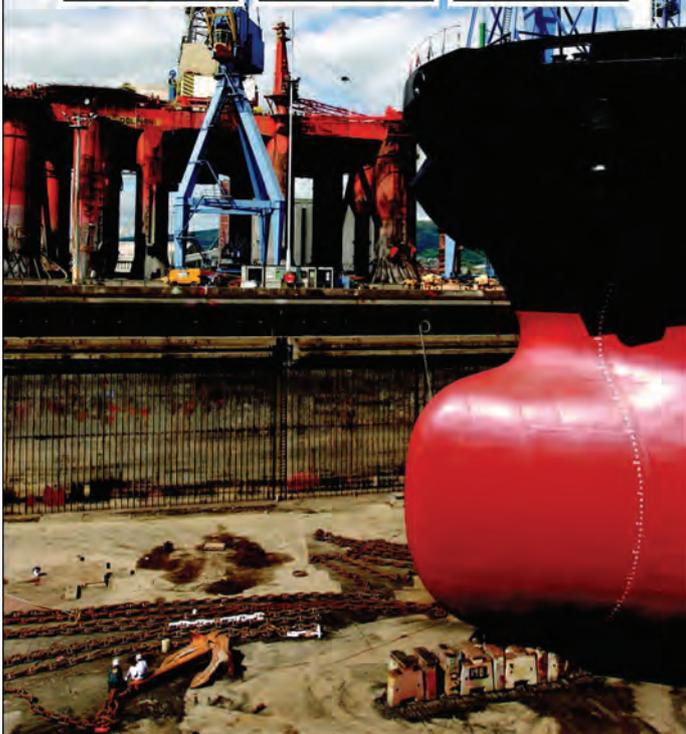
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Getting involved in design

A new opportunity for those toying with a new cruiseship.

For years, automobile makers have provided the more discerning customer with the opportunity of developing à la carte vehicle designs on-line, with a wish list of attributes offered through the on-line shopping experience.

It is, of course, an irony that the reason such possibilities are available is that car construction has become increasingly modular, and individualised configurations are nothing more than 'options offered as standard'.

Now, in a light-hearted, but diverting development, cruiseship specialist Meyer Werft has posted what its spokesman termed 'a new toy' on its website, offering the



Screenshot from Meyer Werft's 'ship configurator'.

casual browser the chance to play around with possible basic luxury vessel dimensions. complex than car making, but Meyer Werft points out that the last five years have seen a push towards the modular approach, and suggests that it may take the on-line offering further in future.

Developed with Oldenburg multi-media agency Viva Vision, the Flash Player-based 'ship configurator' package has been deployed in part to 'show the young generation what is possible, and the opportunities that might exist for apprenticeships and

training in the shipbuilding sector', according to the Meyer Werft spokesman. For more information, visit: www.meyerwerft.de **NA**

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SIGTTO steers IGC Code review

A new steering group formed to revise the 'International Code for the Design and Equipment for Ships Carrying Liquefied Gases in Bulk' met for the first time in London in late January.

The 'International Code for the Design and Equipment for Ships Carrying Liquefied Gases in Bulk' (IGC Code) was adopted by the International Maritime Organization in 1983, although it has been subsequently amended to take into account developments in the industry.

Now, though, the time has come for a fundamental review. Today's ships are not only larger than ever before; some liquefied natural gas carriers include different propulsion technology – whether dual fuel or slow speed diesel, and some include shipboard reliquefaction and regasification plants not envisaged in the earlier code.

Furthermore, in being of its time, the existing IGC Code is based on prescriptive rules, where current thinking at the IMO is for ship construction to aim at goal-based standards. Liquefied petroleum carriers, like their LNG counterparts, could be reconfigured in light of such new thinking.

In representing industry interests, the Society of International Gas Tanker &

Terminal Operators (SIGTTO) informally approached the IMO with a view to bringing the existing code up to date. The discussion resulted in the submission of a paper to the IMO orchestrated through the UK Admisitration to the 83rd session of the Maritime Safety Committee, after which the MSC agreed to include the revision of the IGC Code as a high priority work item on the programme of the Bulk Liquids and Gases Subcommittee. The liquefied gas shipping industry, led by SIGTTO, is due to present the revised Code to the IMO as an information paper at BLG 14, in February 2010.

A steering committee has been put together by Roger Roue, SIGTTO technical adviser. It includes a broad cross section of senior industry representatives, both by function and by geographical location.

Broad interests

Mr Roue, as chair, is joined by IACS representative Jim Gaughan (of ABS), Chris Clucas, who was involved in the latter stages of the original IGC Code,

the Maritime and Coastguard Agency's David MacRae, International Electrical Committee representative Bernard Twomey (of Lloyd's Register), Aker Yards' Ari Sipila, Lauritzen Kosan technical director Peter Justesen, Kawasaki Heavy Industries' Matsato Nakamura, Tractabel's Manfred Kuever, China LNG general manager Doug Brown, former LR head of risk Gordon Milne, Mitsui OSK Line's Kiyotaka Yoshida, Teekay's David MacDonald, IMO Maritime Safety Division director Koji Sekimizu, as well as SIGTTO general manager Bill Wayne.

This steering group, specially selected to represent a broad span of interests and geographical coverage, will oversee the development of a new Code by up to 10 working groups, each including eight to 10 industry representatives.

Mr Roue said the move towards goal-based standards had direct implications for designers of gas tankers. He offered the example of the location of protective tanks. The existing prescriptive rules simply state that such tanks need to be at a given



The LNG Carrier *Al Gattara* introduces a new generation of Q-Flex ships - the first of four for OSG Nakilat. Able to carry 216,000m³ of LNG, Q-Flex innovations include the first-of-its-kind shipboard reliquefaction plant – just one of the factors to be involved in the review of the IGC Code.



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position, derived from a percentage of the beam of the ship. Goal-based standards offered the designer more flexibility, with the requirement being only to demonstrate conclusively that a given tank is able to handle a collision or grounding, in the context of both its location and its protection by surrounding steelwork.

Developing agenda

The agenda for the first meeting, on 25 January 2008, comprised the following areas of review:

- Gas burning propulsion systems
- Reliquefaction systems
- Environmental benefits of gas burning in port, and specifically environmentally-friendly gas burning in the context of restriction placed on such practices by shoreside authorities
- Hazardous area classification in terminals, where the IEC will take a lead
- Manifold strength, where there have been cases of LPG carrier manifolds

buckling when connecting to loading arms

- Shore power systems and the consequences for safety in the context of gas carriers
- Containment systems, to include insulation systems and testing
- Gas combustion units
- Pressure relief systems, where a working group will assess fire hazards related to LNG carriers, and the size and basing of relief valve designs
- Instrumentation and controls including safety aspects of programmable software systems
- Emergency shutdown systems
- Operational training for LNG and LPG carriers, over and above basic STCW training requirements; this item might also later include an initiative aimed at continuous training requirements for steam turbine-powered ships. Despite moves to dual fuel and slow-speed diesel on newer ships, 250 ships remain in service propelled by steam turbines, and

some of them will last up to 30 years

- Personnel protection
- Custody transfer systems/filling limits
- Ambiguous terms and archaic terminology
- Regasification systems; guidance regarding safety aspects of shipboard regasification plant
- Cargo sampling systems; to include guidance on pipe connection failures, specifically following on from the propane leak occurring onboard *Ennerdale* at the UK's Fawley terminal in October 2006
- Prescriptive style

Mr Roue said some consideration would also be given to novel concepts for gas transportation, including compressed natural gas and hydrates, with some members of the steering group having a keen interest in such matters, although he emphasised that the Code would predominantly remain focused on liquefied transportation. *NA*

Qatargas considers engine switch

Charterer Qatargas is considering modifying the propulsion of up to 32 liquefied natural gas carriers, seven of which have already been delivered, in response to soaring bunker fuel oil prices.

Internal discussions are continuing at Qatargas over the possibility of modifying slow-speed diesel engines installed or to be installed aboard up to 32 LNG carriers, all of which are above 200,000m³ capacity, so that they are equipped for gas injection.

The move, which a Qatargas source suggested would cost up to €50 million per ship, would involve adapting the twin 6S70ME-C electronically-controlled, low-speed diesel engines from MAN Diesel installed on each ship so that they can burn LNG. This would involve changing the engines' cylinder heads and compression housing, as well as the introduction of a new fuel system.

The Qatargas source said that the original cost model upon which the selection of low-speed diesel engines had

been based was no longer sustainable, with fuel oil prices unlikely to drop below their current levels of \$470-\$480 per tonne.

He said Qatargas had been in discussion with MAN Diesel over a possible modification project and that the engine builder had subsequently approached the three shipyards constructing the carriers – Samsung Heavy, Daewoo Shipbuilding and Marine Engineering, and Hyundai Heavy – to explore the consequences of such a plan. Qatargas was now awaiting feedback from the shipbuilders.

Economic sense?

The Qatargas source emphasised that no firm decision had been arrived at over the propulsion system change. However, he

added: 'If we can make economic sense of this, we will go for it.'

When first ordered, the low-speed diesel engine option, operating in combination with reliquefaction plant, offered significant efficiency gains over steam turbines. At that time, it was also contended that charterers would prefer to burn diesel and deliver as much LNG as possible. Since then, the rise in diesel oil prices has undermined such thinking, while it is also understood that issues have emerged over diesel oil bunkering per se.

Ships so far delivered for Qatargas, all of the Q-Flex type, have come under the ownership of Overseas Shipholding Group and Pronav. It is understood that owners are awaiting feedback from Qatargas on its deliberations. *NA*

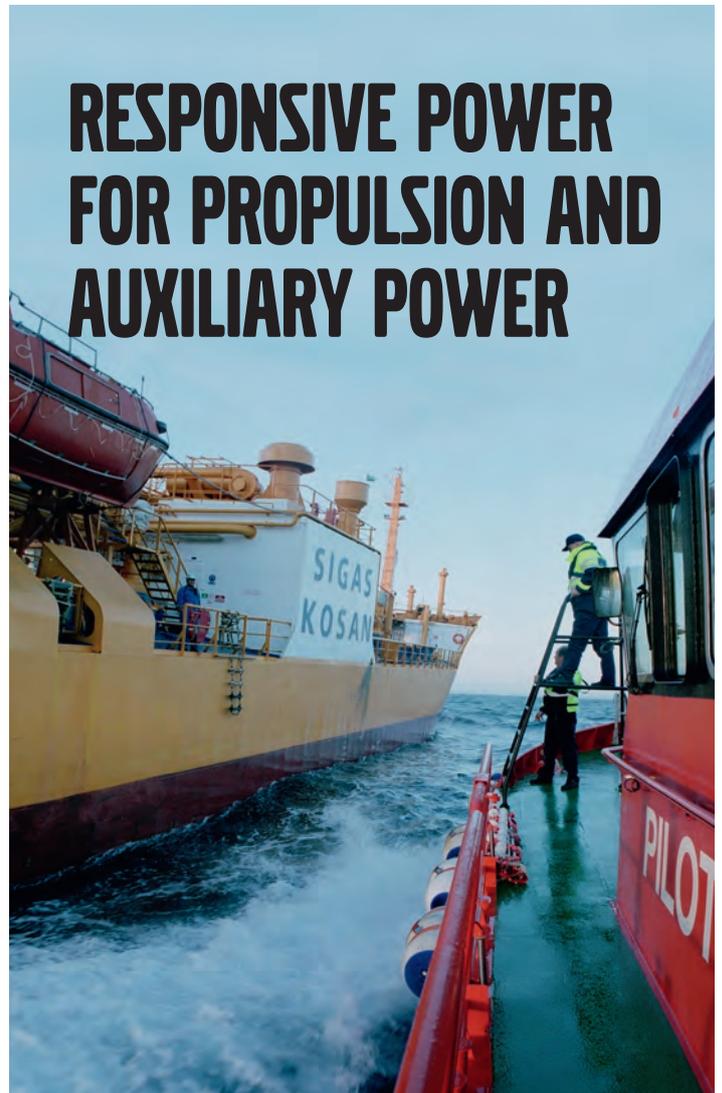
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Golar FSRUs to shine through

Plans involving Golar LNG to convert existing liquefied natural gas carriers into first of their kind floating storage and regasification units are gathering pace, and some of the ships involved are of surprisingly recent vintage.

In January, Golar LNG acquired another LNG carrier earmarked for conversion into a floating storage and regasification unit (FSRU), and disposed of a similar vessel to a consortium of interests, in which it has a stake, with similar plans.

Already under conversion at Singapore's

Keppel yard is the 129,000m³ capacity *Golar Spirit*, the 1981-vintage combined LPG/LNG carrier, which is due delivery as an 'alongside FSRU' to a Petrobras charter in the second quarter of 2009. She is to be followed by the 138,000m³ capacity LNG carrier *Golar Winter*, delivered as recently as 2004, which is due conversion with the same yard to the same charterer by March 2009.

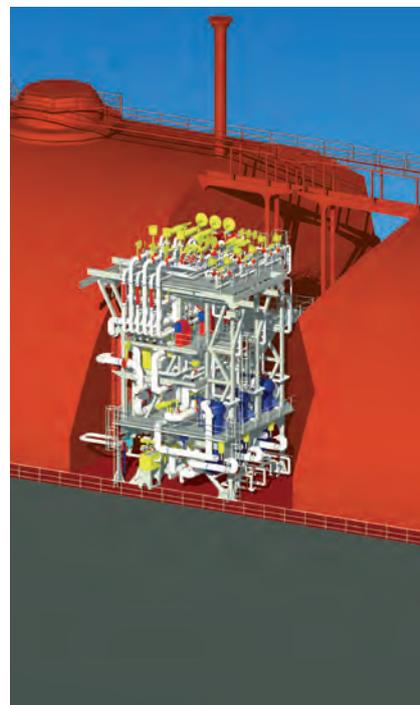
In early January, Golar announced that it had signed a final Memorandum of Agreement to sell the 137,500m³ capacity *Golar Frost*, delivered in 2004, to OLT Offshore LNG Toscana for €160 million. OLT-O is the project company under the control of the Livorno FSRU project (Italy), in which Golar owns a 16% interest. The other major shareholders are Endesa Europa S L, IRIDE Mercato, and OLT Energy Toscana.

Golar Frost is currently fixed on a time charter until the end of March 2008, with extension options thereafter, but the eventual conversion is expected to be carried out during an extended period charter by Saipem.

Then, in mid-January, Golar acquired the 140,000m³ capacity Shell LNG carrier *Granatina*, delivered in 2003. For the moment, the ship will continue to trade conventionally, but Golar is already seeking opportunities for a conversion.

Golar Management (UK) group technical director, Graeme McDonald, said that, after conversion, both *Golar Spirit* and *Golar Winter* would be chartered by Petrobras for 10 year periods, with options to extend for a further five years.

'Engineering and development work continues to progress on the *Golar Spirit* and *Golar Winter* FSRU conversion projects,' he said. '*Golar Spirit* entered Keppel shipyard in Singapore as planned in early October 2007 and physical work has now commenced on the vessel conversion. *Golar Winter* is scheduled to enter Keppel Shipyard in October 2008.'



Artist's impression of the regas skid to be installed on *Golar Spirit*.

The precise details of the FSRUs that will emerge from the conversions remain confidential. What is known already, however, is that *Golar Spirit* (which on delivery will, it is believed, be the first ship of its type) will feature a turret mooring system connected in the forward part of the ship. Thus, her bow area has had to be modified. The turret has been configured to provide a non-rotating platform for supporting the anchor lines, flexible risers, and associated control/service lines. The turret is also being equipped with a turntable which allows 360° continuous rotation of the FSRU.

The resulting floating LNG terminal will feature six Moss tanks arranged in the middle, regasification plant in the forward end, and crew facilities, control room, and utility machinery in the aft end. On delivery, the floating terminal will be permanently moored to the seabed with

TECHNICAL PARTICULARS

Golar Spirit FSRU conversion

Vessel typeLNG carrier, Moss design
 Built 1981
 Length, oa289m
 Breadth, moulded44.60m
 Depth, moulded25.00m
 Draught (design) 11.40m
 Complement Approx 44 persons
 Nominal gas send-out pressure 85bar

Capacities LNG (100% at -163°C)
 129,000m³
 Gas send-out231tonnes/h
 Cargo containment system MOSS
 spherical type, IMO class B
 Number of tanks 5
 Internal diameterTank 1 - 35.50m
 Tank 2, 3, 4, & 5 - 37.1m
 MaterialAluminium 5083-0

Cargo Handling System

In-tank cargo pumps 1100m³/hr- 5 sets,
 140m³/hr- 5 sets
 Spray pumps50m³/hr, 50mth - 2 sets
 HD Compressors 27,000m³/h - 2 sets
 LD Compressors6700m³/h - 1 set
 LNG vapour heater 2200MJ/h
 (7000kg/h vapour) - 2 sets
 LNG vapouriser 7500MJ/h
 (8800kg/h LNG) - 1 set
 LNG loading arms16inch - 2 sets on
 starboard side
 Vapour loading arm 16inch - 1 set on
 starboard side
 Inert gas plant5000m³/h

a turret mooring arrangement, and the gas send-out line arranged through the turret down to the seabed and to shore via a seabed pipeline. The LNG tankers offloading to the floating terminal will be moored in a side-by-side configuration. Berthing, loading and unberthing will take approximately 24 hours.

The terminal will allow safe berthing of standard LNG carriers, which will need no modification. Assuming that the terminal is being serviced by LNG carriers of size 125,000m³ to 137,000m³, the arrival schedule will be about every nine days.

Also known is the fact that the *Golar Spirit* FSRU will be provided with standard loading arms to allow side-by-side transfer of LNG and vapour return. She will be equipped with three 16 inch loading arms; two for LNG and one for vapour return. Operation with two LNG arms will ensure a loading time of 16 hours. The loading arms will be quite similar to the type used on onshore terminals, but modified to take account of relative motions between carrier and FSRU.

According to a general description provided by Golar, the *Golar Spirit* FSRU will also be fitted with equipment for guiding the arms onto the carrier's connection flanges. This pre-coupling guide operation will be necessary to compensate for relative motion during coupling when the relative motion exceeds +/- 0.5m.

As far as regasification is concerned, LNG will be sent from the tanks to the regasification skid situated forward. The regasification skid essentially comprises booster pumps and steam heated vapourisers. The booster pumps will increase the pressure to about 90bar, before the high pressure LNG is vapourised, after which the gas passes through a fiscal metering unit and is sent to the subsea pipeline via the gas swivel and flexible risers. Maximum boil-off from the storage tanks is 0.25%, as per original design requirements off the existing LNG carrier. The boil-off gas is collected and used as fuel for steam generation in the FSRU boilers.

'The full suite of agreements associated with the employment by Petrobras of *Golar Winter* and *Golar Spirit* as FSRUs have now been finalised and executed,' Mr McDonald said. 'Petrobras has recently announced a



Artist's impression of *Golar Spirit* FSRU.



Golar Winter - to be converted into an FSRU for Petrobras charter.

tender for a third FSRU in which Golar will bid.

'We have [also] been working on an Offshore Regasification project near Livorno, Italy. A government decree approving the project was issued on 23 February 2006 and in November 2006 we acquired a share in the project development company which currently stands at 16.38%. The Livorno project has now reached a critical stage as the project contemplates FID [final investment decision]. Final EPC [engineering procurement and contracting] costs have now been submitted to the project development company and the process of evaluation is drawing to a close. In December 2007 the project development company committed to purchase *Golar Frost* for conversion into the floating terminal (vessel delivery to the project in June 2008). *Golar Frost* will be converted

to a floating terminal by installing regasification equipment onboard the vessel and permanently mooring her off the coast of Italy.

'Golar continues to field enquiries from a growing pool of counterparties interested to progress FSRU projects. Detailed assessment of identified conversion opportunities for both *Golar Freeze* and *Khannur* are now well advanced. Additionally, *Granatina* (purchased from Shell on 14 January 2008), being a sister ship to *Golar Winter*, is well placed to secure FSRU employment opportunities. Most of these projects could utilise the company's older vessels currently on charter to BG and which are likely to be redelivered by BG at the end of each charter's initial term during the period from 2008 to 2011, which fits well with the anticipated project portfolio.' **NA**

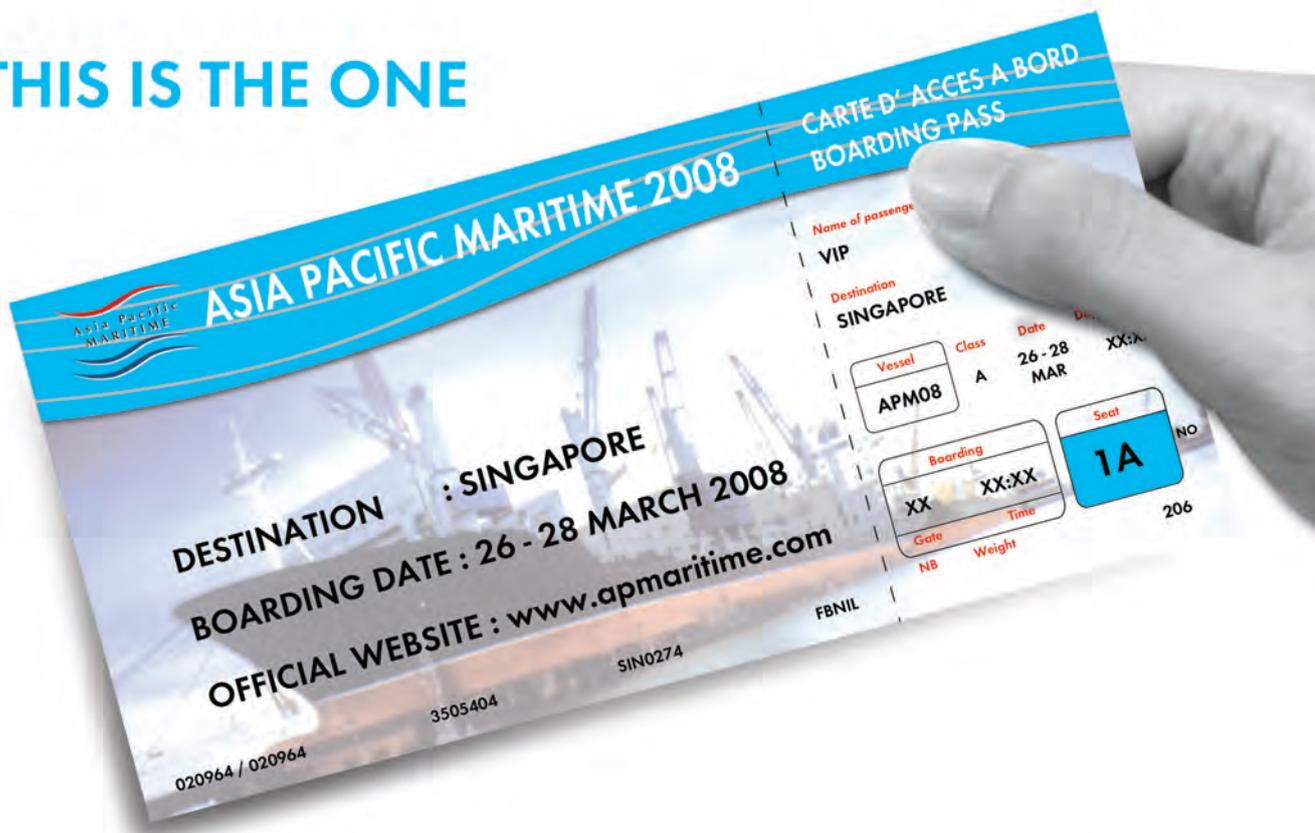
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Fatigue in focus

Bureau Veritas has developed a new fatigue assessment methodology for typical details of very large gas carriers. Philippe Cambos, BV head of oil and gas technical section, gives an overview.

LPG carriers have experienced a sudden growth in size, and we now commonly see ships of 80,000m³ capacity. They are built for very long service lives, yet they pose special problems of fatigue, due to their large open tanks and the tank/hull coupling.

Accordingly, Bureau Veritas has developed special techniques focusing on the detail of VLGC structure, to design out fatigue and to assess fatigue in service. The vessels considered in a major study were large LPG carriers, typically up to 230m loa, with prismatic tank structures. The key fatigue areas requiring attention were determined to be the feet of main frames of the side shell, shell longitudinals with transverse webs, knuckles between double bottom and hopper tanks, brackets in the cargo tanks, tank supports and keys, and tank dome.

Fatigue calculations are based on a deterministic approach using notch stresses, calibrated on the results of a full hydrodynamic analysis taking into account both hull and cargo movement. Both the cargo tanks and the hull structure had to be modelled, because the reaction forces in the hull structural members and tank supports depends on the stiffness of both. The model and analysis were built up in the following way.

A 3D FEM model using VeriSTAR Hull was used at three levels of focus. A three hold coarse mesh model was used for the big

picture of loads, a 3D fine mesh model gave yielding assessment, and finally a 3D very fine mesh model focused in on the detail. For the fine mesh the element size was taken as the plate thickness.

Each type of tank support was fully modelled and then subject to fatigue analysis in both longitudinal and transverse directions, and in way of the hull structure.

The 3D coarse mesh model focused on the yielding and buckling of primary members in tanks and holds. That in turn yielded the forces on the keys of the tanks for supports assessment and the boundary conditions for fine mesh assessment.

The assumptions for fatigue analysis were: sailing factor 0.85; ship sailing 40% ballast and 60% full load; Bureau Veritas design S-N curve based on British standard; upright and inclined ship condition and corrosion environment (not applicable in the cargo hold).

Both internal and external dynamics of sea conditions and cargo and ballast internally were considered in the dynamic load modelling.

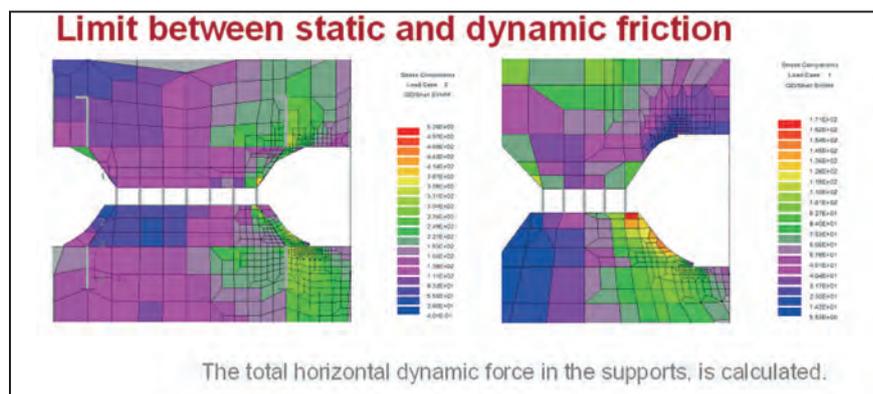
With the right loads and friction forces, there were three steps to the fatigue assessment of the supports. These were to calculate all the merged loads on the supports with no sliding, then to calculate the probability of sliding, and then to go on to calculate the stresses on the supports

in the sliding mode and the resultant damage. Friction forces were applied in the longitudinal and transverse directions depending on the load case. The static friction coefficient used was 0.3 whereas dynamic was 0.15. The results of the calculations clearly show fatigue stresses spread across the hull supports.

When it came to the fatigue assessment on the anti-rolling keys a different methodology to that used for the vertical supports was deployed, due to the gap in the key.

The three stage approach was based on calculating the fatigue damage without anti-upper rolling key to define what probability level there is of contact in the anti-rolling keys, then a repeat calculation with the anti-rolling key merged, ie in contact, followed by a combination of the damages obtained in steps one and two.

BV's conclusions, validated on vessels in service, are that the methods developed produce clear and correct fatigue damage assessment. That in turn points to remedial actions at the design and build stage, including the need for brackets to be with soft toes, both in the transverse and longitudinal direction. Local grinding may be requested during construction to get weld detail correct. For anti-rolling keys a gap is necessary, and in almost all cases local reinforcements are required, based on fatigue assessment. **NA**



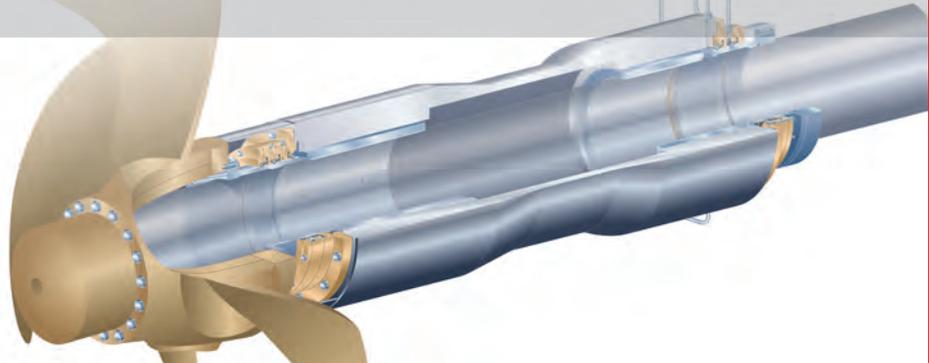
Fatigue assessment of vertical supports. Limit between static and dynamic friction, wherein the total horizontal dynamic force in the supports is calculated.

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Deepwell pumps for LNG

Hamworthy Svanehøj A/S is now offering its full range of deepwell pumps to the entire gas carrier market.

Already well established for handling LEG (ethylene) and LPG cargoes, pumps of capacities ranging between 50m³/h and 700m³/h can now handle LNG as well, following on from a 2006 deal through which Hamworthy Svanehøj signed its first contract involving the use of deepwell pumps for LNG at its standard -163°C transportation temperature. The supplier has confirmed that final cryogenic testing recently demonstrated the success of the modifications.

First contract

Hamworthy Svanehøj is supplying its first such deepwell pumps in early 2008, for installation in a 7700m³ LNG/LEG/LPG carrier being built by Polish yard Remontowa for Rotterdam-based shipping company Anthony Veder. This unique vessel will be an LNG tanker for regional distribution, and will also be able to transport other gases as well, among them liquefied petroleum gas (LPG) and petrochemical gases including ethylene.

The pumps will be fitted with normal explosion-proof motors powered by frequency converters, enabling them to develop 210mlc LNG and the typical 120mlc LEG/LPG at a rated flow of 450m³/h for both duties.



The test temperature using liquefied nitrogen as pump medium for the modified Hamworthy Svanehøj deepwell pump was -185°C.

pressure was -185°C, well below the required -163°C.

In close cooperation with the client, the final cryogenic test was carried out in August 2007 to demonstrate some main objectives, including that the selected material modifications of some elements were satisfactory, and the selected clearances between the static parts and the rotating parts of the pump were correct for the specified temperature range of -163°C to +45°C.

Ready for more

Another objective was to demonstrate that the standard sealing and bearing arrangement will not be affected by the lower service temperature.

'Based on this successful test, Hamworthy Svanehøj A/S is now ready to enter other specific projects in this segment as the use and distribution of LNG in smaller quantities is rapidly increasing,' said Hans Høyer Jensen, responsible for sales and marketing at Hamworthy Svanehøj deepwell pumps. *NA*

After the pumps had been modified to lower the normal design temperature of -104°C for LEG down to -163°C for LNG, a series of cryogenic tests using liquefied nitrogen as pump medium were carried out. The test temperature with nitrogen at approximately 4bar

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Waiting on compressed solutions

A first order commitment is awaited to match the resurgence of interest in new floating solutions aimed at capturing 'stranded' gas reserves around the world.

Although natural gas is abundant, more than one-third of global gas reserves are said to be stranded by their location of field size without commercially viable access to world markets. Estimates place these stranded gas reserves at more than 3000 trillion ft³.

It is for this reason that significant interest has been stimulated by design concepts for compressed natural gas carriers, proposed as being able to claim such resources without recourse to costly shoreside handling solutions. To date, despite years in the pipeline, no single project has come to fruition, however.

In fact, the idea of CNG-based marine transport dates back to the 1960s, but early attempts at commercialisation foundered, due to the expense of pressure vessels and the lack of effective safety standards.

Today, new technologies, growing market demand, and new guidelines for CNG ships have brought the CNG carrier back to market.

ABS Europe president and chief operating officer, William J Sember, recently told the CWC Eighth Annual World LNG Summit

in Rome that the repertoire of proposed gas transport systems designed to monetise stranded reserves continued to expand.

'ABS has now provided its "approval in principle" (AIP) to numerous emerging proprietary technologies or transport designs that are intended to economically develop these remote gas fields,' he said. 'The increasingly competitive cost and the operational benefits of these gas concepts are what developers hope will lead to sustained growth in this niche market.'

Mr Sember said that nearly a dozen CNG projects were 'on the verge of commercialisation' in various parts of the world.

'ABS has granted approval in principle to all the leading technical concepts that have been developed for this sector... It is only a matter of time before the first major contract is finalised.'

EnerSea, based in Houston, and SEA NG, of Calgary, Alberta, have been pushing hardest towards turning CNG carrier concepts into reality.

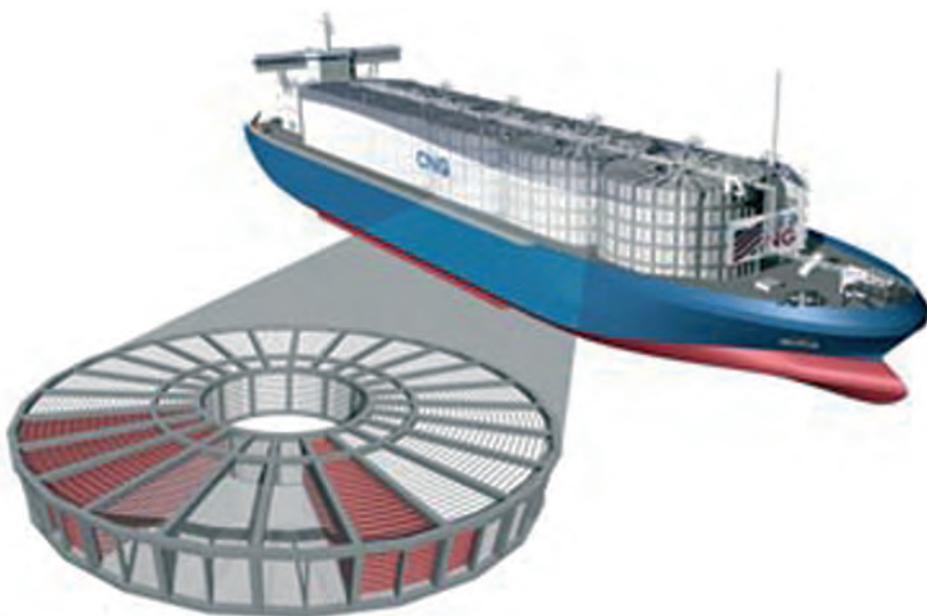
EnerSea has made available CNG concept designs ranging from barges to ships capable

of carrying 1bcf of gas, and is among those to have received approval in principle for its base ship design from ABS. Partners behind the venture include Mitsui & Co, Tanker Pacific, K Line, ABB, Lone Star, R S Platou, Hyundai Heavy Industries, Nippon Steel Corp, Amec Paragon, and naval architects Alan C McClure Associates.

In this case, the storage technology itself envisages the deployment of the VOTRANS cargo containment system, comprised of many CNG bottles made from large-diameter steel pipe segments. This technology can be seen as a recent iteration of the original conception for CNG transportation. CNG tank modules are formed by manifolding groups of bottles together. This arrangement is inherently scalable and provides segregated gas storage.

EnerSea vice president business development, John P Dunlop said that the company's technology had reached the point where 'confirmation of systems is such that we can move into production. We have cleared all of the hurdles with ABS that mean we could take this project into the detailed engineering and construction phase. Approval in principle sets out a road map to take plans to the project

Sea NG's compressed natural gas carrier design features the 'Coselle' containment solution.





Enersea's VOTRANS shipboard cargo containment system is comprised of many CNG bottles made from large-diameter steel pipe segments.

phase and to actual class approval.'

While the commercial complexities of the various gas projects EnerSea is pursuing (in West Africa, the Caribbean, South America, and Asia) make it difficult to be definitive when it comes to first ship orders, Mr Dunlop termed himself 'very optimistic and confident' that 2008 would be the breakthrough year.

An alternative technology is being offered by Sea NG, which is also backed by big hitters, having formed a strategic alliance with Marubeni Corp and Teekay Shipping Corp.

Sea NG's 'Coselle' containment system will typically involve 10 miles of small diameter, high-strength, but industry-standard X70 pipe, coiled into a reel-like structure, called a carousel. This carousel provides support and protection for the transportation and stacking of the Coselle system. Each Coselle carries about 3 mmscf of gas and can be stacked on the deck or in the holds of a ship. These stacked Coselles are then manifolded together using a system that allows for safe and efficient gas loading and unloading.

Lyndon Ward, Sea NG director of marketing, said that the Coselle system had been referred to as 'the floating pipeline', as it is simply a series of coiled pipelines. 'The natural gas industry has been using coiling pipeline for years in sub-marine pipelaying and the Coselle system is a new application of a proven technology', he said.

The reel is enclosed and then filled with inert gas, with Coselles subsequently contained in an inert-gas filled cargo house. Since the Coselles are large, only a relatively simple manifold with few valves and controlling systems is required.

The size of the ship is best defined in terms of its carrying capacity. Sea NG has developed several ship designs, including: a 16 Coselle ship transporting about 50 mmscf of gas; an

84 Coselle ship transporting about 250 mmscf of gas; a 108 Coselle ship transporting about 325 mmscf of gas; and a 144 Coselle ship transporting about 450 mmscf of gas.

Also approved in principle by ABS, Coselle CNG ships will be deployed to carry moderate volumes of natural gas (30 mmscf to 500 mmscf) over medium distances (200 km to 2000 km).

A somewhat different solution to capture stranded gas was proposed at the end of 2006 by private entity SeaOne Maritime Corp, of Houston, in the shape of the 'compressed gas liquid carrier'.

At that time, SeaOne said it planned to convert three 150,000 dwt conventional Suezmax oil tankers into CGLCs.

Also dubbed 'LNG Lite', this technology is also approved in principle by ABS and envisages the carriage of all types of liquefied gas, ranging from C1, defined as LNG, to the C2-C5 types that are the preserve of LPG carriers. The CGL containment system would not require the low temperatures of LNG, nor the high pressures of current CNG containment systems. Instead, gas would be stored aboard in a liquid form at minus 40°F/C at pressure of 1400 psig.

By comparison CNG, which has been consistently pitched as the alternative to LNG technology when it comes to exploiting remote finds, offers refrigerated compressed storage systems operating at 1800 psig at minus 29°C, or pressure-only systems operating at 3000 psig-3600 psig.

Like its CNG counterpart, the CGLC proposal potentially compares favourably with LNG with regard to requiring no costly shore-based facilities which would be required for CGL liquefaction and regasification. Production gas loading and sales gas offloading would be handled by a flexible

pipeline connected to a conventional single point mooring.

The CGL concept deploys 80 miles or more of large diameter steel pipeline packed within the cargo holds of a new or converted vessel. Horizontal pipe sections are linked in a vertical serpentine arrangement, in this case referred to as a 'bundle'. Each pipe bundle is connected in a looped manner to multiple pipe header groups. Bundles are arranged across the holds of the carrier, with adjacent pipe bundles nesting together to maximise use of hold space. They are housed within a covered and insulated cargo area through which chilled nitrogen flows.

The gas stream would be first fed to a deck-mounted inlet separator at a typical scalable load rate of 0.2 bcf/day.

SeaOne has said that the new storage technology is suitable for either purpose-designed newbuilds or for converted existing tonnage, particularly single hull crude oil tankers facing phase-out.

A single hull Suezmax tanker would be convertible into a carrier capable of delivering up to 1.5 bcf of natural gas. A typical high block coefficient vessel, such as an oil tanker, would face no problem in providing the displacement necessary for this type of gas carrier, SeaOne has said.

Meanwhile, newbuild designs are available for carriers of up to 6 bcf capacity. In this case, the cargo hold dimensions and configuration can be fully optimised for maximum CGL capacity, with hullforms tailored to the speed requirements of the market.

At time of going to press, SeaOne said it had furthered its work with ABS over the configuration of its containment system for shipboard use and would make a new presentation of its solution in May. *NA*

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Arctic LNG transportation at the double

Aker Arctic has undertaken the challenge of designing an LNG carrier for Arctic conditions.

Since 2004, Aker Arctic has been investigating solutions to transporting LNG from the Siberian Yamal Peninsula. The double acting tanker (DAT) concept has proven to be the most attractive, due to its icebreaking capabilities, and the design had to comply with Russian ice class level LU7.

The double acting Arctic LNG carrier design which Aker has produced is 340m long, with a breadth of 50m, and a deadweight of around 95,800dwt. Its cargo capacity is 206,000m³ and has a service speed of 19.5knots in open water. Icebreaking performance at 5knots is 1.5m astern and 70cm ahead, plus the vessel also has the capability to pass through ridged ice fields at a minimum speed of 1knot.

Classed to LR+100A1, Liquefied Gas Carrier, Ship Type 2G, with methane in independent tanks, type B, at a maximum pressure of 0.25kg/cm² and a minimum temperature of -163°C, the carrier features 10 deepwell pumps rated at 1600m³/h.

Four Wärtsilä 12V50DF engines provide gas diesel electric propulsion, with these dual fuel engines running generators. The natural boil-off gas and forced vaporised cargo gas, together with a small quantity of liquid fuel, will be burnt for ignition, but the engines will mainly run on fuel gas with liquid MDO fuel as back-up or as alternative fuel. This can be switched over automatically as the need arises.

Its two 20MW azipods required a new size of pod unit, as the previous largest units for heavy ice class were 13MW. They have been dimensioned to meet the icebreaking loads. Propeller diameter is 7.8m, at nominal 120rev/min.

In open water mode, the vessel will operate as a normal tanker, and the podded propulsion will provide good open water efficiency and easy arrangement of general spaces. The vessel will operate stern ahead with pulling propellers in ice operating



Drawing of Aker's concept design for an Arctic LNG carrier.

mode, plus good icebreaking capability can be achieved with normal open water propulsion power.

Model testing was involved to progress the design, taking place at VTT model test basin in Espoo, Finland. Results from tests upon DAT icebreaking LNG carrier models, one with a bulbous bow, and one with a sharp icebreaking bow, were compared, with both showing good icebreaking capabilities. However, the icebow produced slightly better results.

The conclusions from Aker's development work suggested that an icebreaking DAT LNG carrier is a feasible solution for Arctic trades, with wintertime speed reduction being kept at an acceptable level. Ice induced speed decreases or downtime during loading can also be handled with a reasonable number of LNG carriers.

However, the costs of a full build need to be evaluated, taking into account fuel consumption and operational costs. The calculated cost of Arctic LNG transport is about 30% higher, compared to an open water case, but LNG transport for the Kara Sea currently requires 20% more vessels.

Aker has a number of future projects slated for the concept, including a detailed design of the propulsion system, optimisation of the hullform, follow-up work with reference vessels, and the study of ice-induced vibration effects. **NA**

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A year to remember

The last 12 months have been dynamic for Finland's marine industries, but the future for Aker Yards remains unclear. Henrik Segercrantz reports.

Finland's remarkable strength in depth in home grown marine equipment supply was amply demonstrated through 2007. Over the last 12 months, Wärtsilä has inaugurated new production plant capacity in Italy and in Finland, ABB Marine has inaugurated its new plant for the fabrication of Azipod units in Helsinki, and Vacon has expanded its Finnish production facilities, in a programme which continues this year.

Over the same period, Finnish shipowners have shown themselves to be equally ambitious. Last spring, Finnish shipping company Bore ordered two new 2900 lane metre ro-ro vessels from German Flensburger Schiffbau-Gesellschaft, and registered options for another two. The vessels can take double-stacked containers on gooseneck roll trailers on all decks. Bore, which has grown fast in the last years by acquiring Bror Husell chartering in 2005 and Rederi Ab Engship in 2006, now has a fleet of 22 vessels sailing under Finnish and Dutch flags. Two second-hand vessels were recently acquired and were placed under the Finnish flag.

Finnlines received its last and fifth newbuilding *Ms Nordlink* from Fincantieri in July, for the Travemünde route. The

company performed relatively strongly through 2007, the first under Grimaldi ownership. Six new 3200 lane metre ro-ro newbuildings were also ordered last summer from Chinese Jinling Shipyard.

Meanwhile, in October, bulk operator ESL Shipping laid the keel for the first of two 18,800dwt 1A Super ice class bulk carriers, which are under construction at ABG Shipyard Ltd in India. The vessels will double the company's Eira-class to four vessels. The company operates a fleet of ice-strengthened vessels including bulk carriers and pusher-barge systems.

For its part, Langh Ship last year received the first of two new containerships from the German shipyard J J Sietas. *Ms Linda* has a capacity of 907TEU. The reinforced tank top also allows transportation of bulk cargo. Both ships are ice class 1A Super vessels. The company owns and operates a fleet of five Sietas-built multi-purpose general cargo and containerships, all Finnish flagged. Godby Shipping also received two 1 A Super-class newbuildings from J J Sietas last autumn. The 11,300dwt ro-ro vessels are chartered for UPM's paper traffic from Finland to Spain.

Meanwhile, Eckero Line's final offer for Birka Line was approved by the shareholders

for the remaining 14% shareholding in the company.

Aker facing challenges

An anticipated bumper year for Aker Yards, and its Finnish operations in particular, instead ended in disarray, as the European shipbuilding group found almost 40% of its equity snaffled up by South Korea's STX and its Finnish operations posted losses after production delays.

The Finnish part of the group started the year strongly, with a series of order announcements shaking out by the end of the spring. Royal Caribbean International (RCI) placed the order for the second, record-breaking *Genesis* cruiseship in March. The delivery of this €900m vessel is scheduled for August 2009.

Then, in April, Tallink placed an order for a €180m ferry for delivery in spring 2009. Tallink's *Cruise 5* project is the third vessel in a series of Baltic cruise ferries.

Deliveries from Finland last year included, in April, the Freedom-class vessel *Liberty of the Seas* (154,000gt, €600m), for RCI from the Turku yard and the ferry *Tallink Star* (30,000gt €110m) for Tallink from the Helsinki yard. *Color Magic*, the world's second biggest cruise ferry

Aker Yard's Helsinki yard in the autumn. From left *Viking XPRS*, *Cotentin*, and Tallink's *Galaxy*-sister newbuilding.



sister ship for Color Line, was delivered in September. Color Line still has two SuperSpeed ferries under construction in Finland. In November, Aker Yards' Helsinki yard delivered the trailer ro-pax ferry *Cotentin* for Brittany Ferries. The vessel is designed to carry road cargo vehicles between France and England at a speed of 23knots. The 165m long and 26.8m wide vessel has 2.2km of vehicle deck space and 120 cabins.

The keel-laying of the first 220,000gt/5400 Project *Genesis* cruiseship took place at the Turku yard in December.

In sum, the orderbook of Aker Yards Cruise & Ferries businesses includes 21 vessels, of which nine are cruiseships and 12 are ferries, including three small coastal LNG-powered ferries. At the end of third quarter 2007, the value of the orderbook was around €5.68 billion.

Nevertheless, last September, Aker Yards felt obliged to launch a new organisation in Finland, in recognition of production problems, as the combination of an overheated market and a lack of design and production capacity came home to roost. The builder concedes that the lack of



The keel-laying of the Project *Genesis* cruiseship took place at the Turku yard in December. *Independence of the Seas*, being outfitted, is due for delivery in April.

design office capacity has led to delays also in the delivery of suppliers' designs and products. To get a feel for the magnitude of the *Genesis* projects underway alone, it

might be observed that some 600 supplier companies are engaged in the process, 32 of which are design companies. The two vessel project translates into 12,000

Aker Yards orderbook of cruiseships and ferries

Project	Name/Project	Gross tonnage	Price	Yard/Approx delivery
Fast day ferry for Color Line	<i>Color Superspeed 1</i>	33,500gt	€116m	Rauma 1/2008*)
Cruiseship for MSC Cruises	<i>MSC Poesia</i>	89,600gt	€410m	St Nazaire 3/2008
Fast ro-pax ferry for Viking Line	<i>Viking XPRS</i>	34,000gt	€130m	Helsinki 3/2008
Fast day ferry for Color Line	<i>Color Superspeed 2</i>	33,500gt	€116m	Rauma 4/2008*)
Cruiseship for RCI	<i>Independence of the Seas</i>	158,000gt	€600m	Turku 4/2008
Cruiseship for MSC Cruises	<i>MSC Fantasia</i>	133,500gt	€550m	St Nazaire 5/2008
Cruise ferry for Tallink	sistership to <i>Galaxy</i>	48,300gt	€165m	Helsinki 6/2008
Ro-pax ferry for Brittany Ferries	<i>Armorique</i>	8500gt	€111m	Helsinki 10/2008
Small ro-pax for Morbihan			€13m	Lorient Q2/ 2008
Three small coastal LNG ferries for Tide Sjo			€45m	Lorient Q1-Q2/2009
Cruise ferry for Tallink	" <i>Cruise 5</i> "	48,000gt	€180m	Rauma spring 2009
Cruiseship for MSC Cruises	<i>MSC Splendida</i>	133,500gt	€550m	St Nazaire 6/2009
Cruiseship for NCL	" <i>F3</i> "	150,000gt	€735m	St Nazaire 11/2009
Cruiseship for RCI	<i>Genesis 1</i>	220,000gt	€900m	Turku 10/2009
Cruiseship for NCL	" <i>F3</i> "	150,000gt	€735m	St Nazaire spring 2010
Cruiseship for MSC Cruises	<i>MSC Magnifica</i>	89,600gt	€410m	St Nazaire spring 2010
Ferry for Stena Rederi	<i>Ferry 1</i>	62,000gt	€200m	Aker Germany Q1/2010
Cruiseship for RCI	<i>Genesis 2</i>	220,000gt	€900m	Turku 8/2010
Ferry for Stena Rederi	<i>Ferry 2</i>	62,000gt	€200m	Aker Germany Q3/2010

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Picture courtesy of Ulstein Verft. AS Norway

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The reorganisation saw shipyards in Turku, Helsinki, and Rauma getting back a less centralised and more yard-led structure, with the yard manager overseeing traditional design and production departments. Earlier, in July, Yrjö Julin was appointed president of the whole of Aker Yards and Juha Heikinheimo was appointed president of Aker Yards' Cruise & Ferries business area. The Cruise & Ferries business area has production currently taking place in Finland, France, and Germany. Aker Yards employs some 2300 of its own staff and 1600 suppliers at its main yard in Finland, Aker Yards Turku.

Even so, Aker Yards went on to issue two result warnings last year, largely as a result of production difficulties in Finland. In December, it announced another Nkr400m loss, mainly for the Cruise & Ferries business area, and said that the delivery schedule of some of the ferries

had been revised.

With the unexpected bad news hitting share prices hard, October saw an audacious move by Korean STX Shipbuilding, which acquired a 39.2% shareholding in Aker Yards, making it the biggest single shareholder in the group. STX filed the acquisition at the European Commission, with shaken competition regulators subsequently opening a 90-day, in-depth investigation into the matter. This may or may not demand changes to the deal, or even a deal-blocking decision.

Speculation was rife that STX was looking for a short-cut into the cruise market, particularly given the fact that STX has rapidly focused its home yards in Korea on more sophisticated tonnage, and developed a new facility in China to focus on bulk carriers and other more straightforward merchant vessels. However, for the short to medium term, there appears to be little logic in trying to squeeze cruiseship construction into the already very well booked Korean yards, especially

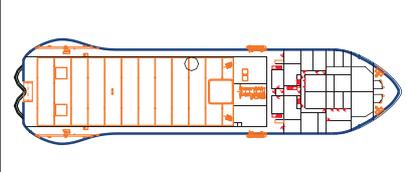
considering the huge supplier network required and the technical difficulty of the ships in Aker Yards' cruiseship portfolio. Of course, there would be other synergies to gain, including those from containerships and LNG carriers.

At first seemingly wrong-footed by the STX move, Aker management have subsequently been far from idle. In December, Aker Yards announced that it was looking into spinning off its offshore and specialised vessels business area, which has been very successful lately in both sales and earnings.

Then, suggestions emerged that the group had been in contact with Fincantieri, looking towards a possible tie-up. A straight merger of the two cruiseship building giants would be unlikely to pass the EU's competition authorities unchallenged but, and indeed regardless of the outcome of the STX cooperation, 2008 promises to be another interesting year for Aker Yards and for European shipbuilding as a whole. **NA**

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Refined thinking on Azipod reliability

The reliability of the operation of Azipod propulsion depends on many factors - design and production, how the Azipod is operated, and also on operating conditions, service routines, and schedules.

In the process of refining the Azipod, ABB Marine last year conducted a study aiming at verifying the differences between failure and downtime of vessels using electrical podded propulsion with shaft-driven propulsion. Probabilistic methods based on failure statistics were used.

'It is very important to gather statistics on failures, as our clients want to optimise their service routines and schedules,' said Markku Hokkanen, ABB Marine sales manager, cruise vessels. 'With these types of investigations by our reliability engineering team we can provide answers to questions on failure statistics, based on existing real material. The more information we gather over time, the better is the reliability of the analysis.'

Mr Hokkanen said definitions are often misinterpreted in practice, say in the example 'time between failures' (TBF), and 'time to failure' (TTF) as defined in figure 1. 'If the mean time between failures is two years, for example, one should understand that the statistical spread defines the probability to operate a system for that time without failure. The bigger the spread, the more probable is a failure already after a shorter time in operation. Spread tends to become bigger when the sample covers a wider range of different operation conditions and operators.'

Figure 2 shows empirical data of failure statistics for a mechanical application over time. Figure 2a shows the probability density function. The proportion of the area under the clock-formed curve between, for example time A and time B to total area under the curve, gives the probability that the failure takes place in that time period. Figure 2b shows the cumulative distribution function. The rising curve tells what the probability is that a fault will take place, (vertical scale) on or

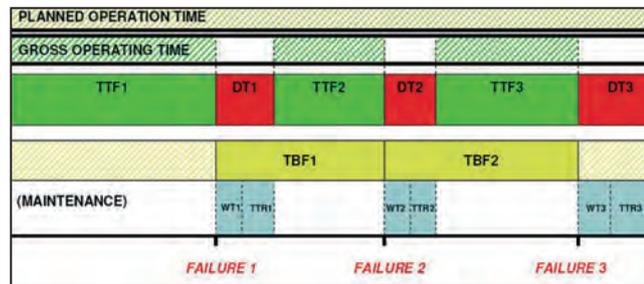


Figure 1. Definitions of failure statistics and operating times.

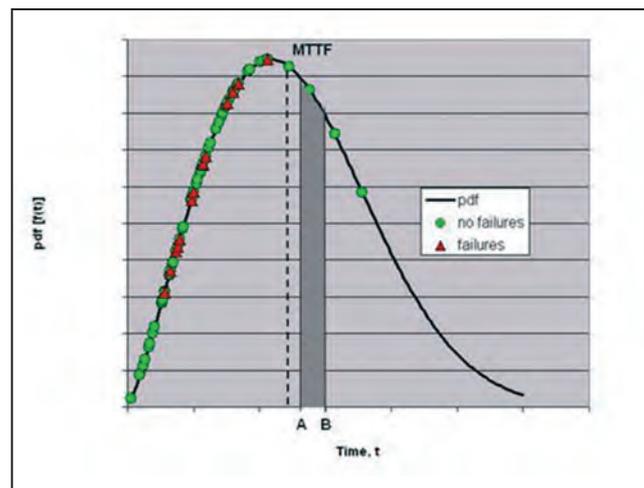
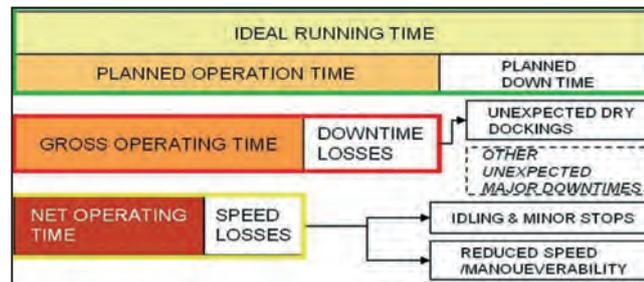
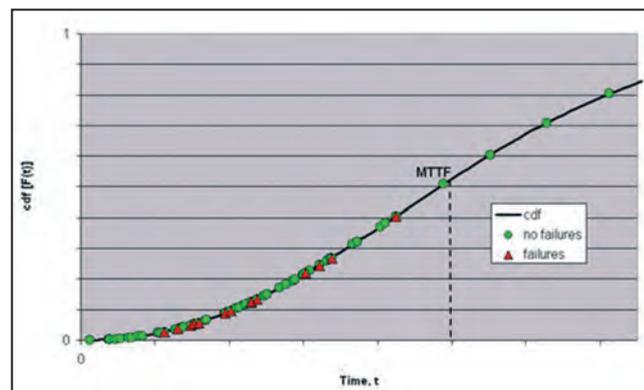


Figure 2a and 2b. Empirical data of failure statistics over time.



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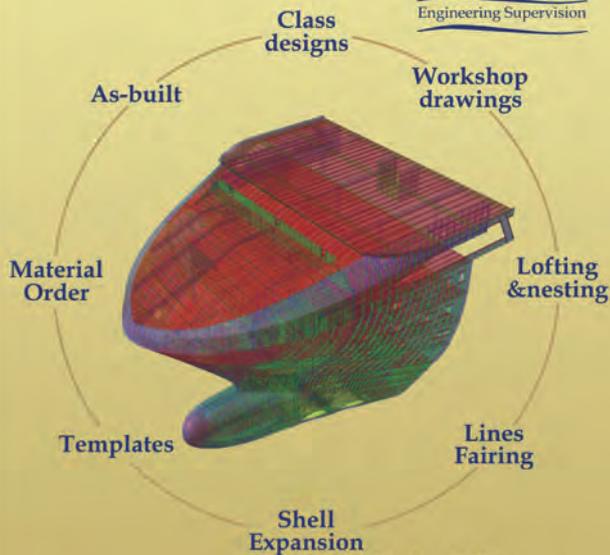
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Figure 3. Results of the failure comparison between pod propulsion and conventional shaft propulsion.

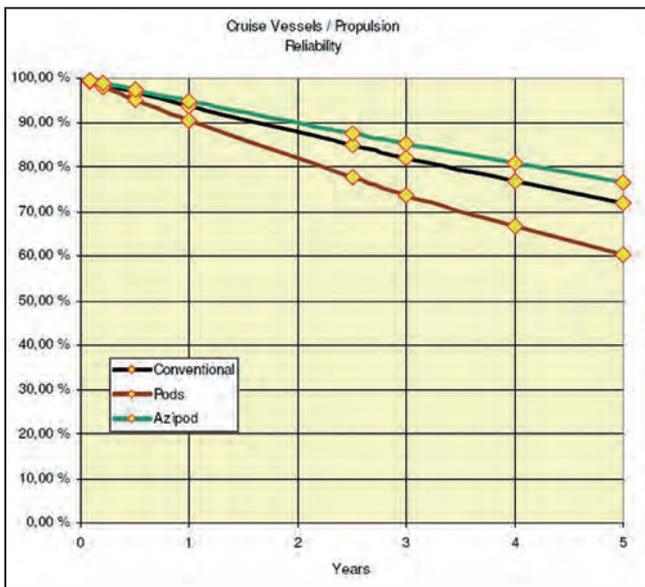


Figure 4. Reliability comparison.

before a specific time (horizontal scale).

Pods versus shafts

Sample cases were assessed of cruiseships with both shaft and podded drives, minimising the effects of differences in service routines. Information was mainly gleaned from Internet sources. The reliability of the information on failures of shaft systems was verified by comparing the information provided on failures on pod systems with ABB's own documented information on failures of the Azipod system. The comparison verified the reliability of the source material. In all, 50 cruiseships with shaft-driven propulsion were statistically compared with 38 cruiseships with electrically driven pods.

Downtime was calculated for both systems over a total period of five years, from 2002 to 2006. In the calculations of downtime, days spent at a repair yard and days spent in port forced by a failure were calculated. Also, one missed port call was considered as corresponding to one day in a drydock.

The results in figure 3 show that the mean time between failures (MTBF) for cruiseships with shaft drive systems is 91,097 hours, ie some 10.4 years. Here the shaft systems investigated included failures of the propellers, rudders, and eventual stern thruster, shaft bearings, reduction gears, and related auxiliary systems.

The similar duration for the Azipod system with auxiliaries was 112,192 hours, ie 12.8 years.

When looking at the statistics on availability, the figure shows 99.95% for shaft drives and 99.86% for Azipod drives. This means that of 100 ships with shaft drives, operating for 100 days, one vessel experiences five downtime days, or five vessels one off-hire day, whereas the corresponding amount of days is 14 for vessels with Azipod propulsion.

The results indicate that there are fewer faults leading to downtime for Azipod propulsion, as the MTBF is longer, but when there is a failure, the Azipod requires more time to be repaired.

The figure also shows that a vessel operates without a failure during a drydocking period of 2.5 years with a

probability of 87.49% for cruiseships with Azipod propulsion and 84.82% for shaft-driven vessels.

The reliability statistics for the different systems is shown in figure 4. In this comparison it is assumed that the time between regular drydockings do not differ between cruiseships with different systems.

'According to the results, Azipod is on the same level with shaft lines with regards reliability, but our goal is naturally to further improve,' Mr Hokkanen said. 'We are by no means seeking excuses for our performance not to meet with our customers' expectations. We have learnt a lot and have improved in all areas, in design, production, and also in operations. In addition, our tools and methods for proactive maintenance have much improved.'

Figure 5 shows the development trend of the reliability of Azipod propulsion. The availability statistics show an improving trend over time. The influence of faults can be seen to be distorted, at a time when only a few Azipod vessels were on the market. Today, Azipod propulsion has accumulated some 3.3 million operating hours, increasing with some 63,000 each month. There are currently some 138 units in operation on 64 vessels.

Mr Hokkanen pointed out that it was important to determine the definitions correctly when investigating system operation with probabilistic methods. Mean time to a failure (MTTF) is too easily presumed as a time until a technical application may be operated 'trouble free'. Being an average MTTF is the time until approximately half of the population has failed. Depending on the shape of the probability distribution curve, the failures may either concentrate around the MTTF or they may be scattered over a wider area of a time span. 'As shown in this example, MTTF may be calculated from field data that is from real applications. There are mathematical tools that also take into consideration the cases where a part has been replaced before it failed by estimating that parts life time with proven and feasible statistical methods,' Mr Hokkanen noted.

ABB uses the Kaplan-Meier and Maximum Likelihood method to estimate the survivor function, or the reliability, from

the incomplete field data of the operation history of Azipod units. Weibull distribution is used to model life distributions. It can be flexibly used where the failure rate function is decreasing, but also constant or increasing. It can, through an appropriate choice of parameters, model many types of failure rate behaviours. Figure 6 shows an example of survival probability for various components over time calculated using Kaplan-Meier-Weibull estimation.

When looking at risk management of Azipod propulsion, there are electrical, mechanical, heat-related, and hydrodynamic loads on the system. The area of operation differs, resulting in different environmental conditions for the systems. All of these factors have to be investigated when looking into the reliability of the system components. The gathered statistics provide a useful tool when defining the acceptable risk level to determine service intervals or when a component needs to be replaced. *NA*

Figure 6. Example of survival probability for a component over time calculated using Kaplan-Meier-Weibull estimation.

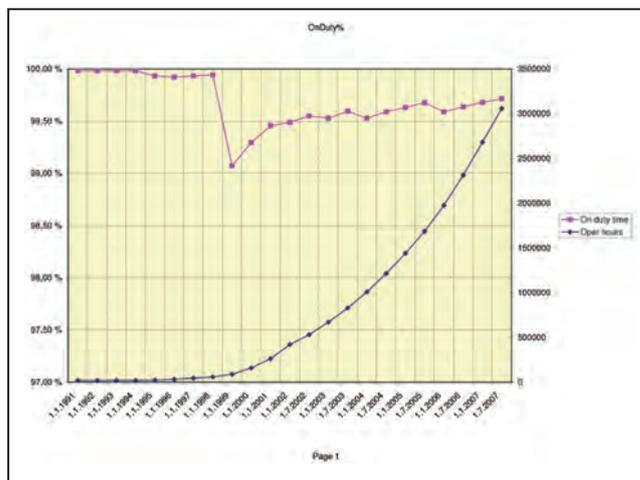
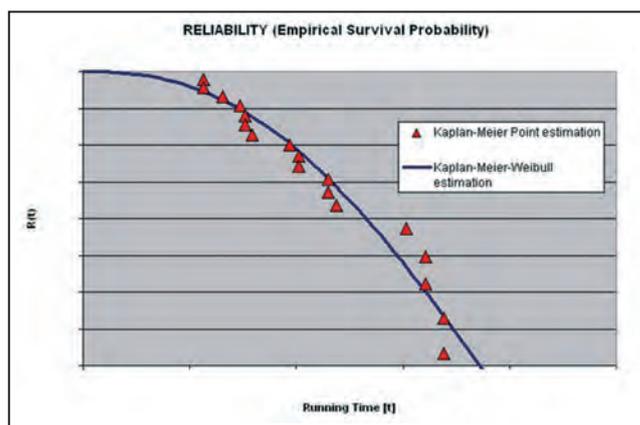
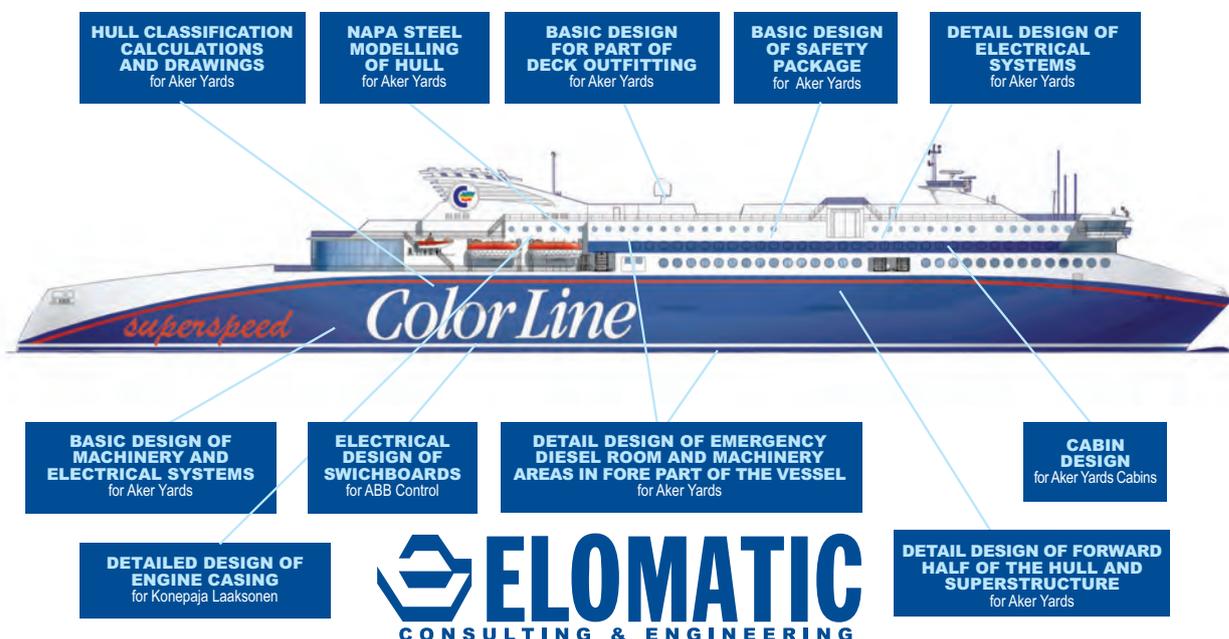


Figure 5. Development trend of the statistical availability of Azipod propulsion.



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Training for ice navigation

Finstaship has teamed up with a number of Finnish maritime academies and experts in ice navigation to provide training for deck officers in ship navigation and operation in ice.

The heavily increased vessel traffic in the Baltic, primarily due to growing crude oil exports from Russian Primorsk at the inner end of the Gulf of Finland, has led to an urgent need for ships' officers with experience in ice navigation.

Fortunately, recent tanker accidents have not proved calamitous to vessel crews or the environment, but the potential for a major accident in the area exists. Typically, inexperience in ice navigation causes broken or deformed propeller blades, damaged rudders or steering machinery, or dents and ruptures in the shell plating and hull framing. Lack of ice navigation skills can also, as recent winters have proven, lead to ship-to-ship collisions and groundings.

The first 'Icetrain' course aiming at increasing skills in ice navigation took place last autumn. Organisers include Kymenlaakso University of Applied Sciences/Maritime Faculty, one of the maritime academies in Finland, Meriturva Maritime Safety Training Centre, which also operates a bridge simulator for navigation in various ice-covered waters, Deltamarin Contracting, offering information on icebreaking ship theory, design, and

developments, and Ice Advisors, an affiliate of Finstaship offering onboard assistance for vessels operating in ice. Germanischer Lloyd has been selected to audit the three-day training programme and certify that it corresponds with the recommendations of IMO.

'Some 10% of the vessels visiting ports in the Baltic Sea during the difficult ice winter of 2003 suffered ice damages caused by errors, most of which could have been avoided,' said Kimmo Juurmaa, director of concept development at Deltamarin Contracting. At that time, the EU-funded ARCOP programme was investigating the availability of and future need for deck officers with ice navigation skills. The programme concluded that some 3500 trained seafarers would be needed for the Russian Arctic within five years and also that there was a lack of skilled deck officers in the Baltic.

'Based on these findings, ARCOP concluded that special training was needed,' Mr Juurmaa said. 'Now a model course has been developed also with the purpose to provide guidelines for this type of training within IMO.'

The course is divided into a theoretical

section, providing information on issues like ice conditions, ice damages, ship design and performance in ice, operations of the vessels and systems, icebreaker assistance, icing, information systems for ice conditions, route planning and radar operation, rules and regulations, and safety and emergency issues. In addition, practical navigation in ice is offered using simulator training at Meriturva Maritime Safety Training Centre on how to approach ice, on independent navigation, convoy operations, and icebreaker assistance and manoeuvring in ports. Icetrain courses are provided monthly throughout 2008.

'The first pilot course [has] shown that the offered training increased vital knowledge of the participating deck officers, although they already were rather skilled ice navigators,' Mr Juurmaa noted. 'The simulator training proved particularly popular. It offers a very realistic feeling of a ship operating in ice. Shipowners operating in the Baltic in wintertime have shown great interest in Icetrain. I think they realise that the cost for providing training to their deck officers is very small compared to the potentially huge costs of an accident.' **NA**



Simulator training in ice navigation at Meriturva Maritime Safety Training Centre.



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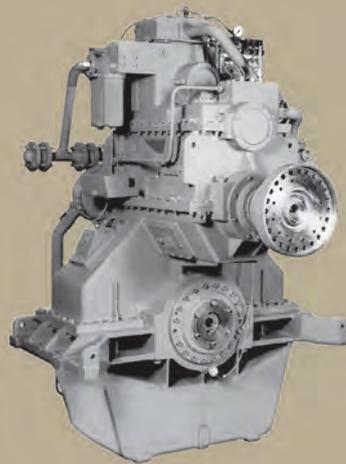


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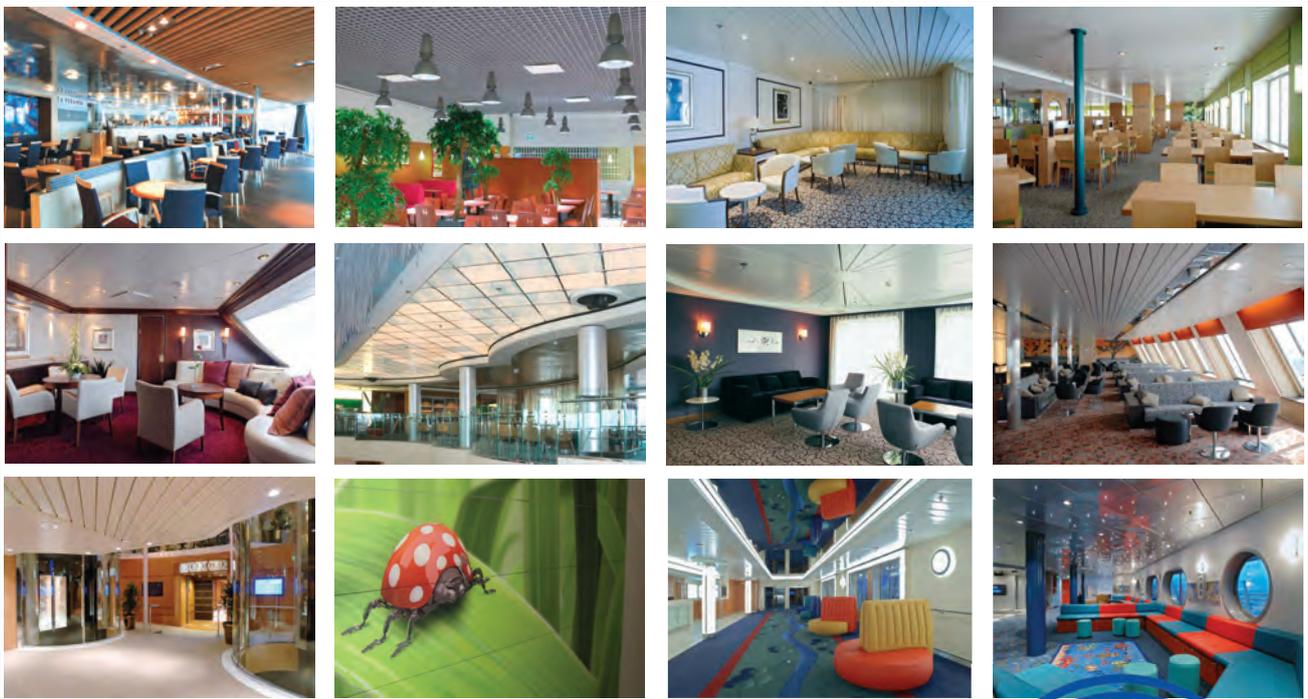


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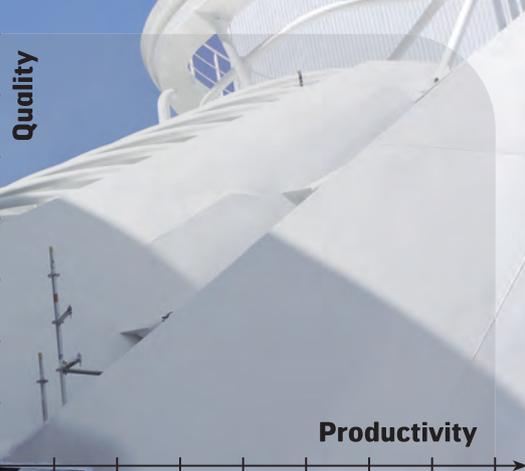


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On the EVE of discovery

Finnish universities have developed a medium-speed extreme value engine (EVE) that offers higher pressure densities without increasing fuel consumption. Clare Nicholls observed the engine in action.

Part of the vast remit of the EU-funded IP Hercules project to research the next generation of marine engines, the extreme value engine (EVE) was specifically designed for test purposes only by Helsinki University of Technology (HUT), in collaboration with Tampere University of Technology. The engine is able to withstand increased mechanical and thermal loads, features which will be utilised to develop medium-speed engines so that they can operate at higher power densities without increasing fuel oil consumption.

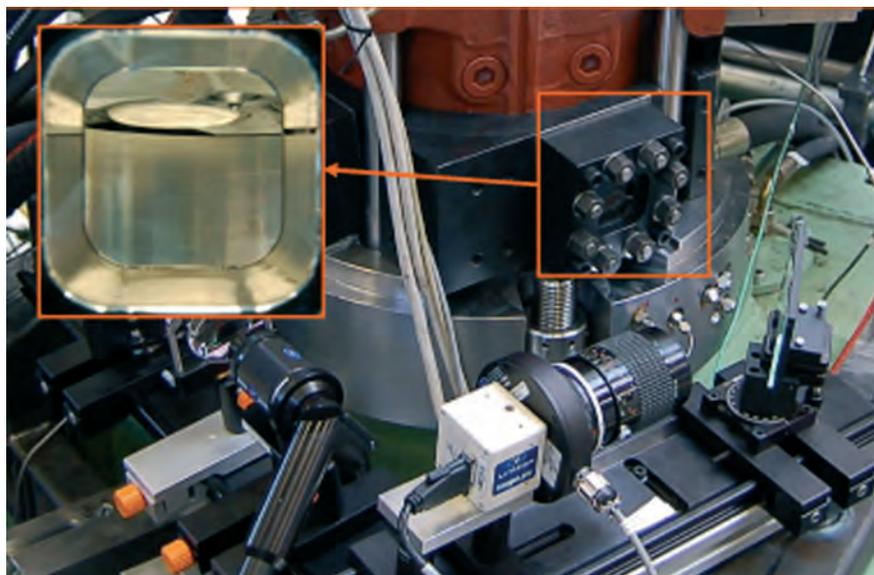
The design of the EVE was initiated in 2000, and the resulting engine was first ignited in February 2004 at HUT. It has been built to endure a combustion pressure of up to 400bar, a mean effective pressure of up to 40bar, and a piston speed of up to 15m/s. For lower peak pressures, the engine can be equipped with combustion chamber windows for visual access.

The engine is flexible and there is no hydraulic piping. Charge air pressure, temperature, and exhaust back pressure can be remotely controlled. Remote adjustment of valve timing without the need for camshaft changes can also be achieved with the EVE's electro-hydraulic valve actuation (EHVA) system, which replaces the camshaft, push rods, and rocker arms.

The design has a modified Wärtsilä W20 cylinder head with a common rail injection system, and a 200mm diameter cylinder, designed to take double the power of a standard W20 engine. The cylinder liner, anti-polishing ring, and cylinder head have separate cooling circuits with water flow and temperature measurements.

Modifications and testing

During the testing process in 2005, it became apparent that some modifications to the EHVA and auxiliary systems were required in order to reach the targeted design value of 400bar maximum cylinder pressure, which led to a second generation system being



Optical setup of the EVE engine with measured fuel spray, 40bar cylinder pressure, 900rev/min, and injection pressure at 1400bar.

installed, with a different cylinder head, and the common rail fuel injection system.

From March 2004 to September 2006, several new or modified components were installed, including rearrangement of the air supply, rearrangement of the exhaust system, and optical components.

The engine was restarted in early 2006 and showed significant improvements in reliability and controllability during testing. Testing was continued by operating the engine with fuel injection and a mean effective pressure of 24bar. The results revealed a need for earlier intake valve opening and later exhaust valve closing in order to have a better comparability with cam-driven engines of the same size.

Testing mainly involved five areas: variable valve timing; variable valve overlap; variable valve lift; variable charge air/exhaust back pressure; and run-up timing. The tests were done without firing the engine, and were intended to validate different systems and find operational limits.

Results showed that early exhaust gas valve closing and late intake valve opening reduce

the cylinder charge, thereby lowering the cylinder pressure. This can be compensated to some extent by increasing the charge air pressure, but the valve control system needs further programming in order to achieve earlier intake valve opening.

The EVE's operation has proved to be reliable, but the intended original values of 50bar indicated mean effective pressure and mean piston speed of 15m/s have not yet been achieved. A higher power density is the main aim for the future, with development required for combustion chamber components capable of handling extreme values.

Flexibility of the gas exchange valve and charge air systems will be the most important issue when studying these new combustion technologies. All EHVA parameters are able to be reprogrammed, enabling easy modification of the gas exchange process.

Miller timing research has already commenced, but this work will continue, along with further engine development such as improved control of valve lift, timing, position, and movement. **NA**

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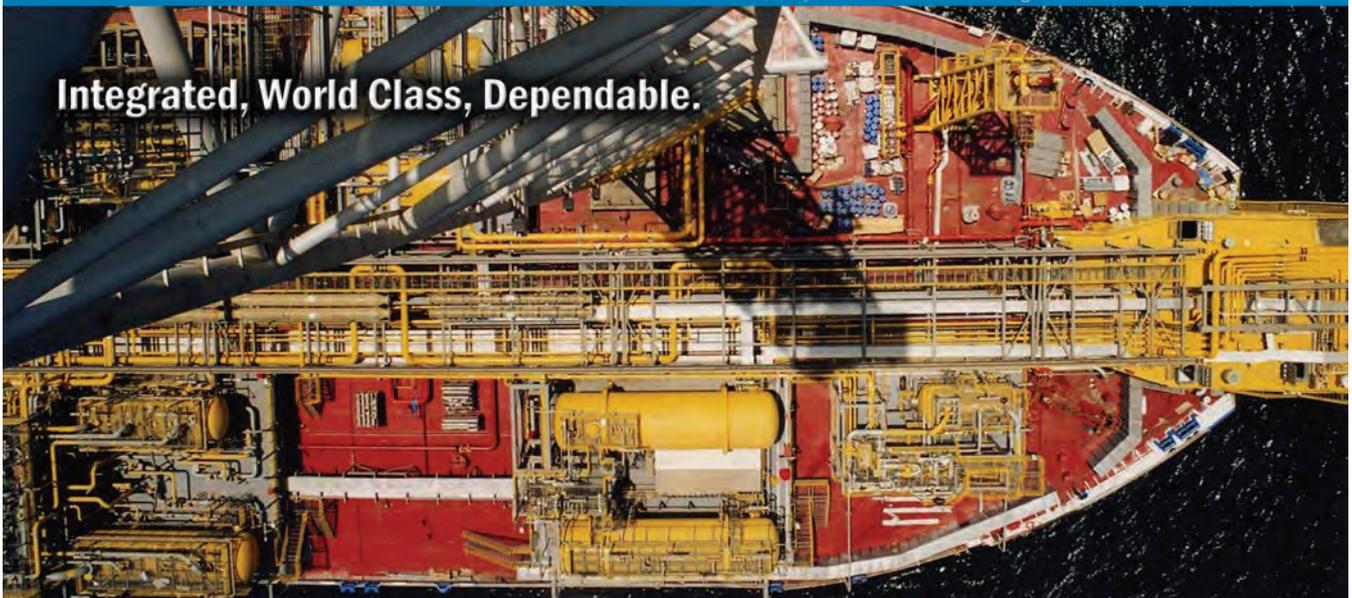
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Wärtsilä doubles its four-stroke

Persistent strong demand has brought significant worldwide investments from Finnish propulsion specialist Wärtsilä.

Due to the recent strong demand for ships worldwide, shipyards and shipowners have faced difficulties in acquiring engines for their newbuildings. Delivery times of up to three years have been common for all main engine manufacturers. With new investments in Italy and Finland the four-stroke engine production capacity at Wärtsilä has been doubled, helping to match demand.

In September, Wärtsilä inaugurated its new engine production facilities in Trieste. The €18m investment, which includes two new production lines, increases the capacity for engine assembly and testing. Wärtsilä's Trieste delivery centre turns out four-stroke engines of types Wärtsilä 26, 38, 46, 46F, 50DF, and 64 with a power range between 1.7MW to 25MW.

A further €30m investment was made in Wärtsilä's Vaasa Plant, also inaugurated in September, increasing the size of the production plant by one third. The new premises include a new assembly hall for engines, a logistics centre, and testing and final assembly facilities for gas engines. A new operating model of the entire factory was also introduced. In the assembly area a modern production line concept has been taken into use and revised logistics solutions reduce internal traffic in the factory area.

Changes in material handling improve flow and efficiency of operations. The new facilities cover an area of some 40,000m². In three years the staff in Vaasa has been increased by some 600 people. Wärtsilä today employs some 2500 people in Vaasa. The plant produces Wärtsilä 20, 32, 32DF, and 34SG -type engines.

Both in Vaasa and Trieste the engines are now turned out using a car-factory style assembly line, with assembly done at several stages along the line. The engines are transferred along the



Engine production line in the Wärtsilä Vaasa factory.

manufacturer in China of fixed-pitch propellers.

Other new businesses included the acquisition of the marine business of Railco, UK. The company specialises in synthetic stern tube bearing technology and adds water-lubricated bearing technology to Wärtsilä's product portfolio. Another company acquired was Electrical Power Engineering (Scotland). A re-conditioning workshop of diesel engines for ships and power plants was established in Shanghai, China and another in Vietnam.

In May the company signed a licence agreement with Vietnam Shipbuilding Industry Corp (Vinashin) for the manufacture and sale of low-speed marine engines in Vietnam. Wärtsilä is also proceeding with a similar plant in China, with China Shipbuilding Industry Corp and Mitsubishi Heavy Industries, with production estimated to begin in autumn 2008. Bryansk Engineering Works in Russia is also to begin producing low-speed marine diesel engines under a licence agreement for yards in Russia, Ukraine, Romania, and Bulgaria. Production of engines with a bore size up to 82cm is to begin in 2009.

In 2007, Wärtsilä also reorganised into five Ship Power customer segments. Merchant, Offshore, Cruise & Ferry, Navy, and Special Vessels are now supported by a joint technology office, Ship Power Technology, responsible for product and solution support and development. The aim is also to better prepare for market fluctuations. This reorganisation also led to a merger of the propulsion divisions of the company, with the R&D and manufacturing functions merged with the Wärtsilä Engine Division, into Wärtsilä Industrial Operations. **NA**

assembly line using air cushions.

In fact, Wärtsilä's worldwide investments last year exceeded €200m. In South Korea, for example, the construction of a new joint venture manufacturing plant with Hyundai Heavy Industries for Wärtsilä 50DF dual-fuel engines for LNG carriers is underway. Last autumn Wärtsilä had received orders for 206 Wärtsilä 50DF engines for 52 LNG carriers. The Yeongam factory is scheduled to produce some 100 engines per year, beginning from the second half of 2008.

Elsewhere, increases in the production capacity of propulsion, gearboxes, and controllable pitch propellers in India, The Netherlands, and Norway are expected to be finalised in 2008. The fixed-pitch propeller production capacity in Chinese joint-venture company Wärtsilä CME Zhenjiang Propeller Co doubled last year through the establishment of a second plant. The company is now the biggest

Performance is key to design

Performance-based design criteria bring the freedom of radical thinking to the naval architect, according to Deltamarin.

‘In recent years, the risk- and performance-based approach has resulted in new possibilities for designing ships,’ Markku Miinala, project manager at Deltamarin told *The Naval Architect*. ‘This trend has also resulted in the development of new tools for designing and analysing the validity of the ship design at a very preliminary design stage.’

In the case of the IMO’s design and arrangement regulations on fire safety, alternative designs are now possible according to SOLAS, as long as they are proven to fulfil or exceed the requirements in the SOLAS regulations through detailed engineering safety analysis. Mr Miinala noted that alternative design has to be applied where the maximum fire zone length is 48m or a fire zone area is 1600m²; otherwise they would be difficult to achieve.

‘The new approach really allows for new modern designs,’ he noted. ‘Risk level analysis models have to be done, and if the analysis shows the same or lower risks with an alternative design compared to a rule-based design, it can be approved. To be able to carry out the alternative design approach for large spaces, efficient tools

for fire technical analysis and evacuation simulations are today available for the preliminary project stage.’

According to Mr Miinala, similar regulations on lifesaving appliances and other safety features are being implemented.

The new SOLAS Chapter II-1 damage stability regulations will enter into force from the beginning of year 2009. These new probabilistic regulations will leave out the B/5 and other prescriptive rules. The new rules will basically look into a set of different damage lengths and depths, giving numbers 1 or 0 depending on whether the ship survives. If the resulting summarised index is sufficiently high, the regulation is fulfilled.

‘This gives the naval architect more freedom in arranging subdivision, bulkheads, and deck heights,’ Mr Miinala noted.

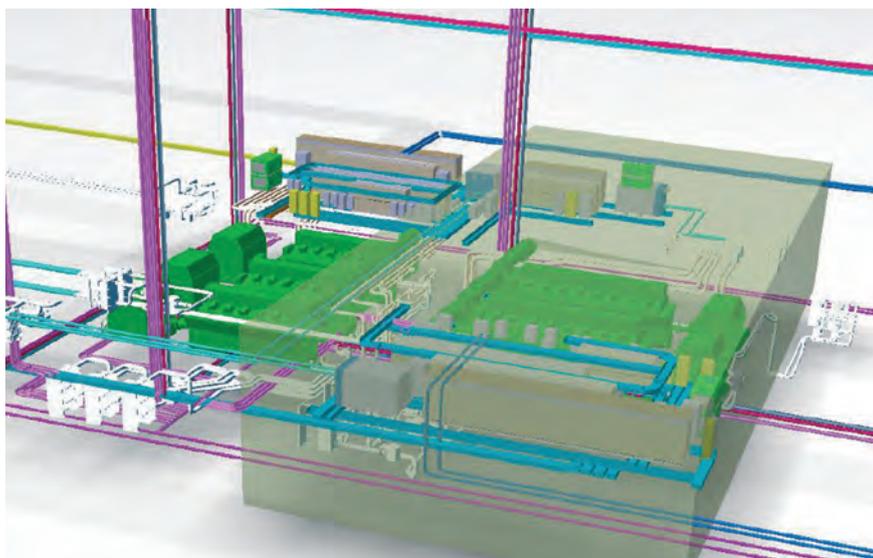
Regarding the Recommendation on Passenger Evacuation Analysis, Mr Miinala noted that the regulation today requires evacuation analysis calculations to be done for ro-ro passenger vessels either as simplified or as an advanced evacuation analysis in the form of a simulation. Carrying out advanced

analysis is highly recommended for all passenger vessels, both newbuildings and ships in operation. ‘With simulation, bottle-necks and sensitivity analysis of the effect of the number of people in various areas along the escape routes can be calculated as well as the evacuation time.’

Other new regulations underway are the revised Intact Stability Code, Goal-based New Ship Construction Standards, and Safe Return to Port. This last regulation stems from concern over how to arrange safe evacuation from today’s big passenger vessels. The conclusion has been that the ship itself is the safest lifeboat. ‘This implies that there is, in the case of an accident, sufficient redundancy of the vessel to guarantee that it can arrange for safe space for the passengers and that it can, with own machinery, return to a port,’ Mr Miinala said. The regulation is to enter into force on 1 July 2010 and applies to vessel newbuildings with a length of or above 120m.

‘This is a typical performance-based regulation, as performance criteria which have to be fulfilled after flooding are defined. The principle is that if one watertight compartment is lost, the vessel’s functionality has to be maintained, and the vessel shall be able to return to port,’ Mr Miinala said. The regulation also requires safe return to port in the case of the loss of one A-class fire compartment.

Systems for transportation to be available after damage include propulsion steering and steering control, navigational systems, systems for fill, transfer, and service of fuel oil. The speed of the vessel is not determined. ‘In the



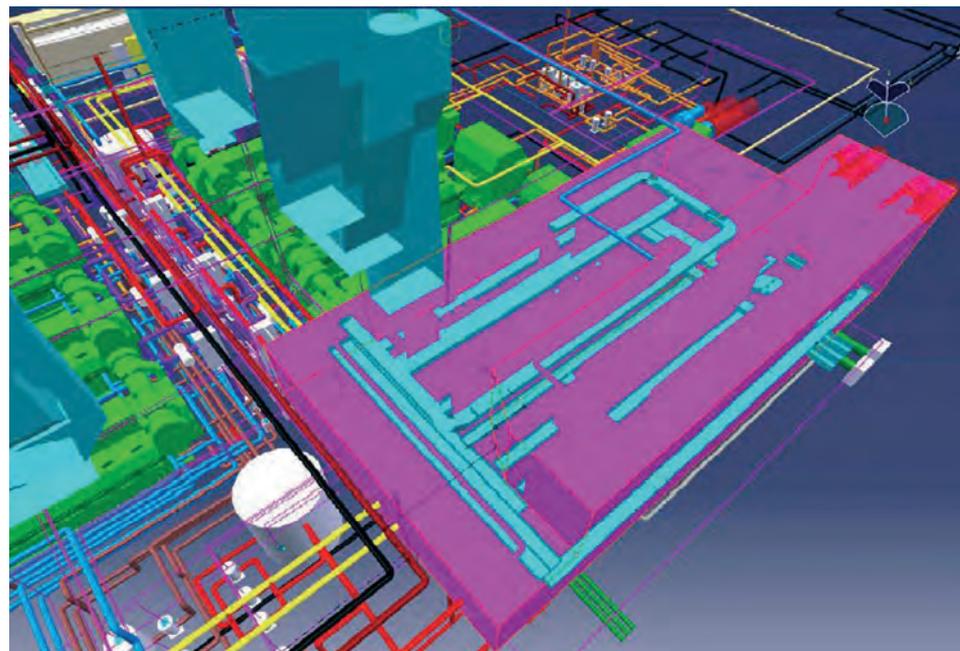
A case study on the implications of the loss of the forward engine room on a modern cruiseship. Analysis done using Deltamarin’s Intelligent 3D System Coordination Model.

design, the worst case biggest distance to port should be weighted against time at sea, including the functionality of the comfort systems required.' Sanitation, water, food, medical care, weather shelter including means of preventing heat stress or hypothermia, lighting, ventilation, and access to lifesaving appliances have to be arranged. How the above requirements are to be arranged is not specified. A number of safety systems also have to be kept operable, including communication, fire systems, bilge and ballast systems, power-operated watertight and semi-watertight doors, and flooding detection systems. 'The challenge is, that many of today's vessels are not fully designed to this principle, except for some specific systems,' Mr Miinala said.

Intelligence in 3D

To solve the technical requirements, a Failure Mode, Effects and Criticality Analysis is done, in which the implication of a failure in each system or component is examined. Realising that existing 2D methods mean a very heavy workload, also resulting in making design alternatives very difficult, Deltamarin has developed a new tool specifically for this purpose. 'It is very difficult to coordinate the position of different piping and cables onboard and the effect damage has on these, without a tool like this,' Mr Miinala noted.

The 'intelligent 3D system coordination model' is built on Catia's ship design software, applied by Deltamarin. A



A case study on the implications of the loss of one of the Main Switchboard Rooms on a modern cruiseship. Analysis done using Deltamarin's Intelligent 3D System Coordination Model.

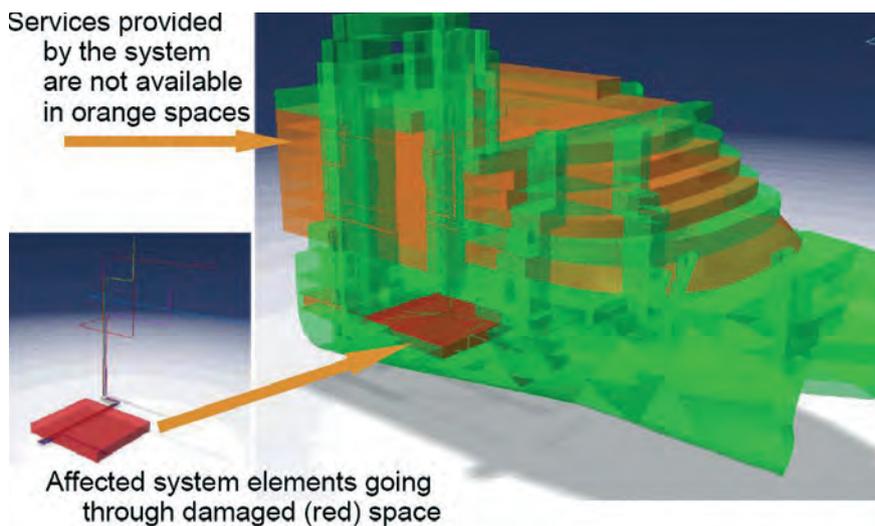
3D space model of the ship is made, including a system model with all essential equipment including pipes, ducts, power and control cables, and control locations. The functional logic between the system sub-elements is determined, ie by systems needed for each component in order to function. Then each compartment is destroyed one by one. The software calculates which system sub-elements are lost, which systems are lost due to this, and the status of redundancy for that system.

The software has built-in graphical 3D display of the areas and systems affected as well as written reporting.

'The idea is to do this analysis, with the shipowner, already before the ship contract with the yard is signed, in order to confirm which systems are required and their location and configuration,' Mr Miinala said. Deltamarin also considers it useful to upgrade this 3D model throughout the design and construction of the vessels, on a functional level, in order to have a coordination model throughout the lifecycle of the vessel. The intelligent 3D system coordination model supports the ship design process at the yard and is at the same time a verification tool for the redundancy calculations.

'Our goal is also to integrate other tools for safety-analysis into the same system,' Mr Miinala said. This tool has been developed in close cooperation with Royal Caribbean Cruise Line and Aker Yards in Finland. Deltamarin works in close cooperation with its alliance partner Safety at Sea from Glasgow in developing the overall Safety Level product. **NA**

Services provided by the system are not available in orange spaces



Affected system elements going through damaged (red) space

The areas with lost functionality can also be expressed in 3D. In this case a Black Water Collection System is lost.



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Napa adds new tools

Finnish NAPA Group is continuously adding new modules to its Ships Performance Systems (SPS) family of software tools for onboard use.

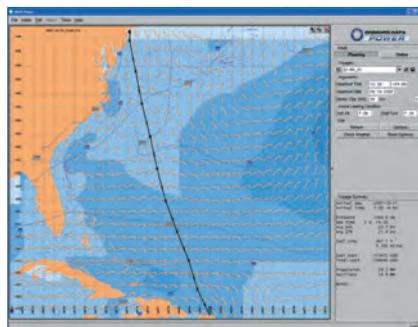
Recent additions to the NAPA suite of onboard software performance tools include NAPA Log, a data collection and reporting system with an electronic logbook that provides advanced reporting systems ashore, and NAPA Power, a fuel consumption optimisation system which also includes weather routing functionality.

NAPA Log gathers synchronised and time-stamped information from hundreds of signals onboard, which are automatically replicated in desired format to the shipowners' shore-based reporting engines. Data is used for the Electronic Logbook, NAPA Fuel Management System, allowing fleet-wide reporting on fuel and energy consumption and related information. NAPA Performance is intended for monitoring time-chartered tankers against contract values.

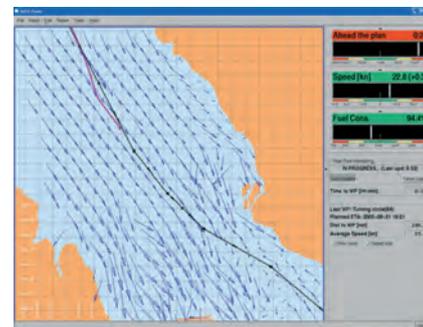
According to Matti Salo, president of the Napa Group, NAPA Log is unique in that it combines the electronically gathered on-line information with logbook information fed manually. 'The traditional logbooks (deck, engine, and oil record logbook) are separate records filed on the wheelhouse and in the engine control room. With the new system all information can be filed in one single system, which is sent to the owner's office ashore using an automated script.'

Information includes the ship's position, course, tracked distance, speed, wind data, engine power, fuel consumption, and any other data needed or available. NAPA Log includes summary reports to be used for budgeting and follow-up of fuel consumption, for example.

'The software has been developed in close cooperation with Carnival Cruise Lines,' Mr Salo said. Currently CCL uses NAPA Log on two vessels, for monitoring the performance and for budgeting, and intends to extend it to the entire fleet this year. Other ship operators are testing the system as well. Mr Salo said NAPA Log is also applied on a number of merchant vessels.



Route optimisation with NAPA Power.



Real-time monitoring view. Follow up is simple by comparing real position and ETA with that of the plan.

NAPA Log can be used as a single data gathering system onboard, for collecting and distributing all types of onboard system data and operational information, monitored by several system providers.

Napa is currently in the process of receiving flag state approval for the system, with first approvals already received from The Bahamas and Panama.

Fuel consumption cut

NAPA Power is a product intended for optimising the ship's operation, route, speed profile, and engine mode optimisation. The installation process begins by producing a simulation model of the vessels, based on information such as hullform, resistance, propulsion, machinery, sea-keeping, manoeuvring, and steering characteristics. Strip-theory based sea-keeping calculations determine the vessel's behaviour in various sea states. The information is used for simulating the vessel's performance and fuel consumption in different operating modes and weather conditions. With the model, the performance can be predicted and optimisation algorithms can be created.

Before departure, route planning takes place. By simply pushing a button, the route can be optimised as the model also includes weather information, shallow water data, and information on possible currents on the route, including tidal data. NAPA Power uses the data from almost any weather forecast service provider as preferred by the shipowner. The route can be decided

on based on allowed sea state from which the course, speed, and power usage is optimised.

'Significant fuel savings have been achieved with NAPA Power on cruiseships from optimising the speed profile and number of engines in operation,' Mr Salo said. 'A 4.3% saving was monitored during a six months benchmark period onboard *SuperStar Virgo* on its route from Singapore, which had been operated for nine years prior to the test. This means annual savings of US\$600,000, with current fuel costs.'

During the voyage, follow up is easily made by comparing real position and ETA with that of the plan. According to Mr Salo, the system is unique in that it combines power, propulsion, and weather data monitoring in the same package monitored during the voyage.

'The development of NAPA Power has been going on for ten years and we have now reached the functionality looked for,' he noted, adding that the product has gone through several prototype stages before reaching its current good level. 'For example, during the pilot test phase onboard *SuperStar Virgo* we discovered that it is quite difficult to manually control the desired speed. This resulted in the introduction of NAPA SpeedPilot, which takes care of this task, according to a specific algorithm.'

Today there are over 50 vessels equipped with NAPA Power. **NA**

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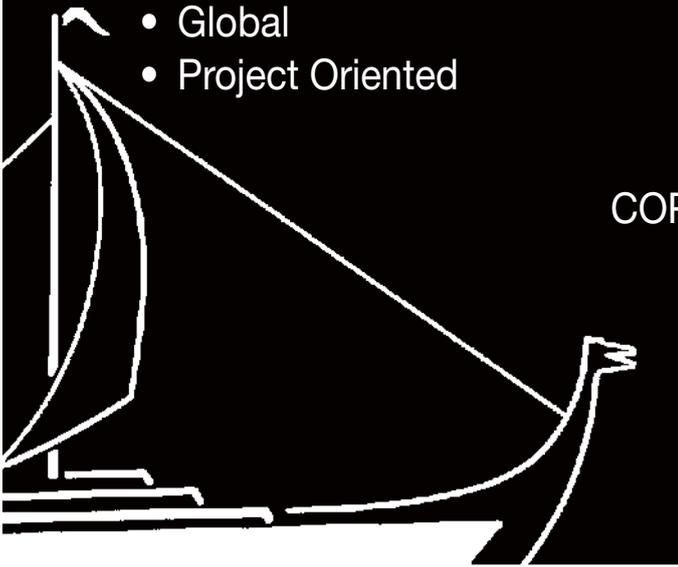
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Pemamek at home and abroad

Welding stations business leaps by 50%.

Pemamek has already delivered some thirteen production lines or portals to Aker Yards' Turku shipyard. The cooperation with the Finnish yard began back in 1989, since when Pemamek has grown to a worldwide provider of production automation systems for shipyards and other industries.

According to the company, sales volumes have increased by 50% over the last year, with automation system deliveries for a number of shipyards including yards in USA, Singapore, and Europe.

Aker Yards Turku shipyard is currently working on increasing throughput capacity and productivity and its latest investment has been in a PEMA SWP22000-8 welding station for double fillet welding of stiffeners on the panels. The station has eight independently-programmable welding carriages functioning in pairs, each with a Tandem MAG welding head of type ESAB AristoMig 500.

After reading the panel geometry data, welding areas of each carriage are programmed and welding parameters are selected from a

database. The off-line programmable system has a graphic user interface based on Pema WeldControl software. Motion is numerically controlled and individual programming of the welding carriage pairs allows for versatile welding of the profiles, including chain and staggered intermittent welding allowing for unwelded areas, profile openings, and

the selection of welding parameters during welding. The Tandem welding station has been designed especially for fast welding of profiles needing only small fillets, typically 3mm to 4mm, which are common for panels on cruiseships. The claimed productivity is high, with a welding speed on small fillet welds close to 2metres per minute. *NA*

The AristoMig 500 Tandem MAG welding head can produce up to 2metres of weld seam per minute.



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Vacon's drives towards growth

New type approvals for the Vacon range of air- and liquid-cooled AC drives – in the 0.25kW to 5MW power ranges – promise greater market share, according to the supplier.

Last year Vacon received marine and offshore type approvals for its Vacon NXL, NXS, and NXP ranges of AC drives from Det Norske Veritas and Bureau Veritas. 'In practice this means that Vacon NXL, NXS, and NXP drives can be delivered without surveyor presence according to given terms. This will definitely boost our sales in the marine and offshore business,' said Jussi-Pekka Sampola, Vacon product marketing director, marine and offshore.

Vacon approval procedures are also underway with several other certification bodies.

Vacon variable speed AC drives are used for main propulsion, thrusters, steering gear, draw-works, top drives, rotary tables, and various types of winches, and also to control pumps used in dredging, cooling, cargo handling, and oil drilling. A majority of the Vacon AC drives used in the marine and offshore segment are based on liquid cooling technology. Available in the 7.5kW – 5MW power range, liquid-cooled Vacon AC drives can be supplied with a three- or six-phase rectifier or with an active front-end rectifier.

The Vacon NXP is used as the control

platform, and the control concept is based on the Vacon DriveSynch, a new technology introduced last year. Vacon DriveSynch allows the control of one motor by means of two to four power units of 100kW to 2500kW, thus bringing significant redundancy in processes controlled by AC drives.

The modular Vacon NX has separate power and control sections and easily customised software. The range provides options for air cooling for smaller units. Although both solutions use the same control section, all the components requiring cooling in the liquid-cooled Vacon NX version are mounted on aluminium cooling elements, resulting in major space savings. With plug-and-play modules, maintenance and logistics are also simplified.

DriveSynch introduced

Built by Bergen Yard and acclaimed as the world's biggest purpose-built seismic research vessel, *Geo Celtic* is equipped with diesel-electric propulsion, using Vacon liquid-cooled active front-end units (AFE). The Vacon AFE unit is a bidirectional (regenerative) power converter for

the front-end of a common DC bus drive line-up. An external LCL filter is used at the input. This unit is used in applications where a low level of mains harmonics is required.

With its 4.2MW main propulsion drives, *Geo Celtic* was the first vessel to use Vacon DriveSynch, Vacon's new, fully redundant control concept for paralleling high-power Vacon NXP drives. Vacon DriveSynch technology is also used to control the pair of 4.5MW drives on *Fairmount Fjord* and *Fairmount Fjell* – originally semisubmersible barges being converted into self-propelled heavylift vessels at Malta Shipyards.

Last summer, Vacon also introduced one of the smallest drive families in the market today - the Vacon 10, ranging from 0.25kW to 5.5kW. Typical applications include HVAC fans and pumps, material handling, conveyors, and automatic doors. The functionality of the Vacon 10 is incorporated into the flexible control card, called the Application Interface (API), allowing clients to specify API cards for their specific needs.

Vacon's Vaasa factory is currently being expanded. Production space will be extended by a total of 7000m², and office facilities will be extended by 5000m². The number of personnel has increased to more than 800, not yet including that of US-based TB Wood's, the AC drives business that Vacon announced it would acquire in December 2007. After completing the acquisition in January 2008, Vacon has sales on all continents, and R&D and production on three continents. **NA**

Vacon liquid-cooled drives are available in the power range from 7.5kW to 5MW and in voltage ranges of 380V to 500V and 525V to 690V.



Halton clears the air

Product innovation remains the core pursuit for ventilation, fire safety, and galley systems supplier Halton Marine, and new demand is emerging for energy-saving technology.

Tommi Rantanen, Halton Marine marine and offshore business area director, says that new demand is fast emerging for energy-saving air-conditioning units with automated fan control from cruise ship customers. Such units, for passenger cabins, are already being produced for MSC Cruises' big newbuilding, the 133,500gt *MSC Fantasia*, being built at Aker Yards in France.

In summer 2006 a test onboard *MSC Musica* was arranged. Fifty cabins were connected to a system providing individually controlled fan pressure and supply air temperature. Comparing the energy consumption with a near identical group of cabins with a semi-automatic system, the results showed energy savings of between 15% to 30%. In this type of system, various equipment, such as frequency converters and the operation of valves, can be optimised for minimum energy consumption.

Halton Marine also recently introduced a new version of its single duct air-conditioning cabin units intended for crew cabins. The manually operated Halton HMC is arranged to fit in a standard roof panel construction, with the visible air duct plate having standard paned dimensions. It can be installed from below. The units are available for B-0 to B-15 fire classification.

Ultraviolet solutions

Another example of an innovative Halton Marine product is ultraviolet (UV) filtration of the exhaust air from the galley duct. Galley hoods are provided with different amounts of filtration depending on the use. The purpose of mechanical filters is to remove large particles from the exhaust stream and to provide fire protection by preventing flames from entering the exhaust duct. The three-stage filtration process is considered to be the best solution for

hoods with a high utilisation rate. Most of the grease particles are filtered through two-stage mechanical filtration. The third stage removes the remaining small grease particles using ultraviolet light technology, called Halton Capture Ray technology. Here, UV-lamps are arranged after the mechanical filters. The UV light results in two chemical processes. Photolysis takes place when UV light hits the long molecular chains and breaks the double bonds resulting in smaller molecular chains of grease. The second chemical reaction taking place is called Ozonolysis, in which the ozone generated by the lamps continues to react with the smaller chains of grease and grease vapours and alters them chemically.

The resulting substance does not stick to the ducts or fans, which reduces the risk of fire and also the need for expensive cleaning of the ducts. The first marine installation of this type was on *QM2*. After 10 months in operation, the ducts were examined using a robot. The ducts with UV filtration were clean. Consequently, Cunard placed an order for UV-filtration for the remaining galley hoods. Today a growing number of the galley hoods in the orderbook are of the three-stage type with UV filtration. Retrofits are also being installed, for example on the fleet of MSC Cruises. **NA**



Variable Air Volume-type cabin units for *MSC Fantasia* being produced at the factory of Halton Marine in Lahti, Finland. On the right, one unit in the test station, part of the quality control procedure.

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MacGregor enters offshore

MacGregor has been developing its offshore offering, after acquisitions last year.

Cargotec subsidiary MacGregor has expanded aggressively into the offshore manufacturing business through the 2007 acquisition of Norwegian Hydramarine and Singaporean Plimsoll Corp. A new offshore division has been established to cover the North Sea and Asia Pacific markets, and also to develop existing and new products to serve the offshore industry.

Hydramarine has a staff of 200 and manufactures hydraulic and electrical deck machinery equipment. With an assembly plant in Kristiansand and a 2006 turnover of €63 million, the company's main products include active heave compensated cranes, davits, winches, and subsea load handling solutions, for offshore supply vessels and rigs.

Plimsoll Corp, meanwhile, has 500 staff and produces hydraulic deck machinery for the offshore oil and gas, and marine industry in the Asia-Pacific region. With net 2006 sales of €43 million, main products include winches and cranes. Plimsoll has assembly plants in

Singapore and Indonesia, while a new plant is under construction in China.

MacGregor president Olli Isotalo said that the two acquisitions provided a complete package of winching and handling solutions, complementing each other geographically. 'We now have a strong setup in offshore, which we intend to build on organically.'

Expansion continued, in May, with the acquisition of Vestnorsk Hydraulikkservice, a service and turn-key system supplier to the offshore and marine industries. Its main focuses are offshore hydraulics service and products, complementing the hydraulics and spare part service of offshore support vessels of Scottish Grampian Hydraulics - acquired earlier.

During the first half of 2007 alone, MacGregor's new offshore division won some €57m worth of offshore deck machinery orders for supply vessels and FPSOs. The orders comprise offshore cranes, with and without active heave compensation, davits sold

under the Hydramarine brand, and anchor-handling winches and mooring winches sold under the Plimsoll brand.

In July, the new division received a €28m contract for 23 knuckle boom offshore cranes for 11 offshore supply vessels to be built in Europe, the USA, and India. In August and September orders totalling €60m equipment to be delivered during 2008-2010 were secured, including a €15m order for six cranes for two Vik Sandvik-designed offshore construction barges from Davie Yards, Canada. In November, offshore equipment orders totalling €50m were received including cranes with lifting capacities of 100tonnes-150tonnes and 2000m-3000m hook travel for offshore vessels for German and Indian shipowners, to be manufactured in Singapore, and a record size active heave compensated (AHC) crane for an offshore vessel with a lifting capacity of 400t and a 3000m hook travel (see p95). **NA**

Lautex ceilings rise to challenge

New investments to extend and modernise production.

Suspended metal ceilings specialist Lautex has continued with an ambitious investment programme as sales volumes have increased, pumping money into a new powder coating plant, enabling the company to work with large dimensions and units of up to 7m, and the modernisation of its wet coating plant and pre-treatment washing, flushing, and drying processes.

With recent deliveries primarily for shipyards in Europe, including Aker Yards, Fincantieri, Meyer Werft, and Lloyd Werft, the company's Nummela-based plant in Southern Finland manufactures demanding thin sheet products based on CAD/CAM programming. The steel and aluminium raw material thickness is between 0.4mm to 3mm and panel width 50mm to 300mm. They are certified to C, B-0, or B-15 fire resistance classes using, when needed, fire resistant wool filling.

All pre-treatments at Lautex are



New production technology introduced at Lautex includes the powder coating plant (left), and a bending robot (right picture).

manufactured to fulfil high quality criteria. In order to provide interior materials of highest quality, powder coating is a vital element of its production. Lautex provides some 400 different shades and surface textures, including genuine wooden coatings. Digital coating allows any images to be transferred onto the

surface of ceiling, wall, and floor panels up to a size of 1.5m x 3m, which can be combined to generate bigger images.

Recent deliveries of Lautex include ceilings for the cruiseships *Liberty of the Seas* and *MSC Orchestra* and ferries *Tallink Star* and *Color Magic*, all built at Aker Yards in Finland and France. Typical areas are ceilings in public spaces, corridors, and some cabins.

AIDAdiva, built at Meyer Werft, also received ceilings from Lautex. Lautex also provided panels, typically for public spaces, for Finnlines' ro-pax vessel newbuildings *Finnlady*, *Finnmaid*, *Finnstar*, and *Nordlink* built by Fincantieri, and for a number of cruiseships which were retrofitted at Fincantieri, Meyer Werft, and Lloyd Werft. Lloyd Werft and Götaverken also utilised Lautex panels for a number of retrofit ferries, including *Stena Germanica*, *Stena Britannica*, and *Stena Hollandica*. **NA**

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More modules from cabins

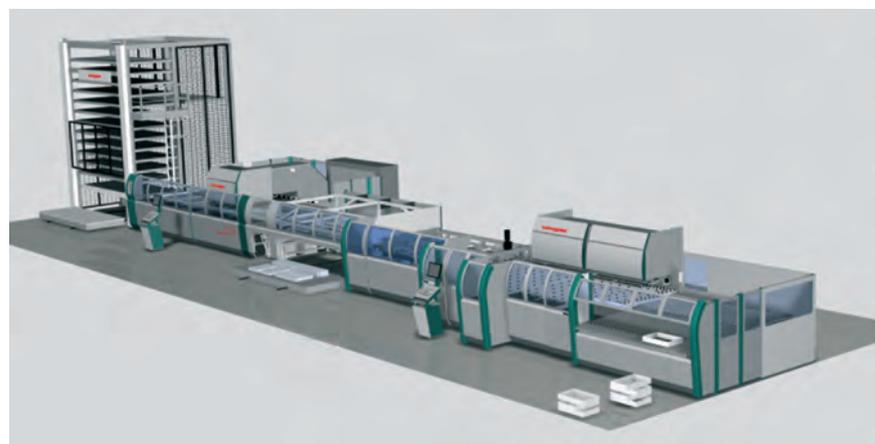
Aker Yards rationalises its cabin-building capability and invests heavily in new capacity.

Aker Yards Cabins, a business unit launched last year by Aker Yards, combines the cabin module manufacturing businesses of Aker Yards Cabins in Finland (previously known as Piikkio Works) and Aker Yards Cabins SAS in France. The unit is part of Aker Yards Cruise & Ferries.

The business unit oversees 300 staff at the two factories in Piikkio and Paimio in Finland, and 200 at Montoir de Bretagne in France, near Saint-Nazaire. The 22,000m² factory in France recently expanded from five to eight lines of production.

Aker Yards Cabins in Finland also recently introduced another panel production line at its factory in Piikkio, at a cost of €3m. Here, new technology has been applied, increasing the automation level of wall and roof panel construction and reducing the number of separate steel parts (screws, strips etc) needed by an estimated four million per year. In addition, the work needed for fastening has been much reduced.

According to the company, the new panel production line increases competitiveness and allows it to produce



The new panel production line of Aker Yards Cabins in Finland.

products like doors, service hatches, and sandwich panels, which were not previously part of its product line.

Aker Yards Cabins has an orderbook safeguarding production until 2010. Currently the cabins for the first *Genesis* cruiseship are keeping the Finnish factories busy. Aker Yards Cabins is producing some 7600 modular cabin units for the two vessels in the series, of which 5300 are passenger cabins

and 2300 are crew cabins. The factories currently also produce cabins for Leirvik Module Technology, which is building the accommodation blocks for the offshore platforms Gjøa and Troll A. All cabins will be delivered this year.

During recent years, Aker Yards Cabins has also expanded to cover installation onboard. Currently the company is outfitting the cabin areas onboard Tallink's ferry *Galaxy 2*. **NA**

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More space for bulk

Shipboard storage space constraints are challenged by a new approach from MacGregor Bulk.

Figure 1 shows an illustration of a typical bulk handling system concept of the type found on most existing supply vessels, including vessels under construction. The basic principle of this concept is that the bulk storage tanks are pressure vessels and that compressed air is used for discharging the bulk cargo. Typically, the bulk tanks are designed for a maximum operating pressure of 5.6bar. Typical volumes are 30m³-80m³, diameters 4m-5m, and heights 5m-6m. The bottom part of each tank is covered with aeration panels to fluidise the cargo when discharging to rig. The valves for selecting the tank to be filled or emptied are usually butterfly-type.

MacGregor Bulk claims that the main weakness in this scenario is the basic principle of such systems, where pressure vessels are used as bulk tanks. A circular footprint is not an optimum shape for efficient use of valuable space on an offshore service vessel, because it limits available below deck space for other liquid cargos and equipment. In addition, the complicated piping layout and inconvenient location of pipes and valves is further disadvantaged by the use of butterfly valves, claims the company - the piping layout demands a considerable amount of attention during design, fabrication, and installation phases. Even operators of the system point out the clogging problems they regularly face in the areas where pipes branch out and the difficulties encountered in maintenance due to the inconvenient location between main deck and top of the tanks, the company claims.

In its solution MacGregor Bulk draws on the 50 year experience of its Nordströms brand - the pneumatic conveying systems that have been installed on more than 60 cement carriers sized between 1000dwt and 40,000dwt, and at more than 15 marine cement terminals, where conveying rates in excess of 650t/hour of cement through a single line have been achieved. The technology has been used for transferring huge quantities of bulk cement from ship to shore silos and vice versa.

As a result of a market study, MacGregor Bulk has tailored its Nordströms dry bulk handling technology for the offshore supply



Figure 1: typical bulk shipboard storage system today.

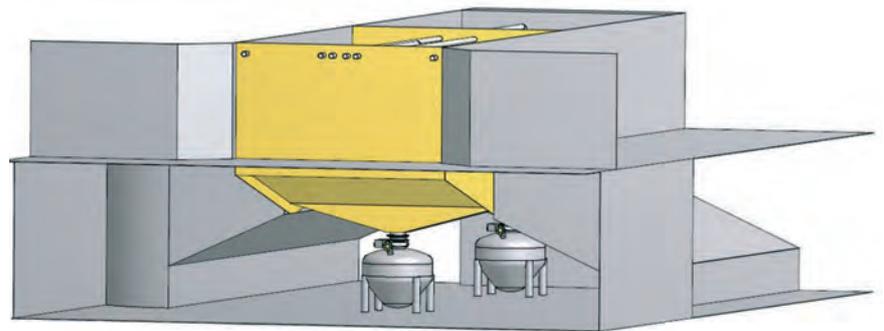


Figure 2: MacGregor's high volume bulk handling system. Since the hopper is not performing the discharge operation it is not subjected to pressure and therefore a rectangular shape can be used.

vessel market and, in 2005, received its first order from Qatar Shipping Co for dry bulk handling systems for two anchor handling tug supply vessels for Halul Offshore Services, with delivery this year. Today the total number of systems on order has grown to some 50 units.

In MacGregor's high volume BHS concept, cargo is received and stored in a hopper integrated into the vessel's hull and the discharge is performed by a blow pump, using compressed air. The advantage of this approach is that the hopper is not required to be pressurised and can be shaped to fit the overall hull design and utilise the available space more effectively. With this Hopper

and Blow Pump configuration the dry bulk capacity is increased by some 50%-75% within the same space occupied by conventional spherical bulk tanks.

Existing bulkheads form the walls, and the main deck forms the roof of the hopper. Some 2.2m space is needed under the hopper for the blow pump. The inclination of the hopper is 15°. The complete area of the floor is covered with aeration panels. For segregating different cargos, the hopper may be further divided into two or more compartments by adding transversal and/or longitudinal partitions.

MacGregor Bulk uses a two-way valve

system, which provides maintenance-free operation and an improved piping arrangement, since branching pipes are eliminated altogether, which also simplifies the piping arrangement, saving space onboard the vessel.

Cement is loaded into the hoppers pneumatically by means of compressed air provided by compressors onshore. To maximise the net cargo volume the filling line to each compartment is split into two or more branches before entering the hopper, thus providing several drop points in each compartment. Transport air is evacuated, from the compartments being filled. Dust is separated and conveyed back to a compartment.

When unloading, the control system activates the aeration system in the selected compartments and starts the blow pump system. The air supplied by the blowers passes through the fabric of the aeration panels and fluidises the cement which will start flowing by gravity towards the outlet at the lowest point of the hopper floor. The cement is discharged into the blow pump in batches of approximately 3m³ which conveys it to the rig pneumatically. This is a cyclic operation. The compressed air for pneumatic conveying is supplied by the onboard transport air compressors. Only the blow pumps are pressurised.

In a case study, a Vik Sandvik VS491-type anchor handling vessel was originally designed with conventional bulk tanks with four 75m³ tanks each, giving a total capacity of 300m³. It was decided to replace the conventional system with the high volume Bulk Handling System, which resulted in an increased capacity to about 500m³. *NA*

Detail, MacGregor's new high volume bulk handling system.

Boom in bulk handling cranes

The bulk carrier boom has recently resulted in major orders for MacGregor. During the first half of 2007, the company secured cargo handling crane orders for 74 bulk carriers in China and India, with deliveries to continue into 2011.

The supplier says the Chinese market has been the most active and counts for a total of 62 ships at five different shipyards. Main products are standard GLB-type cranes with a 30tonne to 36tonne SWL capacity. In the second quarter of 2007 alone, the company received 276 GLB-crane orders for bulk carriers with a total value of approximately €75m. A major order, for a pair of GLB cranes apiece for 27 Yangzijiang Shipyard-built 7600dwt bulk carriers was announced in August.

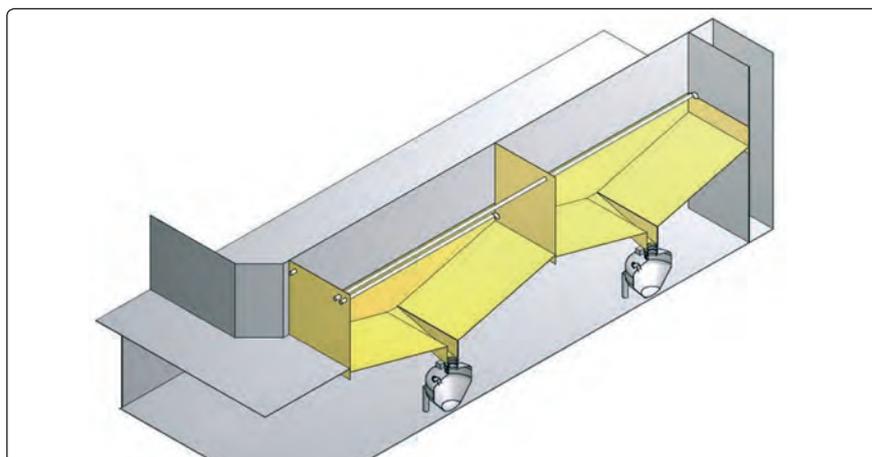
More crane orders were received in the autumn. Ten 56,000dwt bulk carriers on order at Hyundai Mipo Dockyard for E Rickmers of Germany will each feature four GLB 3026-2 cranes. Towards the end of 2007 the company confirmed contracts for 390 cranes in all with a total value of close to €140 million. The cranes are destined for 101 ships on order in China and South Korea, comprising 80 bulk carriers, 14 general cargo ships, and 7 container feeder ships. The cranes are manufactured by MacGregor's manufacturing partners in these countries.

The strong demand for bulk carriers, combined with the phase-out of single-hull tankers, has resulted in an increasing amount of conversion projects of tankers to bulk carriers. The company has also received several enquiries for converting tankers to FPSO vessels. MacGregor's scope of delivery includes design, key components, steel structure and installation supervision of new hatch covers.

'At the moment we have about 30 projects on order, including mostly single-hull tankers but also double-hull tankers,' says Pertti Vilhonen, sales manager from MacGregor.

The company has a dedicated, special unit to prosecute this task. The conversion projects vary from 30,000dwt to 300,000dwt ships, with drydockings taking four to seven months depending on a ship's size.

The same specialist team carried out about 400 conversion projects in relation to the URS30 regulation changes a few years ago, raising the strength standard of securing devices and stoppers for steel hatch covers and their cargo hold openings in the forward part of the ship issued by the International Association of Classification Societies (IACS).





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Shape of cranes to come

On delivery, in March 2010, the crane vessel *Borealis* will feature the largest shipboard single mast crane ever to have been built.

Nordic Heavy Lift subsidiary Avonway, registered in Cyprus, ordered a unique US\$221 million, 13,500dwt crane vessel last year, with a record 5000tonne Huisman-Itrec single mast lifting capacity to be fitted aboard the vessel. Due to be delivered through Singapore's Sembawang Shipyard in March 2010, an option exists for a second, identical ship.

The 'SOC 5000' crane vessel, to be named *Borealis*, will be capable of supporting the construction and maintenance of offshore surface and subsea oil and gas developments worldwide.

Overall concept and basic design for the DNV-classed, monohull vessel have come from Sea of Solutions (now part of Ulstein Group). The design has many innovations but, according to Huisman-Itrec, what will catch the eye will be the enormous single mast crane, reaching approximately 150m above the deck



Borealis will feature the largest shipboard single single mast ever installed.

TECHNICAL PARTICULARS

Borealis

Length, oa.....	180.9m
Length, bp.....	170.1m
Beam.....	46.2m
Depth (moulded).....	16.1m
Draught (operational).....	6m-9m
Main deck area.....	5500m ²
Main azimuthing thrusters.....	2 x 5500kW
Retracting azimuthing thrusters.....	3 x 3000kW
Tunnel thrusters.....	2 x 2000kW
Speed.....	ca 14knots

5000tonne Heavylift Mast Crane

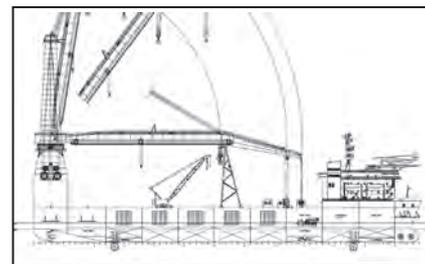
Capacity over the stern.....	5000mt at 34m
Capacity revolving.....	4000mt at 41m
Mast height.....	82m
Total boom length.....	120m
Max radius main hoist.....	79m
Max radius aux hoist.....	109m
Max radius whip hoist.....	122m

when topped up. To date, the largest shipboard crane specified has been for *Sapura 3000*, commanding 3000tonne lift capacity. This, too, has been a combined Sea of Solutions/Huisman project.

Today's deepwater oilfield construction projects demand high transit speeds and good DP capabilities when on station. Where the current crop of heavylift achieve no more than around 7knots, the SOC 5000's hullform has been optimised for higher transit speeds of up to around 14knots, in order to ensure short mobilisation times and thus maximise revenue earning potential. *Borealis* will be driven by two propulsion thrusters of 5.5MW each.

Main thrusters, when combined with four 3.2MW retractable thrusters and 2.5MW bow thrusters, will give the vessel DP3 class. Provision for a future eight-point mooring system is also being built into the design.

The SOC 5000 will also be able to handle large subsea modules of up



Design drawing the SOC 5000 crane vessel *Borealis*.

to 600tonnes at 3000m water depths including heave compensation. Furthermore, the vessel will feature a large deck area of around 5500m² for the storage of modules handled and will be pre-prepared for the later installation of S-lay pipelaying equipment.

The build contract will see a Chinese-supplied hull, with 3D modelling, outfitting, and commissioning undertaken by Sembawang in Singapore, to deliver a vessel able to accommodation 220-400 crew. The crane itself is being supplied through the owner. **NA**

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400tonnes and rising

Offshore equipment orders recently signed by MacGregor's Offshore division include the single biggest order in the history of the newly-acquired Norwegian company Hydramarine. This is for two Hydramarine active heave compensated (AHC) knuckle jib cranes for a 156m long offshore vessel being delivered in 2010 to a Norwegian shipowner for deepwater subsea operations. One of the cranes, which will be installed under the main deck, will have a lifting capacity of 400tonnes and a 3000m hook travel. The same ship will also receive a 50T AHC crane. The cranes will be manufactured at the Offshore division's factory in Kristiansand, Norway.

Other orders include four Hydramarine AHC cranes for four offshore vessels being delivered during 2009 and 2010 to shipowners from Germany and India. The cranes have lifting capacities of 100tonnes-150tonnes and a 2000m-3000m hook travel. The four cranes will be manufactured at the Offshore division's factory in Singapore. *NA*

400tonne capacity crane from Hydramarine, now part of MacGregor's offshore division.



Flexible tank cleaning

Palfinger HTC reports strong uptake for its innovative internal tank platform (ITP), developed as a maintenance, service, and inspection tool for bulk carriers, container vessels, and oil tankers.

The Salzburg-based manufacturer of marine cranes identified the labour-intensive tank cleaning, blasting, and recoating process as a significant bottleneck in ship maintenance procedure, involving the time-consuming construction of scaffolding, or the costly deployment of cherry-pickers. As well as lay-days involved in traditional methods



Palfinger HTC's innovative internal tank platform.

of vessel maintenance, it is simply a fact that when scaffolding is used, the

scaffolding itself will need to be cleaned, while shipyard staff are exposed to poor working conditions, such as insufficient light, exhaust gases, and cramped conditions.

The ITP, developed by Palfinger HTC after extensive talks with shipyards, is a system of four independent operable working platforms (baskets) designed to fold into a tube with the smallest possible dimensions (1250mm by 725mm). Weighing 8500kg, the ITP confers quick deployment, with outreach per arm system given as 15m, and each basket able to take a payload of 125kg. *NA*

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The International Human Element Bulletin

Issue 16 of Alert! focuses on complacency and routinisation. It introduces the term Rogue Behaviour to describe some of the character traits that can bring about a culture of non-compliance, lapses of judgment and unprofessional behaviour.

Included are articles from accident investigators, academics and a ship master offering some thoughts on how to overcome some of these traits.

Some rogue behaviour inducing conditions are readily recognisable: boredom, complacency, drudgery, familiarity, ignorance, impulsiveness, risk taking and routinisation. Others may not be so easy to recognise: apathy, assumptions, compliance, contentment, contempt, dumbing-down, invulnerability, perceptions, predictability and seclusion – all of these are explored further in the centrespread feature of this bulletin.



Issue 16 is now available from www.he-alert.org

The automated tandem lift

Liebherr's innovative control system for shipboard cranes features new anti-collision technology.

With demand for heavy load vessels continuously in the ascendant, Liebherr has adapted its existing range of equipment to meet requirements, with ship cranes now offered providing lifting capacity of up to 450 tonnes. In parallel, it has been developing its Litronic control system for higher efficiency. This sophisticated technology is designed to allow automatic tandem operation, and includes other optional features, such as anti-collision and remote control of cranes for improved safety.

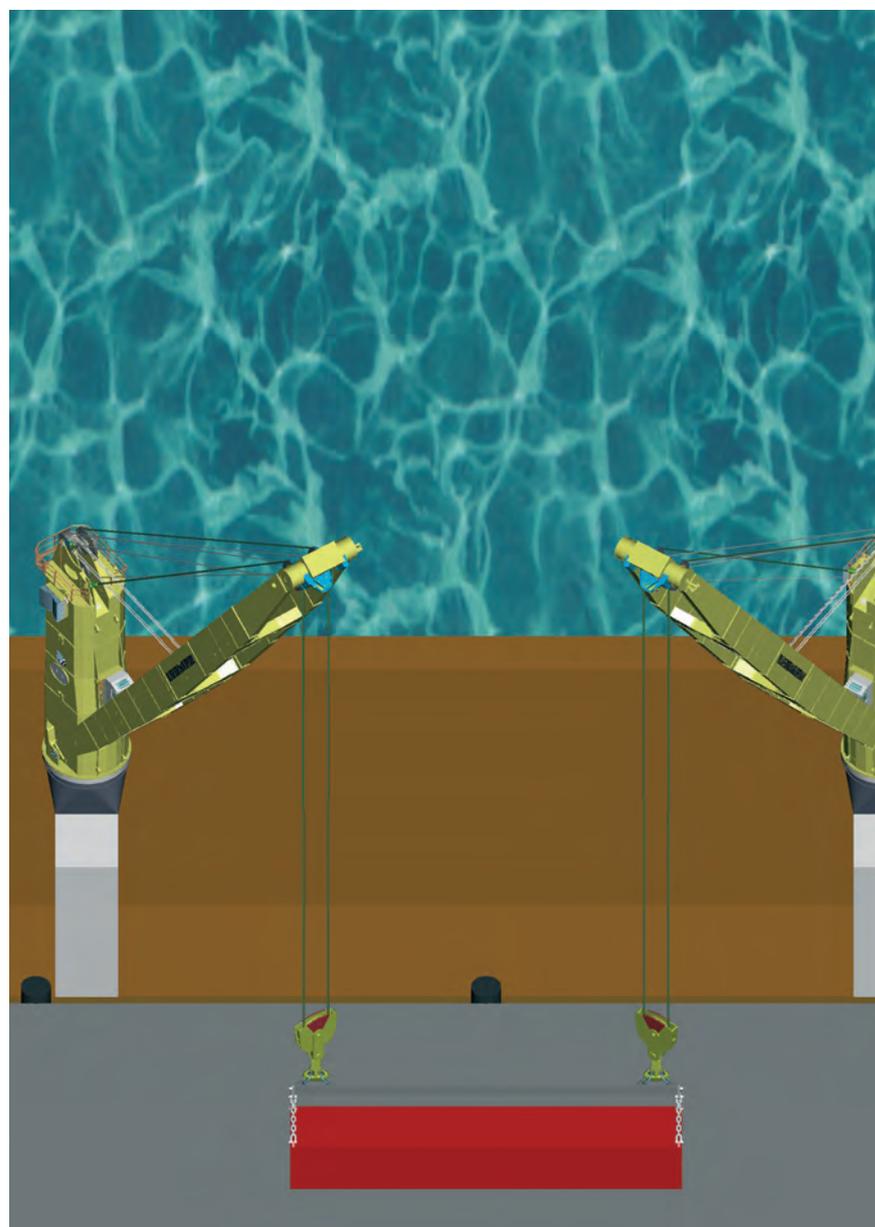
The company's dynamic anti-collision system controls the simultaneous operation of crane motions, ensuring best possible performance and protection for the crane, according to the supplier.

The basic idea behind the anti-collision system is the prevention of collision between cranes and/or obstacles. When a number of cranes are operating simultaneously, the action of each one can be controlled based on information regarding the current position of neighbouring units. According to Liebherr, the unique feature of its system is that it automatically calculates actual positions and speeds, as well as the acceleration of each crane and the load moment limitation. This provides crane drivers with maximum flexibility, backed by full safety.

Conventional anti-collision systems define a virtual border, in order to prevent collisions. This amounts to a restriction of the working radius of each crane. With the dynamic anti-collision solution, working radii are not restricted, as the system calculates the actual and anticipated crane movements.

Automated tandem lifts are another important feature of the Liebherr control system. Two cranes can be operated by one crane driver to lift one heavy load, possibly attached to the traverse. Tandem lifts can be carried out in three different modes:

- Standard mode tandem lifts, requiring each of the two cranes to have its own driver and each driver to be informed of the main functions (speeds, etc) of both cranes on their respective screens, in order



Automated tandem lifting – a new innovation from Liebherr designed to accommodate ever rising load weights.

to control simultaneous speeds

- A more efficient alternative is the automatic parallel mode, with only one crane driver controlling both cranes. In this mode the traverse remains parallel to the ship or to the starting position and an automatic control system calculates the movement

of the boom head of both cranes. Speeds are derived from the calculated boom head speed. The traverse remains horizontal. As the length and hook height difference is kept constant during motion, there will be no diagonal line pull in the cables. Another big advantage here is that communication

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The trend towards increased size of Container Ships presents unique challenges for Owners, Designers, Operators and Classification Societies. The high speeds and unconventional structural arrangement of Container Ships can increase the risks associated with innovation. Questions of structural strength, severe weather loads and stability must be addressed. Thought is also being given to deck cargo arrangements; problems with securing the containers to resist green water and potential problems with the safety and speed of loading and unloading are beginning to be addressed.



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involves one driver and one banksman, rather than two crane drivers

- A third option for tandem lifts is the automatic rotation mode, with the traverse being able to rotate. The crane driver only has to control the direction and/or rotation of the traverse while the control system automatically calculates the required movement of the boom heads of both cranes. Speeds are again derived from calculated boom head speed. The traverse remains horizontal

Furthermore, the anti-heeling system

of the vessel can be supported through the control system.

The total moment of all cranes can be calculated in relation to the vessel's longitudinal axis, depending on the load and working radius of each crane, and displayed on the bridge.

Another innovative feature for these cranes is the vertical line finder, which is provided as an optional control assistance to avoid side loading of the crane. This new device controls the crane jib position by indicating the exact vertical rope position before the load is lifted off. According to Liebherr, this

ensures maximum accuracy by avoiding eventual side loading of the load, resulting from the long distances between the operator and the load or asymmetric centre of gravity. The benefit is that load swinging is avoided right from the start, thus reducing the risk of damage on both the load and the crane, as well as the maximised safety of the operator and the environment.

The first ship cranes to include Liebherr's latest anti-collision system and automated tandem operation are the CBB series of electro-hydraulic heavylift rope luffing cranes. [NA](#)

Offshore on the up for TTS

Diversified cranes and cargo handling supplier TTS Marine has established a separate organisation focusing on large anchor handling and towing winches.

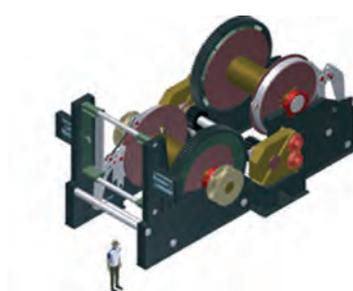
New TTS subsidiary TTS Offshore Handling Equipment (TTS-OHE), based in Ålesund, is served by a satellite office at Os, outside Bergen, and is marketing products to clients worldwide.

The group said the main offshore office in Ålesund would develop and produce all control systems for these winches and the office at Os would handle the mechanical and hydraulic construction. The organisation would add new employees over the coming months.

TTS-OHE is involved in the winch market, through its offering of advanced active heave compensated subsea winches, operating at depths down to 3000m.

'We have already been contacted by several customers and have already started up construction and developing of a long range of anchor handling winches,' said TTS-OHE sales manager Sverre Mowinckel-Nilsen. 'Through TTS we can offer our clients a strong organisation which can secure both the delivery of advanced anchor handling/towing winches together with a worldwide service organisation which secures our clients at operational time of the equipment.'

TTS-OHE is offering winches in the range of up to 600tonnes lift capacity. The company will deliver the winches with high pressure (HP) hydraulic drift, in line with



Automated tandem lifting – a new innovation from Liebherr designed to accommodate ever rising load weights.

what it termed growing acceptance from both shipyards and shipowners, where low pressure hydraulic winches have found favour historically.

Separately, TTS Marine Cranes also reports strong activity in the offshore sector. In December 2007, the company secured a Nkr49million order through Greek owner Toisa, calling for delivery of two offshore cranes before the end of 2010. Two vessels under construction in China will be fitted with one active heave compensation crane apiece, with delivery to be made out to TTS Shanghai.

Then, in January 2008, the same company announced an order for three more active

heave compensation offshore cranes to the Norwegian stock exchange, for unspecified customers. [NA](#)

ODIM in acquisitive mood

Norwegian winch and lifting equipment specialist ODIM has acquired Aukra-based ABAS Crane and Aker Brattvaag Winch, of Søvik. The acquisitions extend ODIM's portfolio in specialised electrical winches for ships and offshore installations. ABAS Crane supplies cranes for merchant ships, offshore vessels, and fishing vessels.

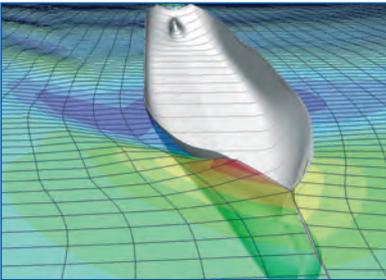
Among ABAS Crane's most recent contracts is its largest ever, covering the delivery of three advanced cranes for the FPSO *Aker Smart 1*. The deal marks a step change for the company, extending its reach from standard deck cranes to large offshore cranes.

The Royal Institution of Naval Architects

MARINE CFD 2008

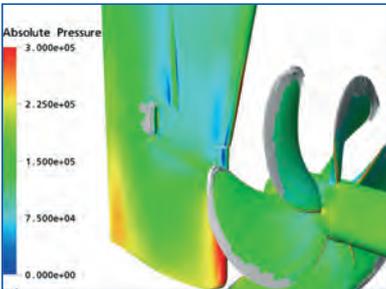
26 - 27 March 2008, Southampton, UK

Second Notice

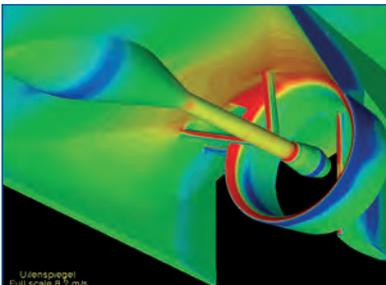


Computational Fluid Dynamics (CFD) is an increasingly important tool for analysing flows around ships and propulsors. It is used to solve a wide range of maritime applications from resistance prediction to slamming loads calculation. It can provide important insights into physical flow characteristics and can offer an economic way to investigate design options.

Generic CFD codes often lack some features and capabilities needed to address specific maritime applications. The presence of the free surface provides a major departure from conventional CFD applications. The need to represent this fluid interface accurately presents a considerable challenge, not least because its behaviour can vary considerably within the computational domain, and as a function of hull form and speed.



Advances in computer technologies over the past two decades are slowly turning the dream of the complete numerical towing tank or 'virtual basin' into a reality. However, today's methods still lack the accuracy to match results obtained in real-life experiments. While it is unlikely that a single CFD tool suitable for all applications will be developed, there are many synergies that could be better exploited. The three major requirements for practical engineering applications are computational speed, accuracy and integrated into the overall design process.



This International conference will offer delegates an opportunity to meet and discuss the latest developments and practical marine application of CFD. The programme will also include software workshops which will give delegates a chance to participate in and discuss demonstrations of the latest CFD software. Papers will cover such areas as:

- Practical applications of CFD techniques to marine design
- Experimental and computational validation & benchmarking
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The probability of survival

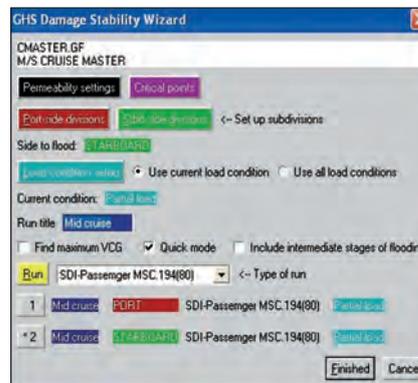
Damage stability application eases complexity of probabilistic methodology, writes Bill Plice, president, Creative Systems, Inc.

Several variations of the probabilistic approach to stability-while-damaged have been developed over the years, but newer regulations are focusing on the method adopted in 2005 by the International Convention for the Safety of Life at Sea (SOLAS), known as Resolution MSC.194(80).

Two versions of this method are prescribed: one for passenger ships and one for cargo vessels. The passenger-ship version escalates the complexity of the required calculations to a new level since it adds a requirement to evaluate stability with heeling moments due to wind, passenger crowding, and lifeboat deployment and, in addition, requires checking intermediate flooding to determine whether lesser stability might be encountered as flooding progresses.

All probabilistic methodologies are based on a thorough analysis of the vessel's response to damage or flooding where single and multiple compartments are assumed to be flooded one at a time and in combination. A range of damage extents is considered, where higher probability of damage is generally assigned to lesser extents of damage.

For each damage scenario, the probability of survival is calculated using certain formulas that are ultimately based on statistics from experience with ships at sea. The product of the probability of damage times the probability of survival is a partial probability that contributes to an overall measure of stability when added together with all the other partial probabilities from all of the extents of possible damage along the length of the vessel. This grand summation is called a subdivision index. Actually it is only a partial subdivision index, because under other loading conditions or draughts the calculations will produce different results. Therefore, partial indices from multiple draughts are combined to arrive at the attained subdivision index that is then compared to a required index. The required index is



Probabilistic approach to stability.

set in consideration of the type of ship, its length and, at least for passenger ships, the numbers of people onboard.

The probabilistic approach to stability has much to recommend it. It takes into account the fact that there is no such thing as enough stability to meet the most severe damage or the most severe weather. As a practical matter, ship design must aim for an acceptable probability of survival. Since all of the design features affecting stability are rolled into one probability, the designer is free to make tradeoffs without being hurt by unnatural features of rigid stability criteria, on the one hand; or, on the other hand, being tempted to exploit loopholes in the rule to increase loading limits at the expense of real safety. With the probabilistic approach, design tradeoffs, insofar as they affect stability, are realistically represented in the attained subdivision index.

From the standpoint of the computational procedures, the great advantage of the probabilistic method is that it embraces the problem of damage extents as well as the problem of survivability after damage, combining the two in one elegant measure. This formalises and standardises the generation of damage scenarios and makes it possible to present the results in a compact format. Since the probabilistic methodologies directly address specific features of ship subdivision, there are (at least theoretically) fewer decisions left

to the person running the calculations. It offers the potential of a high degree of automation and time-saving for the designer.

The methods of determining damage and survival probabilities must address the many possible intricacies of ship subdivision in a general manner. The approach that has been taken by the formulators of these methods is to envision an idealised set of features which is assumed to represent all of the important features of any real ship, and then design rules that address the idealisation. However, it is not always possible to address real subdivisions, using such rules, without ambiguity. Therefore, when actual computational procedures are laid down in computer code, the verbal rules have to be augmented in order to make the software work. In other words, methods must be programmed that take the features of the real ship and fit them into the idealisations upon which the rules are built. In most cases this transformation is straightforward; but in some cases a choice has to be made between alternatives, which seem to satisfy the wording of the rules. In such cases, the software might well have a means of user input so that decisions about how to treat these features can be made intelligently and deliberately by the naval architect.

For example, wing tanks or compartments are effective in limiting the flooding due to horizontal penetration through the side shell of the vessel. The extent of such penetration is linked to its probability: a greater extent of penetration requires more energy and is therefore less likely. In concept, a given wing-tank design will limit flooding to the wing tank when the penetration is less than a certain value. In order to get the highest probability out of this damage case (that is, to contribute most to the attained index) the designer will want the penetration value used in the calculations to be as large as possible. But what is this penetration value that just misses rupturing the wing bulkhead? Is it

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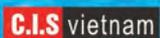
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simply the distance from the side shell to the wing bulkhead? What if the side shell is not a nice flat wall? What if the bulkhead is sloping in various directions, has knuckles, or is stepped? What is a fair penetration value to use in those cases?

What should, in theory, be a highly automated task can become demanding, not only for the software designer but for the software user. Designing software that both automates the task and avoids hiding decisions the user should be overseeing is a challenge.

An example of how this challenge can be met is the new damage-stability wizard that runs in GHS. It can automate almost all aspects of the task, so that setting up a run for calculating the subdivision index on a passenger ship using the MSC.194(80) method can be done in just a few minutes. Yet it provides the naval architect with a means of refining the procedure to take advantage of special features of the ship design. In keeping with this philosophy, it

automatically produces a compact report presenting all of the essential information on which the computations are based; yet it provides options for getting detailed notes that describe every step of the process.

GHS alone, without the wizard, provides procedures which implement several versions of the probabilistic damage method, including MSC.194(80). Traditionally, the user would prepare a run file laying out the commands for defining subdivisions, setting up load conditions, and executing the appropriate probabilistic calculations. For passenger ships under MSC.194(80) the user would also have to write a macro to perform the survival probability calculation, including heeling moments and intermediate flooding. The Damage Stability wizard takes over all of these tasks, yet it provides for additional control by means of optional inputs.

Known simply as DAMSTAB2, this damage stability wizard is more like an

application program than a wizard, as the term is commonly used. Though written entirely in GHS command language, DAMSTAB2 operates like an independent program. Its job is to automatically prepare the input files for performing damage stability calculations and then to run the calculations. It accomplishes this by launching a separate session of GHS that runs off the inputs it has prepared. It can launch and keep track of more than one session at a time - one performing the calculations for starboard-side damage and the other for port-side damage, for example. For preliminary design calculations it is a great time-saver. But it also provides the means of optimising the calculations to take advantage of special design features while providing detailed reports to answer any questions about the manner in which the calculations were done.

For more information on DAMSTAB2, go to the contact Creative Systems, Inc website at www.ghsport.com. **NA**



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3rd-7th March 2008

By Joe Stiglich

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- Hull boards
- Vessel stability
- Incidents/accidents

About the Course Leader: Joe Stiglich is a retired Naval Officer, qualified NAVSEA Docking Officer and holds a Masters Degree from MIT in Naval Architecture and Marine Engineering. He has been responsible for over 250 safe docking and undocking operations. He currently runs a series of conference and training courses for personel involved in all phase of the drydocking industry and acts as a consultant for ship repair companies.

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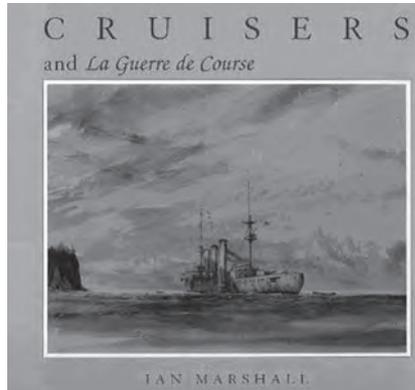
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Cruisers and 'La Guerre de Course'

Review by Robert S Hunter

Cruisers and 'La Guerre de Course'

by Ian Marshall
 Mystic Seaport Museum
 PO Box 6000
 Mystic
 CT 06355 0990
 USA
 ISBN 978-0-939511-20-4
 Hardback, 232 pages
 US\$60.00



This is marine watercolour artist Ian Marshall's fifth publication, and it demonstrates his extensive knowledge of naval history, as well as his artistic talent. On this occasion he has chosen as his subject the evolution of the Cruiser Type, from early beginnings with the activities of the 18th and 19th Century Privateers, the havoc caused by the Confederate Commerce Raiders in the American Civil War, followed by the worldwide 'La Guerre de Course' strategies

SMS Konisberg, Dar es Salaam, German East Africa painted by Ian Marshall.



adopted by the major naval powers in the late 19th and early 20th Century.

Over 50 colour plates of his evocative, slightly impressionistic but detailed work, and many pencil sketches, diagrams, and maps illustrate and bring his text to life, clearly the subject of detailed research. The author traces the developments in naval architecture and marine engineering made possible by the transition from sail to steam, and from construction in wood to iron, and then steel.

The life of an army of firemen and trimmers, perpetually shovelling coal in the hell-hole of the boiler room floor plates to maintain a head of steam, is in stark contrast to the roles taken by Lord Armstrong and his contemporaries as arms and warship suppliers to the navies of the world from his Tyneside shipyard at Elswick, Newcastle upon Tyne, UK.

Ian Marshall devotes a lengthy chapter to a detailed account of Cruiser development in the Royal Navy, thereafter tracing development by other leading naval powers of the Victorian era; recounting some of the more significant confrontations by legendary

ships commanded by legendary names at a time when radio communication was in its infancy. These battles took place between opposing naval forces as far apart as the Mediterranean, the Sea of Japan, the hide and seek stealth activities in the Chilean Fjords and Tierra del Fuego, the Falklands, the Atlantic, Pacific, and Indian Oceans.

The last chapter highlights some significant merchant ships, many of them passenger liners which were commandeered and very hurriedly converted into Armed Commerce Raiders. These vessels struggled to break through the British blockade of the North Sea on their roaming mission to seek and destroy vital communication and fuel supply lines, and undermine the commerce of the allies.

For those with an interest in maritime history and marine art, on the presentation of the colour plates alone this volume is a worthy and major addition to any private book collection with a naval heritage theme; but for a reader interested in the evolution of naval design, engineering, and naval warfare, and those who devote their lives to service in the modern navies of the world, the detailed and informative text is a wonderfully explicit read, and the quality of the colour plates is an added bonus.

Ian Marshall, born in Fife, Scotland, trained as an architect in Cape Town and Pennsylvania Universities, and now lives in Maine, USA, with his American wife Jean. He is also currently president of the American Society of Marine Artists.

His work hangs in the permanent collections of the US Naval Academy Museum at Annapolis; the Royal Naval Museum at Portsmouth, England; the Scottish United Services Museum, Edinburgh Castle; the Maine Maritime Museum, Bath; Lloyd's of London; the Foynes Flying Boat Museum County Limerick, Ireland; the Botswana National Museum at Gabarone; and the Royal Netherlands Navy Museum at Den Helder, The Netherlands. **NA**

General O'Higgins for the Chile Navy, Elswick Shipyard, Newcastle Upon tyne, 1898.

Shallow Water and Supercritical Ships

Review by Nigel Warren

Shallow Water and Supercritical Ships

by A Lyakhovitsky
 Backbone Publishing Company
 PO Box 562
 Fair Lawn
 NJ 07410
 USA
 ISBN 978-09742019-5-5
 Hardback, 277 pages, 2007
 7.5"x10"
 US\$156.00

The topic of Shallow Water and Supercritical Ships has been generating research documents

ever since John Scott Russell wrote about a barge being towed along a canal by a horse. The horse was suddenly startled and bolted, towing the barge past the critical Froude depth number and leaving the water disturbance and wash behind.

As naval architects know (or should know), get past the critical shallow water hump and the resistance and wash is less than in deepwater. What is less well known is that this led to a fast passenger transport system on the canals of England, Scotland, and Ireland – all horse drawn.

Some say that books like this are dinosaurs, that nowadays if you are looking for some specific topic you reach for a search engine, not a book. Not everything is on the web, however, as this compendium contains extracts of research which is not on the Internet, because the work was published many years ago, but is still totally valid and relevant.

The book also has a huge list of

references of research mostly residing in Institution libraries, particularly in Russia, and probably not accessible online. So this publication is a very useful reference work for anyone involved in boats and ships that work in shallow waters, and it is not a dinosaur!

The author is professor of the department of naval architecture, State Marine Technical University, St Petersburg, Russia. He co-authored another similar book: *Multi Hull Ships*. Also in the range published by Backbone Publishing Co are *Small Waterplane Area Ships* and *Ships with Outriggers*.

All of these books are written in a similar vein and, like the classic Hoerner's *Fluid Dynamic Drag*, contain a multitude of little graphs and tables to give quick guidance to a specific problem. For instance, if you want to know the effect on the residuary resistance of moving the centre hull of a trimaran forward of the wing hulls at the critical speed in shallow water, you will find it in this book.

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Although the book is entitled 'supercritical', in fact half the book is about subcritical situations in shallow water. However, the book is not about supercritical operation in sea-keeping terms.

There are seven chapters, and pages of theory are interlaced with descriptions of ships and boats that work in shallow waters; shallow in this context includes the Irish Sea and the HSS ferries that used to ply their trade there. Some of the descriptions of ships and their performance are gleaned from journals and magazine articles therefore sometimes the statements have to be taken with a pinch of salt – the reference to SLICE and the Quadrimaran for example.

Russia, of course, has extensive shallow waterways which are heavily used by both sub- and supercritical vessels, and some of these are highlighted. The sharp rise in resistance near the critical speed is demonstrated by numerous extracts from model and full scale tests. The change in trim and sinkage is also dealt with in one chapter.

Another chapter deals with the environmental impact of ship waves. This is a modern topic that attracts a lot of research work both in terms of how to design a vessel for minimum wash but also the effect the wash has on the environment (river banks, other users of the waterway etc).

This section fails to talk about the truly low wash catamaran vessels operating in Holland, Australia, and on the River Thames in the UK, and how they have achieved their purpose. The only clue lies in the statement: 'Relative hull length should be as high as possible.' It takes some time to figure out what it means - relative to what? It's to displacement, usually called length-displacement ratio. In other words, the longer you make the hull for a given displacement, the lower the residuary resistance and the lower the level of wash.

This is actually quite simple; it is a shame this is not emphasised as the only practical way of reducing wash that a naval architect has in his toolbox, apart from adopting a hydrofoil or hovercraft arrangement. Many devices claiming

to reduce the wash of conventional subcritical ships (some patented) are described, but to my knowledge none are in practical use.

Reference is made to the phenomenon that wash height differs widely whether the craft is proceeding upstream or downstream, but no explanation is given. The failure of the Pacificat ferries in Vancouver is also referred to, a problem that could 'easily be solved' – but how?

Trimaran configurations feature strongly in the book and there are lots of comparisons with catamarans and monohulls. Also included are numerous model test results. A large section is devoted to the effect of shallow water on the propulsors, using experimental studies. This relates to coasters and river barges.

While the term 'ship motion' is regularly used it means horizontal motion through calm water, but there is an interesting bit on the motion of a cargo vessel in waves in shallow water compared to deepwater. In fact the book is full of interesting bits. Just forgive the, at times, odd translation! **NA**

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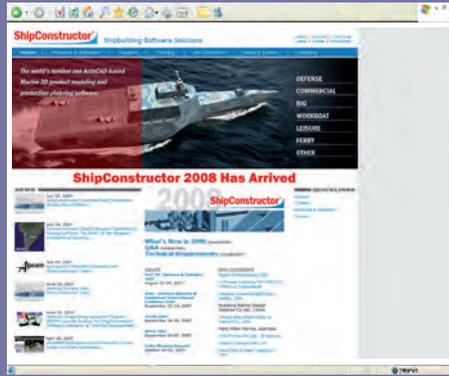
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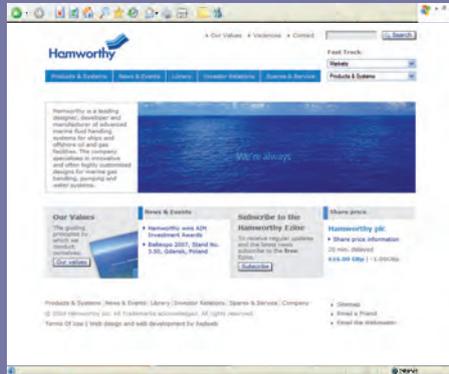
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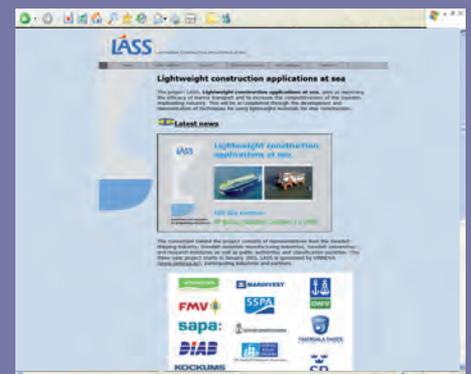
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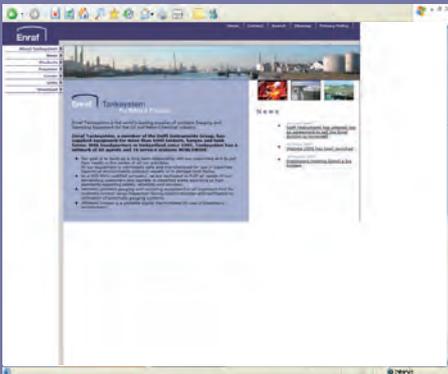
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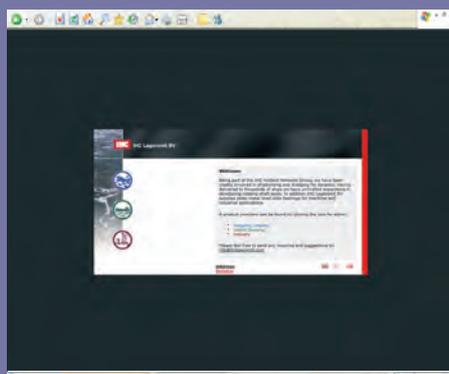
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