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# THE NAVAL ARCHITECT



Seen here during her pre-delivery drydocking at the DSME (Daewoo) yard is a 145,700m<sup>3</sup> LNG carrier for Maran Gas. She is the first Korean-built ship to be coated with International Paint's Intersleek foul-release antifouling. Two further ships for this owner are to be similarly coated. More details appear on page 40.

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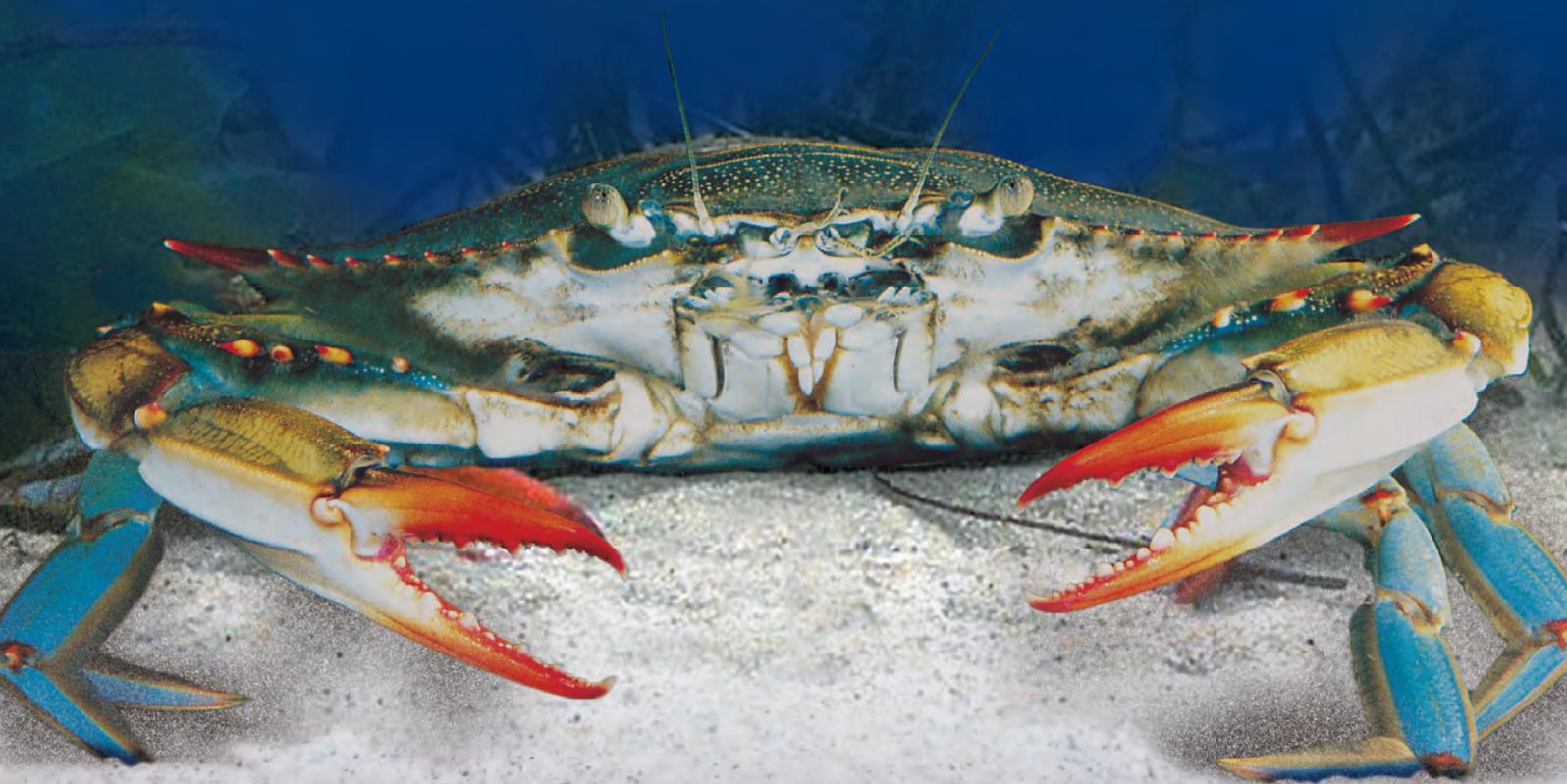
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# Utopia attained for bulk carriers?

MANY words have been written in this journal and elsewhere about the technical concerns that have faced bulk carrier structures. In the UK at least, the whole question was thrown into focus for several years by the 1980 loss of Bibby Line's *Derbyshire* (actually an OBO carrier), but since then there have been other significant losses, often of ships carrying dense iron-ore cargoes and accompanied by large loss of life. There have also been one or two spectacular accidents during loading and discharging.

Bulk carriers may be 'simple' ships compared with LNG carriers or cruise liners but they probably have the hardest life of all - especially if sailing in the coal or iron ore trades, where corrosion hazards are high (iron ore is particularly in great demand today to fuel China's booming industrial economy). Only last month, a leading member of the UK maritime community was reflecting to *The Naval Architect* on an alarming experience during his time at sea when he witnessed the cranes on his loaded bulker twisting one way and the funnel at the stern twisting another, due to torsion in the hull.

Such heart-stopping stories will hopefully come to an end when the International Association of Classification Societies (IACS) formally agrees in December the finalised text of its common structural rules for bulk carriers (also common rules for tankers). Aims are, amongst others, the elimination of class competition on scantling matters and the embrace of IMO's projected goal-based standards. The rules are scheduled to come into force on April 1 next year, for all contracts relating to vessels of more than 90m length signed after that date (the date of contract, not keel laying, will be the critical point).

This agreement has been hammered out after much vigorous debate and considerable consultation with the industry, following the setting up by IACS of the Joint Bulk

The new regulations will specify extra thickness in-built for corrosion (0.5mm/0.9mm for each side of a plate) - equal to an increased wastage allowance of around 4% for IACS URS25-compliant vessels. Of course, as Mr Peter Bryson, from Anglo-Eastern (UK) - one of three industry speakers invited to talk at the BV presentation - points out, much depends on the operating attitude of the owner. Careful superintendents, maintaining meticulous records and taking early action to remedy possible coating or steel problems, know that remedial work on discovery of any signs of failure and coating breakdown (the latter quite likely to be indicating steel problems behind them) will certainly reap dividends for their companies.

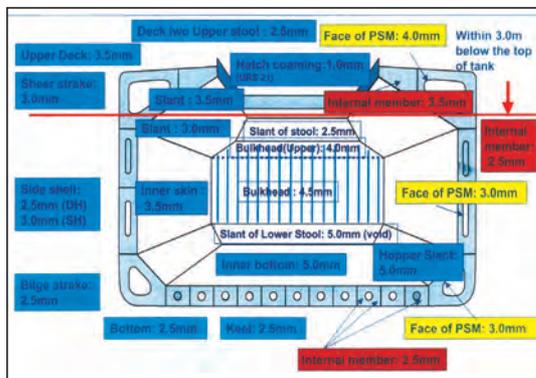
Commentators have pointed out previously, that it is not just the scantlings themselves that are important but the way the whole structure is assembled, ie, naval architects need to pay meticulous attention to detail design. At the same, the same designers will be required by the new rules to make all fatigue life calculations based on 25 years in North Atlantic conditions - regardless of where a ship is to operate. They will also need to take into account a new chapter on hold structures suitably buttressed against the massive crane grabs that are often used today - tanktop damage can be severe on both sides of the plating - and strengthened to withstand pressure from steel coils.

Some features will not be included; one is the action of weld-grinding, especially in critical tanktop/hopper connection areas of a hull. Although highly desirable to relieve formation of stress cracks, this procedure was deemed (possibly disappointingly) by IACS as unworkable, since for a shipyard, the operation takes time and would probably not be carried out in any case - not withstanding that Mr Bryson believes that correct grinding can increase steel life by 1.5times. Another desirable feature, hold and ballast-tank coatings, also make no appearance since they are not a class matter and it was felt their application calls for a specialist to be on hand for long periods. However, Intercargo and IMO continue to work on this subject.

Double side-skins are, of course, not mandated, following IMO's recent decision not to include this feature (largely following loud protests by the Union of Greek Shipowners). Advocates of single skins can quite justifiably argue that a correctly designed and properly maintained single-skin structure is quite satisfactory - although this journal has always been a supporter of double skins. Many shipyards also do not want double skins - they want to offer an easy standard hull that can be turned out as economically as possible at great speed, and giving as much profit as possible. In fairness, it must be pointed out that the Greek Union also made several other constructive comments that have been included in the new common rules.

Still to be totally smoothed out is the harmonisation between the common bulk carrier rules and those for tankers. Some aspects are expected to be ready by April next year but others will follow (wave loads and fatigue-life computation). Maybe further comments by various players in this demanding sector will be revealed at The Royal Institution of Naval Architects' October bulk carrier conference\*, but let us hope fervently that April 1 2006 will be remembered not only as a really positive milestone in the advance of our industry but also that shipyard inertia on specifications and complaints that class societies have let owners down will be a thing of the past. 

**Fit for purpose: corrosion wastage allowances for bulk carriers in the BC-A and BC-B conditions, as proposed under the new common rules.**



Carrier Project (and the Joint Tanker Project). Unsurprisingly, several Far East shipbuilders specialising in series production of bulk carriers protested at some of the measures proposed.

At a special Bulker Day last month in London, French classification society Bureau Veritas - 31% of whose fleet consists of bulkers, outlined the prime features of the new regulations, which have been preceded by two important IMO initiatives: special SOLAS regulations for bulkers (1997) and adoption of a new SOLAS Chapter XII (2004). The joint rules were approved in principle by IACS members in June this year in Paris.

It has not been an easy ride for those involved - some 3000 comments were received, including those from bodies such as Intercargo - but several successes have been achieved, notably the agreement that only net steel scantlings, ie, after corrosion or diminution has been taken into account, are to be used for all structural calculations. Scantlings have been one of the major sticking points, particularly with those yards whose customers were perhaps not seeking exceptionally long lives for their ships.

\*A special international conference, Design and Operation of Bulk Carriers, organised by The Royal Institution of Naval Architects, October 18-19, 2005 in London.

## New rules for marine ventilation

**S**HIPBOARD ventilation systems are the subject of a new set of construction rules from Germanischer Lloyd which came into force on September 1. These contain - in one document - technical requirements for different ship and ventilation types; the rules apply to all new ships classed for unrestricted service.

Twelve chapters deal with subjects such as ventilation and air conditioning schemes including those for accommodation and service spaces, engine rooms and gas/watertight enclosures, as well as cargo holds. Also covered are details of fire flaps and weathertight enclosures, duct penetrations, approval information, principal electrical supply, control and monitoring, and emergency fan stops. Additional rules for passenger vessels focus on requirements for smoke extraction systems.

These *I-1-21 Ventilation* rules contain technical requirements based on international regulations, which are relevant for classification as well as recommendations, ie, ventilation requirements for the carriage of livestock.

To assist designers, yards, and owners to check the effectiveness of planned and/or installed ventilation systems in cargo holds, Germanischer Lloyd can offer the application of computer fluid dynamics (CFD) techniques. These can be applied to simulate significant flow effects and physical phenomena, such as heat transfer, buoyant air flows, and gas distributions.

Using this technique, designs of ventilation systems can be supported by volume flow variations. Additionally, heat flux around refrigerated containers also sizes and locations of mechanical and natural air intakes and outlets can be changed. By applying CFD methods, GL is able to compare alternative designs and provide consultation on qualitative questions concerning air ventilation.

### HUGE MARKET FOR FEEDER SHIPS -

According to the first edition of Lloyd's Register's new *Container Ship Focus* publication, a massive potential for up to 2000 new feeder container ships is opening. This follows the recent surge in orders for mega container liners. Analysis of predicted regional trading requirements for feeder and intra-regional operations indicates a doubling of trade during the period 2002-2012; such an increase cannot be met by the current fleet, even if cascading of some larger liners into the feeder sector is taken into account. Additionally, up to 40% of the current fleet is at least 15 years old. Lack of feeder tonnage could compromise liner operations and investment in large new ships, believes Lloyd's Register; the society has linked with Ocean Shipping Consultants to identify a range of feeder designs, each optimised for a particular region.

### FERRY CONCENTRATION FOR HELSINKI -

Aker Finnyards has decided to make its covered Helsinki building dock into a cost-effective yard for ferries. This move has been made since the dock there is too small for ever-growing cruise liner sizes, and there is no room for expansion, given the yard's city centre



**Cosco Karachi**, the second of two 2700TEU container ships ordered by the Alfred Hartmann group, was handed over last month at Nordseewerke - ThyssenKrupp Marine Systems, in Emden. The ship was launched in April as *Frisia Copenhagen*. Successful marketing of this class has largely been due to good yard relations with shipowners based nearby in Leer, East Frisia. Our illustration shows the first of the pair, *Cosco Sydney*. Orders for six additional hulls are in hand at the yard, while a larger version of 3000TEU capacity is currently being designed.

location. Activity at the yard has been low since the last cruise liner was completed in February 2004.

The company is 'determined to continue shipbuilding activities in Helsinki', and the plan is to focus on the assembly and outfitting of ferries, new examples of which will be the ships for Tallink and Brittany Ferries, which were reported on this page last month. For some time now, steel sections have been transported by barge to Helsinki from the group's Rauma and Turku sites.

As part of this new move, all management, designs, sales, and procurement functions will be transferred from Helsinki to Turku. Aker Finnyards says that when recruiting staff for other sites, personnel affected by these changes will be given priority. Recent investments have included a new block factory at Turku, for which 200 new employees will be recruited by the end of this year. In addition, the Rauma yard has chosen the Mars production software from Logimatic as part of efforts to further increase efficiency and competitiveness.

### TANKER PHASE-OUT PROFILE -

According to Intertanko, the size distribution of tankers between 5000dwt and 80,000dwt due to be phased out according to MARPOL 13G is quite different to the size of vessels on the order book. Around 28 million dwt of single-hull tankers are due to be phased out, including single-hull and double-bottom/double-side oil tankers and oil/chemical tankers, but excluding chemical tankers. The order book in the size range 5000dwt-80,000dwt is approximately the same size; however, whereas some 63% of the fleet (in tonnage terms), to be phased out consists of smaller tankers below 30,000dwt, only 32% of the order book in tonnage terms is in this size range.

On the other hand, there are some 173 larger tankers in the range between 30,000dwt and 80,000dwt to be phased out, compared with an order book in this larger size range of some 330 tankers. These phase-out figures are based on information used by IMO's group of experts that

evaluated the consequences of accelerated phase-out after the *Prestige* accident, and have been adjusted for sales for decommissioning and conversion, as well as on the basis of information received from brokers and owners.

### SUCCESSFUL TESTS FOR RT-flex50 -

Official workshop tests have been successfully completed at Diesel United, in Japan, on the first two of the latest Wärtsilä Sulzer RT-flex50 common-rail two-stroke diesel engines. This model, jointly developed by Wärtsilä and Mitsubishi Heavy Industries, is ideal for Handymax/Panamax bulkers, product tankers, and container ships. The first of the two engines has been exported to Korea to power a 37,000dwt product tanker at Hyundai Mipo Dockyard, while the second has been delivered to the Shanghai Edward yard in China for a 19,625dwt cargo ship. Both are six-cylinder versions.

### EU ANTIFOULING PROJECT -

Experts from the chemical company BASF are among 30 partners currently investigating new possibilities for prevention of build-up of fouling organisms on ship hulls. AMBIO (Advanced nano-structured surfaces for the control of biofouling) aims to develop so-called nano-structuring to reduce significantly the adhesion of organisms to hulls and other marine structures.

## PEOPLE

**PETER FRENCH** has been appointed chief executive for British Maritime Technology (BMT), as from October 1, to replace **Roger Swann**, who unfortunately suffered a stroke earlier this year but is recuperating well. **ANDREW TYLER**, managing director of BMT Defence Services Ltd, succeeds Mr French as operations director, Europe and the Far East. 



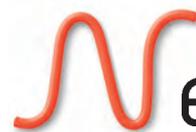
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# Improving fast-ship seakeeping using several moving actuators

Profs S Esteban, J Recas, J M Giron-Sierra, and J M de la Cruz, all from Department ACYA, Fac CC Fisicas, Universidad Complutense de Madrid, and Dr J M Riola, from Canal de Experiencias Hidrodinamicas de El Pardo (CEHIPAR), Madrid, Spain discuss means of avoiding excessive ship motions.

SHIP motion in response to waves degrades passenger comfort and even crew operational efficiency. In particular, vertical oscillations due to pitch, heave and roll cause seasickness. Such motions can be significant in fast ships.

There are means to avoid, or at least alleviate, this problem. For instance, by using a combination of moving submerged appendages, such as flaps, fins and T-foil. In such cases, a suitable control system must be provided, to move these actuators in the most efficient way. This is the target of the University and CEHIPAR research.

Work is proceeding on a scientific basis, along two main routes: first to obtain a control-oriented model of the ship dynamics, and second to design and experimentally confirm a control procedure. A fast ferry has been selected for the research and a scaled-down autonomous physical model has been developed, including the moving actuators. A complete experimental design has been carried out, in a towing tank facility, to support the two research steps. Good and interesting results have been obtained.

## Research details

The fast ship selected for the research is a deep-V aluminium monohull, 120m length, with three waterjets. The experimental design considers a matrix of cases, combining three ship speeds, 20knots, 30knots, and 40knots, three sea states, SSN4, SSN5 and SSN6, with JONSWAP and Brestchneider (ITTC) spectra, and six heading angles with respect to waves.

The object of the study is the optimal control of a set of moving actuators, for seakeeping improvement, focusing on the alleviation of vertical oscillations in response to encountered waves. Two transom flaps, two lateral fins, and a T-foil near the bow have been added to a 1/40 physical model of the fast ship.

Experimental studies are taking place in El Canal de Experiencias Hidrodinamicas de El Pardo (CEHIPAR), outside Madrid, in Spain. Dynamic behaviour of the ship, before and after adding actuators, is being studied in a 150mx30m basin with a wavemaker. In parallel, the lift and drag of the actuators, for different angles of attack, has been studied in a 300m long quiet water channel.

## Establishing a control-oriented model

The development of a control-oriented model of the ship dynamics has been based on two data sources. One of the sources is a

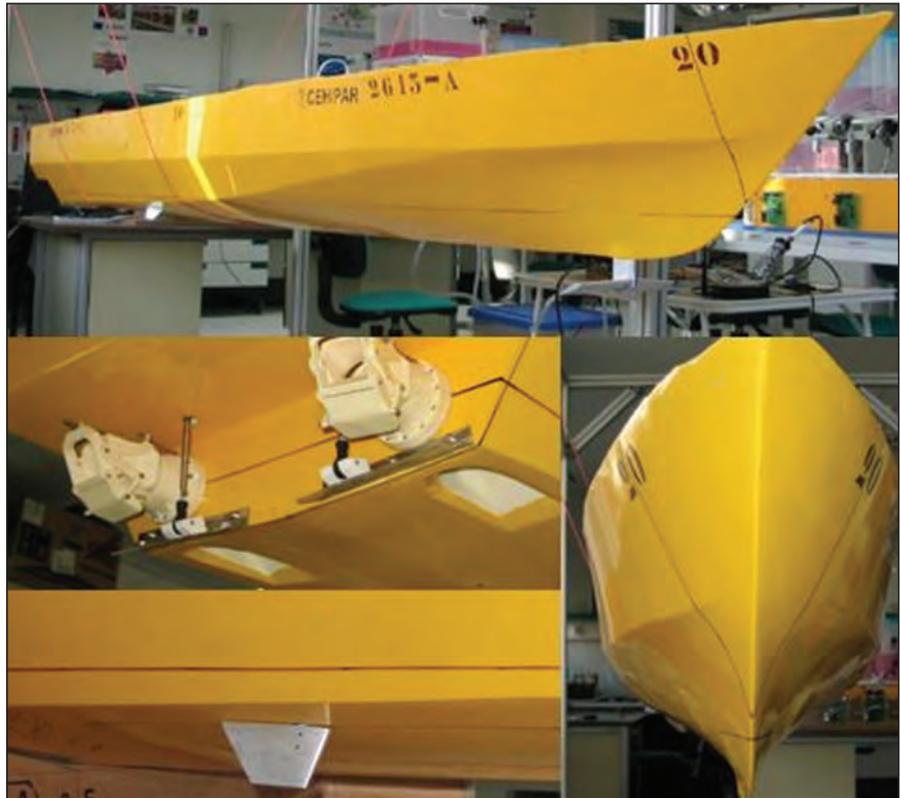


Fig 1. The experimental model ship with its actuators.

seakeeping prediction program, which computes a linear approximation of the six motions of the ship in response to regular waves.

The other source is experimental. A series of experiments with regular waves of different wavelengths have been carried out, using the scaled-down ship in the basin with wavemaker. Both data sources are useful, since the program offers information on forces and torques, difficult to measure in the physical model, and the experiments are important to determine more precisely the characteristics of the six motions.

The scaled ship itself is completely autonomous, with a distributed on-board electronic system for control and data acquisition. By means of a digital radio link, and using an external experimental support unit, the experiments can be defined outside the ship - ship speed, heading angle, run time, manoeuvres - and then downloaded to the ship to be carried out. The ship takes measurements during experiments, and sends them to the external unit. Fig 1 shows a photograph of the experimental ship.

Using the data, and some tools of the MATLAB environment, a complete 6DOF model of the ship has been obtained. It consists of two main blocks. One of the blocks computes the six ship motions in response to forces and torques due to waves. This block includes 18 transfer functions, describing in detail the intricate couplings of the ship



Fig 2. External support system, with a real-time 3D monitoring panel.

motions. The other block computes the forces and torques due to the encountered waves. This block includes six transfer functions with delays.

Control-oriented models of the actuators, including the dynamics of hydraulic cylinders, have been also determined. These models can be easily integrated with the 6DOF model of the ship dynamics, to obtain a complete model of the vessel with actuators, This model is the basis to start control design studies.

## Control analysis

The control analysis has been divided into two main fronts. One concerns the group of surge,

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heave and pitch ship dynamics. The other concerns the group of roll, sway and yaw ship dynamics.

The conventional control solution for many applications is based on the use of PID controllers. Taking it into account, a main objective of the study is to confirm the PID effectivity for seakeeping improvement, and establish the best tuning of this type of controller.

Going further, the research also tries to obtain better control solutions, if any, keeping the new solutions as simple as possible. The controllers have access to real-time motion measurements, based on sensors such as accelerometers and gyrocompass, to close the feedback loops.

For the group of surge, heave and pitch dynamics, the relevant actuators are the transom flaps and the T-foil. Most vertical oscillatory motions, which cause seasickness, are due to pitch motion.

Based on the model, it has been found that proportional plus derivative action will produce a good attenuation of pitch motion, with the T-foil being more effective than the flaps. It is interesting to note that the optimal tuning for the flap controller is different than the tuning for the T-foil. In this research, advanced control strategies have been designed, with significant improvement over the optimal PID.

With respect to the group of roll, sway and yaw, there are two main control objectives: roll motion decrease and heading stabilisation. Roll motion may cause seasickness. Lateral fins are used to alleviate roll motion.

Good attenuation results can be obtained with proportional plus derivative action, with an additional benefit: yaw oscillations diminish. Orientation of the waterjet outputs is mainly used for heading control. Moreover, it can be used to make yaw oscillations decrease. In this case, again the proportional plus derivative controller, using yaw motion measurement, renders good attenuation of yaw oscillations and, in addition, some reduction of roll motion. As in the other group of motions, research has determined advanced control strategies to be much more effective than the PID.

## Experiments

Using the communication facilities provided by the on-board distributed electronic system, in the model ship, different control tasks can be easily integrated. That means that heading, speed and seakeeping controllers work in conjunction.

The architecture of the on-board electronic systems consists of several digital processing nodes connected to a CANbus. Since this fieldbus can be extended to distances of kilometres, the same architecture can be applied to full-scale ships. The nodes execute measurement functions, handling sensors, inertia units, accelerometers, digital compass, and other components; and also perform the control of actuators, waterjets, fins, T-foil, and flaps.

Fig 2 shows a screen of the external support unit. With real-time 3D graphics, this screen monitors the data sent by the scaled ship, via digital radio, and saves data on disc for further revision of the ship behaviour during experiments.

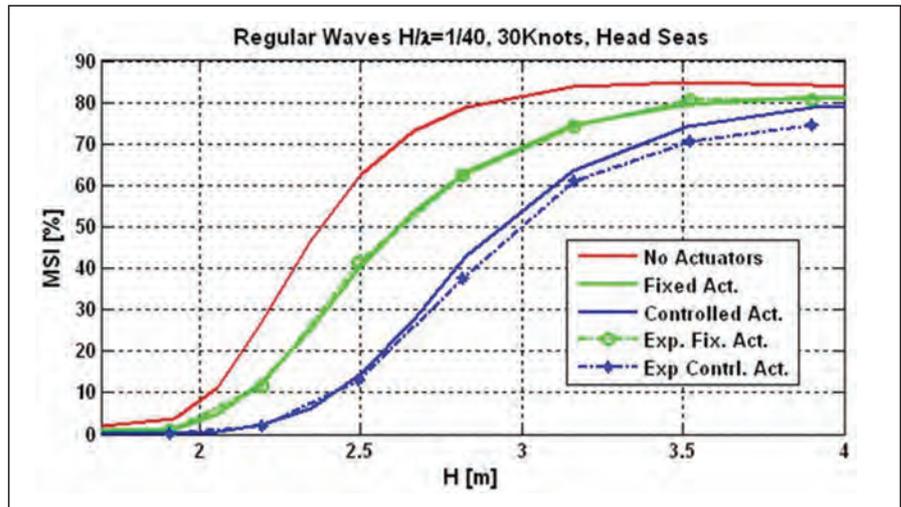


Fig 3. Bow motion sickness incidence (MSI) attenuations.

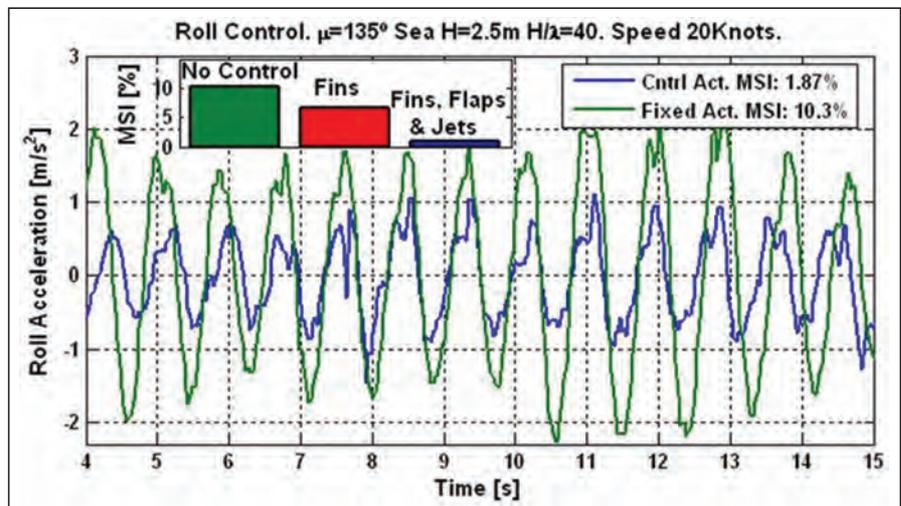


Fig 4. Roll motion sickness incidence (MSI) and acceleration attenuations.

A set of initial experiments were carried on, to check the manoeuvring capabilities of the ship, and make the sensorial system work properly, since part of the sensorial system is redundant and the information must be fused.

Once the scaled ship has been put into operational condition, experiments for modelling have been done. With the 6DOF model, initial controllers have been designed, in simulation. After that, new experiments have been carried on to confirm the results of control design. Figs 3 and 4 show some of the results obtained.

Fig 3 shows the good results obtained by the T-foil and transom flaps to attenuate the motion sickness incidence (MSI) near the bow at a 30knots ship speed in a head sea. The curve in red shows the the vertical MSI without actuators, the green curve when actuators are kept in a fixed angle. When the actuators move, under control, motion attenuation is further increased, as shown by the curve in blue.

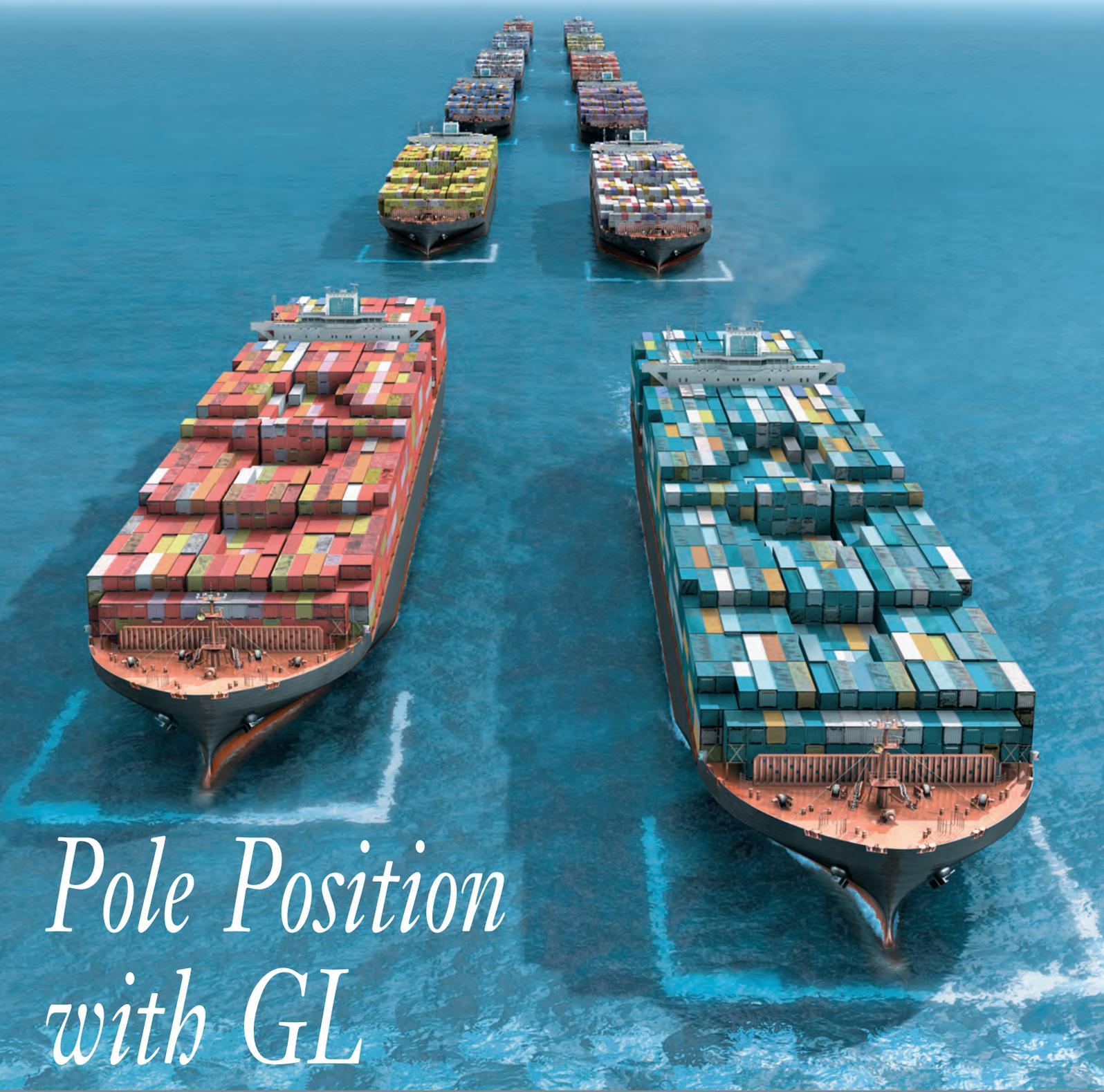
Dashed lines shows experimental results that absolutely agree with the theoretical predictions. For a wave height of 2.5m, the MSI decreases from 63% without actuators, to 40% with fixed actuators, and to 14% with moving actuators.

Fig 4 shows the experimental results for the alleviation of roll accelerations using the lateral fins and waterjet orientation. Ship speed is 20knots, and the heading angle is 135deg. The curve in green shows the roll vertical acceleration with fixed actuators. The curve in blue shows how the vertical accelerations decrease when the actuators move under control. The MSI decreases from 10% to 1%.

## Conclusions

Research into the use of several actuators for seakeeping improvement in fast ferries has been described. The research covers a complete control design cycle: 6DOF modelling, control design, and practical confirmation. The experimental support for all phases of the research has been provided by an autonomous scaled ship with a distributed control system. The results obtained are satisfactory, with a good seakeeping improvement.

Further research in the near future will exploit the autonomous ship for systematic experiments at CEHIPAR, and for open-air experiments with more combined manoeuvring and seakeeping tests. 



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# LNG boom opens up opportunities for UK companies

A NUMBER of UK marine technology suppliers are benefiting from the current boom in LNG and LPG gas carrier newbuilding orders. The liquid cargo handling equipment specialist, Hamworthy, has, for instance, recently picked up a number of notable contracts, including an order for four of its LNG reliquefaction systems, taking the total number under contract to 12.

The latest order was placed by Samsung Heavy Industries, and the yard will install the system on four 217,000m<sup>3</sup> LNG carriers recently ordered by Teekay Shipping. Earlier this year, Samsung ordered two Hamworthy LNG reliquefaction systems for a pair of 215,000m<sup>3</sup> capacity LNG ships; Daewoo four for a series of 210,000m<sup>3</sup> ships; and Hyundai Heavy Industries two systems for two 215,000m<sup>3</sup> LNG newbuildings.

All these ships represent the first of their type to be powered by low-speed two-stroke diesel machinery burning heavy fuel only. Hamworthy's reliquefaction technology allows LNG cargo boil-off to be returned to the cargo tanks during the voyage rather than used as fuel.

Tore Lunde, who is responsible for Hamworthy's LNG activities says, 'Our reliquefaction technology has been proven in land-based plant using the same main equipment and control system that will be used onboard. Continuous improvement of the system has resulted in better power consumption, reduced cost, redundancy configurations and improved project execution.'

LNG carriers also feature among some recent orders for Hamworthy's engineroom pumps. BP's four 155,000m<sup>3</sup> LNG carriers ordered from Hyundai feature 10 Hamworthy pumps, while the four 216,000m<sup>3</sup> vessels for OSG Shipping contracted at Hyundai and Samsung each incorporate a package of 23 Hamworthy engineroom pumps.

Hamworthy says it aims to grow further in the LNG market over the next few years. It is currently working on some other interesting development projects, including regasification systems, and is in the process of building a small-scale test plant as part of a joint industry initiative.

## Success in LPG sector

Hamworthy is also achieving success in the LPG newbuilding sector. Recently, the Daewoo yard

**Clive Woodbridge examines some of the newest marine technology on offer today from UK companies.**

specified Hamworthy equipment for two 38,000m<sup>3</sup> LPG carriers being built for K Line. This contract is worth around US\$10 million for Hamworthy, and will involve the delivery of a complete cargo handling and deck tank engineering package. Included in the contract for each vessel is a reliquefaction plant, a cargo heater/vaporiser, an inert gas generator and a level gauge system and instrumentation.

The UK manufacturer is, furthermore, supplying cargo pumping systems for LPG ships being built in Korea. This year confirmed orders include outfits of Svanehøj DW deepwell cargo and booster pumps for eight LPG carriers, while the orderbook also includes 13 more for delivery in 2006, 11 in 2007, and one so far in 2008. In the offshore market, Hamworthy is to supply a cargo handling package, including electrically-driven deepwell pumps, for a 150,000dwt FPSO on order at Samsung.

## Valves for LNG carriers

Another company that is benefiting from the strength of the LNG newbuilding market is Bestobell LNG, a specialist division of Bestobell Valves that was set up earlier this year. The company has recently received an order from Mitsui Engineering & Shipbuilding (MES) to supply sampling and purging valves for a Shell-owned LNG carrier being built to serve the Sakhalin LNG project, and due for delivery in October 2006. In addition, Bestobell LNG has a letter of agreement with Samsung Heavy Industries to supply sampling and purging valves to a total of 16 LNG ships contracted at the South Korean yard. This includes six vessels for AP Möller, four for K Line, and the remainder for CTS.

In July this year, Bestobell LNG completed the third out of three deliveries of stainless steel miniature needle globe valves to Samsung for sampling and purging applications on a newbuild

LNG carrier for AP Möller. This was the sixth shipset that the company has supplied to date to Samsung.

Bestobell LNG was launched in March this year, as a means of focusing on the growing LNG market, building on the experience gained by the group in supplying cryogenic valves to Samsung as well as Daewoo. The company's main factory is in Sheffield, which is supported by a distribution network that covers Korea, Qatar, Japan, Norway, China, Finland, Australia, Denmark, Malaysia and New Zealand.

Product development at Bestobell LNG is said to be 'ongoing', and the company has recently introduced a new range of cryogenic globe valves, with sizes from 12.70mm to 406.40mm. These are designed for use both on LNG carriers and onshore installations. According to Andy Brown, director, 'Our aim is to educate the market with regard to the correct valve selection. We feel it is our responsibility as an experienced manufacturer of cryogenic valves to inform ship owners, operators and shipyards of the possible implications of using valves that were not originally designed for cryogenic applications.'

In a further initiative, Bestobell LNG has introduced a valve maintenance and repair service (VMRS). Mr Brown says, 'The main function is to evaluate the serviceability of all the cargo valves and offer maintenance, repair, or replacement services, while a ship is in drydock for routine maintenance. Our field of excellence is cryogenic valves and we understand the demands placed on these valves. We have established a project team that can work directly with the chief and cargo engineers to develop a scope of work and serviceability programme.'

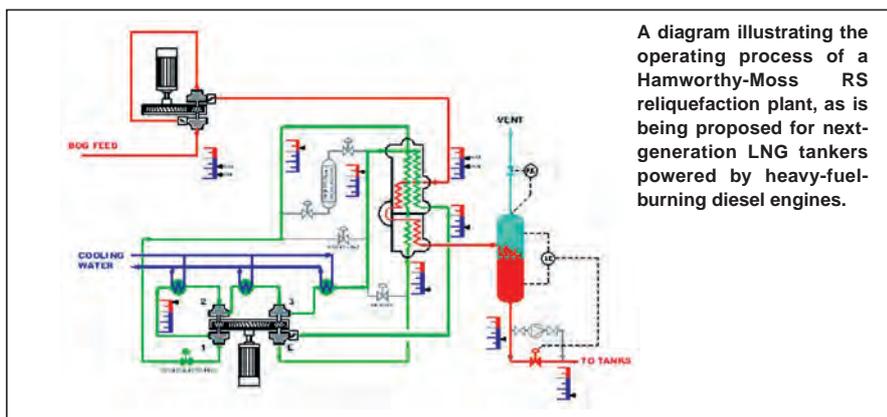
The first vessel serviced by the new VMRS was BP's *British Merchant*. More than 400 sampling and purging valves were overhauled during an 11-day stay in Dubai Drydocks.

## LR milestone

Meanwhile, recent orders for classification services to six LNG ships has resulted in an important milestone for Lloyd's Register (LR). More than 100 LNG ships now exist, or are being built to LR class, confirming the organisation's leading position in the classification of LNG ships. This milestone is also significant because the new ships, two for Teekay Shipping and four for BP Shipping at Hyundai Heavy Industries, will feature dual-fuel engines, one of several recent innovations in LNG ship propulsion.

LR classed the first LNG ship in the world to bear the notation 'Liquefied Gas Tanker' in 1958. According to Tony Bingham, global LNG business manager for Lloyd's Register, 'The 100th LNG ship-in-class milestone underscores our experience in the design, construction and operation of LNG ships, as well as our knowledge of the dual-fuel engine and other new concepts in LNG ship propulsion and containment systems.'

Lloyd's Register currently classes around 37% of the LNG fleet worldwide, giving it the biggest market share amongst classification societies. A total of 65 existing LNG ships carry LR class, and 39 of those currently on order. 



**A diagram illustrating the operating process of a Hamworthy-Moss RS reliquefaction plant, as is being proposed for next-generation LNG tankers powered by heavy-fuel-burning diesel engines.**

## Amot system gains acceptance

AMOT's XTS-W bearing condition monitoring system, launched last year, is now gaining wider market acceptance. Two significant new contracts with high-profile clients have recently been signed for the use of the system, demonstrating its suitability for both newbuildings and for upgrading existing vessels.

Hapag-Lloyd has chosen to fit the Amot XTS-W system on three new 8750TEU capacity container vessels now under construction at Hyundai Heavy Industries, as an alternative to traditional temperature monitoring devices. In addition, the system is being fitted to a Wärtsilä Sulzer RTA68 engine on the Wallenius Wilhelmsen Lines car carrier *Isolde*.

AMOT's system is designed to detect wear of main, big-end, and crosshead bearings on large diesel marine engines before steel-on-steel contact occurs. This contrasts with traditional temperature monitoring and oil mist detection techniques that allow shutdown before failure, but not always before problems have already started.

The XTS-W system is based on linear bearing wear instrumentation, and proven displacement sensing technology, which provide a high degree of sensing accuracy and linear response, progressive wear indication and robust sensor design. Other features include advanced internal signal linearisation, built-in temperature compensation and industry-standard passive 4mA-20mA output.

Sensors within the system produce a signal with every engine revolution, and these signals are passed to a processing unit, which generates continuous representation of the extent of bearing wear. This data is then processed to generate alarm/warning signals and provides wear trend monitoring. Amot points out that the output can be integrated into the main engine control system if desired.



Amot's new bearing wear technology is to be installed on a number of newbuildings, including Hapag-Lloyd container ships.

The system's signal processing technology offers multichannel operation, standard interfacing and automated calibration. Based around a RISC microprocessor, it can simultaneously process signals from up to 14 displacement sensors and permits automatic sensor signal sequencing to speed response times. Full PC access to all processing parameters is via an RS232 port and no special software is required, while the post-processor is

based around the Amot 8635A, a programmable and flexible controller with extensive analogue and logic processing capability.

The continuous bearing monitoring carried out by the XTS-W system enables real-time wear trend analysis. This can give the vessel operator a picture of the rate of change of bearing wear and provide a much earlier indication of a potential engine problem than a simple alarm threshold, Amot suggests.

## Satnav developments

UK companies have a strong position in the marine satellite navigation systems sector, and this is supported by ongoing research and development in new technology. McMurdo has, for example, recently launched its new ICS Nav-7 paperless GMDSS Navtex receiver. The system supports reception of all three IMO Navtex frequencies and provides simultaneous channel monitoring of two channels. The 518KHz English language service is always in view and either 490 KHz national language or 4209.5KHz long range services can be selected and viewed at the same time.

Furthermore, in line with IMO regulations that require cargo ships on international voyages to be fitted with voyage data



The 'white box' of Kelvin Hughes' voyage data recorder (VDR).



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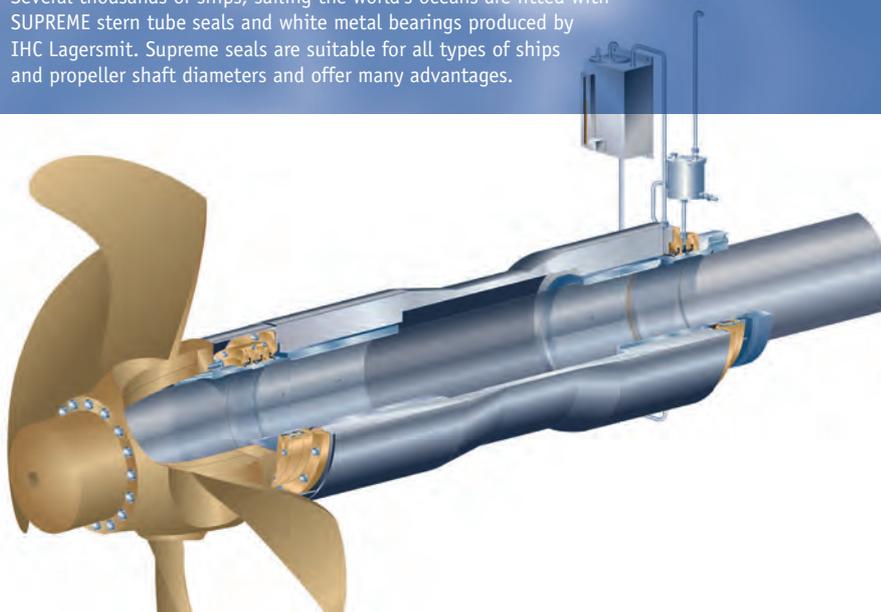


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recorders, McMurdo has introduced the C-1. This is an S-VDR float-free data capsule that duplicates and stores critical voyage related information collected by the S-VDR.

In the event of a vessel sinking, the capsule is automatically released from its housing by an integrated hydrostatic release unit. A built-in GPS EPIRB unit transmits location and homing signals for a minimum of seven days to enable it to be safely recovered.

Voyage status information is held in the flash memory for subsequent analysis of the

causes of the accident. The McMurdo C-1 has memory storage options of 2GB-9GB and can support ethernet and other S-VDR protocols.

Meanwhile, Kelvin Hughes has confirmed that its VDR and S-VDR systems will meet the future requirements for common downloading and playback of data for use by marine accident investigation teams, as proposed by IMO at the recent NAV51 meeting. Concerns have been expressed about the difficulty of downloading data in some cases, especially with different manufacturers using different formats and systems.

According to Martin Taylor, S-VDR programme manager at Kelvin Hughes, 'We are able to satisfy these new requirements immediately, due to the open approach to data downloading, which was seen to be key at the beginning of our product development.'

Kelvin Hughes replay software is extensive and includes full control of all microphones, video input and digital data. Information can be output to ENC systems for training and also to packages such as Microsoft Office for report generation. 

## ACM aims high

**A**LTHOUGH the company has been trading since 1988, it is only really in the past two or three years that ACM Bearings, of Rotherham, has been marketing directly to the marine sector. Previously, the company had been selling bearings for marine applications through another well-known UK-based bearing supplier.

The positive response to its composite bearing products in the marine market was such, however, that a decision was taken to start selling bearings under the ACM brand directly. The company is, as a result, now supplying rudder bearings, as well as stabiliser fin bearings and deck winch bearings for new ships, and for the replacement and repair markets. Tried and tested composite technology used in ACM bearings has been refined to meet the needs of the marine sector, and so is 'application specific'.

In order to sell directly to this market, ACM Bearing has invested significantly to obtain the necessary class approvals. This has involved lengthy periods of liaison with the leading classification societies, and setting up the necessary facilities, such as a bearing test rig, at its Rotherham factory.

Currently, ACM has approvals from various classification societies, including Lloyd's Register (LR), Germanischer Lloyd (GL), American Bureau of Shipping (ABS), and Det Norske Veritas (DNV). DNV approval was, in fact, only secured in August this year, following an extensive period of evaluation by the Norwegian classification society. 'Obtaining DNV approval is important and



**A rudder bearing being machined at ACM Bearings in Rotherham, on the company's new vertical borer.**

will open doors for us, in the South Korean newbuilding market especially,' suggests Robert Birchley, sales and technical manager.

In order to support its marine business, ACM has established an extensive agency and distribution network, which includes Europe, the Middle East and China. Discussions are now underway with regard to the possible appointment of a further agency and distribution presence in Singapore, and other locations worldwide.

While ACM's biggest marine business is the supply of bearings for use in the maintenance and repair of existing vessels, the company is

experiencing rapid growth in the newbuilding sector. ACM Bearings is quickly developing a market in China, and has also gained solid support in South Korea, delivering bearings to a wide range of newbuilding types. Overall, growth in the company's marine bearings activity has been more than 20% a year in the past few years.

According to Mr Birchley, 'Our aim is to become one of the main suppliers of composite marine bearings in the newbuilding market. Name recognition is important in this context, and we will continue to seek to achieve this, by taking part in events such as Kormarine and Marintec China. We will also continue to develop the network of distributors and agents, as well as setting up stock holding centres in strategic locations.'

ACM Bearings' manufacturing base is in Rotherham, Yorkshire, where it employs around 35 staff, working a shift system. Over the past few years, facilities here have been upgraded and there has been considerable investment to improve efficiency, quality and customer service. A new vertical boring machine has been installed recently, for example, and this provides a more efficient way of machining rudder bearings. 

## BMT tests transom sterns

**B**M T SeaTech Ltd, a subsidiary of British Maritime Technology Ltd (BMT), has recently undertaken a series of model tests to examine the effects that immersed transom sterns have on the power required to propel a vessel. According to BMT, transom sterns that run 'wetted' are traditionally regarded as poor design practice and are usually avoided as they can cause a large increase in resistance. However, the company has developed a method for predicting resistance due to immersed transoms at the design stage.

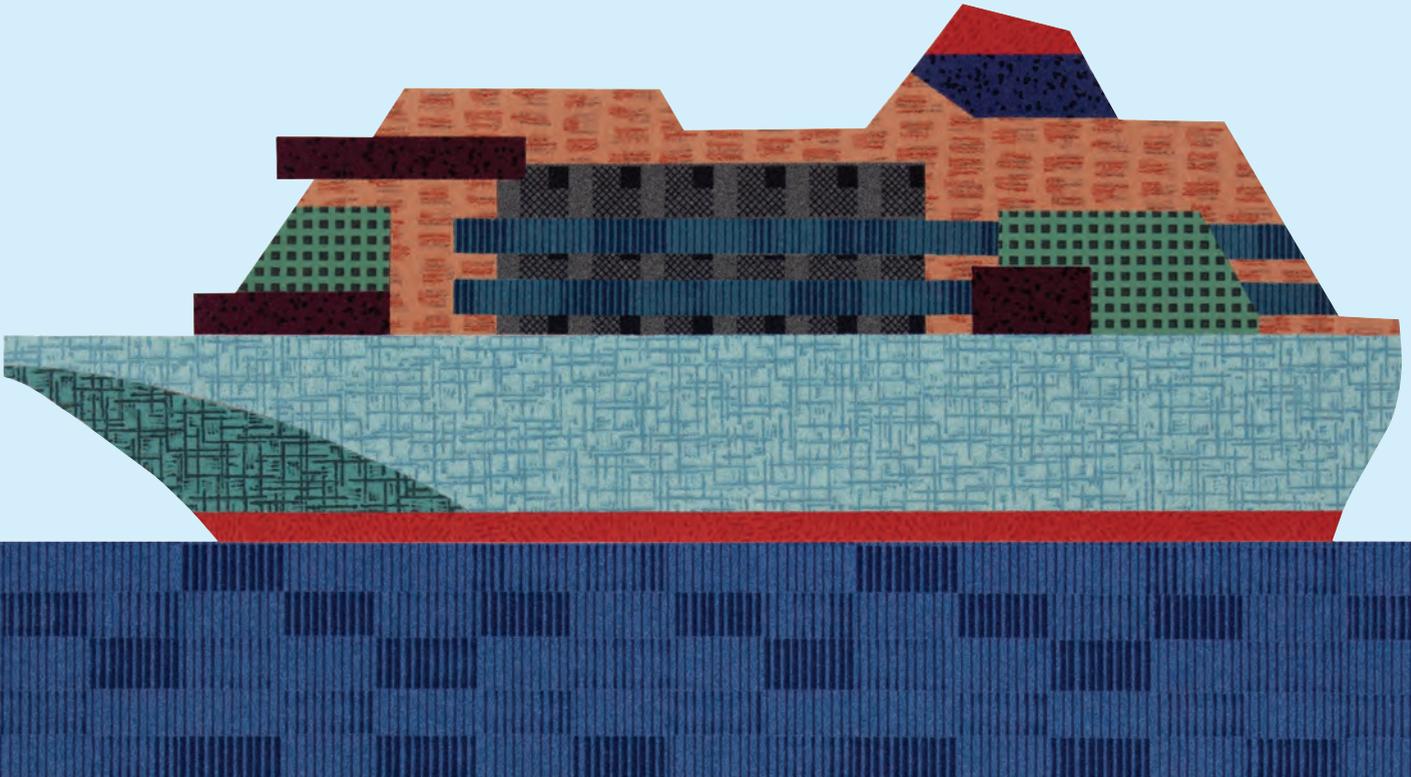
In BMT's opinion, 'This gives the prospect of exciting new vessel designs where the balance between immersed transom area and hull form is optimised to give new low resistance designs. It also means that the effect on powering can be evaluated in cases where large transoms are adopted for non-hydrodynamic reasons.'

A need for this research emerged in recent years due to the increasing tendency for slow- to medium-speed vessels to be fitted with immersed transom sterns. The effect of fitting transoms to higher speed vessels where the transom usually runs dry are generally well

understood. But the existing methods do not allow for the assessment of the benefits or shortcomings of using such sterns for slower speed vessels where the transom usually runs immersed (or wet).

BMT SeaTech has carried out a controlled series of tests on an existing model to analyse resistance characteristics and powering performance. The stern of the model was progressively shortened to provide a series of forms with progressively increasing transom area. As a result, the company now has a set of data which can be used to assess modern vessel

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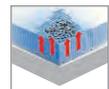
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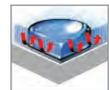
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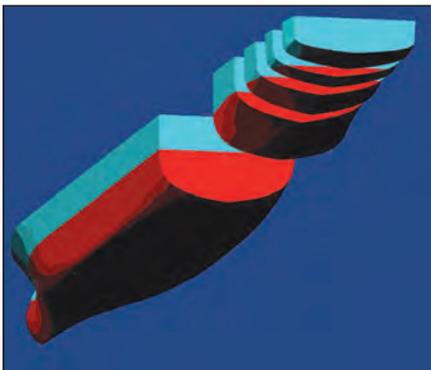


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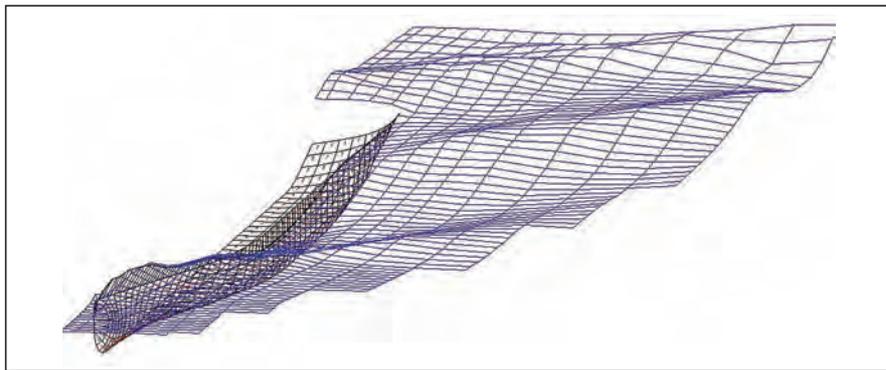


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Model tests were conducted on each transom configuration.



Numerical wave and flow calculations were carried out for each transom configuration.

designs with larger transom stern areas and make predictions about their performance. Moreover, this data has confirmed a theoretical model developed by BMT.

BMT SeaTech expects there will be a number of benefits to its clients from the work it has carried out. A design tool to predict the resistance of vessels fitted with immersed transom sterns is now available, while hull form optimisation studies for new vessels with

immersed transom sterns can be carried out with confidence. In addition, model test results for such vessels can now be assessed, comparing the quality of powering performance against an existing and extensive database of past vessels.

Now that it has the capability to predict the resistance caused by immersed transom sterns, BMT SeaTech believes it is in a position to assess the benefits, or otherwise, of fitting large transom sterns to new, or existing, vessels.

According to BMT, 'The many practical advantages of such sterns can now be evaluated against the likely effect on required shaft power to give a full cost benefit analysis for any proposed design.' As a result, the company will be offering consultancy services to designers, builders and operators, with a view towards helping them to realise maximum efficiency in terms of fuel consumption and speed performance. 

## Tank level gauging goes digital

FOR 30 years, tank level gauging systems for the marine and naval sector has designed and manufactured by PSM Instrumentation. The company's established Series 260 Tankstar electronic level transmitter, widely used as part of the system, is arguably one of the most successful sensors in the industry, and has been purchased by shipyards and system integrators worldwide.

Now PSM is launching its latest generation of digital 'intelligent' sensors and systems, generically called the iCT series. This features, for the first time, sensors that contain embedded programmable functions and intelligent self-diagnostics. They are remotely configured and can transmit level, pressure and temperature data on a single communication bus. Since the devices are generically digital in design, the power requirement is extremely low, enabling 124 sensors to be directly connected to a single

bus, without external power. Modbus and other standard bus protocols are catered for, as well as an optionally selected 4mA-20mA analogue transmission to ensure full integration onto existing bus systems.

PSM has packed many features and functionality into this tiny sensor. The company claims that the sensors have a 200:1 full-span turndown facility, enabling measurement spans from 0mb-50mb to more than 10bar on each sensor, whilst maintaining a 0.1% (of set span) performance standard. The specially developed ceramic diaphragm permits overloads of 25bar with a burst of greater than 30bar.

According to the company, 'This one-size-fits-all feature will surely be welcomed, particularly by shipyards and system providers who can now install any standard sensor where a pressure, level or temperature is required and remotely assign a duty and an individual

configuration later.' To make life even easier for installers, the iCT has over 50 standard mounting components and kits including threaded and flanged process connections, as well as fully immersible options.

The iCT is claimed to be cost-effective compared with conventional transmitters, and PSM claims that further savings can be made in installation and set-up costs. Suitable for nearly all types of ships, from workboats to tankers, and all tanks, from ballast to cargo, the sensors are said to be 'ultra-stable, extremely accurate and require no maintenance'.

PSM will soon release a further development that can not only communicate via satellite to provide a ship's operator with an on-line update of fuel and ballast quantities and movements, but will allow sensor configuration and diagnostics routines to also be carried out remotely via satellite link. 

## Freeze fitting provides container-ship bearing solution

AN INNOVATIVE technique from Orkot Marine Bearings for freeze-fitting rudder bearings has proved extremely successful since it was first applied around two years ago. Developed primarily to meet the requirements of large container vessels under construction in South Korea, the technology has since been refined and has been applied to rudder bearings fitted on in excess of 20 newbuildings at the Hyundai Heavy Industries and Hyundai Samho shipyards.

Traditionally, these yards had used resin chocking to fit rudder bearings on large container

vessels. This approach had some advantages for the shipyards, but caused operational problems for owners, making the task of refitting bearings in service very difficult, since bearings are directly bonded into the vessel.

Orkot developed a freeze-fitting method that uses a 3mm thin stainless steel housing, rolled and welded without machining. The rolled sleeve is joined with an external axial steel strip, and is 20mm shorter than the bearing to reduce the possibility of seawater corrosion.

After the bearing is frozen with liquid nitrogen, and is sufficiently reduced in diameter, it is

assembled into the sleeve. As the bearing expands on returning to a normal temperature it 'rounds' the sleeve as it is stressed.

According to Orkot, because of the relative weight of its TLMM bearing material to steel, the bearing can be finish-machined after fitting. The pre-fitted bearing, and housing assembly, can then be directly resin-chocked into the rudder housing.

With this method, refitting a new bearing is much easier than with conventional methods. Two opposing axial slots in the bearing can be cut with a disc cutter, or router, to remove the



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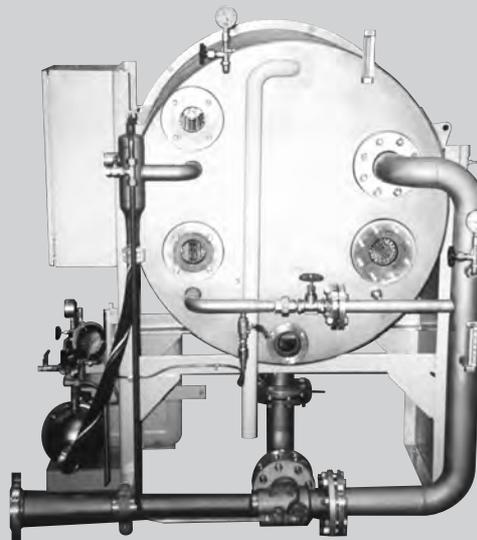
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hoop stress and the bearing halves can then be removed, leaving the metal sleeve in place. However, the new bearing should also be freeze-fitted to prevent the sleeve from moving in the housing, Orkot points out.

As well as facilitating the removal of bearings, Orkot notes that there are other benefits. The thin-wall stainless-steel housing is less costly in material terms than previous alternatives, and also creates more flexibility in design terms, by saving space.

Another relatively new development from Orkot is the development of its TXMM-grade material to produce dry-running bearings. These have particular advantages in ice-class vessels, and avoid the problems that can sometimes occur with lubricated bearings in very low temperature conditions. The company's unlubricated bearings have now received full LR and DNV class approvals, and have been successfully utilised on both large container vessels and LNG ships.

Orkot Marine Bearings, now part of the Trelleborg group, is based in Rotherham, where it has a full-time staff of 120 people. Its order book is very healthy at present, with manufacturing activity being undertaken virtually round the clock, seven days a week.

The company's marine bearings business is especially buoyant, and Orkot is currently supplying the majority of vessels under construction at Samsung Heavy Industries, and also large container and LNG ships requiring rudder bearings of in excess of 1m diameter at Hyundai Heavy Industries.



Orkot's freeze-fitting technique has proved highly successful, especially for rudder bearings supplied to large container ships.

Exports to China are also increasing. One notable recent contract that has been secured by Orkot involves the supply of rudder bearings

for a series of LNG ships - China's first - that will be built at Shanghai's Hudong-Zhonghua shipyard. ⚓

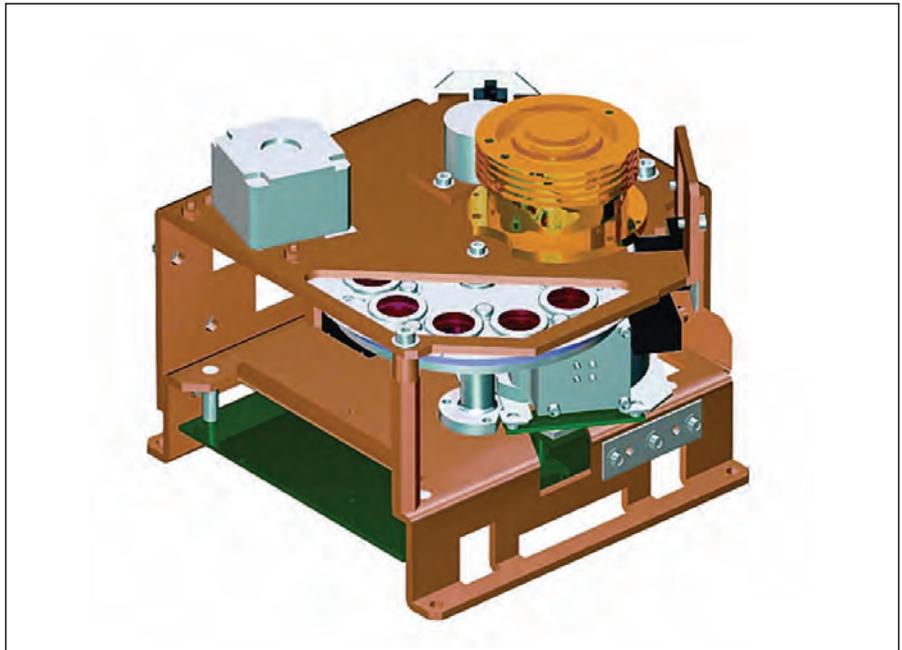
## Emissions monitoring technology

**N**ORTHERN Ireland-based Kelman Monitoring, a joint venture company established to develop, manufacture and market a range of products for environmental monitoring, including marine diesel engine exhaust monitoring, is now marketing the EZNox system to the marine sector. DNV approval for the system, which is available for installation now, is said to be 'imminent'.

The equipment provides complete emissions monitoring for diesel engine exhaust and will allow users to comply with MARPOL Annex VI requirements via the direct monitoring method. This option avoids the annual 'parameter check' survey, which causes recurring disruption and expense.

The EZNox system uses heated chemi-luminescence, the IMO recommended technique, to measure oxides of nitrogen (NO<sub>x</sub>). The chemi-luminescence reaction takes place directly in the EZNox probe, so any potential problem with loss of sample is negated. The response time is very fast, the company points out, due to the fact that there is no sample transportation delay. The completely automated system also measures sulphur dioxide (SO<sub>2</sub>), oxygen (O<sub>2</sub>), carbon monoxide (CO), carbon dioxide (CO<sub>2</sub>), and total hydrocarbons (THC).

The EZNOx also includes an oxygen monitor which will enable the improvement of fuel efficiency, and this is zirconium dioxide based. This unit is also available



Kelman's new system measures emissions using a photo-acoustic spectroscopy (PAS) module.

separately as the Oxytron monitor, and has a vital safety application in the oil tanker sector. The monitor detects dangerous levels of oxygen in the inert gas blanket added during off-loading of oil.

SO<sub>2</sub>, CO, CO<sub>2</sub> and THC measurement will provide users with the ability to meet further regulations. These emissions are measured using an infra-red photo-acoustic spectroscopy (PAS) module. The benefits of this technology

are claimed to include repeatable, stable, and accurate results. According to Kelman, the PAS cell is very rugged, requires no consumables and has no interference from other emission gases. The cell can also measure moisture, which will be of interest in several applications.

The continuous closed-loop monitoring system has inbuilt redundancy for essential reliability and constant availability. The EZNOx system has been especially developed for the harsh marine environment and is made from non-corrosive materials. All the

technologies present combine to give a low maintenance, reliable solution to marine diesel engine emissions monitoring. Only air supply, test calibration gases, power supply and communications connections are required, Kelman states.

## New tank-washing model from Dasic

RECENTLY introduced by Dasic Marine is the MkII model A tankwashing machine for the marine market. This is the second generation of the company's model A machines, 45,000 of which have been manufactured since 1968, and is said to feature a number of key enhancements.

These include a new four-stage wash pattern that allows the COW (crude oil washing) operation to be selected for a quarter, half, three-quarter or full wash of the tank, and a wash pattern that maximises bottom washing capability but with the advantage that the entire tank is washed within each part cycle at a predetermined intensity of pattern. The simplicity of the MkII model, which has no controls to adjust, sets it apart from the single-nozzle approach as far as reliability and ease of operation are concerned, Dasic contends.

Operating at a supply pressure ranging from 6bar-12bar, the MkII model A can be mounted

under the deckhead by means of the Dasic free-standing unit, which fits into a standard size tank washing opening. Alternatively, the unit may be mounted at mid-height, or bottom mounted in an inverted position and supplied by a pipe of up to 80mm bore.



Dasic Marine's new MkII model A tankwashing machine claims many useful benefits.

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### Modular software for complete pipework system solution

In addition to the development and production of pipe fabrication machines, German manufacturer Tracto-Technik has also established itself in the field of applications for pipe end forming and pipe measuring technology. With software solutions such as the PipeFAB pipe production management software, this company can offer complete system solutions for the piping industry.

The current PipeFAB version 2.9 has been tested over the last months by companies which already use it in pipe production. New customers can now obtain the software, and existing PipeFAB installations can be updated according to individual customer requirements.

The modular software package accompanies and manages the complete pipe production process from construction to manufacture, assembly, and settlement with suppliers as well as maintenance. PipeFAB evaluates isometric drawings originating from different input channels, performs the complete calculation of the piping geometry and supplies the data required for pipe production in the form of lists and files.

In combination with ERP/MRP systems, PDM-systems, and especially standard accountancy systems, all data and isometrics necessary for carrying out the project and its control are produced, working packs are created, production times and costs are determined, additional material is calculated, and work schedules are set up. All results for project and data management, quality control and NC machine triggering are available as automated machine-readable files.

Contact: Tracto-Technik GmbH  
Spezialmaschinen Werk II

Rohrformtechnik, Hunold-Rump-Strasse  
76-80, D-57368 Lennestadt, Germany.

Tel: +49 2725/9540 - 0.

Fax: +49 2725/9540 - 39.

E-mail: tubomat@tracto-technik.de

http://www.tracto-technik.de

### New VLCC double-hull cargo handling simulator launched

A new Neptune cargo handling simulator model has been released by Kongsberg Maritime. The new model is called VLCC-Double Hull. This model has been developed following 20 years of use of the Kongsberg Maritime single-hull model, which has been delivered to a number of training facilities worldwide. It provides a tool for training in very complex full-scale cargo, ballast and cleaning operations simultaneously.

Several enhancements over the previous single-hull model have been made to provide a simulation model suitable for modern training, many of which have been directly requested by customers. These include the possibility to 'remove' the terminal whilst underway, and the ability to connect proper loading arms.

Contact: Mark Treen, Kongsberg Maritime,  
Norway. Tel: +47 33032289. E-mail:  
mark.stuart.treen@kongsberg.com.  
www.kongsberg.com

### Integrated bridge systems for Freedom-class liners

Contracts to supply the navigation and communication systems for the second and third Royal Caribbean Freedom-class cruise ships have been won by Northrop Grumman Corp, and the systems will be supplied and installed by Northrop Grumman's Sperry Marine business unit. Last year, Sperry Marine supplied the systems for the first ship in the series, *Freedom of the Seas*, which is scheduled for completion in 2006.

*Freedom of the Seas*, and her two sisters, as yet unnamed, will be the world's largest cruise ships, carrying up to 3600 passengers and 1400 crew. The new ships will be built at Aker Finnyards' Turku yard.

Sperry Marine will supply the complete suite of bridge electronics for the ships, including integrated navigation and communication systems. The integrated bridge system will be based on the new-generation Sperry Marine Vision FT architecture, with large, high-resolution flat-screen displays, convenient console layouts, ergonomic controls, and new operating software.

The bridge layout will be similar to other Royal Caribbean ships, with all consoles and displays arranged in a U-shaped configuration for easy control from trackball devices built into the armrests of the watch officers' chairs. All critical components are duplicated, providing total redundancy and continuous safe operation.

Sperry Marine also supplied the integrated bridge systems for all of the new Royal Caribbean *Voyager*, *Radiance* and *Vision* class ships, and has also retrofitted the same equipment on the entire fleet of existing ships, ensuring that all have standardised equipment and operating procedures. Sperry Marine also provides extensive navigation training for the ships' watch officers and fleet-wide service and technical support under a comprehensive service agreement with Royal Caribbean.

Contact: Sperry Marine, 1070 Seminole  
Trail, Charlottesville, VA 22901, USA.

Tel: +1 434 974 2000.

Fax: +1 434-974-2259.

www.sperrymarine.

northropgrumman.com/Home/

### Multi-clasp eases locking-off

A 'thin-hasps' multi-clasp for machine isolation has been introduced by Castell Iso-Lok. It is especially suited to locking off switches with restricted access to the locking facility. Also available from Iso-Lok is the company's new stainless steel padlock which can be used in conjunction with the multi-clasp.

There are many manual isolating devices where the locking facility is too small to accommodate a standard padlock or scissor clasp. The hasp on the new multi-clasp is only 3mm in diameter but provides sufficient strength to adequately lockout any isolating switch. As with all Iso-lok multi-clasps there is provision for up to six personal isolation padlocks.

Available in nickel-plated or grey sheradised steel finish for extra corrosion protection, the



This new thin-hasps multi-clasp from Castell Iso-Lok could be useful in many shipboard locations.

clasp is simply attached to the relevant anchor point and each person inserts his or her own personalised padlock into the clasp. Access can only be restored once all padlocks are removed, preventing the inadvertent or unauthorised use of hazardous equipment and electrical installations.

This 100% stainless steel padlock is ideal for use where hygiene is paramount or where there may be a risk of corrosion. It can be used when wet and dusty environments are problematic, or where acids and other chemicals are present.

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Building, 217 Kingsbury Road, London  
NW9 9HP, UK.

Tel: +44 20 8511 1883.

Fax: +44 20 8205 0055.

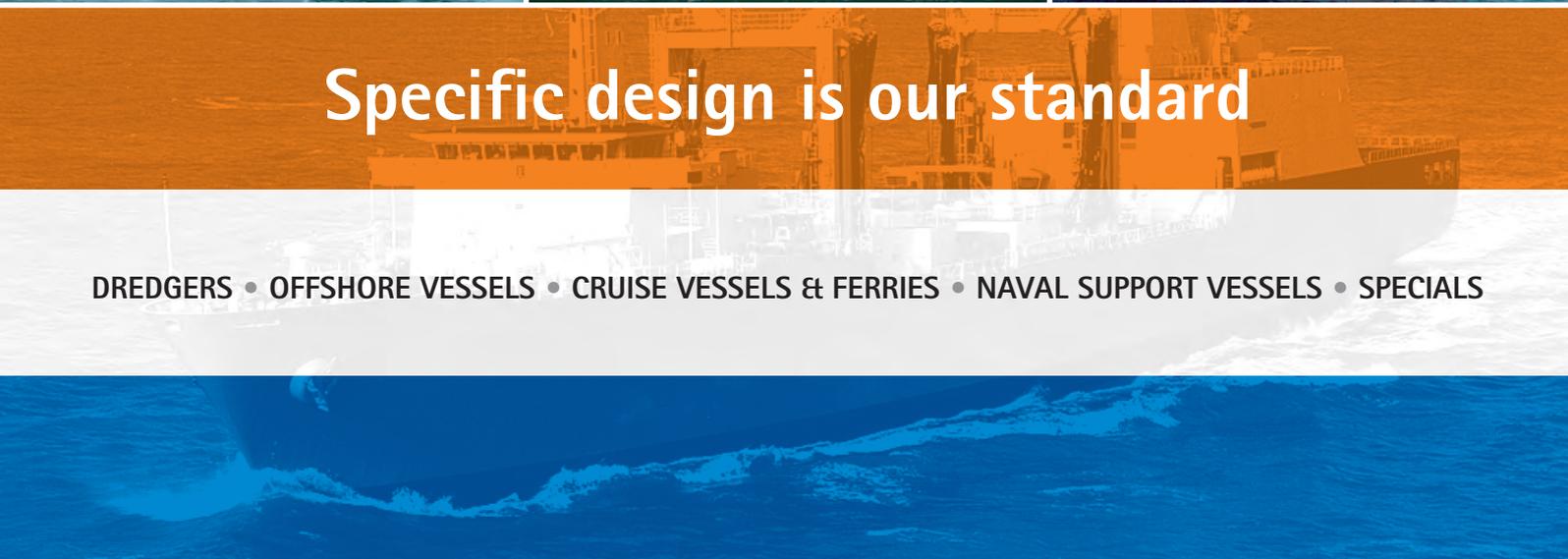
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### First Japan newbuilding contract for 'new' IP company

International Paint Japan (IPJ), the newly reorganised company set up following the agreement to separate from Nippon Paint, has announced the award of its first newbuilding contract with the supply of coatings for two 75,500m<sup>3</sup> Medmax LNG ships. The ships, being built at the Universal Shipbuilding Corp's Tsu works in Japan, are scheduled for delivery in 2007 and 2009. Each ship will be protected with over 150,000litres of high performance International Marine Coatings products, including Intershield 300 in the ballast tanks and Intersmooth 465 SPC on the underwater hull.

Once completed, the two LNG carriers, named Medmax because they have been especially de-signed and optimised to trade in



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the Mediterranean Sea, will have the largest cargo loading capacity of their type. Both ships will be operated under joint collaboration between the Hyproc Shipping Co (wholly owned by Sonatrach, the Algerian state-owned hydrocarbon company) and MOL (Mitsui OSK Lines).

This arrangement is part of a joint venture between Sonatrach, the Hyproc Shipping Co, the ITOCHU Corporation (a globally integrated Japanese corporation covering a broad spectrum of industries), and MOL to build new LNG carriers and charter them to Sonatrach on long term contract. Algeria is the world's second largest exporter of LNG. Sonatrach plans to use these vessels to service European countries, further reinforcing its ability to transport and sell LNG from Algeria.

Contact: Jim Brown, International Paint Ltd, Stoneygate Lane, Felling, Tyne and Wear NE10 0JY, UK.  
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Fax: +44 191 495 2003.  
E-mail: jim.brown@internationalpaint.com



ENRAF TankSystems' new UTImeter emissions gauge.

### New gauge reduces VOC emissions

In recent years, concern has been growing over the release of volatile organic compound (VOC) vapours, with regard to both air pollution and occupational exposure. New vapour control systems that require closed operation to avoid VOC emissions have been developed by several companies, and Enraf TankSystem SA has responded by introducing gas-tight gauges which allow gauging to be carried out without releasing any vapours.

The new HERMetric UTImeter is designed to offer fast, accurate, and reliable gauging without any vapour release. A compact ball valve, specially designed, is permanently fixed on the tank. The UTImeter is easily connected to this valve via a quick coupler. Then a single penetration of the tank can establish ullage, oil/water interface level and product temperature. All along the gauging process, the system remains tight and the operator is never exposed to the VOCs.

Compared with current models, the new UTImeter is believed to be the first gauge that allows the tape, the sensor or the electronic board to be simply exchanged, with no effect on the accuracy of measurement, it is claimed.

The new UTImeter does not require any subsequent calibration of the temperature function over time. Each sensor contains a high precision platinum RTD element. The RTD element signal is digitised, and all errors (offset, non-linearity, and drift) are corrected and compensated by a micro-controller directly located in the sensor probe itself. The meter will give the same consistently accurate temperature readings over the life of the sensor.

Moreover, as the RTD element characteristics are stored in the sensor memory and are dedicated to each sensor, changing a sensor does not require a new calibration. This means the units used onboard vessels by the crew, by vetting inspectors, or the ones used at terminals, will always give the same results.

This results in reducing the time consumed in reconciling figures between the different parties involved in cargo inspection operations. It can also give owners more flexibility to optimise their pool of gauges, as exchanging parts between units will not downgrade their individual accuracy.

Compared with current units available on the market, the UTImeter weighs between 30% and 40% less, and is 15% to 25% less bulky. Depending on the model, its weight varies from 3.4kg to 7.5kg. To achieve this, TankSystem ensured the aluminium housing was injected instead of cast, many parts are made from plastics that are unaffected by contact with petroleum, solvents, and chemicals, and the measuring tape is thin.

Most such gauges are not immune to electromagnetic fields, because the measuring tape acts as an antenna and the transmission of the signal from the sensor to the processor/display unit can be affected by interference. Due its new digitised transmission of the signal from the sensor to the display, and other protective special features, the UTImeter fulfils the requirements of the EN 50081 (emission) and EN 50082 (immunity) standards for electromagnetic compatibility.

The tape, sensor, and electronic display unit components can all be changed without special tools or soldering; just plug-in and plug-out. The verification of temperature

accuracy is achieved by a simple ice point check that is easy to carry out without sending the unit to a laboratory, and without the need for a reference thermometer.

Contact: ENRAF TankSystems SA, Rue de l'Industrie 2, 1630 Bulle, Switzerland.  
Tel: +41 26 9191500. Fax: +41 26 9191505.  
E-mail: info@tanksystem.com  
www.tanksystem.com

### Hatch covers for 7500TEU series

Six new 7500TEU container ships (hull numbers 3193-3194/3200-3203) on order at Ishikawajima-Harima Heavy Industries Co Ltd (IHI), in Japan, are being installed with MacGregor liftaway hatch covers. The six vessels are part of an eight-ship order, with the first in the series (hull number 3191), P&O Nedlloyd Mondriaan, delivered in December last year, and the second, P&O Nedlloyd Manet, in March this year.

The delivery schedules for the remaining newbuildings will be during 2006 and 2007. MacGregor has already delivered the hatch covers for the third ship, which are currently being installed, and work is underway for the remaining orders. All hatch covers have been fabricated at MacGregor's partner plant NCSC in Nantong.

The 320m-long vessels - classed by Germanischer Lloyd - are owned by Reederei Blue Star, in Germany, and operated under the P&O Nedlloyd brand. Each ship will have 56 liftaway hatch cover panels and stack loads for the 20ft containers of 90tonnes and 120tonnes for the 40ft units. The hatch covers will comprise a partial box steel structure with trapeze-profile deck plate girders. The maximum lifting weight per panel is 40tonnes. The hatch cover panels will also feature Mac-Gregor's Unipad replaceable bearing pad, which slides on the coaming against the stainless steel mating plate.

Contact: Esko Karvonen, MacGregor (FIN) Oy, Hallimestarinkatu 6, FI-20780 Kaarina, Finland.  
Tel: 358 2 4121 314.  
Fax: 358 2 4121 390.

E-mail: esko.karvonen@macgregor-group.com

### New non-stick antifouling

A solution to persuading non-stick coatings to stick to vessels seems to have been solved by Hempel's Hempasil Nexus. This product binds the underlying anticorrosive coating to the silicone-based elastomeric topcoat.

Hempasil fouling-release paint consists of four coating layers from the steel to the topcoat, including the Nexus tiecoat. The first two coating layers are for corrosion protection, the third layer is the Nexus, and the fourth is the smooth topcoat to which Nexus creates a chemical bond.

This solution is said to benefit both owner and builder as emissions from volatile organic compounds are several times lower than with comparable products, it is claimed, and waste water is free of biocides. In addition, release coats are faster to apply on vessels with long service times since fewer coats have to be applied compared with traditional antifouling.

Hempasil Nexus is ideal for vessels working at a minimum speed of 15knots with 75%

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### OSCAR for Color Fantasy

Ferry operator Color Line AS has streamlined services onboard its new flagship, luxury cruise-style *Color Fantasy*, with the commissioning of OSCAR software from retail systems provider, Anker. The implementation saw OSCAR tailored to meet the specific needs of cruise

management, and forms part of a new technology project for *Color Fantasy*, which is valued in the region of Nkr15 million (£1.3 million). Anker's OSCAR software will manage all of the day-to-day sales, logistics, and enhanced hotel operations onboard the vessel and will communicate online via satellite to the main system servers in Oslo.

Customers travelling onboard the ship will no longer need to use cash or credit cards. OSCAR manages all of the ship's key customer services such as payment at EPoS, pre-payment, and activation of TVs and minibars in 971 cabins, as well as minibar refills, conference and cabin management, currency exchange, duty free, housekeeping facilities, cleaning rotas, table reservations, lost property, and wake up calls. The next stage of development will be the

introduction of wireless mobile POS devices, which will enable *Color Fantasy's* crew to tend to passengers wherever they are onboard.

The OSCAR system also makes use of integration modules to interface with Color Line's existing external ERP and booking systems, which are based upon Mapper, Multiplus Solutions, and Oracle. This provides integration with the current IT infrastructure, eliminates inconsistency of data, and means there is no need to manually re-key data to obtain information in real-time. Color Line now plans to install OSCAR upgrades on the other 10 ships in its fleet.

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## New MARS allows costing and messaging

LAST month, a new release of MARS production software, from the Danish company Logimatic, was launched. Version 6.1, Patch 2 includes functional and technical improvements, according to the manufacturer, and focuses on operational enhancement and overall improvement of general user interfaces.

These new interfaces include a pre-calculation module, which allows the user to make pre-calculations on costs very early on in a project, and then later transfer the pre-calculated values to the project budgeting and cost control. The estimation will include cost types for standard material, plates and profiles, estimated value of project components, hours, sub-contracted work, and estimation of costs for direct expenses.

Message builder is another new module. It specifies project management information across the organisation, extracted from MARS, and can distribute/provide this information to various MARS users through an internal mailing system in MARS, or directly through MS Outlook.

Colour hints in MARS screens is now available as an improvement to the user interface throughout all screens in the MARS standard function. Reporting hours, another new module, allows the user to report hours based on activity, and not only job level.

In other news, Aker Finnyards' Rauma yard has recently selected MARS, which means that all three yards in this Finland now use the system for its enterprise resource planning. Riga Shipyard, in Latvia, has also become a MARS user recently.

# The Royal Institution of Naval Architects

## Safety Regulations & Naval Class

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The first conference on Safety Regulations and Naval Class was held in 2002. This conference will follow on from that and draw on the experiences of the past few years.

Changes in national laws and public perceptions, developments in procurement and support, and recent accidents have increasingly led to Navies re-assessing their existing safety management policies. Foremost in supporting the navies in their re-assessments are the Classification Societies. Significant investment has been made by both Navies and Classification Societies in developing these new procedures and has resulted in a far better understanding of the Navies' requirements and the differences between naval requirements and the requirements of national merchant ship administrations. Since the last conference in 2002 warships have been built to comply with Naval Classification rules and kept in "Naval Class".



Influential speakers will be gathered from around the world to ensure the latest advances are available to the audience. Papers will be presented on the following topics:-

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- **Navies:** how recent changes in procurement and support policies, budgets and the public perception have altered the status quo. Implications of maintaining ships in Class
- **Classification Societies:** development of naval ship rules, regulations and procedures. Provision of independent on-site survey and product audit. Lessons learned from classing warships
- **Regulation:** development of strategic partnerships between Navies and Classification Societies, safety certification and safety cases, improvements in regulatory competence, dual use vessels, maintaining ships in class.
- **Defence Contractors:** reaction and lessons learnt in dealing with the new regulatory regimes and Classification Society requirements.



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# Refined ABS rules for very large container ships

Class society ABS has developed new rules that address the technical challenges posed by the ever-increasing size of container liners.

ULTRA-LARGE container ships with a carrying capacity in excess of 10,000TEU pose challenging design issues that cannot be adequately addressed by traditional, prescriptive classification society rules or simplified structural analysis methods. ABS has applied the knowledge gained from first-principles engineering analyses and extensive in-service experience with large container liners to establish scantling requirements for giant hulls that maintain the overall level of structural integrity and further improve the durability of critical structural details.

Although developed specifically for mammoth container liners, the new rules provide a more rational approach to the establishment of appropriate strength requirements for container ships of 250m length and greater. Application of the latest rules will result in steel being effectively distributed to critical areas that are prone to yielding, buckling and fatigue.

Previous rule requirements were developed for container vessels of 130m to 350m length. With rapid expansion of the global container trades, some ships being designed have already exceeded the upper length limit. It is therefore necessary to broaden the application envelope of the current rule requirements to cover hulls up to 450m length. The technical basis for such an extension is first-principles engineering analyses. These encompass non-linear sea-load predictions, full ship dynamic loading approach (DLA) finite-element analysis, spectral fatigue analysis, bow-flare slamming analyses, springing analysis, whipping analysis, green-water analysis, and vibration analysis.

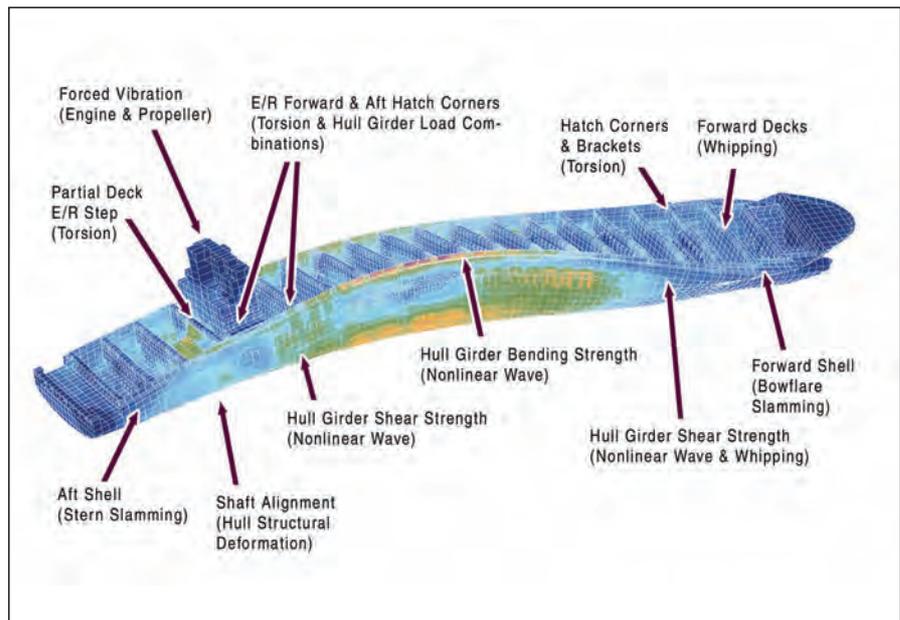
The latest rules also include the scantling requirements discussed in the following paragraphs.

## Refined torsional strength requirements

For post-Panamax or super-post-Panamax designs, it is imperative that torsional response and critical structural details beyond 0.4L amidships be evaluated with desired accuracy using full-ship finite-element models. For this reason, the latest rules mandate a full ship finite-element analysis for container ships over 250m length and require compliance with the requirements of DLA for container ships over 350m length.

## Enhanced strength requirements

It is known that significant cyclic warping stresses in side shell/bilge longitudinals can be induced by wave torsional moments. The new fatigue strength requirements improve the connection details. The requirements are applicable to side shell/bilge longitudinals below the scantling draught. Furthermore, forebody hull structures are strengthened



A diagram illustrating some of the most critical areas on super-large container-ship hulls that ABS says need to be examined very carefully.

against buckling in the upper deck region and against shear buckling of longitudinal bulkheads due to whipping.

## Non-linear sea loads

Container ships, having large bow flare and pronounced overhanging sterns, tend to experience significant non-linear sea loads. Deviations between wave-induced sagging bending moment and hogging bending moment, and between wave-induced positive shear force and negative shear force are noticeable. Non-linear correction factors were introduced into IACS' wave-induced hull girder loads formulations (developed for full-formed ship types such as tankers and bulk carriers) to account for the unique hull form of these large container designs.

## Design challenges

Container ships inherently possess low torsional rigidity due to their open-deck structural configuration. With more pronounced structural failure mechanisms than other ship types such as tankers and bulk carriers, some of the structural failure mechanisms for container ships are caused by wave torsional moment in combination with other load components in oblique seas.

For ultra-large designs, the structural design issues associated with low torsional rigidity cannot be resolved by relying on prescriptive classification society rules or simplified engineering analysis methods, which were calibrated to the service experience of mostly smaller vessels of less than 6000TEU.

The design features of these ultra-large hulls can be characterised by the principal dimensions (length overall, breadth, depth, and draught) and are driven primarily by the growth in container trade and continual expansion of port facilities. Container liners of 10,000TEU or greater are now under consideration or construction at most major shipyards in the world. With improved port infrastructures, the next frontier of technology could be 18,000TEU.

## Positioning the deckhouse

The positioning of the deckhouse is greatly influenced by ship length in order to meet the SOLAS visibility requirements. For an ultra-large container ship, the deckhouse is likely to be placed closer to the midship region. However, the torsional strength requirements in classification society rules were primarily developed for ships with deckhouses situated much closer to the stern. A slender deckhouse

sitting on a flexible hull structure is more likely to resonate under vibratory forces from the main engine that provides the necessary shaft power to maintain the service speed of these large ships. Therefore, forced vibration analysis should be an integral part of the engineering assessment.

Geometrically, increased breadth for higher on-deck container capacity can result in significant bow flare and an overhanging stern, which are contributing factors for non-linear motions and sea loads. Also, with increased breadth, the double-bottom structure becomes a greater load-bearing member, and the outboard portion of double-bottom floors can be critically stressed.

With a typical double-skin width less than 3m, the open deck structure of an ultra-large container ship is intrinsically more flexible than its smaller counterparts, resulting in much greater hatch opening distortion. An increased forebody deck area, with large deck openings for the purpose of maximising container capacity in the forebody region can further aggravate this problem. Ultra-large container ships with significant bow flare and overhanging stern are also more prone to damage from wave impact loads and the subsequent transient responses.

Therefore bow flare and stern slamming pressures, as well as whipping-induced hull girder loads, should be considered for these ships. Final resolution of these design issues relies on direct wave impact analysis. Ultra-large container ships pose other operational

challenges, for example, on-deck container securing systems and hatch cover designs under extensive movements between hatch cover and hatch coaming, loss of containers due to parametric roll, and excessive vibratory levels in substructures. The SafeHull dynamic loading approach (SH-DLA), pioneered by ABS, represents an efficient and reliable way to address these critical design issues.

#### SafeHull dynamic loading approach

SH-DLA represents a first-principles systematic dynamic loads and strength assessment procedure to evaluate ship structural strength under realistic dynamic load conditions. This approach has been successfully applied to many ship types such as tankers, container ships, bulk carriers, FPSOs, and large LNG/LPG carriers. Central to this concept is the full-ship finite-element analysis integrated with large amplitude seakeeping analysis.

Unlike other ship types, hull structural responses of container ships in oblique seas are difficult to approximate by a closed-form solution or by carrying out a finite-element model analysis of a portion of the hull structure. The difficulty stems from the open deck structural configuration of the cargo hold block that is supported by relatively rigid substructures such as engine room, deckhouse, forepeak structure, and fuel tanks. Therefore it is essential to carry out a full-ship finite-element analysis. One critical

component of the ABS SH-DLA is accurate representation of wave loads on ultra-large container ships with large bow flare and overhanging stern.

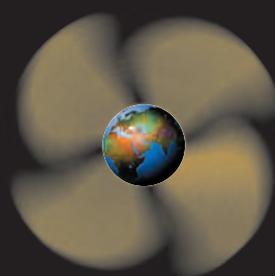
This can be achieved by the large-amplitude motion program (LAMP), based on a non-linear hydrodynamic theory. LAMP incorporates non-linear motion and load concepts to calculate the pressure distribution over the instantaneous actual wetted surface of a hull in extreme waves. Where higher uncertainties exist in the dynamic loads such as relative bow motion, hull girder loads of bending moments and torsional moments, hydrodynamic pressure and shipping of green water on deck, a consistent analysis of non-linear motion, acceleration and hydrodynamic pressure is essential for the full-ship finite-element analysis.

Speed requirements, hull form and increased ship size are contributing factors that make ultra-large container ships susceptible to bow flare and stern slamming impact. The impact forces may result in local structural damage.

For these ships, the occurrence of impact loads is highly concentrated in a very short time duration. The hull girder natural frequencies of ultra-large container ships can be such that bow flare and stern slamming forces can also accentuate structural vibration throughout the hull structure. At ABS, the LAMP system is effectively applied to predict the slamming pressures on upper bow flare and flat stern regions. ☺

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## Tougher new rules for lifeboat inspections

Richard Higgs reports on some of the newest advances in the ship safety sector.

**S**TRICT new regulations governing maintenance of shipboard lifesaving equipment, coming into force next year, could mean possible detention and costly delays for vessels not fully inspected and approved. From July 1 2006, regular inspections, tests and services by manufacturer-trained and approved technicians become mandatory for all SOLAS ships.

For the first time, a clear and safe international regime for the inspection and maintenance of lifesaving appliances will be introduced in an amended chapter III of SOLAS rules. This will require regular tests and inspection of lifeboats, release gear, and davit winches on all SOLAS ships, and specify what these tests should be and who should carry them out.

Owners and managers who cannot document and demonstrate that they have used fully-trained and approved technicians to service their lifeboats and davits may pay a price, believes Liev Groenstoel, senior engineer in Schat-Harding's service division. This may not be just dealing with delays, but also the cost of flying in spares.

While weekly and monthly work can be carried out by on-board personnel, this must be completed to standards set down by the manufacturer. The annual and five-yearly tests and service have to be done by personnel, trained and authorised by the appropriate manufacturer.

The new rules set strict testing criteria, specifying when a lifeboat should be manned and when not. For instance, the annual survey is detailed, and must be followed by a dynamic full-speed load test of davit and winch. That should be done with the boat unloaded and with a 1.1 times maximum load, at five-yearly intervals. On-load release gear is subject to a similar operational test routine.

An analysis of accidents involving lifeboats and davits, reported to IMO, shows that 60% were caused by lack of maintenance or improper resetting of the hooks, release mechanism, or winch and brake assemblies, according to Rosendal, Norway-based Schat-Harding.

'Shipowners should insist that any lifeboat service company they engage can produce certification from the original manufacturer to show they are authorised to work on the brand of boat and davit in question. They should be able to demonstrate that the individual technicians have been trained and authorised to work on that equipment too,' states Mr Groenstoel. Brands now supported by Schat-Harding include Watercraft, Waterman, Fiskars, Davit-Co, William Mills Marine, Schat, Harding and Mulder & Rijke, as well as the Beiyang Boatbuilding Co.

Mr Groenstal pointed out that the critical parts on lifeboats and davits requiring testing



A trained Schat-Harding technician checks and maintains the service hook outside a lifeboat.



A maintenance technician from Schat-Harding adjusts a lifeboat davit sheave.

are the hook and release mechanism, and the winch and brake system. 'Time and time again', he alleges, 'we see problems with these, simply because unauthorised technicians are not familiar with the required tolerances and have not been trained on the systems by the original manufacturer. They do not know when parts should be replaced or reset'.

Inspections of lifesaving appliances by Schat-Harding in a number of cases resulted in major problems being exposed. 'We recently inspected the lifeboats and davits on a cruise ship. The hook tolerances were no

longer within the requirements, which might have meant malfunction in use. Extra equipment had to be supplied so that the whole outfit could be properly renovated'.

He stressed that too few operators realise that regular maintenance is cost-effective, avoiding major costs when ships are held up after an inspection or incident. A typical cargo ship, with two lifeboats, needs to plan for one day of test and inspection by authorised technicians every year. Requirements do not just cover the winches and hooks - all the boat systems have to be examined, so the task takes time. ⚓

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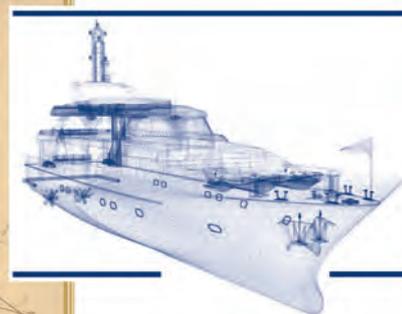
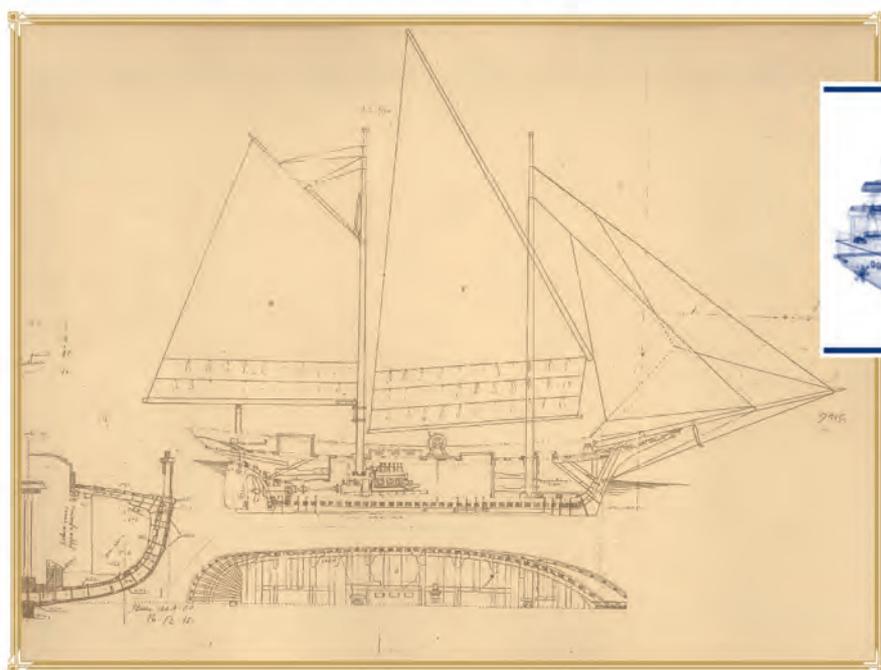


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## Survival suits for all crew members next year

IMO regulation changes on ships' safety equipment, due to come into force next year, have helped open up a new market for survival suits for two Norwegian supply companies. International marine equipment supplier Strømme ASA, of Haslum, and survival suit manufacturer Helly Hansen Spesialprodukter, of Moss, have joined forces in a bid to tap this fresh market opportunity.

New rules, adopted in May last year, mean that from July 2006, all shipping companies will be required to equip their vessels with one survival suit for each crew member as specified on the ship's safety certificate. Existing regulations demand only a small number of such suits.

In June, Strømme and Helly Hansen announced they had reached agreement on the distribution of survival suits produced by the Helly Hansen group company to Strømme's worldwide shipping clients.

The new rules will generate substantial market growth with the total potential estimated to be worth in the region of Nkr750 million. The company has set itself the target of capturing a worldwide market share from this of around 10%.

'This agreement will enable us to offer our over 350 international shipping customers suits of the highest quality. The Helly Hansen suits perform exceptionally well, one of their features being that they allow the hands to be released easily for performing necessary tasks during a rescue operation,' said Strømme's chief executive officer Christian Krefting. The product should fit well among the rest of his firm's marine safety equipment and lifeboat portfolio, he added.



**Hands free:** Strømme ASA will distribute the Helly Hansen survival suit which allows the wearer freedom to perform rescue tasks.

Strømme has grown steadily since it was formed in 1971 as a traditional supplier of technical equipment to the shipping industry. It was granted listing on the Oslo Stock Exchange four years ago and today, after gradual international expansion through acquisition, has a network of operating companies in eight countries.

It comprises two business areas: marine equipment and supply & logistics. A recent strategic acquisition was the February 2005 takeover of Norwegian Maritime Equipment AS, based at Husnes, which has provided Strømme with a source of new products in the fields of cranes, lifeboats, and safety equipment. 

## LASS: aiming to boost use of safe lightweight materials

FIRE risk has presented a major obstacle to the greater use of lightweight materials at sea, but a newly-launched Swedish project aims to establish ways of improving such safety aboard many types of ship. A three-year project, 'Lightweight Construction Applications at Sea' (LASS), backed by national shipping lines, shipyards and designers, aims to develop and demonstrate ways of using light materials and lightweight ship designs.

Its coordinator, SP Fire Technology, part of the SP Swedish National Testing & Research Institute (SP), aims to examine the various means available to enhance fire safety where lightweight ship design is employed. LASS will investigate the use of combinations of steel, aluminium, and composites in various types of ship, including high-speed passenger ferries, ro-ro vessels, smaller tankers, and fully composite ships, such as stealth-type naval vessels.

The project recognises the need for greater use of new technology in Sweden's merchant marine sector, which represents a significant

part of the country's industry. This is particularly important today as Swedish shipping is facing severe competition.

Lightweight products and designs are becoming increasingly important for the transport industry in general, not least in the marine sector. Composites or aluminium materials are now being used, so as to reduce weight and for the construction of high-speed vessels. The lighter a vessel is, the more deadweight it can carry or the less energy it will require for propulsion. Replacing heavier conventional materials, in ship superstructures for example, lowers the centre of gravity, in turn allowing either the volume of ballast to be reduced or for ballast to be replaced by useful cargo capacity. In addition, reduced fuel costs bring major environmental benefits.

However, the development of lightweight materials at sea is being impeded, SP points out, not only by various technical difficulties, but also by classification and design regulations based on the use of steel. The organisation concedes that lightweight materials generally have lower fire resistance than traditional steel,

and they can actually make a direct contribution to a fire if, for example, plastics are used. Thus, a major area of investigation by the LASS study will be reducing fire hazards.

While the project is expected also to benefit small boats in the recreational craft sector, those behind it see it resulting in new opportunities for lightweight structures in larger ships. The study will not simply focus on the standard lightweight type of vessel (built to the HSC code) but look also at ro-ro ferries and car carriers. Lighter fabrication would enable more cargo to be loaded aboard ships such as the giant car/truck carriers operated by the Wallenius Line (and its joint operating company Wallenius Wilhelmsen).

Along with shipyards, designers and shipping lines, LASS will directly involve the defence industry, industrial organisations, and research institutes including SICOMP and SSPA as well as universities including Chalmers and the Swedish Royal Institute of Technology. Financing of the study will come from the Swedish Agency for Innovation Systems. 

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## New contracts for Australian-built escape slides

A COMPLETE marine evacuation system (MES) is now in service on the new trimaran *Benchijigua Express* (*The Naval Architect* September 2005, page 42). This highly innovative ro-pax ferry, operating in the Canary Islands, has an outfit of slides and liferafts supplied by the Australian company Liferaft Systems Australia. There is a total of six slides on board, comprising four 14m twin-path slides and two 9m twin-path units, all fitted with a 100-person self-righting liferaft. An additional 10 100-person self-righting liferafts are permanently linked to the slides, providing capacity for 1600 persons. Total system weight is 9320kg.

Recent new contracts for the company include two slides for fitting on the Royal New Zealand Navy's 131m-long multi-role vessel building at Merwede Shipyard in The Netherlands. Each slide here will be supported by a 100-person self-righting liferaft and six linked SOLAS-A liferafts. Inclined slides have already been supplied to US Navy high-speed ships, including the X-Craft, and to LPD vessels for the French Navy.

A LSA MES consists of an inflatable inclined slide of various lengths with a connecting inflatable large-capacity liferaft. The liferafts can be self-righting (SOLAS A or B pack) or open reversible (HSC Code), and the slide can be single or twin path, depending



Seen here is part of a marine evacuation outfit from Liferaft Systems Australia, deployed on the new Hellas Flying Dolphins fast ferry *Highspeed 5*, built by Austral. This is the 14th ship in that Greek company's fleet to be fitted with the Australian-built equipment.

on the customer's requirements. This type of MES equipment will also be installed on an LPD-2 vessel being built for the Royal Dutch Navy by Schelde Naval Shipbuilding.

At VT Halter Marine, in the USA, a further contract calls for two open-reversible-type

MES systems, each consisting of a 9m inflatable inclined slide connected to a 128-person open reversible liferaft. The equipment will be installed on the new Steam Ship Authority vessel *Island Home* later this year. 

## Masterglas: an economic insulation alternative

LEADING US thermal, acoustic and passive fire insulation supplier MAS Industries, of Wallingford, Connecticut, has developed what it bills as a low-cost, lightweight insulation alternative to foam and glassfibre for shipbuilders. Together with project partner, the Bakersfield, California-based company UPF, the supplier has come up with Masterglas, a light and inexpensive fibrous material intended for thermal and acoustic insulation on board ships of all types.

Masterglas is claimed to offer superior thermal and acoustic performance, low smoke, flame, and wicking properties as well as a lower installed cost. The material is the result of a

joint development project, launched in 2000, by MAS and UPF, and today is said to have successfully passed all the required tests and studies. It has already been adopted for the US Coastguard's Island-class vessels and for the Littoral Combat Ship platform by the US Navy. MAS Industries president Jeff Blake reports that Masterglas is 'a third-generation fibre that is safe and breathable, while allowing a handler to be irritation-free'.

The project set out with the goal of creating an alternative to 'expensive foam and irritating glassfibre materials' for the global marine industry, while not sacrificing weight savings for the shipbuilder.

MAS Industries is a distributor for all major insulation manufacturers, as well as for most of the companies involved in sundry products that are used to install these materials. Masterglas makes use of a patented non-adhesive-based laminating system for the protective face, so maintaining its lightweight advantage. It is claimed to be lighter than foam products with the same facing and also to be 40% less costly. MAS Industries, which also supplies specialist materials to the aviation sector, has a wide-ranging marine customer base including Fincantieri, Kvaerner, Northrop Grumman, Hyundai, China Shipbuilding Corp, DSME, and Derecktor Shipyards. 

## Lifeboats and davits for Freedom-class liners

GLOBAL evacuation systems manufacturer Umoe Schat-Harding AS has won firm contracts worth around US\$7 million to supply lifeboats and davits on board the world's biggest cruise ship and the largest cruise-ferry. Royal Caribbean International has ordered 30 MPC32 lifeboats, with VIP24FD davits, together with two fast rescue boats and davits, for installation on *Freedom of the Seas* - at the present time probably the largest cruise ship. It is under construction at Aker Finnyards (Turku complex) in Finland.

Schat-Harding, of Rosendal, Norway is due to deliver the davits for November 2006, with lifeboat delivery scheduled for February 2008.

In addition, Schat-Harding announced it has been contracted to provide six MPC32 lifeboats and davits, together with two fast rescue boats and corresponding davits, for use aboard what is believed to be one of the largest ever cruise-ferrys, Color Line's *Color Magic*. A sister ship to the company's *Color Fantasy*, *Color Magic* is also being constructed at the same Finnish shipyard.

*Color Magic*, when she enters service in late 2007, will alternate with *Color Fantasy* on the Oslo-Kiel route service. The ferry's davits will be delivered in August 2006 while the lifeboats are set to be supplied in May the following year.

Schat-Harding is a leading global provider of lifeboat and evacuation systems for the cruise, offshore and shipping industries. It has factories and offices in Norway, UK, Germany, The Netherlands, and the Czech Republic, as well as in Canada, Singapore, the USA, and now China. The firm retains agents in 30 other countries. 

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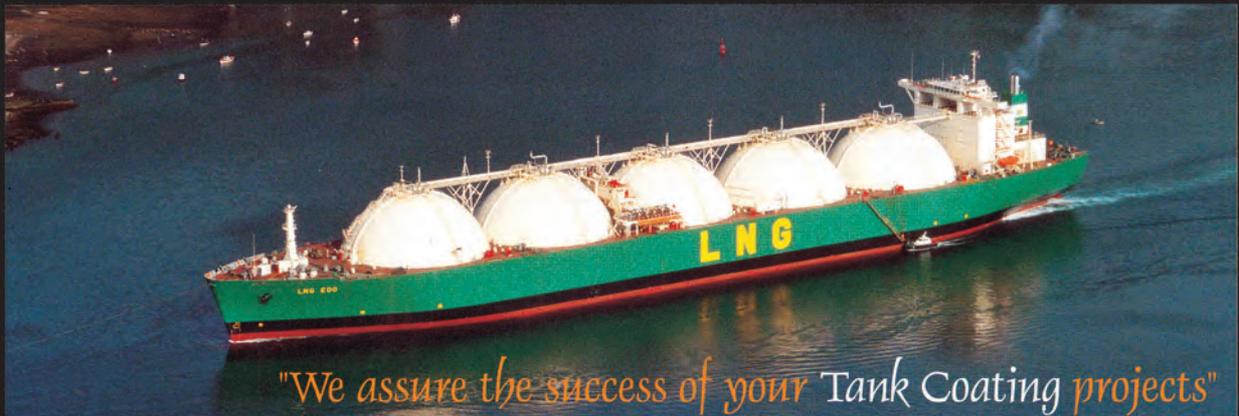


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## SRA to be extended to passenger ships

**H**AMBURG-based classification society Germanischer Lloyd is working on an extended version of its container vessel shipboard routing assistance (SRA) system, which is specially designed for cruise liners and ferries. This navigational decision-making aid was originally developed to help container ships avoid the potential risks of damage to boxes or injury on board from approaching heavy weather with dangerously high waves.

With the SRA now installed and proven aboard a number of vessels, the system supplier is responding to demand for the extended version from cruise shipping companies.

The new variant is aimed at improving passenger comfort by permitting ships' officers to slow or alter course if seasickness aboard is likely to increase. With the SRA system, GPS is used to check a ship's position, bow-mounted radar observes the wave motions, and the present

loading condition is used to compute the probability of sudden rolling, with the results being displayed on a monitor on the bridge.

Through the systematic evaluation of waves, winds and currents, SRA is able to calculate their effects on a hull and to simulate adequate countermeasures on board. As a result, it should be possible to avoid the potential risks for the crew, ship, and cargo posed by the dreaded phenomenon of parametric rolling.

This is the sudden and unexpected violent rocking of a vessel in following- and head-sea wave trains. Several spectacular accidents - with large number of container losses and damage - have befallen container liners in the Pacific Ocean as a result of this. In addition, a master can use seaway data from weather forecasts for active route planning.

Thanks to SRA, an officer on the bridge can now determine how his ship will respond. The system supplies a continuous flow of

information on the behaviour of the vessel in a seaway, from which navigational countermeasures can be derived', explained Helge Rathje, head of the hydromechanics department at GL, who evaluated the three-year trial phase of the system. Interest in the new GL system, developed jointly with The Netherlands consultancy Amarcon, has come from shipping companies keen to avoid the worst effects on their vessels.

Following trials on two different vessels last year, GL has received SRA orders for use aboard a number of container ships, and today, a handful of vessels are already underway with the system fitted. In Autumn 2004, Hapag-Lloyd decided to instal SRA on board several jumbo container liners. At that time, preparatory work had commenced on the 7500TEU *Hamburg Express*, and installation was scheduled for five 8600TEU sisters under construction at Hyundai Heavy Industries in Korea. 

## Turkish delight for APC

**A**DVANCED Polymer Coatings (APC) has announced that the 50th vessel built in Turkey using its MarineLine coating, a 7000dwt chemical tanker for Chemmariner, has been delivered. MarineLine is a lining system for cargo tanks that was first introduced onto the market in 1994.

The 50 ships that have been coated at Turkish yards have ranged in size from 3500dwt to 15,000dwt, and are designed to carry a wide range of cargo types, including sulphuric acid, phosphoric acid, methanol and other chemicals.

According to Mumtaz Yildiz, managing director, Chemmariner, 'We have coated the ships in our fleet with MarineLine because we realised a high success rate and a tremendous return on investment with our initial ships that were coated.'

APC employs its own team of professional inspectors to oversee the tank surface preparation and the MarineLine coating application. Heat curing, the most challenging part of the finishing process, is controlled directly by APC engineers to ensure that the coating is properly cured and

ready for service prior to leaving the shipyard. This allows the vessel to immediately load any IMO-approved cargo, rather than waiting 90 days, which is the time required for an alternative phenol epoxy coating to cure.

APC chairman, Donald Keehan, says, 'Because the coating is virtually impermeable, the tanks can be quickly and easily cleaned, so the ship can carry a different cargo the next voyage. This faster in-port turnaround leads to more profit for the shipowner, plus the security of knowing that the cargo is safely contained.' 

Two views of the MarineLine coatings inside cargo tanks of the recently delivered chemical tanker for Turkish operator Chemmariner.



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### New paradigm for propulsion: an update

Sir - I write as a follow-up to the article 'New paradigm for propulsion', which was published in *The Naval Architect* two years ago (July/August 2003, page 40). I understand that severe criticisms have been made of the technique proposed.

I have found an old Swedish book, of which the first half is lacking, with title page and author. It concerns John Ericsson, who in the summer of 1837 demonstrated the propeller by towing an admiral's boat, with The Lords of The British Admiralty on board. Though the speed reached was higher than with paddle wheels, The Lordships were disappointed, perhaps because of the evaluation of the naval inspector, Sir William Symond, who declared that in spite of its force being equal to that of side wheels, the screw propeller was useless in practice, since it was impossible to steer a ship having its propelling force placed aft.

The Norwegian Patent Office declared (in a letter dated August 30 2001), after having received the result of our model test in 1997, that my theories would not work in practice. The application was filed in 1990 and is still not finally decided upon.

In 1936, 99 years after Ericsson's demonstration, Det Norske Skipsforskningsinstitutt (The Norwegian Institute of Ships' Research), now Marintek, at Trondheim, tested its first model propeller. The two last decades have seen a rich harvest of new propeller constructions, most presumably better than previous ones for their specific applications. They are all design propellers, which implies that they have to be tested in model size in order to have their performance measured.

In 1979 I had patented a propeller that should be built according to hydrodynamic calculations. It would leave a minimal wake. It was then I discovered the combined function of the screw propeller. Since ship hydrodynamics are a body of empirics, tests are the hurdle; and they were too expensive for me.

I do not expect myself and my colleagues to be capable of developing, within a perspective of months, our hydrodynamic propulsion to the relative technical level of the screw propeller of, say, 1975, which was 138 years after 1837.

Development of Tyvik's flushing technique is still in its first phase. If we can produce a work-

horse version of hydrodynamic propulsion, it will be useful for the efficiency and economy of marine transport, even if any formal efficiency is disregarded. The development of a race-horse version may be a possibility, though not a priority task.

The way, psychologically, socially, and technically, that we relate to the world and its details is decided by our concepts and models. Understanding the pertaining procedures and their consequences is the essence of epistemology (the theory of knowledge - Ed). This is important not only for science in general, but also for its technical applications. It will be seen that model-free empirics lead into a morass of data, from which anything may be deduced, cf, medicine. Marine hydrodynamics, to which Professor Doctors (one of the critics\*) refers, is not built upon hydrodynamic functions, but upon what has been measurable. My approach to physics, by asking questions about the way fundamentals and functions are described, has lead to interesting answers - as in medicine.

The efficiency of an energy converter is, by tradition, calculated by a formula (algorithm, algorithm) from and through its stages of conversion. Since these stages of the flushing technique are different from those of the propeller, so should its efficiency formula be different as long as we stick to conventions.

What is more interesting, is the efficiency or productivity of the transport system as a whole. At the same deadweight and speed, flushing is expected to be the cheaper alternative, when the cost of hull, fuel, and class is included. The cost of wash is higher on rivers and canals. The cost of manoeuvring at zero speed is high today. It will be lowered by flushing; and its efficiency will be higher.

Source and sink: as a part of their fluid mechanics, naval architects have learnt about sources and sinks, which are, respectively, areas of outflowing and inflowing stream. They can as well be seen as areas of a positive or negative differential of potential, pressure, force, or energy.

Pressure is a potential that can be released against a lower potential. A potential under release (thus a transient) is energy. A sustained release is power:  $J s^{-1} = P = W$ . A screw-propelled ship produces an area of elevated pressure forward, which is seen as the bow wave. In addition, it produces an area of lowered pressure aft, between the hull and the propeller, cf, the thrust deduction

fraction. These are equivalent to a source fore and a sink aft, thus the ship is working against two potentials.

Flushing forward produces a sink; and the deceleration of water passing along the curve of the afterbody is equivalent to a source. Thus, the flushed ship is working on the side of the hydrodynamic forces, not against them. It will extract a pushing force from the pressure potential between the source aft and the sink fore. Seen from the point of view of the hull, it is pushed behind by a rising pressure and falling into a lower pressure forward, or into a sink of lower potential or power.

What are the 'correct marine hydrodynamic principles', as suggested by Prof Doctors? Reading Harvald on *Resistance and Propulsion of Ships* and comparing with textbooks on hydrodynamics (fluid mechanics), it will be seen that the principles claimed are:

1. empirics with a tenuous relation to models of physics
2. a nearly complete avoidance of general hydrodynamics.

Through my work on propellers, I learnt a lot about the greater possibilities of theoretical, thus general, models and calculations, compared with those of the method of 'design and test'. This method has influenced ships' and propeller design since the days of Ericsson. Should it not be the time for a start from general principles?

Arne Kristiansen, Cand Mag (BA)  
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Einern 61  
N-1405 Langhus  
Norway

\* Editor's note. Prof L Doctors was one of two severe critics of our 2003 article. His comments at that time have not been published. An update on progress with the Tyvik bow-flushing technique, including recent trials with a 14.00m-long prototype, appears in the Special Supplement: *Marine Power and Propulsion: Solutions for Naval Architects*, which accompanies the October 2005 edition of *The Naval Architect* (to be distributed with the November issue). Further correspondence on this subject is invited. 

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Driveline and Chassis Technology





The recently completed *Maersk Jaun*, owned by Suisse-Atlantique and chartered to Maersk Sealand, can load up to 2824TEU.

## Transformation pays off for HMD

FOR many years, Hyundai Mipo Dockyard's (HMD) Ulsan yard was primarily known as a world-leading shiprepair and conversion facility. Within the past decade, however, the South Korean company's board has shifted strategy and focused activity at the yard mainly onto newbuildings, with repair and conversion work now carried out to a large extent at its Hyundai Vinashin sister yard in Vietnam.

Newbuilding capacity at HMD has recently been further increased by converting its Dock No 1 from repair work. This facility completed its first newbuildings, a 52,000dwt chemical carrier for Western Petroleum and a 47,000dwt product/chemical tanker for OMI, during July this year.

The results of this strategic shift in direction at HMD have been quite stunning. In mid-

September, the company's orderbook stood at a total of 189 vessels, comprising 104 product and chemical tankers, and 85 container ships. Recent contracts include an order for four 46,000dwt product/chemical tankers for the Gulf Navigation group, in Dubai. These 183m long, IMO II class tankers, which will feature a service speed of 14.7knots, are due for delivery in 2008 and 2009.

In addition, in April this year, HMD signed a contract for the construction of five 13,000dwt product/chemical carriers with another Dubai-based operator, Eships Tankers Ltd. HMD believes that this particular contract will contribute greatly to its efforts to improve productivity, since spare space within the newbuilding docks can be allocated to these relatively small tanker types, maximising overall efficiency.

During the first half of 2005, the yard also picked up a significant number of container vessel contracts. These include an order for five 4300TEU ships from Norddeutsche Vermogen Holding GmbH & Co KG; one 2824TEU capacity vessel from Orix Maritime Corp; six 1800TEU ships for Reederei Claus-Peter



The 37,000dwt product/chemical tanker *T C Gleisner* is notable for her unusual bow form.



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Often; three 3450TEU container ships from P&O Nedlloyd; and two small 824TEU ships for Cido Shipping Co. Ltd.

Notable deliveries completed in the first half of this year include the *Didimon*, a 37,000dwt product/chemical tanker for World Excellence, which was completed in January and which is being operated by Tsakos Energy Navigation; the 2824TEU capacity *Maersk Jaun*, delivered

to A P Möller in June; and the 32,280dwt product / chemical tanker *T C Gleisner*. The latter is owned by International Andromeda Shipping, and was also handed over in June this year.

*Didimon* is a new 37,000dwt product/chemical tanker built for World Excellence.



## First export order for new Hyundai-HiMSEN H17/28 engine

THE first export order for its smallest model in the HiMSEN own-developed range of diesel engines has been secured by Hyundai Heavy Industries. This is for nine 5H17/28 auxiliary engines (each developing 575kW at 900rev/min) for alternator drive to be installed on three 20,000dwt bulk carriers for Turkish shipowner, Kaptanoglu group. These ships are being built by Torgem Shipyard in Turkey. Engine deliveries will be from December 2005 for the first ship, to August 2006 for the third ship.

The H17/28 model is the smallest of the three new engines discussed in our March 2005 issue (page 25); it passed its type approval test at the end of last year. The other two models are the H21/32 and the H25/33; orders for the latter

have already been secured from another Turkish owner, Sener Group - two nine-cylinder engines to power two 5850dwt chemical tankers under construction at the Yildirim yard.

The 5H17/28 was in a difficult situation since most conservative customers did not want to equip their new vessels with a newly developed engine. Nevertheless, the Kaptanoglu group recognized its potential merits from previous HiMSEN orders: three 5H21/32 auxiliary engines for a 40,000dwt tanker.

It has been four years since the HiMSEN engine made its debut in the world market. So far, more than 770 sets have been ordered and delivered: 681 for marine diesel-alternators, 19 for main propulsion, and 75 for land-based

power stations; by shipyard, 20% are for foreign yards including overseas power plant, and 80% for domestic use.

The new HiMSEN H17/28 is also designed to be practical for users and the environment; it features the concept of 'Hi-Touch' and 'Hi-Tech'. It also has the longest stroke compared with competitors' engines with similar outputs. Moreover, the H17/28 can burn heavy fuel and meets international environment regulations by applying a high compression ratio, an efficient turbocharging system, and optimised Miller timing. As a result of the development of the H17/28, Hyundai has extended its market by supplying a wider range of engines and can now participate in the growing small-output market.

## Mighty blocks and floating dock speed production at Samsung

TO boost ship production and release construction dock space at its huge Koje island yard, Samsung Heavy Industries has embarked on an ambitious programme of assembling additional and complete hulls in a floating dock. A key factor in this process is the fabrication in the existing workshops of super-large steel blocks - up to 2500tonnes each. Previously, the yard used around 130 blocks for a large ship, each weighing from 200tonnes to 250tonnes. For the floating dock project, only 10 blocks are used - eight for the hull plus one for the accommodation deckhouse, and a final one for the funnel.

Brought to the quayside by heavy-lift transporters, the blocks are lifted into the dock by two Samsung-built floating cranes (one of 3000tonnes lift capacity and the other of 3600tonnes). Some of the simpler blocks are being fabricated by subcontractors.

When Samsung began this system in 2001, 12 blocks were used, and a typical ship spent 96 days in the dock. In 2004, block numbers were reduced to 10 and dock time shrunk dramatically to 45 days. Today, dock time stands at 37 days, and by next year the aim is to use only eight blocks! Thus, a Suezmax-

size ship can be delivered in seven months from the start of steel cutting. Although the floating dock is also used for re-dockings, Samsung expects to build seven Aframax tankers annually there but the goal is to complete 12! A second floating dock for the yard is currently under construction in China.

The information in this article is extracted, with grateful permission, from the article 'Samsung's megablock revolution', published in the Fall 2005 edition of *Surveyor*, the quarterly magazine of classification society ABS.

## Daewoo pioneers Intersleek at newbuilding

THE first new ship to be built in Korea and coated with International Paint's Intersleek foul-release coating is about to be delivered. The sides, rudder, and propeller of a 145,000m<sup>3</sup> LNG carrier for Greek operator Maran Gas were successfully coated at DSME in association with International Paint (Korea) Ltd. The work was carried out during the vessel's pre-delivery drydocking.

Prior to that docking, and after a long period of technical consultation with all involved

parties, International Paint Korea hosted several Intersleek training classes to fully prepare the shipyard, contractors, and owner's personnel for this pioneering application. A small number of guest dignitaries including naval architect professors from Busan National University were also present. Mr O S Kang, general manager, marine and protective coatings for International Paint's Korean company, said, 'The success of this application is seen as a potential turning point in

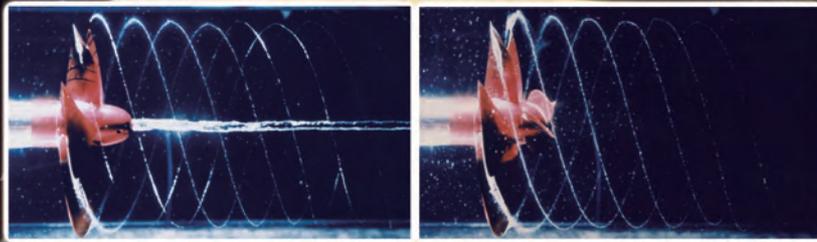
overcoming the practical difficulties in applying silicone-based coatings for new ships. Hopefully, this application will herald, despite some initial difficulties, a new era in shipbuilding and coating methodology'. Two further LNG's for Maran Gas are to be coated with Intersleek at pre-delivery docking in DSME and, if similarly successful, will ease the way for the growing number of newbuilding owners wanting this special coating system.

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# Towards an integrated design environment for the naval architect

Important work to achieve satisfactory interfaces from Microsoft's component object model (COM technology) into the company's own naval architectural software suites is discussed by Patrick Couser, from Formation Design Systems.

DESIGNERS are always striving to improve their products. In creating a vessel, the naval architect is required to find the optimum compromise that ensures that the vessel will fulfil its owner's requirements. However, due to the complexity of the product, finding the optimum solution is an extremely difficult, if not impossible, task, and normally the optimum design from a (small) number of candidate designs is selected. Any tools and methodologies that can allow the assessment of a larger number of candidate should lead to a more optimal design being found.

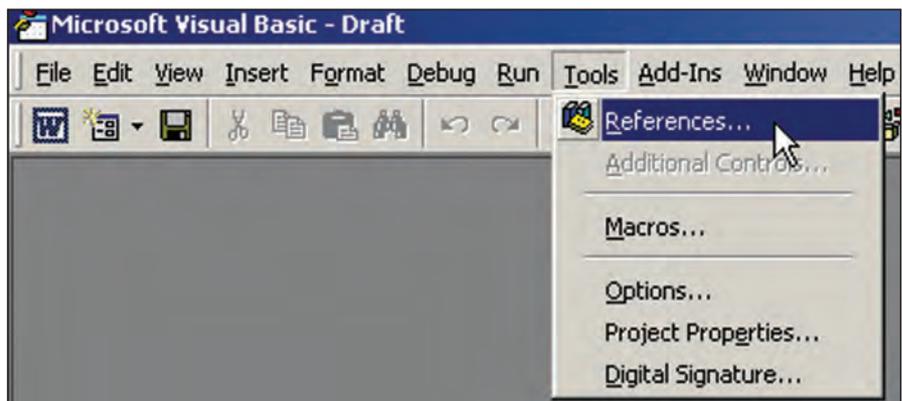
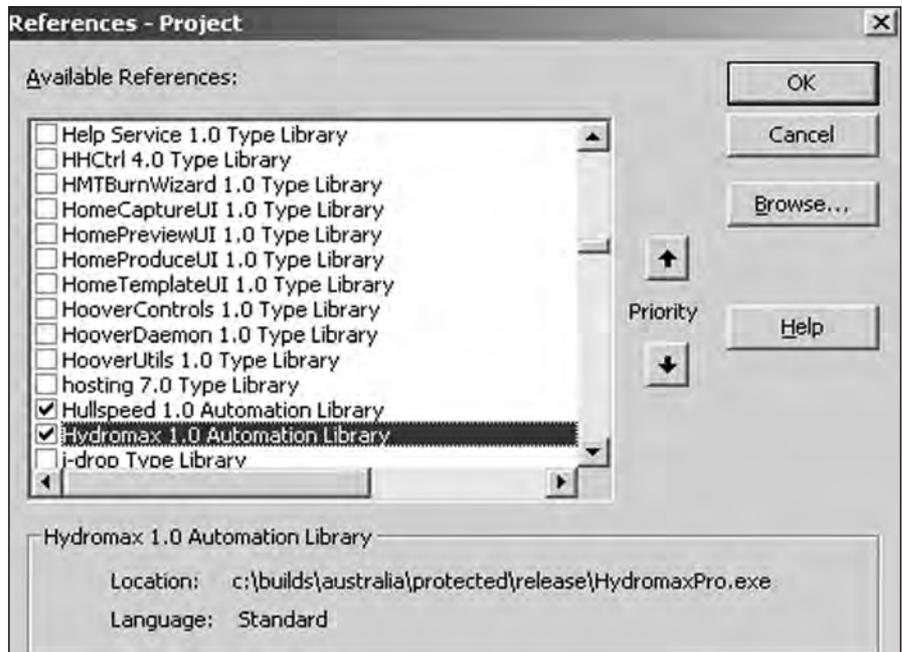
For a number of years now, the availability of cheap, high-performance computers has allowed naval architects to increase the number of designs that are assessed (and the level of detail with which they are assessed) significantly compared with only a few decades ago. However the design process and methodology is still relatively unchanged - there is little automated optimisation, with most of the design decisions being based on the naval architect's knowledge, previous experience, and 'rules of thumb'. In many cases a diverse range of software is used and the individual components are not necessarily integrated in a consistent manner; requiring the user to manually transfer data from one system to the next as the design evolves.

## Automation and COM

Built into Microsoft's operating systems is a mechanism which allows different applications to interact. This technology is called 'Component Object Model' or COM for short. Whilst COM has been around for quite a few years it is only relatively recently that third-party software developers have opened up their applications by providing COM interfaces.

Many software vendors preferred to develop their own macro languages to allow users to exploit their applications at a more fundamental level. From the point of view of the naval architect, one of the key benefits of COM is that it allows interaction between Microsoft Excel and Word and third-party software. Many naval architects are familiar with Excel and Word macros written in Visual Basic for Applications (VBA), and COM interfaces allow these macros to perform tasks in other applications.

For example, one can write an Excel macro that will load a design into Hydromax, set the analysis



Figs 1a and 1b. A surprisingly large number of VBA automation libraries are installed on a typical Microsoft Windows PC.

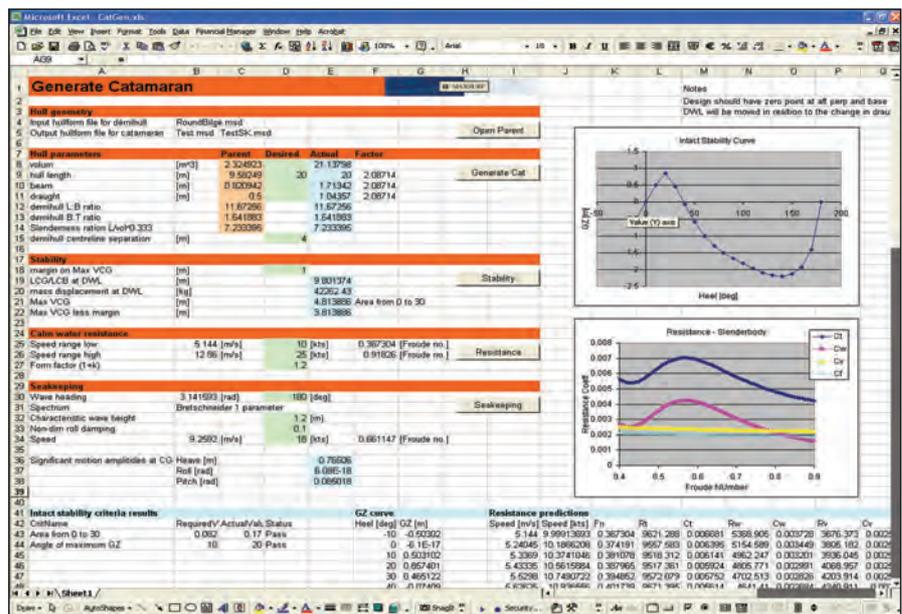


Fig 2. Overview of a relatively simple spreadsheet used to generate and assess catamarans.



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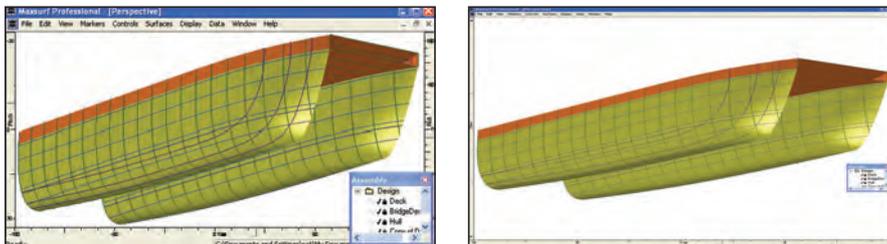
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Input hullform file for demihull	RoundBilge.msdx					Open Parent
Output hullform file for catamaran	Test.msdx	TestSK.msdx				
Hull parameters						
	Parent	Desired	Actual	Factor		
volum	[m <sup>3</sup> ]	2.324923	21.13798			
hull length	[m]	9.58249	20	20	2.08714	Generate Cat
beam	[m]	0.820942	1.71342	2.08714		
draught	[m]	0.5	1.04357	2.08714		
demihull L:B ratio		11.67256	11.67256			
demihull B:T ratio		1.641883	1.641883			
Slenderness ration L/Vol*0.333		7.233395	7.233395			
demihull centreline separation	[m]		4			

Fig 3. Specification of the vessel dimensions in the spreadsheet.

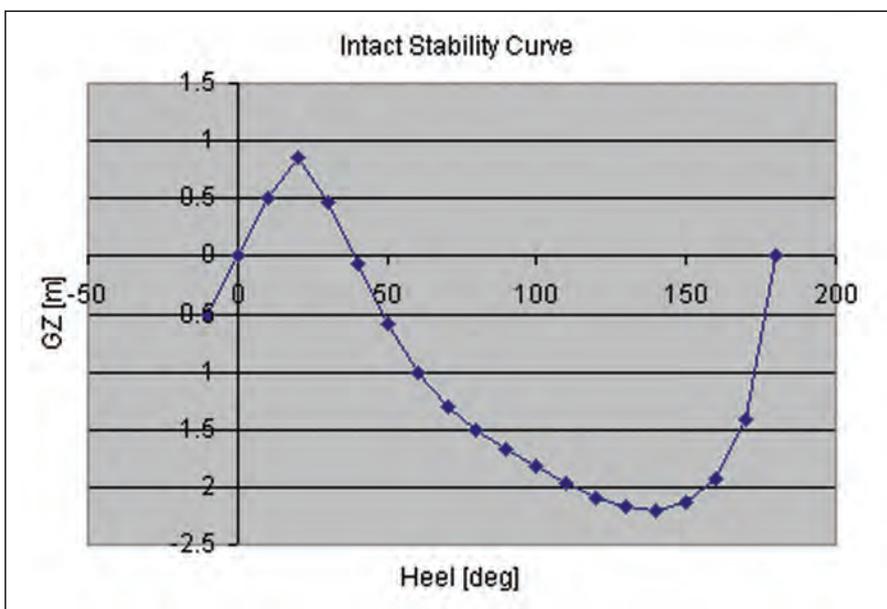


Figs 4a and 4b. Parent hullform and resulting catamaran.

Stability						
margin on Max VCG	[m]		1			Stability
LCG/LCB at DWL	[m]		9.801374			
mass displacement at DWL	[kg]		42262.43			
Max VCG	[m]		4.813886	Area from 0 to 30		
Max VCG less margin	[m]		3.813886			

Intact stability criteria results				GZ curve	
CritName	RequiredV	ActualVal	Status	Heel [deg]	GZ [m]
Area from 0 to 30	0.082	0.17	Pass	-10	-0.50302
Angle of maximum GZ	10	20	Pass	0	-6.1E-17

Figs 5a and 5b. Settings for stability analysis.



6. Results from stability analysis: Maximum VCG and stability curve.

Calm water resistance						
Speed range low	5.144 [m/s]	10 [kts]	0.367304 [Froude no.]			Resistance
Speed range high	12.86 [m/s]	25 [kts]	0.91826 [Froude no.]			
Form factor (1+k)		1.2				
Seakeeping						
Wave heading	3.141593 [rad]	180 [deg]				Seakeeping
Spectrum	Bretschneider 1 parameter					
Characteristic wave height		1.2 [m]				
Non-dim roll damping		0.1				
Speed	9.2592 [m/s]	18 [kts]	0.661147 [Froude no.]			
Significant motion amplitudes at CG	Heave [m]		0.76506			
	Roll [rad]		6.08E-18			
	Pitch [rad]		0.085018			

type and parameters, run the analysis and extract the results into an Excel spreadsheet table. With COM, naval architects are not limited to using VBA, but can use other languages such as C++.

However, the majority of naval architect users would access the COM interfaces via VBA in the manner described above. Accessing other application from VBA macros in Word or Excel is often referred to as 'VBA Automation'.

'What automation libraries do I have on my system?' Resides may be surprised at the number of VBA Automation Libraries already available on a computer. Launch Microsoft Word or Excel, open the Visual Basic Editor (Alt+F11) and then go to the Tools|References dialogue. In this dialogue, can be seen all the automation libraries that are available on a computer - probably in the hundreds.

Some typical VBA codes are shown below. This gives some idea of how easy it is to write macros in Excel which can drive other programs such as a hydrostatic analysis in Formation Design Systems' Hydromax:

```

hmApp As New Hydromax.Application
hmApp.Design.ActiveAnalysisMode =
hmAMStability
hmApp.Design.activeLoadCase =
Range("B7").Value
hmApp.Design.activeDamageCase =
Range("B8").Value
hmApp.Design.RunAnalysis
    
```

In the above example, data is extracted from cells in an Excel spreadsheet and is used to determine the analysis to be carried out in Hydromax. The results from the Hydromax analysis can then be inserted into another part of the spreadsheet.

The use of VBA Automation Libraries as interfaces into third party software has several advantages over built-in macro languages or command line options.

- a common programming language can be used for all macros. Typically this is VBA, but the COM interfaces are also accessible from other common programming languages such as C++, JAVA and C#
- software developers can take advantage of components provided by other software vendors. For example, Formation Design Systems' Multiframe can use Microsoft Word as a reporting engine and generate Word documents directly
- more and more vendors of engineering software are including VBA Automation interfaces into their products, for example AutoCAD, SolidWorks and ProEngineer, to name but three.

A number of uses for Automation libraries spring to mind immediately, but the potential scope is bounded only by the designer's creativity:

Fig 7. Performance prediction options.

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- > Minimised disruption
- > Increased quality
- > Increased familiarity with coating systems

## ...and advantages in service

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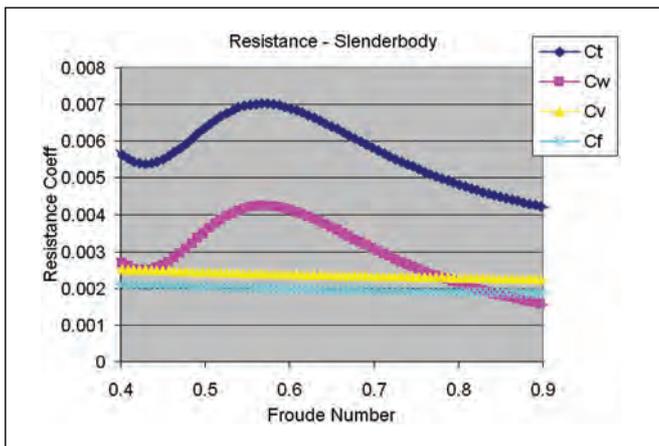


Fig 8. Resistance results from Hullspeed.

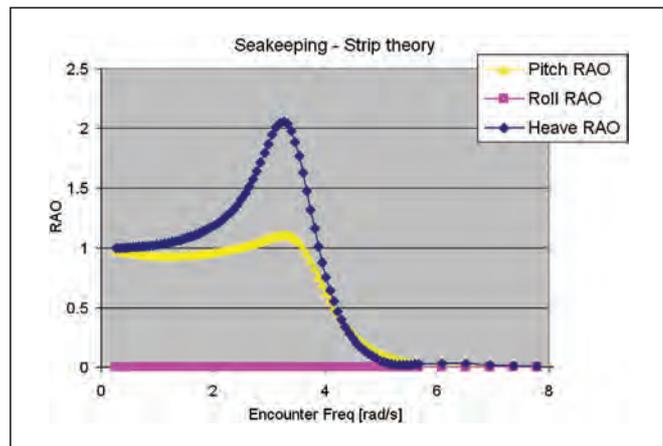


Fig 9. Seakeeping response amplitude operators (RAOs) from Seakeeper.

- automation of repetitive tasks, be these modelling tasks, analysis, reporting, or estimating
- integrating design flow-through by using VBA macros to transfer data from one application to another
- interrogation of databases: In many cases the design and production data are held in a database. Custom VBA macros can be written to extract specific data for special reports or transfer to other software
- optimisation. Being able to access design and analysis software from VB macros or via COM interfaces directly, allows users to develop their own optimisation algorithms or use sophisticated off-the-shelf optimisers such as modeFRONTIER. The scope is limitless; from simple, manual optimisation using automated model generation and analysis, to complex genetic algorithm optimisation methods. modeFRONTIER has recently been applied to a number of ships with problems and mentioned in a number of recent papers. More details about this software can be found at <http://www.esteco.com/>

**VBA automation: an example**

The following example shows the use of VBA automation within Formation Design Systems' Maxsurf suite. A Microsoft Excel spreadsheet is used to define the vessel parameters and present the results of the performance analysis. VBA macros within the Excel spreadsheet open Maxsurf to manipulate a parent hull design and generate the specified catamaran.

The resulting vessel is then analysed in Hydromax for stability characteristics and the limiting vertical centre of gravity is determined from a number of stability criteria. Vessel resistance and seakeeping performance are then assessed in Hullspeed and Seakeeper respectively.

Fig 2 shows a relatively simple spreadsheet used to generate catamarans from parent hullforms and test their stability, resistance, and seakeeping performance. Parent monohull forms have been already designed in Maxsurf. The macro in the spreadsheet takes the desired parent

```

Microsoft Visual Basic - CatGen.xls - [Module1 (Code)]
File Edit View Insert Format Debug Run Tools Add-Ins Window Help
Option Base 1 'Array indexing from 1 not zero
'Global variables
Public maxsurfApp As New Maxsurf.Application
Public hydromaxApp As New Hydromax.Application
Public hullspeedApp As New Hullspeed.Application
Public seakeeperApp As New Seakeeper.Application
Public mainPath As String
Public inputFile As String
Public outputFile As String
Public outputFileSK As String
Private Sub SetPath()
    mainPath = "C:\Documents and Settings\pat\My Documents\Work\F1
    inputFile = mainPath + Range("b4").Value
    outputFile = mainPath + Range("b5").Value
    outputFileSK = mainPath + Range("c5").Value
End Sub
Sub GetSeakeepingResults()
    Dim freq As Long
    Dim numFreq As Long
    Dim speedIdx As Long
    Dim headingIdx As Long
    Dim spectrumIdx As Long
    speedIdx = 1
    headingIdx = 1
    spectrumIdx = 1
    numFreq = seakeeperApp.Design.AnalysisOptions.NumOfFrequencies
    Range("u42").Offset(0, 0).Value = "Encounter Freq [rad/s]"
    Range("u42").Offset(0, 1).Value = "Wave Freq [rad/s]"
    Range("u42").Offset(0, 2).Value = "Wavelength [m]"
    Range("u42").Offset(0, 3).Value = "Heave RAO"
    Range("u42").Offset(0, 4).Value = "Heave phase [rad]"
    
```

10. Sample of some of the VBA macros used in the spreadsheet.

hullform, rescales it according to new values for length, beam, draught or displacement specified by the user in the spreadsheet and transforms it into a catamaran form with the specified hull separation.

Once the catamaran has been created, its stability characteristics are analysed in Hydromax. The vessel displacement is

calculated at the design waterline and then the maximum vertical centre of gravity (VCG) is determined according to certain stability criteria (a sub-set of the HSC code intact stability requirements have been used in this example). The model is then loaded into Hullspeed and Seakeeper to predict the resistance and seakeeping performance.

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# New features aid mono- and multihull designers

AUSTRALIA-based Formation Design Systems has recently announced that it has updated its Maxsurf suite of naval architecture software. Used by over 1000 naval architects and shipbuilders worldwide, Maxsurf provides a comprehensive suite of tools for all types of ship and boat design.

Key features include a complete suite of design, analysis, and construction capabilities, a graphical Windows interface with smooth data exchange with Word, Excel, Autocad, Rhino, and other systems, as well as data transfer to ShipConstructor for detailing, piping, HVAC, and production. This software also works from one common 3D NURB surface model.

The new features in version 11 of Maxsurf will help both monohull and multihull

designers. They include enhanced stability criteria, closer links with ShipConstructor, and improved generation of hull structure. The new version also sees the introduction of automation. This allows users to write macros and other kinds of programs to access the data in the Maxsurf model from inside Excel, Autocad, Word, and other packages.

Enhancements to Hydromax include floodable length analysis and extensive criteria improvements. A number of minor additions to the application will ensure that the most accurate hydrostatic results are achieved, including the ability to view hull sections individually to check that the Hydromax model has been read correctly from Maxsurf.

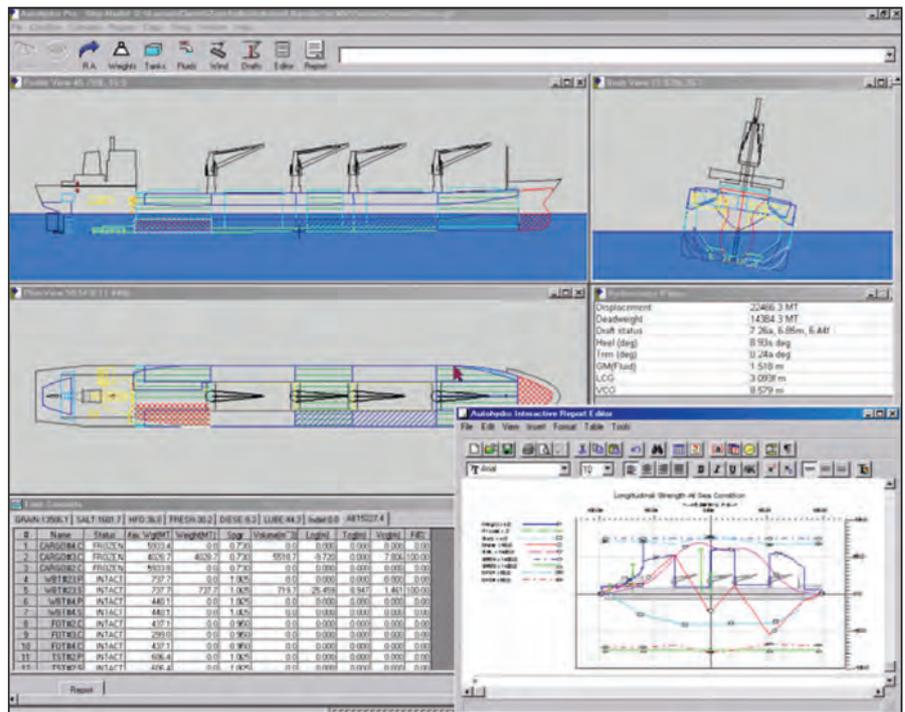
The major areas of upgrade in workshop include frame and stringer definition and plate forming information. A variety of new opening shapes are available for definition of frames, and mouse holes may be inserted at plate boundaries. Hullspeed has a revised slender body prediction algorithm which gives reliable results over a wider range of hull forms.

Across all programs, where necessary, dialogues have been made re-sizeable for ease of viewing, but users can also revert back to the default size of the dialogue. All applications now use pdf-format help documents, the advantages being bookmarks, advanced search tools, and navigation tools.

# US yards select Autohydro system

TWO US shipbuilders, Alabama Shipyards and Derecktor Shipyards, have chosen Autoship's Autohydro Pro Release 6 to undertake their hydrostatic and stability calculations. This program performs intact and damage analyses and produces customised stability reports which are accepted by most major approval bodies.

Alabama Shipyards, located in Mobile, is replacing an older style program with Autohydro and will use the system throughout all phases of new construction and repair work. Similarly, Derecktor, in Bridgeport, Connecticut, will use Autohydro to conduct stability analyses for both newbuildings and repairs/conversions.



The main screen display for Autoship's new Autohydro Pro Release 6 suite.



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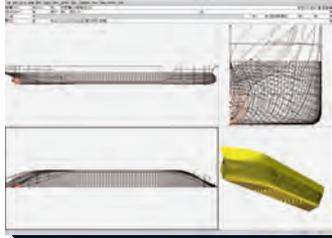


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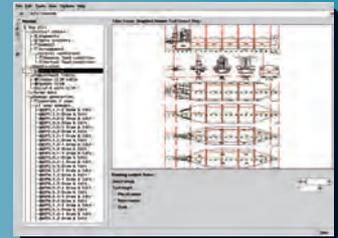
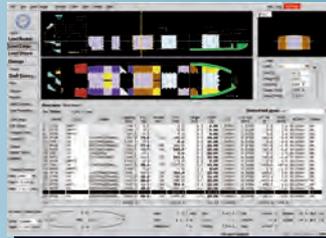
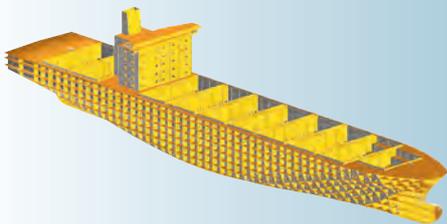
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## NAPA ER for emergency response

RELEASED in June 2005, the latest version of NAPA comes with new features including a brand new add-on application, the NAPA ER for emergency response and salvage calculations. NAPA ER has been developed to meet the demands of easy loading and damage analysis, and to enable fast technical support for ships in operation. A land-based technical support team is already required for tankers sailing in US waters (OPA 90), and the demand for support is expected to grow at an increasing pace.

This new add-on integrates a number of NAPA functions into a single intuitive graphical user interface (GUI) giving access to the necessary stability, loading and longitudinal strength functions needed for emergency response and salvage operations. The tool can be used directly with virtually any existing NAPA project database; no special conversion or preparation of the database is needed.

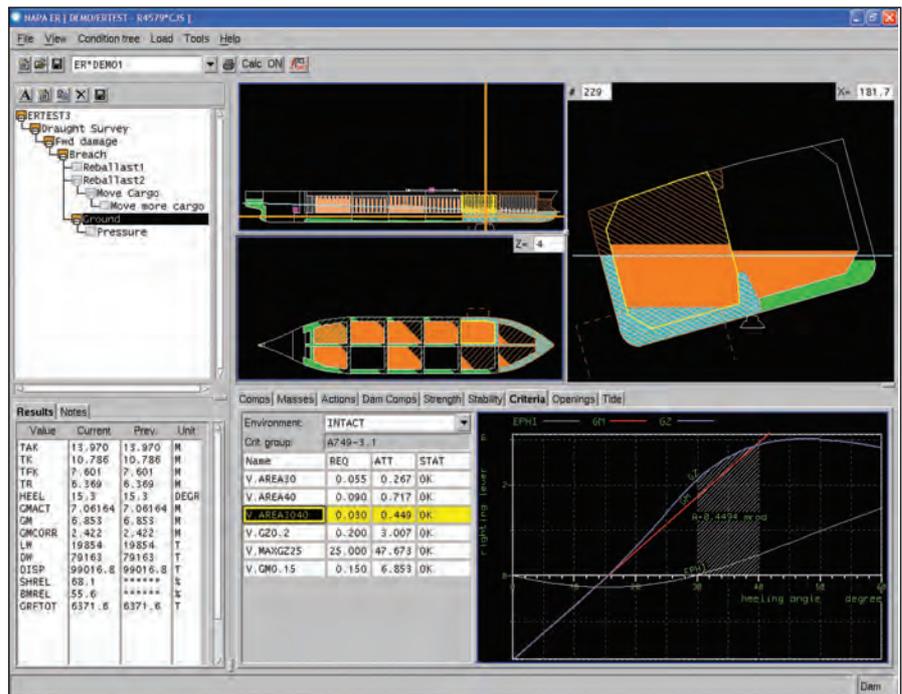
NAPA had been used by a number of organisations for emergency response calculations for some time when the requirement emerged for a more integrated tool collecting all the required functionality under a single GUI. The first prototype of NAPA ER was developed in early 2004. Feedback received from some of the major classification societies and Napa Ltd's own experiences served as the basis for this initial development work, which was followed by a major development effort aiming to incorporate the first official version of NAPA ER in NAPA Release 2005.1. During the development phase, Napa Ltd worked closely with Lloyd's Register in order to develop the new suite's functionality.

Primarily developed for organisations involved in emergency response and salvage work such as classification societies, salvage companies, ship owners and operators, authorities, and consultancies, NAPA ER is also an excellent tool for 'browsing' the ship model and examining stability and strength-related issues. This makes it a useful tool also for, among others, stability training purposes and ship designers wanting to study the behaviour of a given ship model.

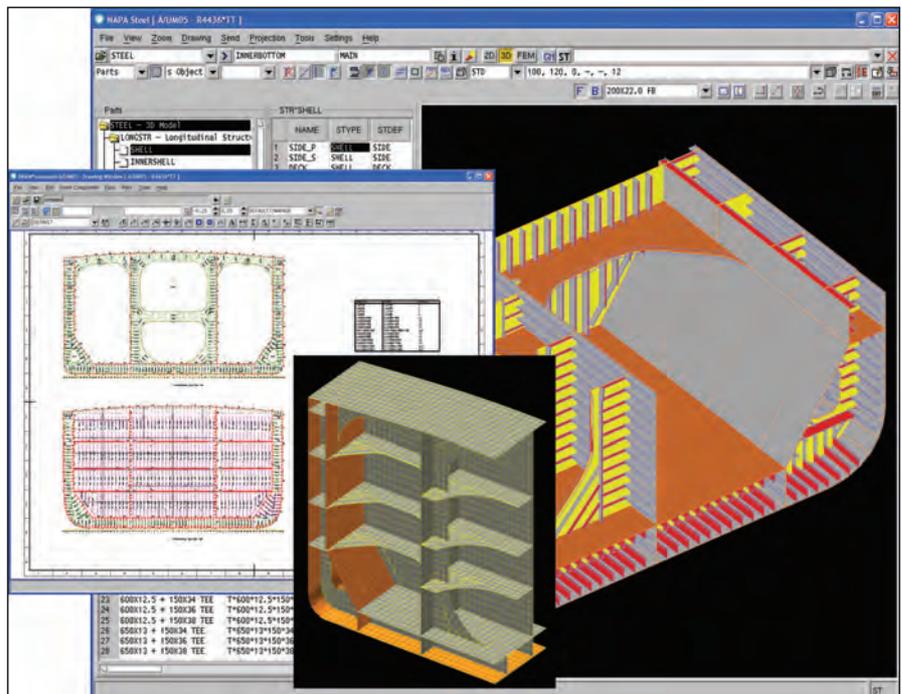
Future development plans of the NAPA ER application include functions for calculating residual strength on the basis of the extent of the structural damage and time domain calculation for loading and flooding, in addition to the already existing time domain calculation of the influence of tide.

### Calculation of probabilistic damage stability

Among NAPA's greatest strengths are its unrivalled features for stability calculations. When SOLAS Chapter II-1 was undergoing revision, NAPA was actually used as the calculation tool by most members of the working group. The revised SOLAS rules will be applicable to new ships built after the expected entry into force date of 1 January 2009.



NAPA ER performing calculations for a grounded ship.



NAPA Steel integrates working with drawings, the 3D model, and finite-element modelling (see page 52).

In order to streamline the performing of calculations in accordance with the revised rules (SOLAS Chapter II-1, Part B-1, Regulation 25-1), the NAPA Manager application for probabilistic damage stability

calculations has been implemented in NAPA. The user can proceed with the calculations step-by-step in a logical order, as the entire process is presented on the main level of the application. *continued*

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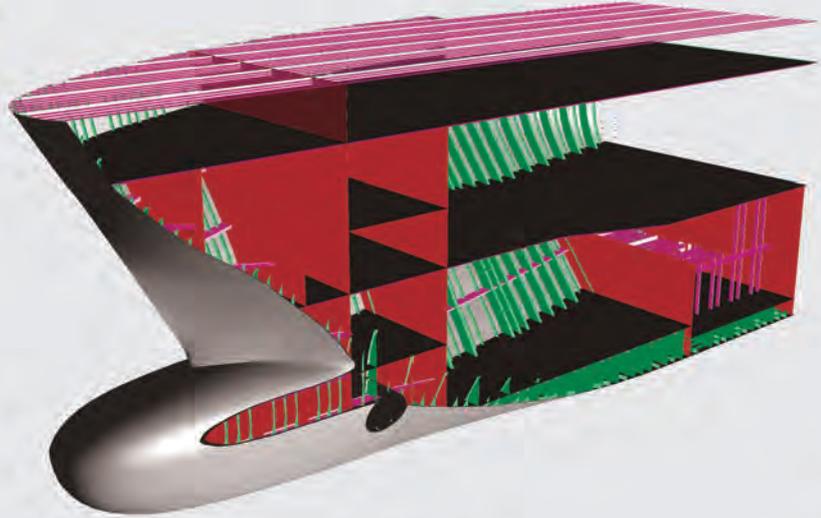
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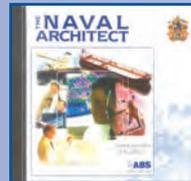
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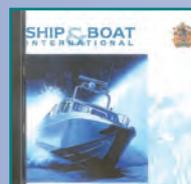
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#### Steel for ship structural design

The graphical user interface of NAPA Steel has been revised for NAPA Release 2005.1. It now contains three different work modes: the 2D drawing mode, the 3D modelling mode, and the FEM mode. The user can toggle

between these modes and work with the different aspects of design simultaneously; the same ship structure can be easily viewed as a drawing, a 3D model or a FEM model in one software system. Traditionally, three separate software systems have been used to achieve the same outcome.

Drawings can now be generated automatically for a selected section, object or shell expansion. Drawings are linked to the model so that when the model is changed, the drawing can be updated automatically and design inconsistencies can be avoided. Furthermore, modelling can also be performed through the drawing, in which case the changes will be reflected to the 3D model.

Different sets of rules can be defined for the generation of global, local and fine-mesh FEM models. Structures are automatically

idealised on the basis of the selected settings. The resulting elements can be further split with the new meshing algorithm incorporated into NAPA Steel.

Moreover, a new interface has been introduced for exporting sections from the NAPA Steel model to the Lloyd's Register RulesCalc system, thus integrating scantling assessment into the initial design process. Another handy new tool has been introduced for generating a 3D model from DXF lines. The user now can simply select lines from a given layer and then extrude them into 3D structures.

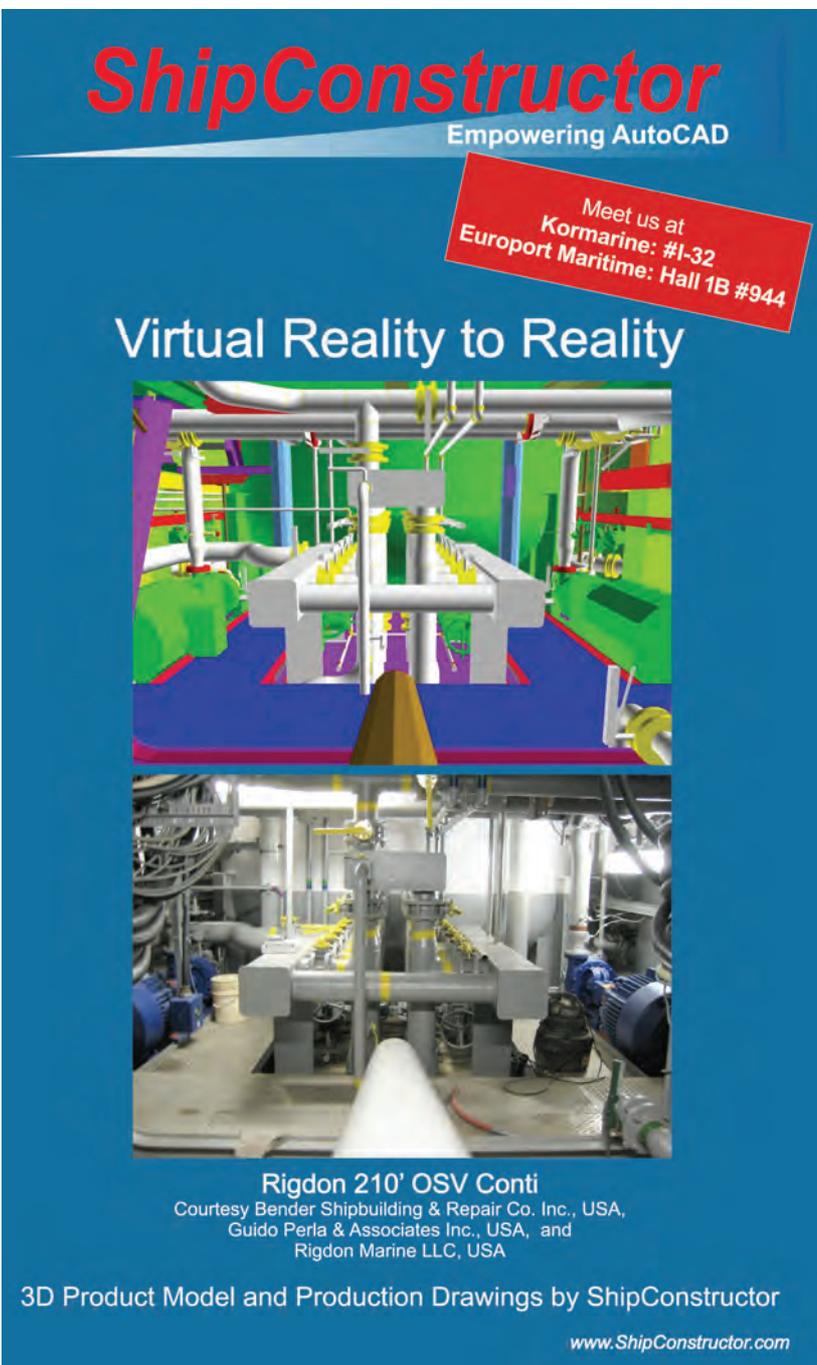
In other news, the most recent companies to employ the NAPA system include CDI Corp, Japan; Hyundai Mipo Dockyard, Korea; Hyundai Samho Heavy Industries, Korea; Mokpo National Maritime University, Korea; Shanghai Xin Ye Marine Design, China; Shipyard Trogir, Croatia; and Vietnam Shipbuilding Corp, Vietnam. In March 2005, Napa Ltd established an independent Napa representation office in Korea, an outcome both of the major agreement made with Hyundai Heavy Industries Co Ltd at the end of 2004, and of the growing number of NAPA users in Korea. 

## Stowage planning system purchased

AUTOSHIP Systems Corp (ASC), Canada, recently announced the sale of SPS (stowage planning system) to AAL Shipping Agencies, manager for Austral Asia Line and Project Asia Service. AAL and PAS operate a fleet of modern multi-purpose tweendeckers between Australia, Papua New Guinea, South East Asia and the Far East. The system is for its fleet of four D-Class Superflex 800 heavy-lift multipurpose vessels: *Cape Donington*, *Cape Darnley*, *Cape Delgado*, and *Cape Delfaro*.

SPS is a cargo management system. It is based on the total voyage concept, in which the impact of any single change is automatically checked against existing plans for every other port. Containers and break-bulk cargo are stowed in a graphical user interface. The system's EDI (electronic data interface) enables ship planners to have real time cargo booking information. Included as a module in SPS is Autoload, Autoship's DNV and LR type approved hydrostatic engine.

For AAL, key SPS features include the EDI capability and the graphical stowage planning. These features will result in effective cargo tracking and efficient utilisation of the ship's carrying capacity. The link between SPS and AAL's in-house ShipNet Information System will allow the ship planners to electronically import up-to-date booking information into the SPS working environment. In SPS, they will then graphically develop the stowage plans, while at the same time use Autoload to consider the vessel's stability. 



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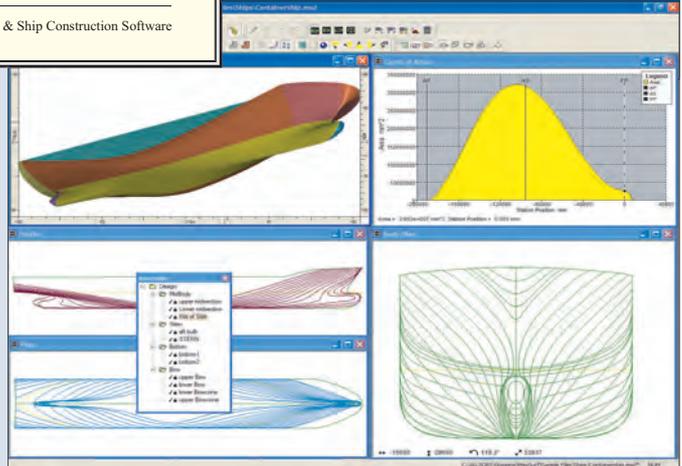
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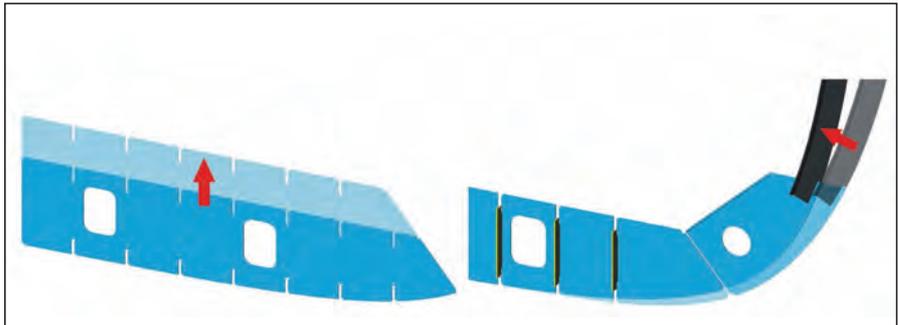
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# New DDROM technology better than parametrics?

**C**REATOR of the 3D product modelling software ShipConstructor, Albacore Research Ltd (ARL), is putting the last touches on this year's new software version, ShipConstructor 2006, scheduled for release towards the end of 2005. ShipConstructor 2006 introduces database-driven relational object model (DDROM) technology, as well as an application programming interface (API). While DDROM will provide ShipConstructor users with a 'better-than-parametric' technology, the API will make it easier for users and third-party developers to tie into the ShipConstructor product model database.



With the new DDROM, moving a tanktop adjusts the height of all frame plate parts under it automatically. Similarly, a hull trace change updates all related parts instantly.

## Database-driven relational object model

The database-driven relational object model (DDROM) is a new technology similar to parametric modelling. In contrast to parametric technology, DDROM will be usable by designers without extensive training - in fact, relationships within the product model are created automatically. Furthermore, the technology works for even the most complex projects while still running on standard PCs. Thus, parametric-like features will be available on a much more comfortable and workable level.

DDROM's secret lies in storing all geometry in the ShipConstructor database and linking their dependencies automatically. Storing geometry in the database means that all structural, pipe, HVAC and other ShipConstructor entities can be accessed and changed directly in the database. DDROM entities are not only represented in the database with their geometry, but also with their attributes such as materials, weights, revisions, and build strategies. Therefore, all ShipConstructor product model entities such as plates, stiffeners, pipes, ducts, and penetrations, can be recreated in the CAD drawings from the database.

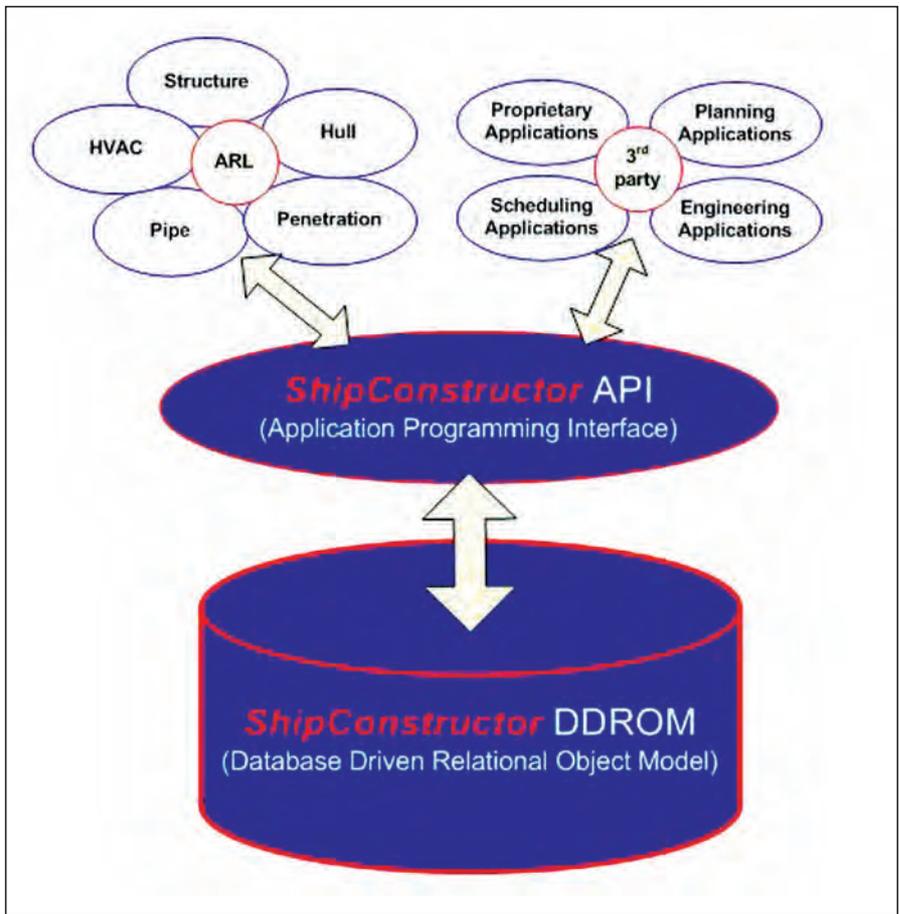
The time designers and drafters spend on modelling structural plate parts will be reduced dramatically (up to 10-fold), due to the many automatic features that replace previously manual drafting operations. Furthermore, the steps involved in implementing late design changes will be significantly reduced, due to the fact that the database is aware of the interrelation between parts and changes linked parts automatically.

For example, moving a tanktop up will adjust the height of all frame plate parts under it as those were automatically linked to the tanktop during the design stage. Similarly, exchanging one frame hull trace for another automatically updates all related frame parts, be they plates or stiffeners.

For user comfort, the new DDROM feature can be initially turned off until a certain level of comfort has been reached. Yet, the user will still gain significant time-savings from the much faster modelling features.

## Application programming interface

ShipConstructor is known for its open design, and many users have successfully interfaced the ShipConstructor product model database with their ERP (enterprise resource planning),



ShipConstructor's API opens secure access to the product object model.

purchasing, and accounting systems. With the 2006 release, ShipConstructor will introduce a fully documented application programming interface (API) providing users and third-party developers with an excellent tool for automation and customisation.

It is the same API that ARL's software developers are using in-house. The API will not only provide secure access to the

ShipConstructor database, but, more importantly, provide users and third-party developers with a stable interface to the ShipConstructor database that will remain unchanged regardless of any changes ARL's developer make to the database. Thus, users with tight integrations to the ShipConstructor product model database can rest assured their own applications will still work after a version upgrade. 

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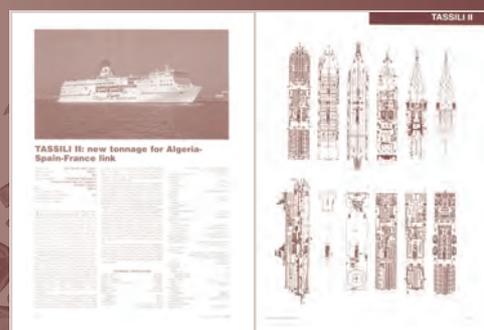
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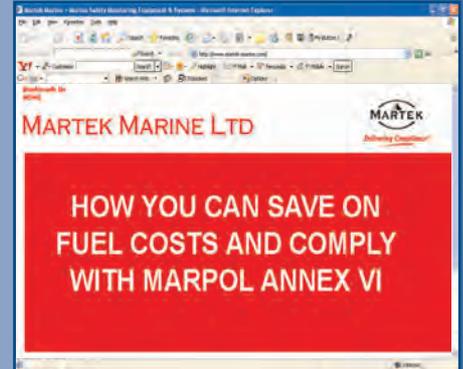
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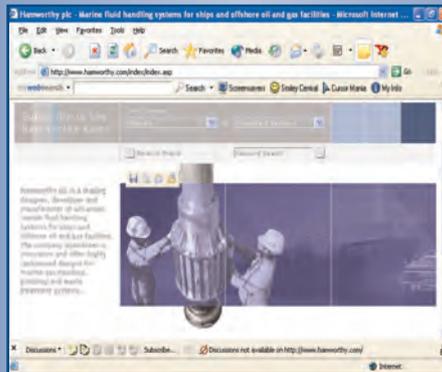
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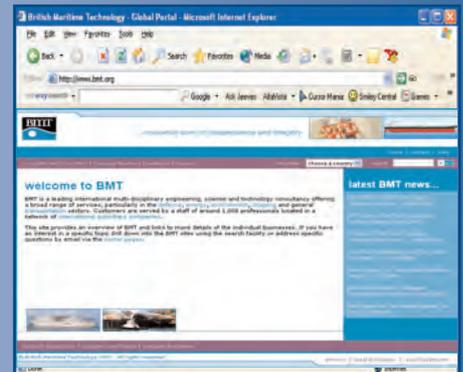
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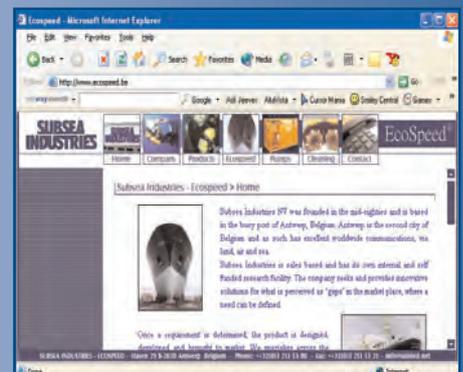
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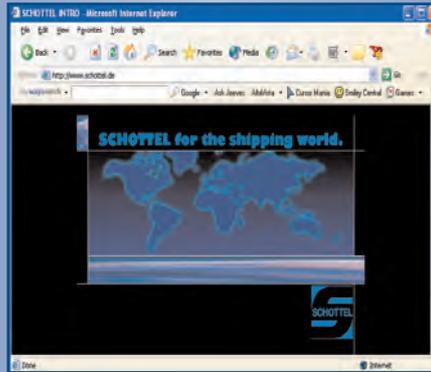
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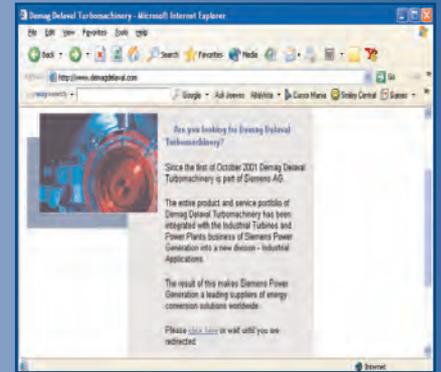
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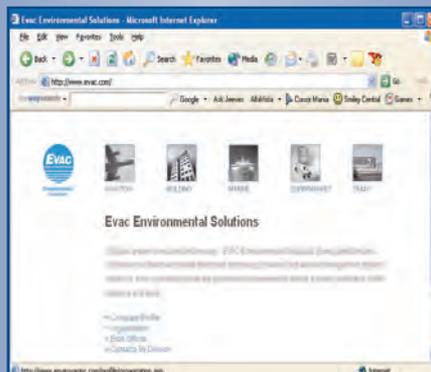
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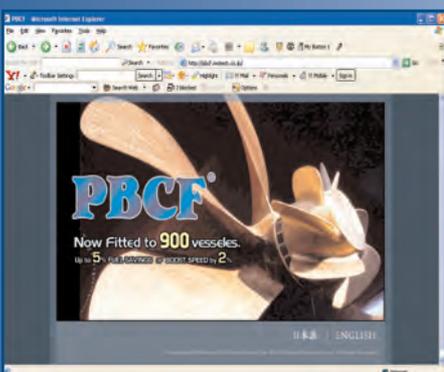
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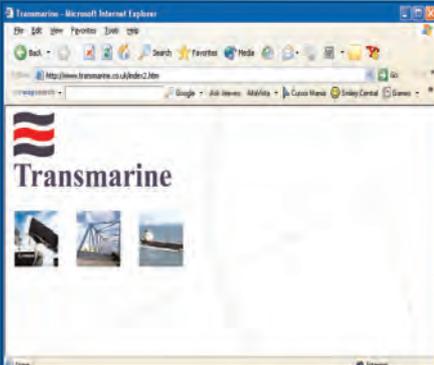
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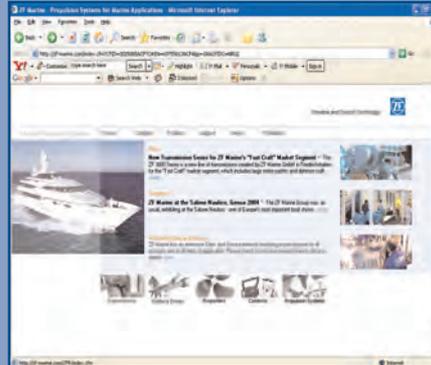
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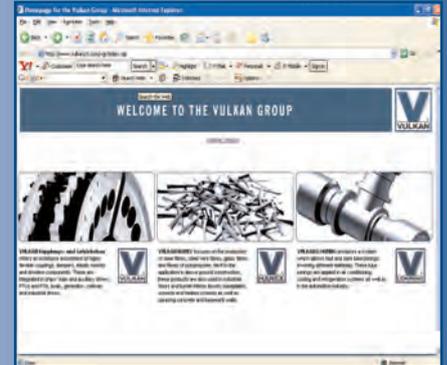
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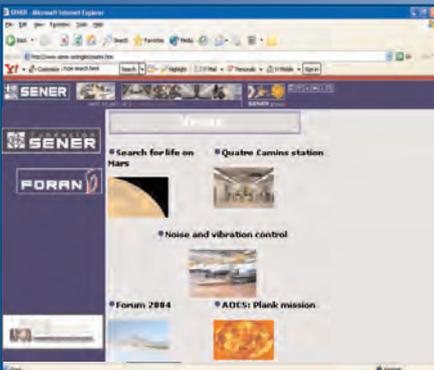
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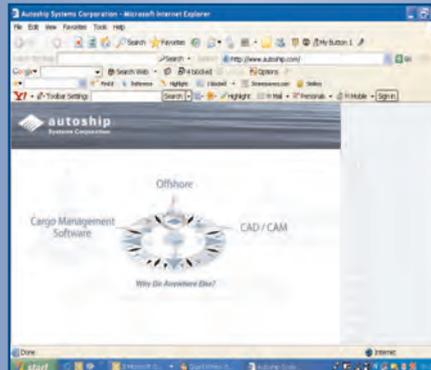
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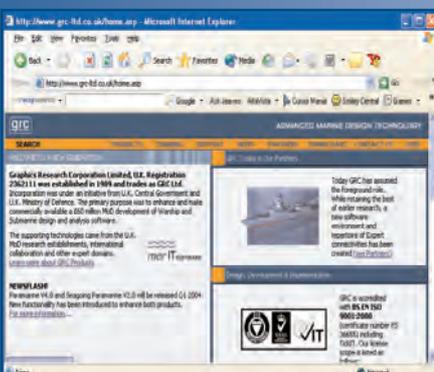
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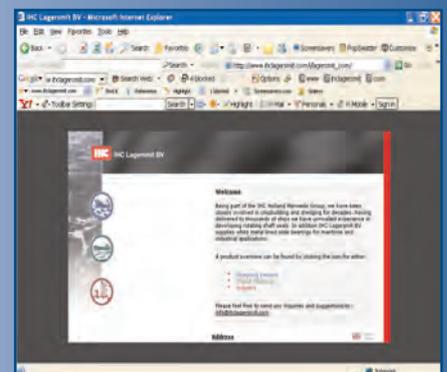
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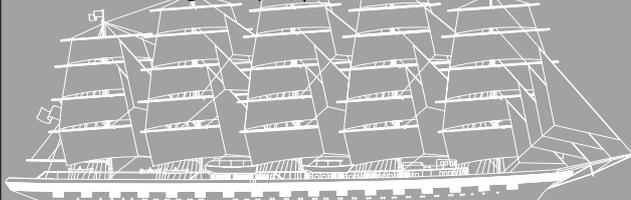
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