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The Korean shipbuilder STX, which today operates mainly out of its 'greenfield' Jinhae complex, has recently re-activated its former Busan city yard to capture contracts for smaller vessels - a reflection of the booming market for new ships. Seen here during her launch is *Clipper Karina*, first of a line of small product/chemical tankers ordered by the Danish Clipper group. A series of LPG carriers is to follow. More details appear in our special report on Korea, which begins on page 31.

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Practicalities of the post-10,000TEU container liner

THE arrival on the shipping scene of A P Møller's giant container liner *Emma Maersk* with her nominal 11,000TEU capacity and the new order at Hyundai for eight 11,400TEU ships have stirred up more discussion about the realities of and prospects for heaping such large numbers of containers in to one hull. Reports indicate that the Danish ship, the first of a series, can probably load many more than 11,000 boxes; for years, the highly successful Møller group has been the most secretive of owners, even refusing to let *The Naval Architect* publish general arrangement plans in our *Significant Ships* series! Certain of its vessels are ordered at its own shipyard - the Odense Lindø yard on the island of Fünen, in Denmark - so there is no need for the outside world to know too much!

Already, this journal has reported (our November 2005 issue, page 4) on the joint Hyundai Heavy Industries and Germanischer Lloyd design for a 13,000TEU mammoth with its deckhouse forward, and some of the factors concerning dimensions of these and similar behemoths were discussed in our February edition this year (page 69). One goal of all designers is to try and ensure that the scantling draught is maintained at a maximum 15.00m, to ensure entry into all major terminals. This can be achieved relatively easily by expanding the breadth - but to around a huge 54m in the case of a 13,000TEU design.

Very large hulls also introduce the possibility of opting for probably more expensive but efficient twin transmission trains; these also add a good degree of redundancy which can be helpful when operating a scheduled liner service. Germanischer Lloyd points out that a 12,500TEU liner can, when employing two propellers, have the same draught as a 9500TEU vessel with one screw. The GL/Hyundai team apparently thought that a single 14-cylinder engine (discussed below) would not have been powerful enough for the industry-standard 25knots, despite the use of such machinery in *Emma Maersk*. The same team also thought that propeller cavitation might be a problem.

The first 14-cylinder in-line diesel engine: a new factor to be examined by those designing ultra-large container ships. Colossal outputs (80,080kW in the case of the Wärtsilä Sulzer 14RT-flex96C model seen here) are possible but potential extra structural work and propeller cavitation may influence decisions.

If these perplexing headaches are not enough, naval architects have additionally to take into account IMO's new MARPOL regulations for shifting fuel bunker spaces away from the traditional double bottom or engineroom side positions to protective locations inside double skins (in force on August 1 next year). A practical alternative is in transverse spaces between cargo holds, but whatever position is chosen, owners can expect shipyards to charge more - more design work and more steel.

One forward-thinking owner, Evergreen, has already opted for between-hold tanks on its newest series of S-class liners (7024TEU), as shown in our article on *Hatsu Shine* (January 2006, page 7). To add to these problems, those seeking to beat the August 1 deadline may now have difficulty in finding suitable slots for post-Panamax tonnage at Far East yards, due to heavy commitments already booked, especially for LNG and tanker tonnage. Another important factor that may need to be in-built is the belief by some that average container loads will grow in the near future.

One further ingredient that is now available for adding to the container-ship mix is the availability of 14-cylinder in-line engines, from both the Wärtsilä and MAN B&W stables, and never in marine history, it is believed, previously offered. The first Wärtsilä Sulzer 14RT-flex96C engine, with an output of 80,080kW, has gone to sea in *Emma Maersk*, and Wärtsilä holds orders for further similar engines.

The crankshaft for these huge machines is suitably upgraded, and a mid-position for the gear drive is expected to reduce deformation and stress, even with the increased thrust, should a vessel be equipped with an integrated propeller-shaft alternator/motor (one of the economic options favoured by Prof Constantin Gallin in his article last month). At the present time, no orders for 14-cylinder engines have been secured by MAN B&W but it is interesting to note that this company tells us that it has recently uprated its K90ME-C model so that it now has the same cylinder output as the Sulzer 96mm bore types.

A noteworthy fact is that 14-cylinder engines are not just being ordered for super-size container liners - the first four engines ordered were actually to power smaller 8600TEU designs being built by Hyundai's Ulsan and Samho yards for Hyundai Merchant Marine. The 80,080kW output will, in these cases, be used to provide a much faster service speed of 27knots.

On the 11,000TEU *Emma Maersk*, the 14-cylinder engine drives a 135tonne propeller cast by Mecklenburger Metallguss; this turns at a speed of 102rev/min and is believed to have a diameter of some 9.5m - close to the practical maximum for container ships. At such large diameters, draught starts to influence matters, and some may think it more prudent to switch to twin propellers - or perhaps even to a single ABB/Samsung FP propeller with a contra-rotating Azipod behind it.

On the question of container ship speed, Mecklenburger Metallguss is also currently casting a series of smaller propellers with diameters of 8.55m for providing other much more modest Møller liners (4170TEU) with a claimed speed of 31knots. This is a surprising figure in terms of current fuel prices and one not seen since the heady pre-oil-price-hike days of the early 1970s, as on, for example, the East Asiatic Co's triple-screw *Selandia*-class cellular container vessels. These new Møller ships are under construction in Germany at Volksverft Stralsund - the first was pictured in our September issue.

Giant container-ship conundrums have appeared in this column before (notably January 2004, when we discussed structural, propeller, and engine problems) but they all appear to amount to a complicated equation involving cargo capacity, service speed, and draught - as in many merchant ship projects. With the exceptionally high capacities being discussed now and for the future, naval architects and engineers will need to find the best possible compromise, while never neglecting today's high bunker prices.

Mammoth cruise liners for Aker's French yard

TWO giant new cruise liners, with an option for a third, are to be built at Aker Yards' newly acquired Alstom Marine yard (Chantiers de l'Atlantique) at Saint-Nazaire, in France. The contract has been placed by Norwegian Cruise Line, and the ships will be designed to carry 4200 passengers - more than the Mediterranean Shipping vessels already on order at the same yard but less than Royal Caribbean's Genesis class designs for 5400 passengers, on order in Finland. Total contract value is €1470 million, and this is the first order placed at the yard since the acquisition by Aker Yards.

All outer cabins are to have their own balconies - more than 1470 in total - and passenger amenities will be based on NCL's Freestyle cruising concept. A crew of approximately 2200 will be carried. Gross tonnage is estimated at 150,000gt, and hull dimensions will be 325m length and 40m breadth. Delivery dates will be 2009, 2010, and 2011 (for the option).

According to Mr Yrjö Julin, president for cruise liners and ferries at Aker Yards, the contract was made possible by using best practice from the French and Finnish yards, which are currently undergoing 'a rigorous integration process'. Without the envisaged synergies, he says, the contract would not have been attainable for either the Finnish or French yards individually.

Some of the design work on this new giant may be carried out in Romania by Icepronav, since Atlantique has been a long-standing customer of the Galati-based consultancy. Following the acquisition by Aker Yards, that company and the ICE group signed, in early September, a framework agreement that simplifies and smooths contracting procedures.

An impression of the new CNG carriers to feature Sea NG's Coselle arrangement of loading compressed gas in 150mm diameter pipes coiled into a carousel shape. A 120m-long ship - three are anticipated to be ordered before the end of this year - would be installed with 16 Coselles arranged in four tiers in an enclosed and inerted cargo space protruding above the weather deck. The Seattle consultancy Guido Perla & Associates carried out the design work for this innovative vessel.

LARGEST-EVER HYUNDAI ORDER - What is believed to be the largest single shipbuilding contract ever has been secured by Hyundai Heavy Industries. This giant Korean yard is to construct a total of eight container liners of 11,400TEU for its long-standing customer, the French owner CMA-CGM. Further details appear in our special report on Korea in this issue.

CNG CARRIER READY FOR ORDER - A first order for a compressed natural gas carrier (CNG) is anticipated before the end of this year. According to class society ABS, which has given full design approval, three ships using the Coselle coiled steel-pipe cargo system developed by the Canadian company Sea NG Corp will be contracted. They will serve projects either in the Mediterranean or Caribbean areas.

The patent Coselle concept, approved in principle by ABS in 1997, features small-diameter high-strength steel pipes coiled into a carousel to stow the cargo at high pressure. Each carousel will hold approximately 16km of 150mm diameter pipe, and the 120m-long ships will each be installed with 16 Coselle carousels in stacks of four to make a total cargo capacity of 50 million standard ft^3. A high- and low-pressure manifold system for efficient loading and discharge will be included, and propulsion will be by an unspecified dual-fuel plant. These brand-new vessels will be given the notation 'A1 CNG Carrier' when complete.

The new ship was designed in association with Seattle-based Guido Perla & Associates; this consultancy developed the hull form, took part in model testing, and was responsible for stability, structural design, ship systems, and lifesaving, as well as obtaining ABS class approval.

NAME CHANGE FOR MAN B&W - The leading German/Danish engine designer and builder, MAN B&W, has converted into a European company - Societas Europaea, or SE. At the same time, the name has been changed to MAN Diesel SE, with headquarters in Augsburg. Nevertheless, to reflect the premier position of Copenhagen-designed two-stroke machinery, these particular engines will retain the brand MAN B&W. It is believed the Danish-built four-stroke engines from Frederikshavn and Holeby will take the name MAN Diesel. For some time now, the group logo has only shown 'MAN'.

NAPA STABILITY FOR MEGAYACHTS - A special version of its advanced ship loading and damage stability software has been created by Onboard-Napa Ltd for megayachts. This move has been spurred by the ever-growing size of such vessels. This new version of Onboard-Napa, previously designed mainly for cruise liners, is ready for delivery now.

MORE INDIAN REGISTER OFFICES - The Indian Register of Shipping, with more than 1000 ships under class, has opened exclusive survey stations in Singapore and Qatar, as a reflection of the increasingly important roes that the society is playing in the booming Asian shipping scene. At the same time, a new brand has been launched, IRCLASS.

NEW FERRY FOR STENA - Stena Line has taken delivery of the first of two new 22knot ro-pax ferries from the Norwegian builder Fosen Mek Verksteder. The 7500dwt *Stena Trader*, with capacity for 3100lane metres of ro-ro space and with 100 passenger cabins, is operating between Killingholme, on the Humber estuary, and Hook of Holland. An extra 70% freight capacity is now offered on this service. The hull of the new ferry (the first of two sisters), was subcontracted to Baltic Shipyards, in St Petersburg.

ARCTIC R&D FOR BMT - The Canadian subsidiary of BMT Ltd, BMT Fleet Technology, has launched a new programme of Arctic research in association with the Memorial University of Newfoundland. For some time, the two organisations have been centres of research into ice and ice-strengthened structures. The Arctic is currently an area of much interest to many in the marine industry, particularly regarding oil, gas, and mineral extraction.

FREE SOFTWARE - We would like to point out that more information on the interesting free 'shareware' marine software packages discussed by Martijn van Engeland and John A MacSween in our July/August edition, page 64, can be obtained from the following websites: Free!SHIP - www.freeship.org ArchimedesMB - www.naval-architecture.co.uk Michlet - www.cyberiad.net/michlet.htm

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Stern module - a novel concept for evacuating cruise ships

This article (the first of two), by Czeslaw Dymarski and Piotr Lubinski, Gdansk University of Technology, Poland; and Alex Vredeveldt, TNO, The Netherlands, presents a novel method for evacuation of passengers from cruise liners. Evacuation is performed by means of a module which is located in the aft of a vessel's hull, on the waterline level. The module is fully integrated with a ship during regular voyages and is able to detach from the mother ship in an emergency. This is a most interesting concept, which is somewhat similar to that advocated for bulk carriers by Capt Dennis Barber and reported in *The Naval Architect* February 2003, page 54.

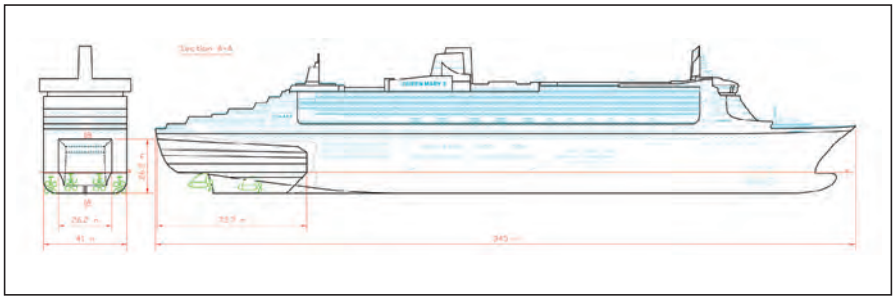


Fig 1. The module integrated with mother ship. *Queen Mary 2* is used as an example of a typical large modern cruise liner throughout this article.

SPECIAL catches have been designed for coupling of the module and its mother ship. The module shape is tapered in three directions for easy release. There are two decks for relatively comfortable passenger and crew accommodation, and three decks for machinery, galley, sick bay, and various stores. The module utilises two gas turbo-driven alternators, and two azimuth thrusters to provide power for clearing and propulsion. The design in this case has been based on a large cruise liner such as Cunard's *Queen Mary 2*.

A brief overview includes:

- the module should be prepared for evacuation of all passengers and crew
- the module should be equipped with propulsion for fast clearance and navigation in heavy seas, as well as various devices and equipment for comfortable and safe evacuation (eg, toilets, sick bay, provisions, water, fuel, and medicines)
- the module should be prepared for smooth, easy, repeated, and reliable detachment and recovery after trials
- the module has to meet requirements as an integrated part of the mother ship and as an autonomous vessel
- equipment and interior spaces of the module should be useful during regular voyages
- power generators and propellers of the module should be part of the power and propulsion plant of the ship
- the main systems of the module should be connected with the mother ship's systems.

Stern module characteristics

The design of the module is related to the design of the mother ship (*Queen Mary 2*). The module is located at the aft end of the hull, on the waterline. The module has a maximum length of 73.7m, a maximum breadth of 26.2m, and a maximum height of 26.2m. It has a capacity for 3873 persons - 2620 passengers and 1253 crew. Propulsion is provided by two 25MW gas turbine-driven alternators, and two 20MW Azimuth pods.

The module shape is tapered in three directions, towards the bow of the ship (3deg) and upwards (2deg). Such a shape is aimed at making release easy and avoiding any jamming. The bottom of the module is faired with the ship's bottom, and there would be double-shell plating in places of contact between the module and the mother ship.

The lower stern part of the module hull is chamfered. This section can be supported by the mother-ship hull. The rest of the load can be carried by four hull catches placed forward and midship of the module.

The estimated volume of the module underwater part, when coupled with the ship, is around 5700m^3, and the estimated weight of the equipped module should not exceed 5000tonnes. Therefore, the hull catches will be able to carry the load.

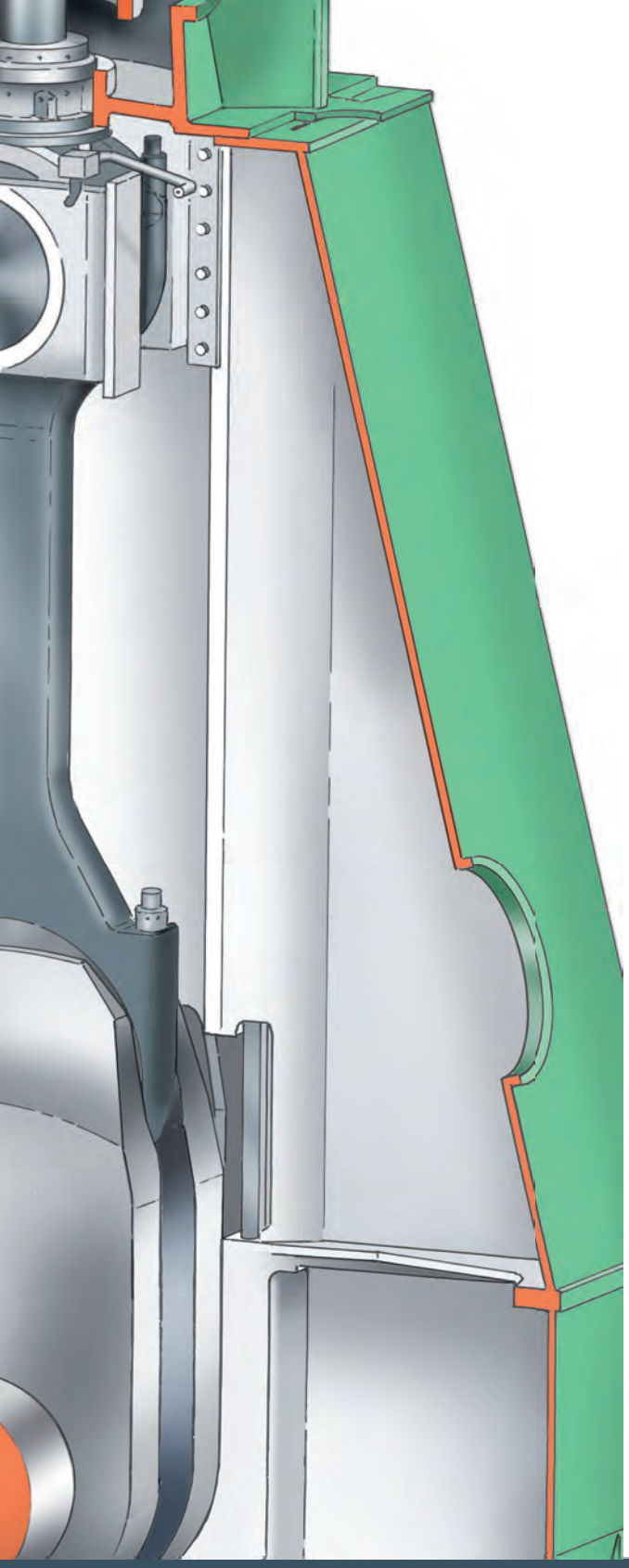
Two azimuth thrusters (part of the mother ship's propulsion plant) play a very important role in the detaching process. These thrusters make detachment easy and quick, with good manoeuvrability and stability. Part of the module, which is nominally an escutcheon of the hull, turns into the bow after detachment, therefore, there are many windows, as well as a navigation room. Interior space of the module is divided by five decks.

Functional sections of the module hull

Machinery plant (decks 0, 1, 2)

Two azimuth thrusters (Rolls-Royce Mermaid pods, each with a large power output of 20MW) are utilised for propulsion and steering of both the mother ship and the module after detaching. Two generators supply electrical power to the pod motors. Each genset consists of a General Electric LM2500+ gas turbine, with an output of 25,000kW, and a General Electric alternator (these would form part of the mother ship's normal main power supply).

Queen Mary 2's power and propulsion plant includes all of these above-mentioned units, therefore the proposed propulsion of the module does not require any additional investment. There are three decks for machinery and technical equipment inside the module, which are necessary after detachment. There are also some tanks placed in the double



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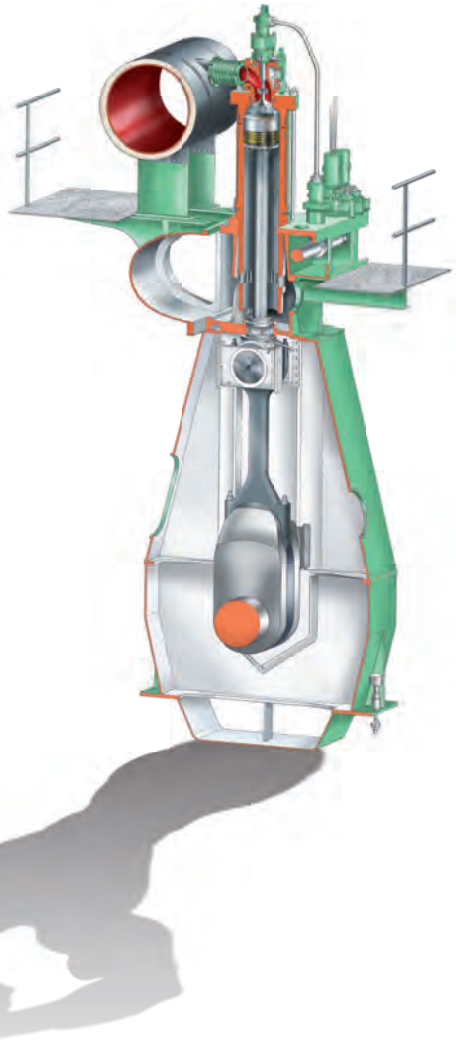

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Furthermore, these smokeless engines have a lower impact on the environment due to the low emissions. Other advantages are the low propeller speed and the low minimum constant speed

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bottom for fuel, lubricating oil/waste lubricating oil, fresh water, grey and black sewage, bilge water, and ballast water.

Food and hospital areas (decks 2 and 3)
A food area would be located on deck no 2. This is composed of a galley plus food and drinks stores. The complex is appropriate for the module's bars as well as during regular voyages.

The medical complex on deck no 3 is composed of a sick bay and isolation wards. This solution provides medical help and secures first aid for potential victims of an evacuation. Passengers suffering from an infectious disease can also be isolated.

Stores and auxiliary rooms (deck no 2)
The rest of deck 2 is used for various essential store and auxiliary rooms. This includes rooms for mechanical, electrical, and electronic spare parts; wood, paint, chemicals, decorative items, carpets, furniture; catering equipment, broken items, crew clothing, laundry; and mechanical, electrical, and joiners' workshops.

Decks for passengers (decks nos 3, 4)
The passenger decks, nos 3 and 4, are inclined at an angle of 1deg (towards the ship's keel) due to partitioning of the tapered module shape. Seats equipped with backs and seat belts would be supplied for every person. Every person occupies a space of 0.75m x 0.5m.

The mother ship and the module are equipped with two or four wide doors for communication during voyages and evacuation. The doors are located in the stern bulkhead of the ship and module on deck no 3. They are located some distance from the vessel's centreline, to form separate streams. Such a solution should help to ensure that the evacuation process is smooth, while increasing safety.

The arrangement of seats forms two main communication ducts, which narrow and branch, leading to the particular sectors and six staircases. There are many toilets and showers on decks 3 and 4, which are useful in both module and working conditions. There is also a navigation bridge on the deck 3, equipped with all necessary instruments.

The design of deck 3 ensures that the space can be divided by light movable partitions or curtains. Compartments would be equipped with rolled screens and film projectors; these would be used as cinema-rooms and lecture halls.

On deck no 4, many seats would be placed sparsely. In addition, there are some bars and a dance floor. A number of seats could be taken out from under-floor lockers during an evacuation. This part of the deck would be horizontal for dancing and mounting seat boxes, while noise from machinery would be neutralised by music and soundtracks.

Concept design of key elements

Hull catches - module/mother ship
A reliable and fast method of detachment of the module and the ship's hull in an emergency, and recovery after trials, is of utmost importance. The proposed technical solution is composed of four sets of specially-designed catches located at deck 2 level.

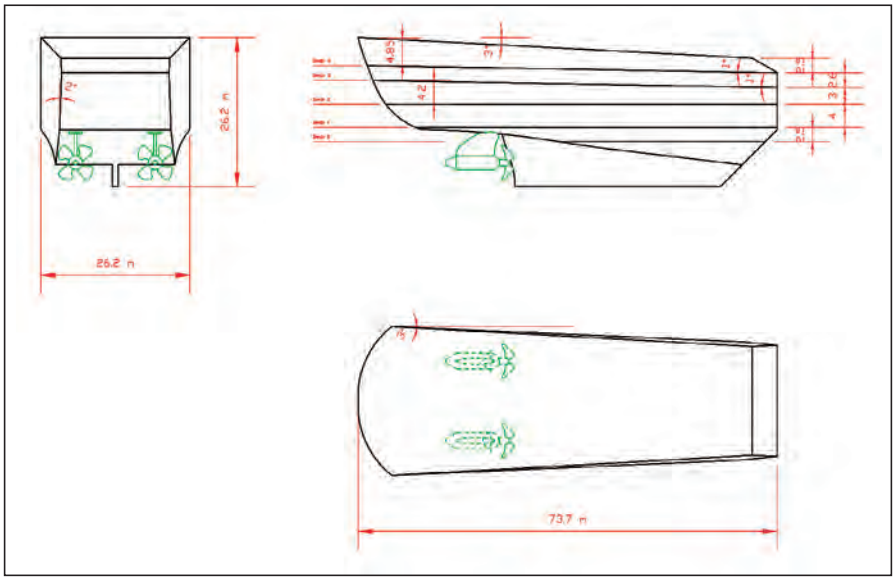

Fig 2. Shape of the module hull.

Two of them are located at the aft of the module and two midships. The quantity and location of the catches can be changed after analysis, and new calculations made for individual ships. Every set of catches is composed of two main elements:

- a catch for bearing the main vertical load, comprising a bracket, triangular lever, and a hydraulic cylinder placed on the module and a pocket in the ships' hull
- a catch for bearing the transverse load, comprising a bolt, nut, lever, hydraulic cylinder placed on the module and pocket, wedge, and hydraulic cylinder mounted in the ship's hull.

The module detachment process proceeds as follows:

- removal of the wedges using hydraulic cylinders, rotation of the bolts using hydraulic cylinders (for transverse release)
- lifting of the brackets using hydraulic cylinders and triangular levers (in order to hide them into the contours of the module).

The module coupling process proceeds as follows:

- lifting of the bolts from vertical to horizontal position using hydraulic cylinders and levers
- insertion of the wedges between nuts and the hull's pockets
- insertion of the brackets into the hull pockets using hydraulic cylinders and triangular levers.

There is no lifting movement of the module during detaching and coupling, due to a specially formed profile of both brackets and pockets. Vertical stabilisation of the module follows final positioning of the brackets. Ballast tanks help the module to obtain a vertical position, normal for coupling operation. Bolts and nuts are used for adjustment and compensation for possible hull structural deformation.

Electrical system coupling
A cruise liner would, typically, be equipped with six main diesel- or gas-turbine-driven alternators; two of them are proposed to be mounted inside the module, and this provides electrical energy transmission between module and mother ship. An estimated energy balance indicates that most of the power produced in the module (2 x 25MW maximum) would be supplied to users in the module as well (two propulsion pods 2 x 20MW; air conditioning compressor; evaporator; refrigerators; auxiliary electrical devices; and hotel requirements).

Despite this, it has been recognised that transmission of energy (10MW-15MW) to consumers positioned in the ship could be necessary. Two high-voltage (11kV) quick couplers can transmit 16MW of this electrical power. Two electrical system coupling rooms are positioned on the deck no 3, in the aft of the module.

These rooms are placed near the module's centreline, opposite similar rooms in the ship. There are two rooms for electrical cable connectors with plugs. Cables pass the openings of the both hulls after plug-in. After module detachment, openings would be covered by watertight vertical sliding doors. Such a concentrated localisation of coupling points has been selected due to aggressive sea water conditions.

Coupling of other ship systems
The design of the module provides for a limited quantity of tanks and associated devices. Two system coupling rooms are positioned on deck no 2 of the module, near the centreline and towards the aft end. On the ship, two rooms for flexible hoses are positioned opposite the module rooms. Here, hoses pass through openings into both hulls after coupling. After

module detachment, openings are covered by vertical sliding doors, in a similar fashion to the electric cables on the deck below. Hoses would be provided for: fuel, water, grey and black sewage, and bilge water.

Conclusions

A preliminary analysis of various emergencies, which dictate decisions about evacuation of a ship, was carried out, and the following situations have been taken into account:

- impact (trim by the head, trim by the stern, or heel)
- fire (in the fore, aft, or midships)
- machinery failure (inside and outside of the module)
- terrorist attack (explosion in the fore, aft or midships).

The module should meet requirements in all these cases, except where some limits are exceeded (for example, the trim of a ship). Definition of such limits, however, requires more advanced analysis and amendments to the module design.

In addition, there is a possibility of module failure and then the module has to be detached. Areas of operation have no influence on system functioning, while remote control of the detaching process from inside and outside the module would be necessary. An increase in the number of module access doors might also be advantageous, and rope winches should be designed for the precise insertion of the module into the mother ship. Some simple devices should be designed for module mooring.

The module is positioned in an unattractive place near the machinery plant, but could still be useful during regular voyages of a cruise liner, since it is fully integrated with the ship's hull. The structure of the module hull is designed as a part of the mother ship's hull but also for autonomous navigation. The most critical part of the design is the strong hull catches.

The module is able to be independent of any ship's systems, but it is also fully integrated. The module would be ready to use in any condition of a mother ship (eg, lack of energy, loss of propulsion, or loss of course-keeping).

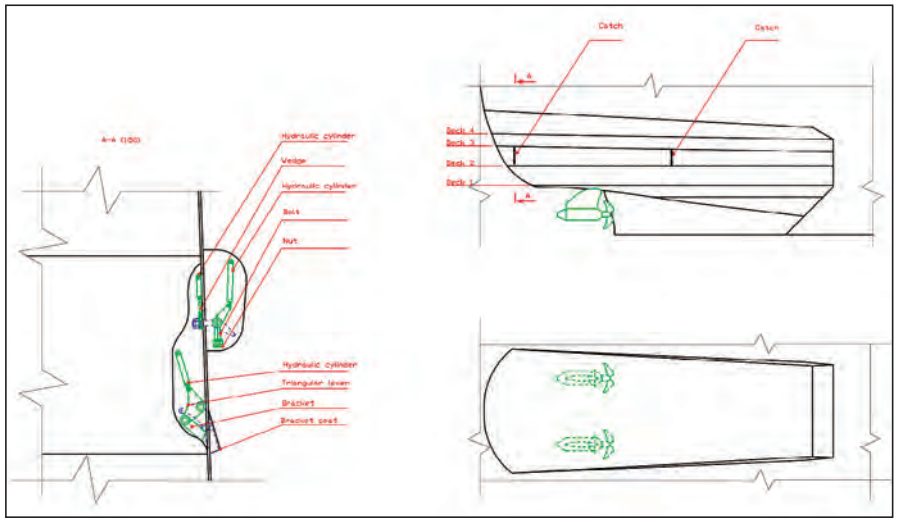

Fig 3. Hull catches - module/mother ship.

While the duration of the actual detaching process is quite short, uncoupling of the ship systems and releasing of the catches would still be necessary. However, there is no high acceleration during the detaching process until the angle of trim is small, and the module does not impact on the water. Seats are equipped with safety belts, and clearance from the mother ships should be fast, safe and reliable, because of the azimuthing pods.

Seakeeping is anticipated to be good since the lines have been destined to survive in heavy sea conditions. Further work however, is necessary, together with more calculations, particularly on the hull design. The module is designed for long-term survival and should be able to reach harbour by itself. Its mechanisms are not complicated, and the principal design feature is its hull catches.

Practical trials would be quite extensive, due to the module's dimensions, but not very complicated or time-consuming. It should be taken into account that detachment in the open sea precludes recovery in a heavy sea state, but recovery without damage is possible in calm water. Cruise liners would, anyway, be equipped with tender boats for short transfers, as well as for ship abandoning, so the module could be detached even if a number of people were still onboard the mother ship.

The actual detachment process needs only a few people. Boarding is efficient if the number of doors is adapted to the number of persons onboard, and the arrangement should be satisfactory for passengers of every age and physical condition, as well as the disabled. The high standard of amenities in the module means that passengers should be able to survive for a long time without any other help.

The authors are aware that such an innovative concept is hard for shipowners to accept; nevertheless, the great advantages of the module would be unrivalled comfort for passengers and crew during evacuation, and a chance to reach harbour safely.

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Ramp- and chain-lift-launched lifeboats - radical concepts for evacuating cruise ships

This second article, by Czeslaw Dymarski and Piotr Lubinski, Gdansk University of Technology, Poland, and Pawel Dymarski, Ship Design and Research Centre, Poland, presents two novel concepts for the evacuation of cruise liners. The authors have tried to achieve the following objectives in comparison with existing systems: improvement of evacuation process safety, reliability, embarkation comfort, and ship space arrangements; also reduction of evacuation time and time spent on maintenance and testing.

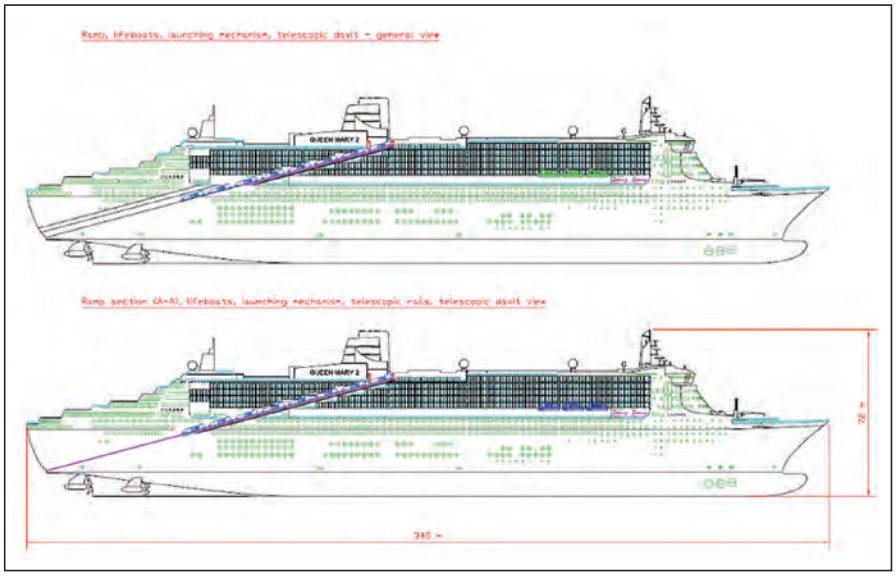

Fig 1. Outer off-the-ramp launched lifeboat system - general view. All illustrations in this article are based on Cunard's *Queen Mary 2*, as a typical example of a large modern cruise liner.

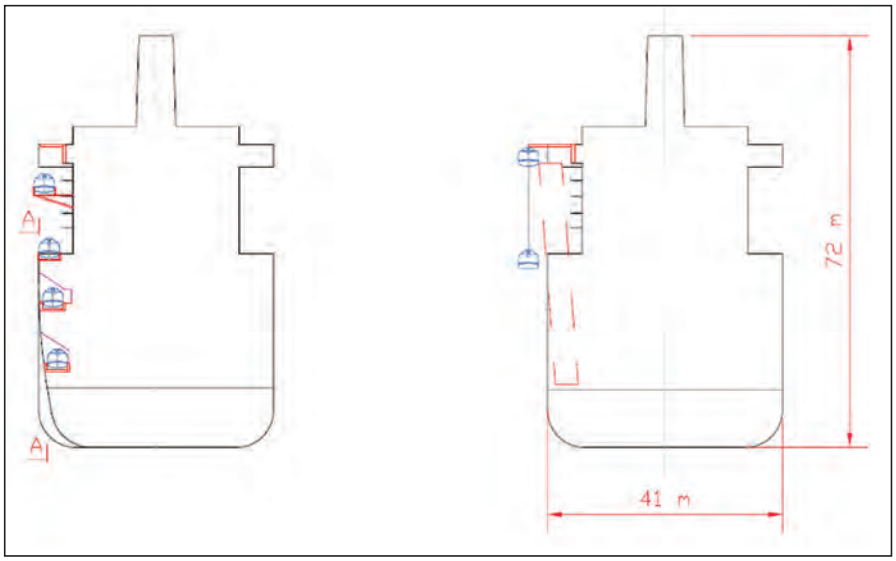

Fig 2. Outer off-the-ramp launched lifeboat system - cross-section.

THE proposed evacuation system is made up of two ramps and a number of lifeboats, also specially-designed equipment for the securing, launching, and recovery of boats after trials and tests. The proposed form of a ship's hull is adapted for ramp and lifeboat positioning, with the ramp angle inclined at 15deg.

There are two versions of the system. The first, with ramps positioned aft, on each side of the hull (outer system), and the second, with aft ramps positioned closer to the centreline (inner system). The presented designs are based on *Queen Mary 2*.

General characteristics

Two ramps are placed at the ship's side aft, outside the passenger cabins, and the lifeboats are positioned in a row, one after another, on ramps. There are eight or nine lifeboats on each side of a large liner such as *Queen Mary 2*. The securing system enables self-activating release of the lifeboats, in the case of rapid sinking (using a hydrostatic release), in the case of mechanism failure, or loss of power.

The lower part of the ramp is outfitted with two telescopic extension rails for smooth launching. Both ramp and rails are equipped with two lines of rollers and the rail extension is actuated by hydraulic cylinders.

The proposed lifeboat design combines features of a davit-launched lifeboat with those of a free-fall design. Capacity, for approximately 120 persons, in a longer and narrower hull is similar to that of a davit-launched boat. The shape of the hull and the specially formed boat sides - prepared for rolling movement - are similar to those of a free-fall boat. The structure of the hull should be less resistant than in a free-fall lifeboat type, because of the smooth launching. The bottom is equipped with a catch pin at the aft end.

A mechanism for smooth, slow, and controlled lowering of lifeboats consists of two chains, via a specially designed winch with chain wheel and turn-back chain wheel. Endless link chains are joined using ratchets for simultaneous movement as well as for attaching the lifeboat via its bottom catch pin.

The mechanism is driven by a double-chain winch with hydraulic drive and controls. The specially designed double chain wheels are adapted to mating with the double chain and ratchets. The winch itself is equipped with an hydraulic motor for auxiliary purposes. Power output of this motor should be reduced, because each lifeboat is launched by gravity, and the motor works as a pump.

A multi-plate hydraulic brake is fitted on the winch (a chain position stopper). The drive and control system makes it possible to use the hydraulic brake to restrict launch speed, and in addition, the mechanism will be blocked mechanically.

Working principles

A re-arrangement of a ship's alleyways and staircases, as well as electronic visual-acoustic systems, is planned, to lead people to muster stations on many decks to ensure fast, ordered

evacuation. The inclination of the ramp and position of the lifeboats should also enable the congregation of people on every deck, with doors leading passengers from the interior directly to the closely positioned lifeboats. Additionally, there would be an emergency passageway alongside the ramp and all lifeboats.

The launching process consists of the simultaneous movement of all lifeboats in a row, one after another, downwards on rollers, using gravity, after release of the brake. There are chain wheels in the lower part of the ramp, where the chains turn back and automatically release the lifeboats while the motion along the further part of the rails is uniformly accelerated.

Lifeboats are launched at a small angle in a direction opposite to the vessel's movements. Each boat's engine is started during the downward roll, and launching is controlled, free from violent accelerations, also from water and ship-side impacts - as occurs in davit-launched and free-fall systems.

Recovery after trials or statutory tests is performed using one telescopic davit, mounted at the top level of each ramp. Boats would be hoisted in succession and placed upon the ramp in a row, one after another, with the help of the chain mechanism.

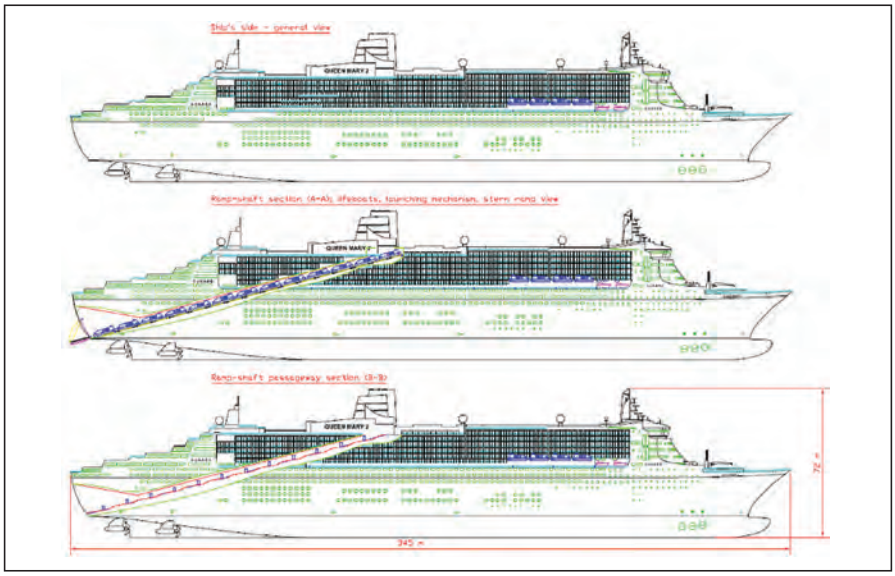

Fig 3. Inner off-the-ramp launched lifeboat system - general view.

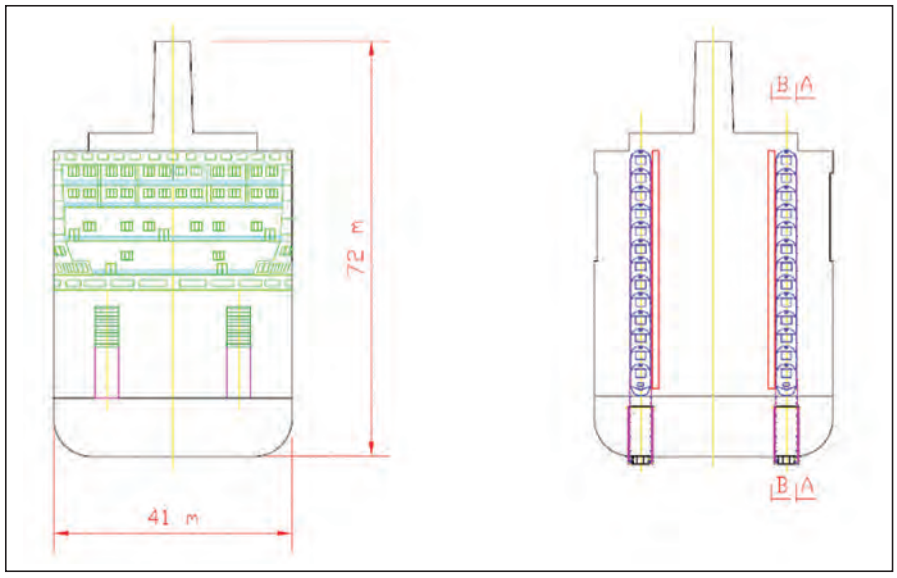

Fig 4. Inner off-the-ramp launched lifeboat system - view from the aft and section.

Inner-ramp launching

An alternative proposal is to use two fixed ramps at the aft end of the hull, closer to the centreline than outer cabins with balconies. These ramps are positioned in specially-designed shafts. Lifeboats are positioned in a row, one after another, on the ramps.

A total of 13 lifeboats would be positioned on each ramp on a vessel such as *Queen Mary 2*. The angle of ramp inclination is 15deg, and the lower part of each main ramp is outfitted with a straight one-segment stern ramp for the smooth launching and recovery of boats.

Both fixed ramps and stern ramps are equipped with two lines of rollers. The stern ramp is lowered and hoisted with the help of a double-drum rope winch. Chains are fixed on both sides of the ramp for additional security in the service position. The lifeboats are the same as those used in the outer ramp-launched system.

The launching mechanism is similar to that of the outer-ramp system, but power output of the winch motor is adapted to the load generated by the weight of all lifeboats (without people) during recovery. The stern ramp, double-drum rope winch, and hauling line are all used for boat recovery.

Functioning principles

Embarkation is similar to that in the 'outer system'. The ramp-shaft with lifeboats and emergency passageway are covered by a roof for protection against bad weather and views of heavy seas. The roof is light and the ramp-shaft space is ventilated.

The launching process is similar to that in the 'outer system', but recovery is different. A hauling line is fired when the lifeboat comes close to the stern ramp and two ropes are attached to the lifeboat using the hauling line. The boat is then hoisted from the water onto the ramp rollers by a winch. Lifeboats would be recovered in succession and positioned on the ramp in a row, one after another with, the help of a ratchet, bottom catch pins, and a chain mechanism.

Chain-lift launch concept

A second alternative is a technique using a chain lift. Lifeboats are again positioned in a row, one above another on the lift, which is used for both launch and recovery. There are two chain lifts placed at the aft end, inboard of the outer cabins with balconies. Chain lifts are positioned in a specially designed lift-shaft.

On a cruise liner the size of *Queen Mary 2*, eight lifeboats would be stowed on each chain lift. The number of lifeboats does not depend on the area of the voyage, but on a ship's aft height and the distance between each boat, as some space is necessary to avoid collisions. The angle of the lift inclination is 60deg. A fixed ramp and a lowered stern ramp are again fitted at the lowest end of the lift for smooth launch and recovery.

General characteristics

The launching mechanism for smooth, slow and controlled lowering consists of: four endless-link chains, four specially designed winches (each equipped with double chain wheels); two chains for synchronous timing of the winches' movement; turn-back chain wheels; guide chain wheels; four trolley guides; trolleys for attachment of the lifeboats to chains and to obtain a rotational movement before rolling into the water; a fixed ramp equipped with rollers; and a lowering stern ramp, again equipped with rollers. Chain wheels are specially formed, because of the chain type and

lifeboat attachment system. Turn-back chain wheels and guide chain wheels are tilted 10deg for free movement of the trolleys after detachment of the lifeboats.

The mechanism is driven by a chain winch with hydraulic drive and controls. This winch is equipped with a hydraulic motor and a hydraulic brake (chain position stopper), and power output of the motor is adapted to the lifeboat-load weight (without people) during recovery. Hydraulics allow control of the lowered lifeboat speed, and the fixed and lowering stern ramps ensure smooth launching.

A double-drum rope winch and hauling line, as well as the two ramps, are again used for recovery. The double drum is used for simultaneous reeling of ropes. The stern ramps are similar to those in the 'inner system', and the lifeboats are also similar to those used for the 'off-the-ramp systems', but without the bottom catch pin.

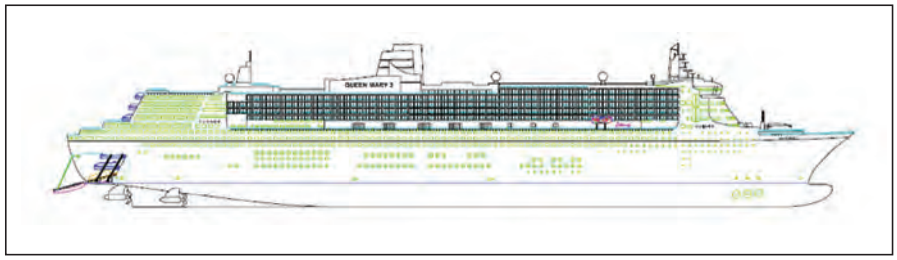

Fig 5. Chain-lift launched lifeboat system - general view.

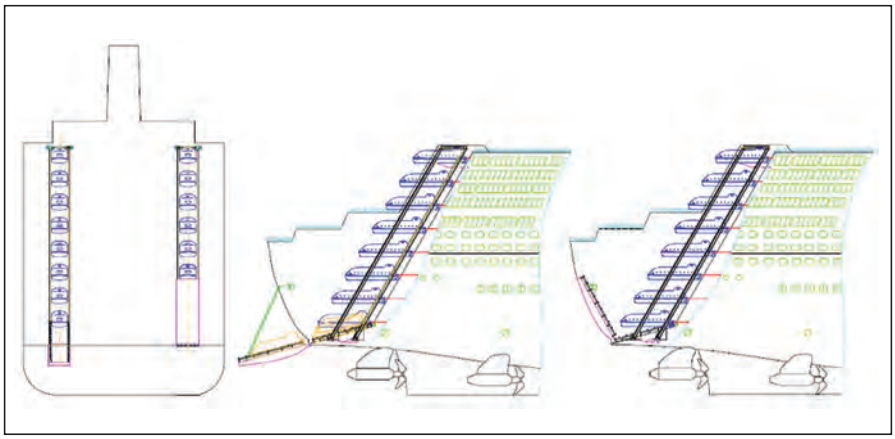

Fig 6. Chain-lift launched lifeboat system - view from aft and sections.

Working principles

The embarkation process for the chain lift is similar to that of the 'outer system'. The launching process consists of simultaneous lowering of the lifeboats in a row - using gravity - one above another, with the help of chains, trolleys, and guides.

Lifeboats are horizontally positioned during lowering, using specially designed trolleys. When the stern section of a lifeboat's base reaches the ramp rollers (the ramp is inclined 15deg), the fore part starts a rotational movement. Trolleys are released when the forwad end of each boat reaches the rollers, and motion along the stern ramp is uniformly accelerated.

Boats are launched at an small angle in a direction opposite to vessel movement, and engines should be started when the rollers are reached for fast clearance away from the ship. Once again, launching is controlled, is free from violent accelerations, and from water and ship-side impacts. The recovery process is similar to that of the 'inner system'.

The design of the cleats for lifeboat securing, as well as that of the open and inclined lift-shaft, enables hydrostatic release in the event of rapid ship sinking or failure of the launching mechanism. An option exists to include a rope mechanism for removal of the lifeboats from the lift in the case of a malfunction.

Analysis and conclusions

Advantages of these proposed evacuation systems include easy and safe access to the lifeboats (muster stations and boats on many decks, doors lead people from the interior directly to the closely positioned lifeboats); passengers enter the lifeboats when they stowed and secured to the hull (so there is no movement against the ship hull and no views of heavy seas).

The lifeboats have relatively small loads and accelerations, and there is no water ship-side impact. This feature is important, especially for elderly and disabled passengers.

Easy and simultaneous checking of lifeboat preparation is possible, and the launching process only needs a few persons, without any specialist training. Collisions should be avoided since the lifeboats are positioned and launched some distance apart. In addition, the lifeboats make safe and slow contact with the water as they are launched at an small angle in a direction opposite to vessel movement. Launching at the stern should ensure that boats are relatively free of any ice or oil on the sea surface.

Technical benefits should mean fewer mechanisms than on traditional davit-launched systems, and the mechanisms are thought to be more reliable, as well as cheaper. The lifeboat is fairly similar to conventional types, so its price would be similar as well.

There are many advantages in using these different systems. The 'outer off-the-ramp' system can have a hydrostatic release, for situations such as a fast-sinking ship. The 'inner off-the-ramp system has more lifeboats, more outer cabins with balconies, safer embarkation (ramp-shaft covered by roof), lower water resistance, and better ship aesthetics in comparison with 'outer system'. The chain-lift system can also self-release, and it is compact - lifeboats are positioned one above another. The position of the system at the stern also ensures there is space for more expensive cabins with balconies. There is also the possibility of including more than two ramps or chain lifts (four or even more systems with the fewer number of lifeboats).

However, these systems do also have some disadvantages. The 'outer' system has a higher water resistance than the ship's hull. The 'inner' system is restricted by the admissible angle of the ship's trim by the stern (3deg). Evacuation has to be carried out before achieving this angle.

To conclude, the authors believe that cruise liners should also be equipped with a few conventional davit-launched lifeboats (or tender lifeboats) towards the forward end of the hull, in addition to one of these new systems. Conventional lifeboats would also be useful for completing the total quantity of required seats as well as for shore visits.

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3. C Dymarski, P Dymarski, M Sperski, M Kraskowski, P Lubinski, 'Calculation method describing the mechanical behaviour of LSA', Safecrafts report, 2005.
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New brand of weight-saving insulation

SAVING on weight is an important issue for certain classes of vessel, particularly fast ferries, superyachts, and naval ships, and there are, of course, several areas where economies can be made. One of these is in insulation, particularly if the material needs to include acoustic properties.

A new name in this sector is Promat, a company specialising in passive fire protection, whose Promaguard microporous material is composed of silica (to limit conduction), an opacifier (a material that is not transparent to infra-red rays, which can scatter infra-red radiation), and E-glass filaments (for mechanical reinforcement).

Both silica and the opacifer have small grain sizes and are compressed to leave voids with dimensions smaller than vibrating molecules of hot air. The most common opacifiers - graded in efficiency from higher to lower - are silicium carbide, titanium oxide, zirconium oxide, and iron oxide.

Such a mix, having a density of 240kg/m^3, provides high insulation performance at flame temperatures up to 960°C, with a thermal conductivity value (Lamba) of approximately 0.040W/m*K. This figures compares with standard fibre mats such as biosoluble (green) types and mineral fibres, which have a Lamba value of approximately 0.15W/m*K and a density from 96kg/m^3 to 130kg/m^3 (as shown in the accompanying illustration).

A lower Lamba figure equates to better insulation, while a higher density means better mass effect against fire.

This is the reason why microporous panels can achieve A60 classification with a thinner layer than fibre matting, and consequently lower weight. Reduced fibre content also means a more eco-friendly environment onboard.

Microporous materials for marine applications are manufactured as flexible panels, made from a glass 'bag', filled with powder mix, then compressed and overstitched, to give flexibility and to ensure constant distribution of powder, even under severe vibration condition, for very long periods. Panels are applied with standard pins and clips (washers), the pins being welded directly onto the steel or aluminium structure behind. For GRP surfaces, square perforated base pins are glued on, using a two-component adhesive.

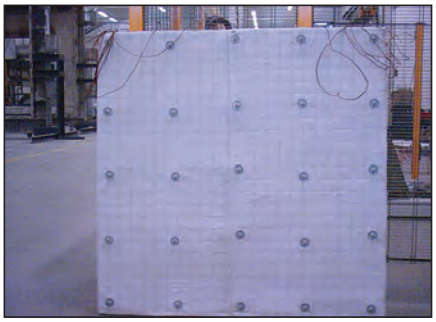
After an intense fire test programme, Promaguard panels are said to have achieved the following results:

To meet European Union Marine Equipment Directorate requirements and IMO resolutions on steel and aluminium structures:

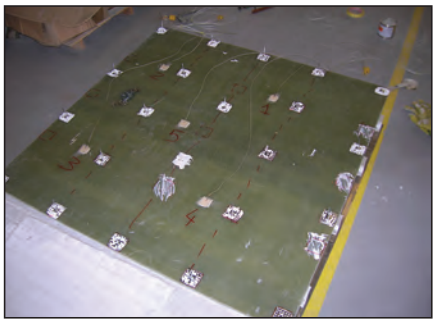
- A60 aluminium deck and bulkhead; structure 4mm plate, 60mm x 60mm stiffeners, 300mm spacing for superyachts and high-speed craft (10mm thick, 2.5kg/m^2)
- A60 steel deck; structure 4mm plate, 60mm x 60mm stiffeners, 300mm spacing for superyachts and warships (10mm thick, 2.5kg/m^2)
- A60 steel bulkhead; structure 4mm plate, 60mm x 60mm stiffeners, 300mm spacing for superyachts and warships (16mm thick, 4.0kg/m^2 - fire on both sides)

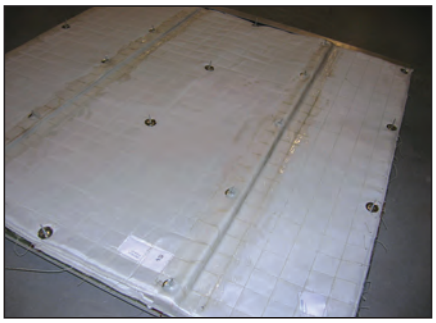
To meet the UK Maritime and Coastguard Agency's LY2 Code on GRP structures:

- 20mm, 5kg/m^2 for fire protection equivalent to B15 on laminated GRP for short-range yachts
- 30mm, 7.5kg/m^2 for A60 fire protection on laminated GRP.



On steel or aluminium, Promat microporous panels are applied using standard pins and clips, the pins being directly welded to the metal.



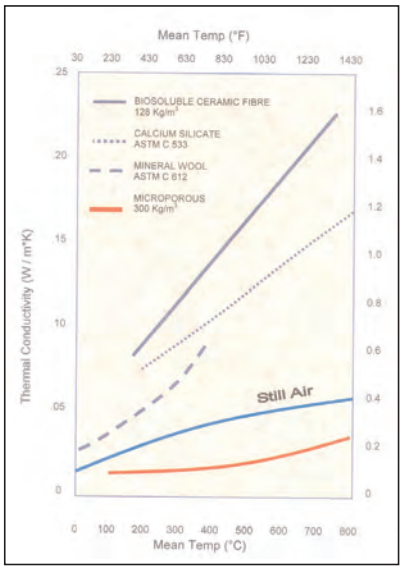


For applying Promaguard to GRP surfaces, square perforated base pins are fixed with adhesive, and insulation secured to the pins by clips.

Further weight-saving possibilities

Even more weight-saving is possibly, says Promat, by using multi-layer 'synthesis' systems - supplied by specialist companies - for passive fire protection in association with light-weight thermal-acoustic insulation materials. This would result in a material with the following characteristics:

- sound damping (no-lead) barrier
- basalt or silica needle felt (approximate density 180kg/m^3) to be applied where non-combustibility is required (SOLAS regulations)
- Polyimide foams (6.3kg/m^3) or polyester fibre mat (30kg/m^3), which is PE-welded - hot-welded without adhesive, to be applied where materials approved for low flame spread and smoke-and-toxicity are required (HSC-Code/IMO resolution or MCA-LY2 Code for superyachts).



A graph showing the thermal conductivity performance for Promat's Promaguard lightweight material, compared with competing products.

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Members who are aware of recent work by a university, company or organisation which has or could lead to an improvement in safety at sea are invited to nominate them for one of the Awards, giving brief details of the achievement. The nominated university, company or organisation will then be invited to submit an entry.

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Requests for further information and expressions of interest should be forwarded to:

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Lloyd's Register

Safe lifeboats: good designs plus good maintenance needed

TO make lifeboats safer, and particularly to try and prevent further serious accidents during drills, IMO has introduced amendments to SOLAS Chapter III and MSC 1206. Yet, it is claimed that some flag states are trying to avoid implementing this legislation. At the same time, the UK Maritime & Coastguard Agency published, in March this year, a new report*; and this claims that many existing on-load release hooks currently fitted to ships' davit-launched lifeboats are inherently unsafe.

The report believes that this is the case because some designs are unstable - they have a tendency to open under the effect of a boat's own weight, and need to be held closed by an operating mechanism. As a result, there is no defence against defects or faults in the mechanism, against crew errors, or against incorrect re-setting.

The solution, says the report, lies not in training or maintenance but in radical re-design of the hook type involved (the authors have seen satisfactory new examples). Given the difficult conditions onboard the decks of most ships, human error will always be inevitable, continues the report.

The MCA report recommends that, before the new hooks arrive, interim risk measures should be introduced, specifically that maintenance shackles are rigged for lifeboat drills, so that they bypass the on-load release hook during lowering and recovery; the shackles should be disconnected at all other times. In a further interesting recommendation, the report concludes that for ships carrying small numbers of people, consideration should be given to designing boats with single falls.

Meanwhile, a leading lifeboat manufacturer, Schat-Harding, which has very recently been acquired by the Norwegian cargo access and crane group TTS, states that 'Whatever technology or concepts are introduced for the future, crews will still need to use the equipment properly, and that equipment will still need to be maintained properly.' As we reported in our October 2005 edition (page 28), the new SOLAS Chapter III regulations relating to regular inspections, tests, and servicing on SOLAS-compliant ships - which now have to be carried out by manufacturer-approved technicians - came into force on July 1 this year.

An example of Schat-Harding's new-design locked-pipe hook for davit-launched lifeboats. This particular one has been retrofitted to boats on Celebrity Cruises' 2001-built cruise liner *Millennium*.

Schat-Harding's experience is consistent with the MCA's analysis that most accidents with lifeboats are caused by mis-use or incorrect maintenance of the on-load hooks. But the company differs on the solution. The MCA's idea is that redesigned hooks will resolve the problem. Schat-Harding believes that the MCA is only partly right, and that the real answer lies with IMO's reforms, which hinge on the need for correct training and maintenance.

'Schat-Harding has always been ready to collaborate with industry or governments to work on new ideas and new standards. We are ahead of the MCA on this and some time ago introduced a complete re-engineering of our hook range. The new models have what we call a locked-pipe system and are much more robust and less maintenance-dependent than most hooks in use today. All our boats, except the MCB range, leave the factory with this new hook, and by November this year all our lifeboats will have it,' explains chief executive officer Ove Roessland. The company has also retrofitted the locked pipe hooks for some owners, such as Celebrity Cruises.

Most current hooks, claims Schat-Harding, all work to a design which has small safety tolerances, making them sensitive to lack of maintenance; with this design, it is hard to see if a hook is locked or not. Schat-Harding's new hooks claim to solve those problems; nevertheless, the company says that it is impossible to avoid accidents with any form of quick-release hook if crews are not trained and the maintenance is not done correctly. For this reason, the company believes strongly that IMO's MSC 1206 regulations must be fully implemented.

* *Development of Lifeboat Design*, MCA Research Project 555, carried out for the UK Maritime & Coastguard Agency by Burness Corlett-Three Quays Ltd, March 2006.

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Swedish shipping lines in favour of lightweight materials

A SURVEY carried out within the framework of the LÄSS project (lightweight structures at sea), coordinated by SP, shows that Swedish shipping lines are firmly in favour of lightweight materials.* We reported on the LÄSS project in our October 2005 edition, page 30.

Today, steel is still the dominating material used for ships, but lightweight materials would allow a significant reduction in weight to be achieved. However, more knowledge and experience are needed before the shipping lines are prepared to invest in new designs of vessels.

The survey has found that many Swedish operators have poor awareness of how lightweight materials can be used in ships, which has an adverse effect on their attitudes to the use of such materials and designs. Improved awareness is therefore one of the most important factors for influencing attitudes towards lightweight structures and encouraging their use.

Difference in attitude between groups of shipping lines

The survey also found that attitudes towards the use of these materials depend on the type of vessels operated. Perhaps unsurprisingly, those concerned mainly with the transport of passengers, either on passenger ferries or by ro-pax vessels, are generally more in favour of the use of lightweight materials. Those least in favour of such materials are the companies operating tankers.

The survey clearly shows that factors such as the size of the shipping line (in terms of turnover and number of employees) have no relation to a line's attitude towards lightweight structures, and nor do personal factors, such as training or age, or the length of time for which a company has been in business.

Shipping lines of the opinion that lightweight designs are not compatible with existing products, and that new investments are required, often have a more negative attitude. However, the survey did not find any general views on the part of operators that lightweight designs as such would have major drawbacks.

Predominantly positive attitude

Today, Swedish operators have, believes the survey, a predominantly positive attitude towards the use of lightweight designs. More than 50% of those taking part had a clearly predominant favourable overall view, although their view of how lightweight designs would affect the relationship between price and performance of a vessel influences their attitude. There is therefore a need to find supporting material to demonstrate the economic benefits of lightweight designs. In general, the survey shows that shipping lines see a change in materials as having more advantages than drawbacks, which further shows that there is a substantial need for lighter vessels in the Swedish fleet.

Cautious industry sector

The survey showed, however, that owners and operators are - as nearly always - very cautious towards the use of innovations. A small number of lines are more prepared to accept innovations, but in general, the sector can be said to be characterised by caution. The majority are prepared to invest only in tried and proven designs. There is a need for detailed costings to show the potentials for designing better safe and lightweight vessels, not least in terms of fire resistance, and which are also economically profitable. This is the main purpose of the LÄSS project, sponsored by VINNOVA and coordinated by SP. Further information is available from www.lass.nu.

* Extracts from an article first presented in *BrandPosten*, No 34, 2006, News from Fire Technology at SP, the Swedish National Testing and Research Institute.

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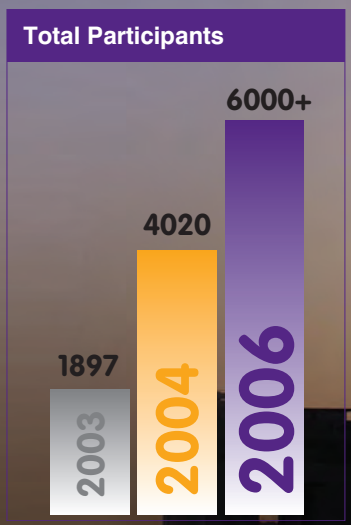

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Reducing the weight of structural fire protection in ferries

New research in Sweden has aided the development of a promising new fire insulation blanket, which has already been fitted to a new monohull fast ferry.

AN SP (Swedish National Testing and Research Institute) coordinated Swedish research project, LÄSS (outlined in our October 2005 issue, page 30), is currently underway to investigate how lightweight construction can be extended in shipbuilding. A major barrier to the increased use of lightweight materials (see our other article on LÄSS in this feature) is the problem of protecting them against fire.*

Investigating more efficient ways to provide fire protection to composite structures is an important part of the LÄSS project and one where SP's fire testing capability and a new fire insulation product development have recently been usefully combined.

Balancing the need for adequate structural fire protection with the desire to minimise structural weight is often a difficult challenge. Certain bulkheads and decks must be insulated with fire-resistant materials to prevent fire spread and this adds unwanted weight.

Paradoxically, lightweight materials require a higher weight of fire insulation than that used on an equivalent steel construction. Aluminium and composite fire divisions need to be maintained to a lower temperature than their steel equivalents in order to prevent collapse and subsequent fire spread. This leads to increased insulation weight. Table 1 illustrates the problem.

Fire Division Type	Fire Insulation System	Weight	Weight increase relative to steel

Table 1. Relative weights to achieve an A60 equivalent performance on various deck structures (based on the use of Thermal Ceramics' FireMaster 607 blanket).

Performance Criterion	Measurement Criterion	Impact on Composite Sandwich Structures	Impact on Steel / Aluminium Structures
Stability	No collapse	High levels of insulation needed to prevent collapse / excessive deflection	Un-insulated steel will not collapse Aluminium requires moderate level of insulation to prevent collapse
Integrity	No gaps or cracks through which hot gasses can pass	Not usually a problem as Stability is maintained	Not usually a problem as Stability is maintained
Insulation	Unexposed face temp. rise: ≤ 140 °C average ≤ 180 °C maximum	Unexposed face temperature rise is minimal due to high insulation value of the sandwich structure	Main cause of failure in a fire test. Insulation thickness design is critically important.

Table 2. IMO A754 (18) fire test performance. The criteria must be maintained throughout the entire test period (typically 30 or 60 minutes).

Application	Weight of FireMaster Marine Plus System	Weight saving compared to previous FireMaster 607
A60 SOLAS Aluminium Deck	3.5 kg/m²	27%
A60 SOLAS Steel Bulkhead	4.8 kg/m²	20%
30 minute High Speed Craft, 2mm Aluminium deck and bulkhead	2.45 kg/m²	32%

Table 3. Weight reduction examples on metallic structures using FireMaster Marine Plus.

Providing structural fire protection for composites

Of all materials used in lightweight ship construction, composites provide the greatest challenge for designers of structural fire protection systems. The reasons can be summarised as follows:

- a typical construction consists of a sandwich panel of 40mm to 50mm, comprising a low-density PVC foam core and a thin skin on either side, built up using resin-bonded e-glass fibre. All these materials have low temperature resistance. Typically, the resin has a maximum use temperature of less than 100°C before softening
- the materials, especially the PVC core, are highly insulating. Heat flow through the panel is minimal, resulting in rapid temperature build-up at its surface behind the fire insulation. Loss of strength ensues and this can lead to collapse
- whilst IMO fire test procedures are quite specific regarding testing of metallic structures, they are not so for non-metallic materials. In particular, the specification of the composite panel that should be tested is not defined, even though construction details can significantly influence fire test performance. For example, the density of the PVC core used, the temperature resistance of the resin, weight of e-glass, and stiffener spacing are all factors that influence structural fire resistance and fire test outcomes.

Requirements

Fire testing of composites is carried out to IMO Resolution MSC 45 (65) using the fire test principles established in IMO Resolution A754 (18). The test method requires a relatively large panel to be exposed in a furnace to a temperature/time curve that reaches around 935°C within one hour. The performance requirements are summarised in Table 2.

IMO MSC 45 (65) specifies that a static load is applied to any non-metallic structure. Limits are also placed on the amount and rate of deflection allowed during the fire test. Unlike steel and aluminium structures, the major failure mechanism in a fire test of a composite structure will be excessive deflection or collapse caused by temperature build-up at the resin skin/PVC core. Because weakening of the structure occurs at low temperatures, a large volume of fire insulation has to be used.

New lightweight insulation blanket

For many years, Thermal Ceramics has supplied its FireMaster 607 blanket to the shipbuilding industry for structural fire protection. The continuing search for lighter fire insulation has resulted in the development by Thermal Ceramics of FireMaster Marine Plus blanket.

* Extracts from an article first presented in *BrandPosten*, No 34, 2006, News from Fire Technology at SP, the Swedish National Testing and Research Institute.

With all fibre insulation products, increasing the fibre density reduces thermal conductivity, thus improving thermal insulation. The real innovation of FireMaster Marine Plus is the production of a blanket with increased fibre density but without a corresponding increase in the density of the blanket itself. For example, FireMaster Marine Plus blanket of 70kg/m^3 density is said to have significantly more fibres for each cubic metre than a standard FireMaster 607 blanket of the same density. Thermal insulation is improved but the density and weight of the blanket remain the same as the standard FireMaster 607 Blanket. All this is possible using an advanced technique developed by Thermal Ceramics' R&D department.

An interesting aspect of all FireMaster blankets is that the fibres are not chemically bound together, but mechanically needled. With high fibre density, more fibres are available for needling, thus higher strength can be achieved. This means that low-density FireMaster Marine Plus blankets can be produced with equivalent handling strength and thermal conductivity to Fire-Master 607 blankets of higher density.

This allows fire insulation designs to utilise a lower density blanket than was previously possible, and this is claimed to be the key mechanism by which fire insulation weight is reduced using FireMaster Marine Plus. The absence of chemical binders ensures there should be no toxic smoke emission from the blanket during a fire, a useful contribution to overall safety.

SP fire tests

The needs of the LASS project provided an ideal opportunity to investigate potential weight savings achievable using FireMaster Marine Plus on composite structures. Thermal Ceramics therefore sponsored two 60minute fire tests at SP in February 2006: one for a deck and another for a bulkhead.

The insulation specification for the full-scale tests was derived following a number of small-scale fire tests carried out by Kockums Shipyards, Karlskrona. These tests compared existing FireMaster 607 composite bulkhead specifications with a number of candidate specifications based on the new FireMaster Marine Plus blanket.

A system of 100mm thickness with an overall weight of 6.9kg/m^2 was chosen for the full-scale fire tests. This represents a weight reduction of nearly 30% compared with the FireMaster 607 system in current use.

Collaboration of the LÄSS project team in these tests provided the important opportunity to address the issue of fire test panel specifications discussed earlier. The decision was taken to test a relatively 'worse case' of composite strength so that the insulation specification tested could be applied to as wide a variety of stronger composite structures as possible.

Working in conjunction with DIAB, which manufactured the bulkhead and deck specimens, and Det Norske Veritas, which oversaw the test programme, a specification was evolved for the bulkheads and decks which incorporated the following key features:

- laminate skin thickness 1mm (bulkhead), 1mm, and 1.4mm (deck)
- low-temperature resin (critical temperature of 80°C)
- 50mm PVC core
- no stiffeners on the bulkhead, and stiffeners in the deck spaced at 2m centres providing a large un-stiffened load bearing area.

Both fire tests demonstrated the ability of the new lighter weight insulation to protect the composite structures from collapse for the full 60minute fire period. In addition, some valuable insights into the behaviour of composite sandwich panels in fire tests were obtained. The deck and bulkheads remained load-bearing even when the theoretical maximum resin temperature was exceeded. It appears that even a thin layer of resin-bonded e-glass provides significant insulation to the PVC core.

The relative importance or synergy of each part of the structure to the overall fire resistance of the composite may be more complex than at first thought. This demonstrates the value of full-scale fire testing to verify fire performance of composite sandwich structures.

Further opportunities

Following the composite test programme, more fire tests have been carried out to demonstrate the weight savings achievable on metallic structures using FireMaster Marine Plus. Examples of these new specifications are shown in Table 3.

A total of 3000m^2 of FireMaster Marine Plus blanket has already been installed for A60 fire protection of steel decks on a monohull fast ferry built by a major European yard. Previously, the yard had used an alternative lightweight system but the improved installation ease and economical cost of the FireMaster Marine Plus system offered a commercial advantage whilst maintaining the low system weight required.

New materials for fire protection

INSULATION and passive fire protection company Unifrax, which specialises in the development and manufacture of high temperature materials, is launching its FyreWrap range for the maritime sector. FyreWrap can offer tested systems capable of providing cost-effective fire protection for both standard and complex installations, and specialist feedstock products for systems fabricators.

FyreWrap materials are said to be ideal for a variety of passive fire protection applications, including marine bulkhead and deck insulation, fireproof and penetration seals, fire doors and seals, cable tray protection systems, grease traps, HVAC ducts, and window system tapes.

The Unifrax FyreWrap system is a fully encapsulated flexible system for fire protecting ducts, particularly against grease-based fires in galley extraction ducts and is designed to provide up to two hours fire rating. This flexible system needs zero clearance between itself and surrounding components.

These fire protection materials claim to have a number of advantages for marine applications, since they are lightweight and easy to fabricate, and they provide protection at temperatures in excess of 1250°C. The product meets all international and local fire standards and code requirements.

Repeat order for Chinese-ferry chute system

AN order for the newest version of its chute systems, the VEMC, at Tianjin Xingang shipyard, China, has been secured by Viking Life-Saving Equipment. The order is the third for this yard - it will be installed on another new train ferry - and is a result of cooperation between the new Viking subsidiary in China and headquarters at Esbjerg, in Denmark. The new vessel will be operating in the Bohai Bay area; its two sisters currently sail on the Yantai-Dalian route.

The evacuation MiniChute, or VEMC, was the ideal solution for the new vessel due to its capacity and installation height. VEMC is a flexible system, with installation heights of between 5m and 20m. The pre-attached liferaft makes for rapid evacuation, and capacity can be matched to suit any vessel by additional high capacity throw overboard liferafts.

Each VEMC system onboard this latest ferry has a pre-installed 101-person liferaft, two additional 101-person throw-overboard liferafts, and a further 25 person throw-overboard liferaft. Installation height is 15.5m.

Viking China is the latest subsidiary in Viking's global network and provides a local presence in a market that is expected to continue to grow and expand.

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Project aims at a better test method for ro-ro deck sprinklers

FIRES on the ro-ro decks of ships are relatively uncommon, but can have serious consequences. Ro-ro decks to which passengers have access are normally protected by water sprinklers, but the efficiency of such systems has been questioned, and there are no suitable fire test methods for 'alternative' water sprinkler systems.*

A recently concluded project has investigated how a fire test method should be structured in order to deal with such aspects as the type of fire scenario. Ro-ro decks to which passengers have access during loading and unloading are today protected almost exclusively only by water sprinklers, with capacities and installation requirements in accordance with IMO Resolution A.123(V), which dates from 1967. Several previous projects carried out by SP have shown that these systems are no longer fully suitable for present-day risks. They probably have insufficient capacity to deal with many of the fires that could occur on ro-ro decks.

There is a fire test method and installation guidelines for 'alternative' systems. These requirements have been adopted by IMO as an alternative, in the form of IMO MSC/Circ. 914. However, there are no systems available on the market that meets these requirements.

Repeatability and reproducibility

The objective of the recently concluded project was to produce a first proposal for fire-testing of sprinkler systems, together with guidelines for the structure of an effective fire-testing method. A number of basic requirements that can be regarded as important for a proper test method were formulated as a starting point.

One of these basic requirements included the ability to simulate fire scenarios that can occur on a ro-ro deck. Two fire scenarios based on these requirements were proposed: one for private cars and one for heavy goods vehicles.

It is also important that any test method should have good repeatability and reproducibility, and so the flammable materials for use in the tests were those that previous experience has shown give good repeatability provided that they have been correctly conditioned: corrugated cardboard cartons filled with plastic cups and stacked on wooden pallets.

Fire tests must be conducted at full scale, using sufficient quantities of flammable materials to make it possible to observe how far a fire spreads. This will require a relatively large quantity of flammable materials for each trial: however, the intention has been to attempt to restrict the quantity of such materials as much as possible in practice.

More efficient systems in the long term

The long-term objective of the project is to encourage the use of more efficient water-based fire-fighting systems on ro-ro decks than those specified in IMO Resolution A.123(V). Such improved efficiency can be brought about by introducing automatically activated systems, increasing the water delivery rate, mixing foam additive with the water, or by using water mist systems. Maritime authorities would like to see future design requirements and fire-testing methods resulting in considerably higher safety levels than at present.

The project was financed by VINNOVA within the framework of its Safety at Sea programme. Two further partners were linked to the project: Marioff Corporation Oy and Det Norske Veritas. In addition, further input was provided by the Finnish fire laboratory at VTT, which also carried out preliminary fire tests using prototype fire scenarios.

* This article was first presented in *BrandPosten*, No. 34, 2006, News from Fire Technology at SP Swedish National Testing and Research Institute.

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Second Notice

Advances in structural modelling have allowed regulators to move away from the traditional deterministic approaches that were based on empirical formulae derived from experience. Modern methods allow for a more predictive approach and mark a significant step in the evolution of ship design.

The notion of goal-based ship construction standards was introduced to the International Maritime Organisation (IMO) in 2002. These standards are to give the IMO a greater role in determining the standard to which ships are built. The job of ensuring that ships meet these standards will still lie largely with the classification societies. The IMO is scheduled to introduce goal-based standards by 2010.

In response to industry requests, and with these new developments at the IMO in mind, The International Association of Classification Societies (IACS) has developed common structural rules (CSR) for Bulk Carriers and Tankers. These were implemented on 1 April 2006.

The concept of risk based design has been made possible by the advances in numerical modelling. This concept can be used to determine the most efficient means by which to reduce risk. This technique was used in the formulation of the Common Structural Rules

This conference will bring together classification societies, regulators, naval architects, shipbuilders and operators to discuss the impact of these new concepts and regulatory changes. Papers are invited on all related topics including the following:

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New megayacht mixes tradition with modernity

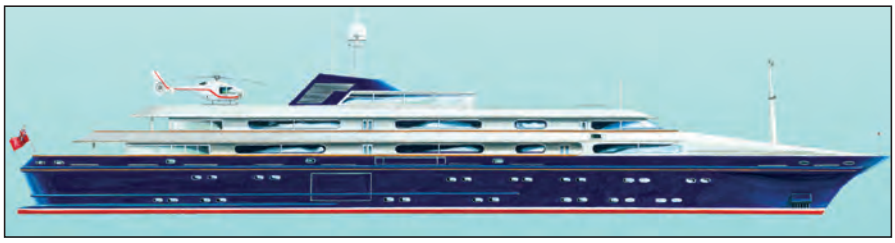
A NEW megayacht project is being worked upon by Beau Mansfield Interior Consultants. The scope of design is to create a vessel that is both traditional in appearance and style, but that will utilise the most modern innovative materials and equipment available on the market.

The yacht has been designed with two boarding platforms, one to port and one to starboard. Tenders will be able to drive straight into a tender bay at the stern, in a similar fashion to a naval landing ship dock. Guests can then disembark and enter the accommodation.

The vessel will have a length overall of 112m, a beam of 18m, a draught of 4.5m, and will be able to reach a maximum speed of 20knots. Propulsion will be via a diesel-electric arrangement, featuring two ABB Azipod drive units. The generator room will be monitored from a separate control room on the bridge.

This megayacht will be outfitted with a synthetic teak decking system, Bolidt Future Teak. Bolideck 1580 will also be used on the helicopter deck; both these products come from Bolidt, based in The Netherlands.

Beau Mansfield Interior Consultants promotes the use of environment-friendly products and uses them wherever possible in paints on the superstructure and hull, and for this reason will be using high-quality laminates in place of wood in the interior. The interior itself will be prefabricated, ie, the cabins, bathrooms, and service areas will be fitted inside the hull and superstructure as almost complete units.



A profile view of the new 112m megayacht, with interior design by Beau Mansfield Interior Consultants.

There will be an enclosed solarium with jacuzzi, bar, changing room, bathroom, and seating area on the top deck, forward of the funnel. It will be possible to access the forward open sunbathing area from the solarium itself as well as the aft helicopter deck.

The helicopter itself will be housed inside an extendable hangar that will extend out on tracks from the centre of the funnel. It will completely enclose the helicopter on long voyages or in rough weather conditions; when not in use, the hangar will be pushed back inside. There will also be a winch-down facility for the helicopter.

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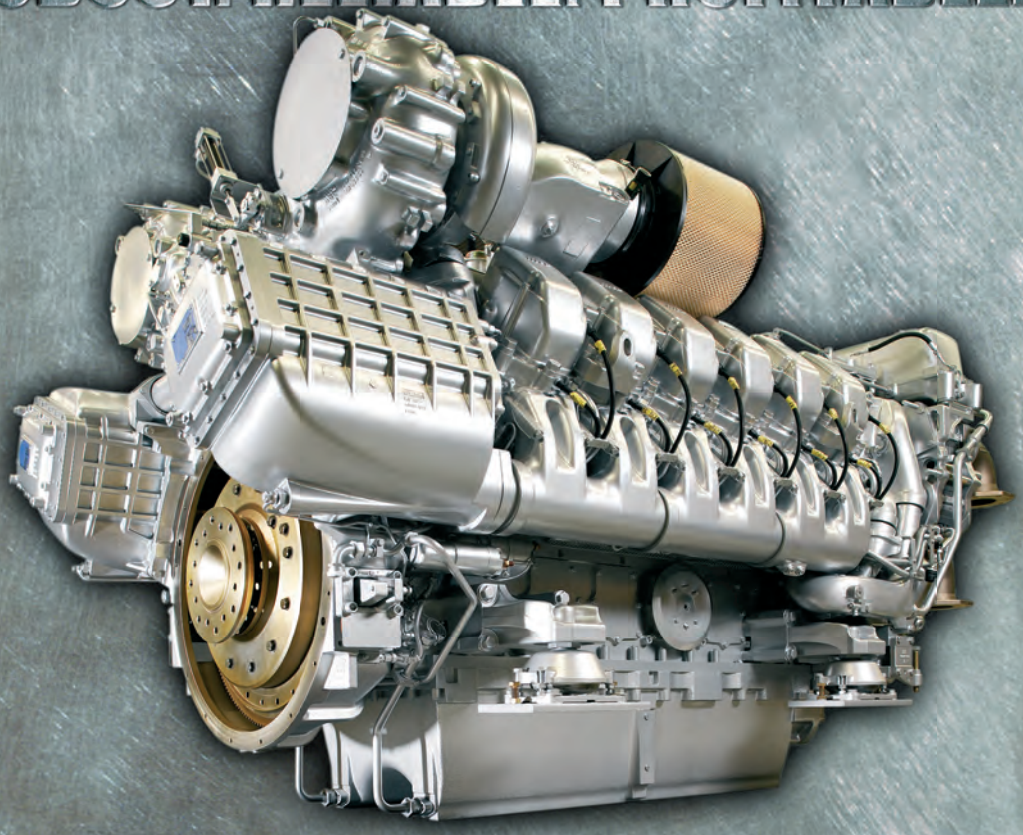

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Cautious optimism and expansion in Korea

IN 2006, Korea's marine industry continues its impressive progress as probably the world's No 1 shipbuilder. Nevertheless, the country cannot afford to take its eye off its close neighbours, Japan and, particularly, China. Korean yard output in 2005 was 10.2 million compensated gross tons, which is 15% more than 2004 and a record, says the Korea Shipbuilders' Association. At the end of last year, shipyards held orders to keep them busy for three-and-a-half years, with a total of 35.6 million compensated gross tons under their belts. Output is expected to peak in 2008, although high levels of ordering are expected to continue.

Like other leaders, Korean shipyards have been wrestling with the extraordinarily high prices of steel plate - in 2005, Pohang Steel's prices had risen by 63% over end-2003 figures. However, they have now fallen somewhat, and at the beginning of this year they were Won30,000/tonne less than they had been; in May a further Won30,000 reduction to Won585,000/tonne was recorded. Nothwithstanding this useful reduction, some KSA members remain concerned over the possibility of future rises.

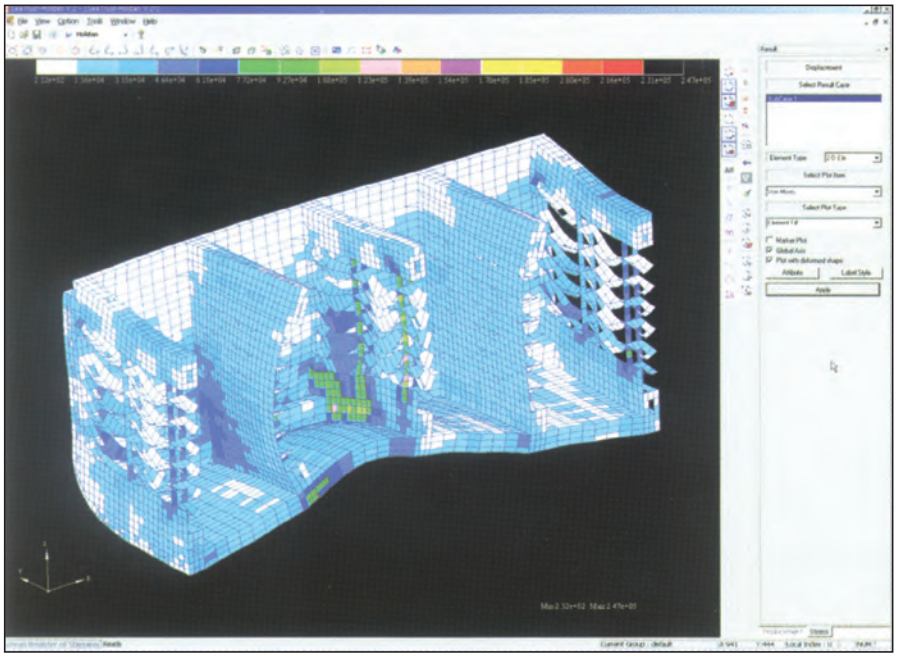
Worries over China centre on the expanding shipbuilding capacities there; at present, there are eight construction docks capable of handling VLCCs but it is believed that there could be 24 by 2010 (13 such docks exist in Korea today). Although both Vietnam and India are likewise expanding their capacities, these interesting countries are not viewed as major threats at the present time. In a few years time, China could be a special threat as regards LNG carriers.

Korean yards are not standing still in the midst of all this, and indeed productivity rose by 15% in 2005. At the same time, yards are making huge efforts to process massive order books; one example is STX which has both introduced an on-ground construction berth to complement its main dock at Jinhae, and which has re-activated its small Busan yard.

Some yards are already taking advantage of lower labour costs in China by subcontracting sections to companies there. Samsung, for example, has a site at Ningbo, where production is said to be being expanded. From here, it is a relatively short distance by barge across the Yellow Sea to Koje Island.

Ambitious plans also lie ahead, including those of Hanjin Heavy Industries and Construction to build a large 'greenfield' yard in the Philippines, while assistance projects exist with various yards elsewhere not seen as major competitors, such as Samsung's technology agreement with Keppel, in Singapore, for LNG carrier repairs and conversions.

At home, some of the smaller, lesser known yards - many of which started out as steel-section fabricators - now hold impressive order books for complete ships and reflect similar expansion in China (Sungdong, for example, is believed to have around 60 vessels on order). One of those visited by *The Naval Architect* recently was INP Heavy Industries; this interesting yard is concentrating on higher-value stainless-steel and gas tankers. It claims a strong technical team and aims to increase its output from six ships annually today to 16 by 2008. At present, few of the country's small yards are members of the Korea Shipbuilders' Association, although this could change; some belong to the KSI cooperative. However, the KSA claims to have a 95% market share.



Korea's own class society, the Korean Register of Shipping, is actively involved in many current and future aspects of ship design and shipbuilding. The society is playing a role in new generations of LNG carrier as well as the mega container liners that are now appearing on the scene. Studies are also under way into aspects of passenger ship safety, alternative propulsion concepts, and IACS unified requirements for ice-strengthened ships (here, the society is particularly contributing towards the design of Arctic tankers). Earlier this year, new branch offices were opened in Ho Chi Minh City (Vietnam) and Sydney (Australia) - a reflection of the expanding shipbuilding industries of South East Asia. The accompanying illustration shows a typical example of the society's work: stress analysis of a container ship hull performed by the in-house software SeaTrust-Holdan.

A new ship type for Korean yards: Samsung holds an order for three of these 70,000dwt icebreaking tankers from the Russian operator Sovcomflot. They are fitted with twin Azipods and will be able to break ice both forward and astern. More details appear elsewhere in this feature.

At the same time, Hanjin is re-entering the LNG carrier market - a sector where Korea excels - after a gap of 10 years when it completed the country's first membrane tanker in 1995. However, the company will face competition from a sector newcomer, the STX group, which has made a decision to enter this challenging field - especially challenging today as more reports arise of problems with membrane containment systems. Full details of Korea's activities in the LNG sector appear in the special supplement which accompanies this issue: *Gas Carriers: Trends and Technology*.

The Korea Shipbuilders' Association's own status was raised last year by a satisfactory outcome to the country's two long-running trade disputes with the European Union and the World Trade Organisation. Now the association is proceeding with its Blue Ocean campaign to keep the country's marine industry in the vanguard of technology through new R&D initiatives, first-class management and innovation, involvement in extra-value-added tonnage, and entry into new sectors, such as deepsea underwater exploration systems.

Hanjin expands to the Philippines

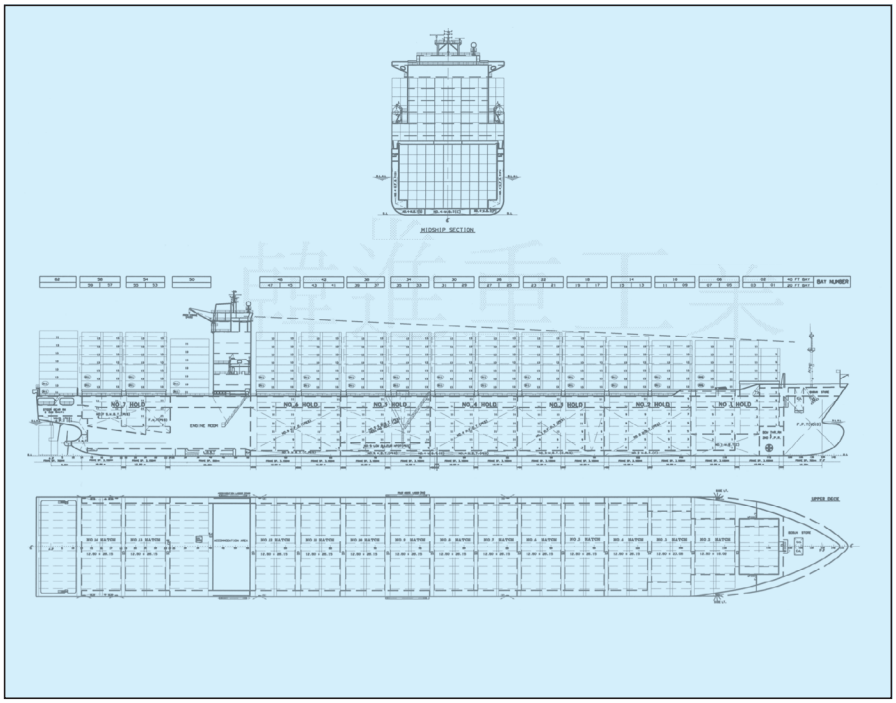
AT long last, Hanjin has been successful in its quest to find a new shipbuilding site outside the restrictions of its base at Youngdo, close to the city centre of Pusan. Hanjin Heavy Industries & Construction Co has chosen Subic Bay, in the Philippines for this new venture; on close examination, the choice of this country was a logical move, since Hanjin Construction had been operating there for some 20 years, so good local knowledge and a workforce was already available - Hanjin Construction will build the new yard.

The new complex will comprise two building docks (460m x 100m, and 360m x 75m). There will be three outfitting quays, planned with an eye on long LNG carrier outfitting times.

Civil engineering work began in May, and fabrication of the first ships began at the same time as ground work, following a fast-track concept. Most yard workers are expected to be Philippinos, many of whom will be sent to Pusan for training.

As reported in our special supplement which accompanies this issue (*Gas Carriers: Trends and Technology*), Hanjin has recently been successful in winning two 153,000m^3 new-generation LNG orders from STX Pan Ocean; one will be steam turbine-powered (considered more economical at the time of contract) and the other will be diesel-electric, based on Wärtsilä engines. Although *Hanjin Pyeong Taek* - the yard's first LNG carrier completed in 1995 - used the NO 96 cargo containment system, the new ships will switch to GTT's Mk 3 system. The two initial ships are to be jointly classed by Det Norske Veritas and the Korean Register of Shipping.

The Youngdo site is being retained, and here the outfitting pier will be extended by 220m, able to berth one large ship on each side. This will give the all-important mooring long-term space needed for outfitting LNG carriers up to 170,000m^3; ships above that size will be constructed at Subic Bay, where much more space will be available for manufacture of bulky LNG insulation components.



Profile, deck plan, and cross-section of the first ships to be constructed at Subic Bay: a new class of 4300TEU container ship, created by Hanjin's own naval architects. An order for 12 ships has been placed - six by CMA CGM and six by NSC.

TECHNICAL PARTICULARS
HANJIN AFRAMAX TANKERS

Length, oa	250.00m
Length, bp	239.00m
Breadth, moulded	44.00m
Depth, to main deck	21.35m
Draught, design	13.60m
Draught, scantling	14.97m
Deadweight, design draught	100,700dwt
Deadweight, summer draught	114,000dwt
Cargo capacity	130,000m^3
Water ballast	42,000m^3
Heavy fuel	3500m^3
Cargo tanks	12 + 2 for slops
Cargo pumps	3 x 2800m^3
Main engine	MAN B&W 6S60MC-C
Output	13,560kW at 105rev/min
Speed, at design draught	14.80knots

In recent years, Hanjin has opted to concentrate mainly on building container ships, which can be completed in a relatively short timespan. Nevertheless, the optimistic LNG carrier market has tempted the yard to re-invest in gas skills.

The Pusan yard has been extremely innovative at overcoming length restrictions for its building docks (300m) and has developed the DAM method of fabricating bow sections separately and welding them to the main hull part when a gate at the seaward end is removed. By using this technique, Hanjin is able to build liners such as the *MSC Maeva* class, which was presented in *Significant Ships of 2005* and which can load up to 8085TEU, including 550FEU reefer boxes.

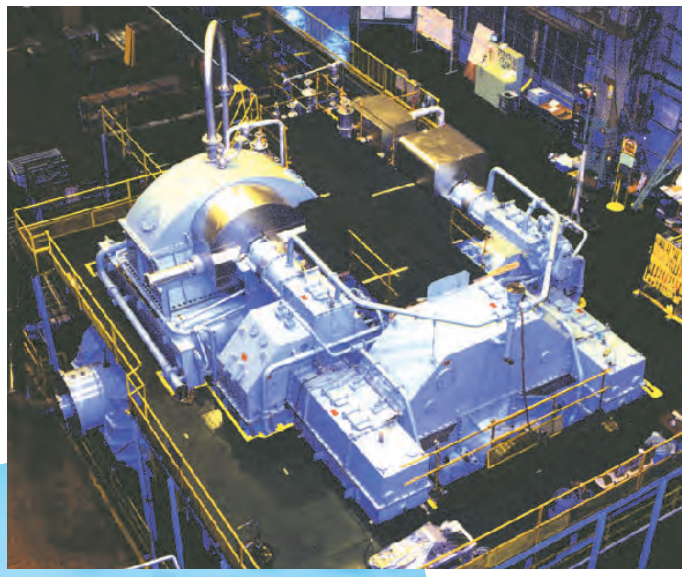
New container ship designs

For the future, designs of 10,000TEU have been created. They will, at least initially, be assembled at Youngdo and will have a length overall of 346.60m, with a breadth of 45.60m long, and a design draught of 13.00m. Thus, a forward length of 50m will be fabricated separately for uniting by the DAM technique. They will be able to load 10 tiers of boxes in the holds and nine on deck, with all refrigerated boxes (a large total of 800FEU) stowed on the hatch covers. Although the nominal box capacity is 10,000TEU, this falls to 7450TEU if the industry-standard 14tonne figure is used.

These liners are expected to be powered by a two-stroke in-line engine with either 12 or 14 cylinders, driving a FP propeller. If one of Hanjin's chosen possibilities is specified, the MAN B&W 12K98MC-C model, this would develop 72,240kW at 104rev/min and would drive a six-bladed FP propeller. This would provide a service speed of 25.80knots on the design draught and at 90% MCR.

The first vessels to be constructed at Subic Bay will be a brand-new class of 4300TEU container ships, optimised for best possible speed and container intake. They were model-tested at the MOERI tank, formerly known as KRISO, and a total of 12 ships have been ordered to date. In future, it is possible that much larger container liners will be constructed here together with Aframax tankers, probably followed by VLCCs.

Kawasaki



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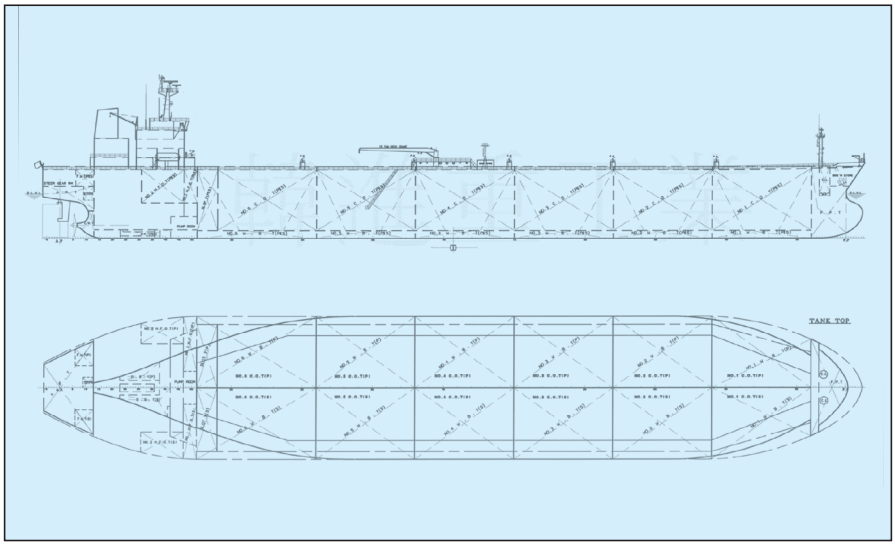
In recent years, Hanjin has built a few medium-range product tankers of around 45,000dwt, but the new-design Aframax models - created by Hanjin's own naval architects - will be the shipyard's largest ever at 114,000dwt. Like the container ships, they were model-tested at MOERI and are optimised and take into account IACS' new common structural rules; they are planned for three-cargo segregations. Hanjin now has orders for four ships from Emarat Maritime, a UAE-based shipping company, for delivery in 2008 and 2009.

Meanwhile, Hanjin has been making great efforts to shrink its production times and increase overall efficiency - as well to speed completion of the 54 ships (plus the 12 container ships at Subic Bay) that were on order at the end of July this year. By employing a new, yard-owned, 3000tonne lift-capacity floating crane and boosting welding and outfitting organisation, the Pusan yard hopes to achieve - by the end of 2007 - a remarkable 30% reduction in overall construction time of a ship.



A new string to Hanjin's bow comes in the form of 114,000dwt Aframax tankers - the largest tankers yet built by the company, although smaller product designs have been completed. Four orders have been placed.

Largest-ever shipbuilding contract at Hyundai

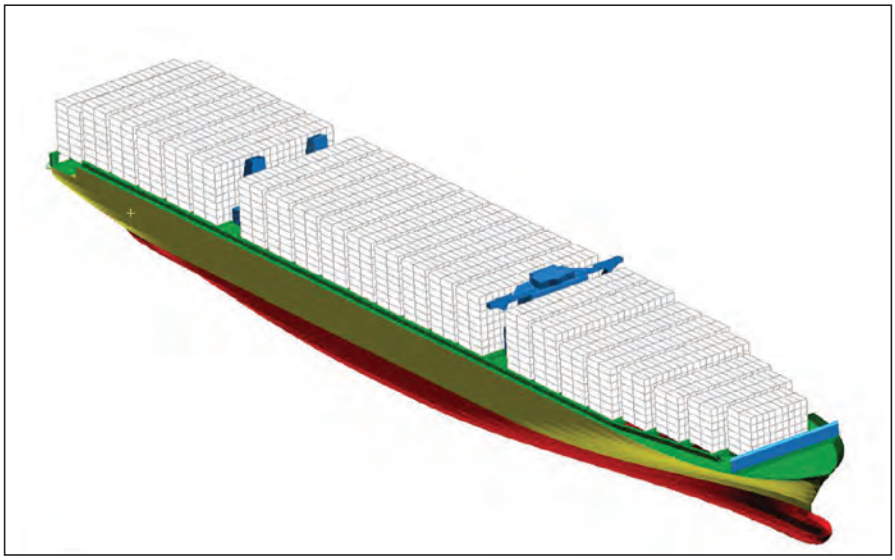
THE world's largest shipyard, Hyundai Heavy Industries, in Ulsan, continues to chalk up impressive orders, its newest being a September contract for an established customer, the French operator, CMA-CGM. This is for eight of some of the large container liners ever ordered; they are of a massive 11,400TEU capacity, and the contract, worth US$1.2 billion, is being claimed as the largest-ever single shipbuilding commission.

This order means that today, Hyundai has a total of 21 mega container liners of over 10,000TEU on its order book. Some of these will be constructed at the Samho yard on the west coast (the former Halla yard).

The new liners will have lengths of 363m, breadths of 45.60m, and depths of 29.70m; each will be powered by a Hyundai-built MAN B&W 12K98MC-C Mk 7 slow-speed engine of 72,240kW to give a service speed of 24.70knots.

In the month of March this year alone, Hyundai booked further orders worth US$2.6 billion; some of these contracts must have reflected avoidance of compliance with the new IACS common structural rules - and hence higher costs - which came into effect on April 1. These March contracts comprised 14 VLCCs of 318,000dwt, five large LPG carriers of 82,000m^3, four 105,000dwt product tankers, and one 150,000m^3 LNG carrier.

Meanwhile, Hyundai's extensive engine shop at Ulsan also signed important export contracts during August to build US$110 million worth of machinery for two Chinese shipyards: Shanghai Shipyard and Chengxi Shipyard. The order - the largest secured as a single project since engines first started to be built by Hyundai in 1979 - comprises nine licence-built MAN B&W 7K90MC-C two-stroke designs and 68 auxiliary engines of Hyundai's own HiMSEN 7H21/32 type. All these will be installed in 3500TEU container ships booked by German owners.



No owner has yet ordered any of these twin-screw container liners, capable of loading 13,000TEU, but the design for one has been fully prepared by Hyundai Heavy Industries, working in association with class society Germanischer Lloyd. Although twin propellers are the primary choice, there is the possibility of installing a 14-cylinder in-line engine, which will give owners the option of a single shaft line.

Last year, Hyundai teamed up with class society Germanischer Lloyd to develop a mammoth container liner of 13,000TEU (see our November 2005 edition, page 4). At the time, it was announced that this would be powered by twin propellers; however, since then the possibilities of a 14-cylinder in-line two-stroke engine (80,000kW) has come more to the fore. As a result, Hyundai has now been model-testing at its own research institute a version with one propeller, thus giving owners a choice. Hyundai estimates that, cost-wise, a twin-screw ship of this size would only be marginally more expensive than a single-screw version. Also considered was a single propeller with a contra-rotating ABB Azipod behind it.

Already, Hyundai Merchant Marine has ordered its first, smaller, container ships with 14-cylinder engines at the Ulsan yard. Incidentally, in 1990 this company took the then bold step of pioneering 12-cylinder engines in its fleet.

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KR
KOREAN REGISTER

INP: concentrating on stainless-steel and gas tankers

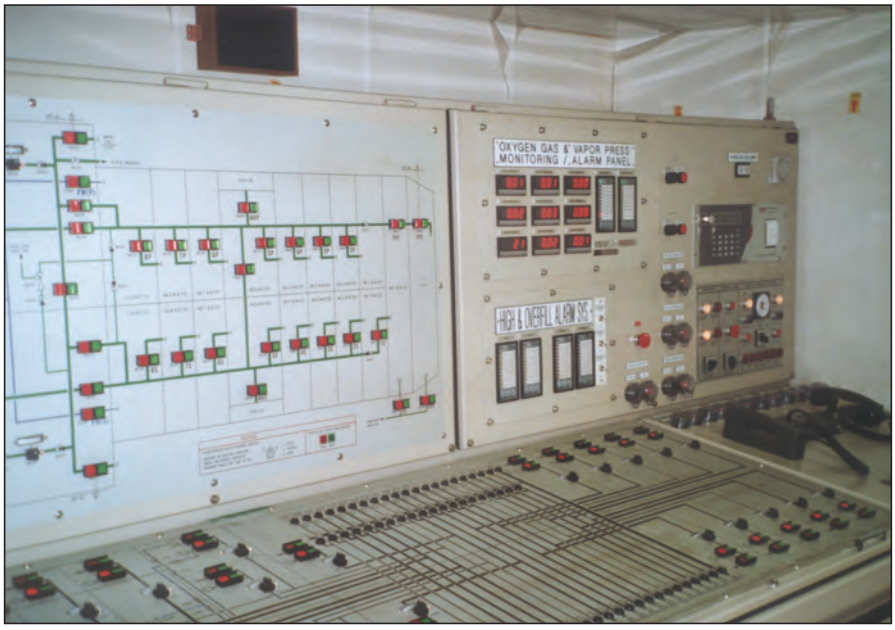
A SMALL Korean shipyard which certainly has clear-cut views on where it is heading is INP Heavy Industries, based in Ulsan. This enterprising company is making big efforts to carve a name for itself in the specialised ship sector and indeed has already succeeded; however, even greater ambitions lie ahead.

An earlier era of low productivity and financial loss, under the name Chung-gu Shipyard, has been dramatically turned round since 1999 (when the name was changed to INP) by new president, Mr K D Kwon, a naval architect by training who formerly worked with STX and a research institute.

The shipyard is made up of three sites, the main yard, with two berths, a fabrication site (no 2 factory), in Woobong, where most of the stainless steel sections are made, and a newly acquired production site (no 3 factory, the former Bangeojin yard) just across the bay in Ulsan. Although the main-yard berths are equipped with a 150tonne and a 70tonne plus 40tonne units, a most important new asset at the no 3 factory is a 700tonne gantry crane to serve the brand-new launchway under it. From here, blocks can launched and towed across the bay for assembly at the main yard.

An impressive order book is currently held, particularly in smaller more specialised types of tanker for leading European and Far East owners. Delivered in July this year was the second of two 9950dwt solid stainless-steel cargo-tank chemical tankers for Crystal Pool Ltd, while at that time, the first of two interesting 8000m³ LPG/ethylene/VCM tankers for Lauritzen Kosan was being fitted out and the second was still on the berth (these ships are featured in our *Gas Carriers* supplement which accompanies this issue); seven more are on order.

INP also holds an order for 13,000dwt chemical tankers for Greek owners Evalend (four ships) and Primera Maritime (two ships), and for the Japanese operator Hisafuku (two ships), plus three 10,000m³ LPG/ethylene tankers for Japanese owners but to be chartered to Ugland in the Unigas group, and four larger tankers of 20,000dwt for Korean company Sekwang Shipping.



A relatively simple cargo control system was specified by the owner of the interesting stainless-steel chemical tankers ordered from INP by the Crystal Pool.

Most deck piping on the 9950dwt Crystal Pool chemical tankers are located in deck trunks (right).

TECHNICAL PARTICULARS
CRYSTAL TOPAZ

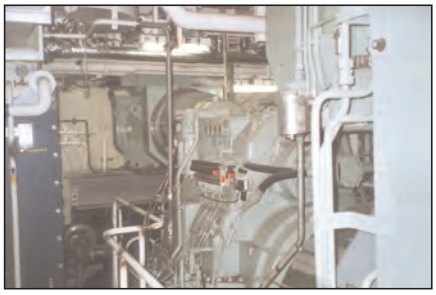
Length, oa	126.20m
Length, bp	119.20m
Breadth, moulded	19.00m
Depth, moulded	10.70m
Draught, design	7.60m
Deadweight	9950dwt
Cargo capacity (100%)	12,150m³
Cargo tanks	18 + 2 slops
Heavy fuel	630m³
Diesel oil	85m³
Fresh water	60m³
Technical water	80m³
Ballast water	4300m³
Main engine	MaK 6M43
Output, MCR	5400kW at 500rev/min
Speed, service at 7.60m draught	13.90knots
Classification	Lloyd's Register +100A1, Double-Hull Chemical Tanker, CR, ESP, ICE 1A, +LMC, UMS, SCM

Finally, there are three 8000dwt stainless-steel chemical tankers for Sichem (Camillo Eitzen).

In recent years, INP has also built anchor-handling/offshore supply vessels but the focus today is definitely on gas and chemical tankers, particularly chemical designs with stainless steel cargo tanks. The shipyard claims to be very strong on the technical front as well as being flexible towards owners' demands; it believes that it has a competitive edge over Chinese and Japanese yards when it comes to complicated ships such as these (it is not so easy to compete on standard coated tankers).

A current trend in these latter markets is towards larger tonnage, and INP anticipates that it will win further orders for 20,000dwt designs in the near future; such large hulls will probably have to be fabricated in two parts and joined afloat. European consultancies will probably have to be employed for such projects. At the present time, the gas carriers are designed with the help of German specialist Tractebel, and the chemical tankers are created mainly by Korean domestic consultancies, particularly Korea Maritime Service, Disec, and Far East Design & Engineering Co. It is hoped that in future, gas carriers can also be developed by domestic companies.

In an interesting move, INP is planning to purchase Tribon software for its own use and for its steelwork subcontractors, in order to eliminate errors resulting from earlier software and to improve the quality of finished sections. INP is believed to be the first small yard in Korea to invest in this well-known suite, and the first real work was expected to start in September. Tribon is expected to be a major factor in helping this yard to achieve its target of completing 16 ships annually by 2008; another required asset will be an extra outfitting quay.



Booster or emergency power for the Crystal Pool tankers can be provided by this 1250kVA dual-role alternator/motor coupled to the reduction gearbox.

The second Crystal Pool chemical tanker, *Crystal Topaz*, was inspected by *The Naval Architect* during outfitting at Ulsan (*Crystal Diamond* was the first). These are heavily ice-strengthened (Lloyd's Register 1A standards) designs with an ice knife to protect the rudder, created by Korea Maritime Service, and all deck pipes are enclosed in a deep trunk on the weather deck.

This pair of vessels has solid stainless-steel cargo tanks (316LN grade) - INP claims to be a leader in stainless steel welding - and all 20 tanks will have their own 300m^3/h Framo hydraulic submerged pump. An ABB power pack supplies not only the cargo pumps but also the high-pressure, non-auto-tensioning deck machinery. The owner wanted a simple cargo control room, so the system there is relatively simple; likewise, the bridge is not certified for one-man operation but is ergonomically laid-out for optimum use.

The propulsion package was supplied by MaK - a 5400kW medium-speed engine driving a Scana Volda CP propeller; output to the propeller can be boosted by a 1250kVA dual-role alternator/motor driven off the reduction gearing. Good manoeuvrability is assisted by a Kawasaki 600kW bow thruster.

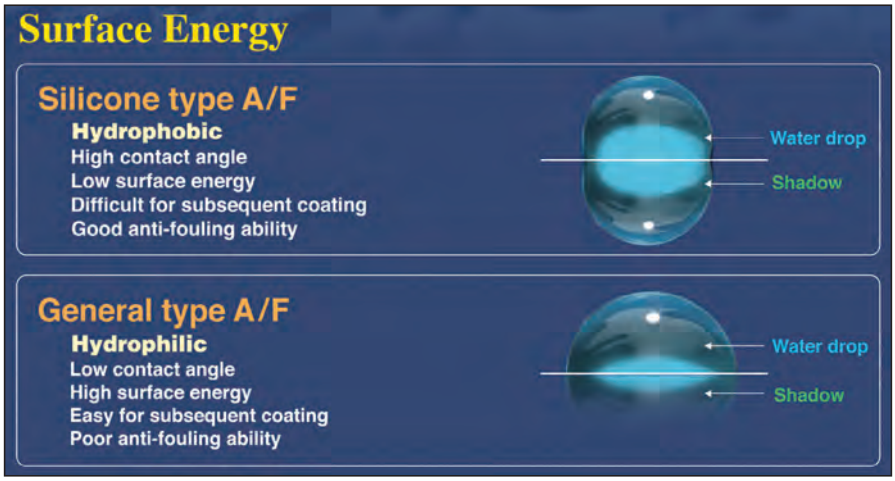
Refining new marine paint products at KCC

THE leading Korean marine paint concern, KCC Corp (KCC), continues to refine it new silicone-based low-friction antifouling. Until now, these new paints have been applied to seven vessels, and coating performances have showed satisfactory results. With confidence in the quality of this new product, applications for at least four more ships will be made by the end of this year.

One new product that has already met with success is the polysiloxane-based Korexane ST1020. This is designed for exposed topside areas and has already been applied to approximately 20 ships. The results are said to show outstanding weatherproofing.

Also under development is a new coating designed as a solvent-free epoxy for water ballast tanks; this is based on a product first developed in 2003 for fresh-water tanks. Commenting on IMO's proposed 15-year lifespan for ballast tank coatings, KCC told *The Naval Architect* that it believed this could be achieved, since 10-year life spans had already been recorded.

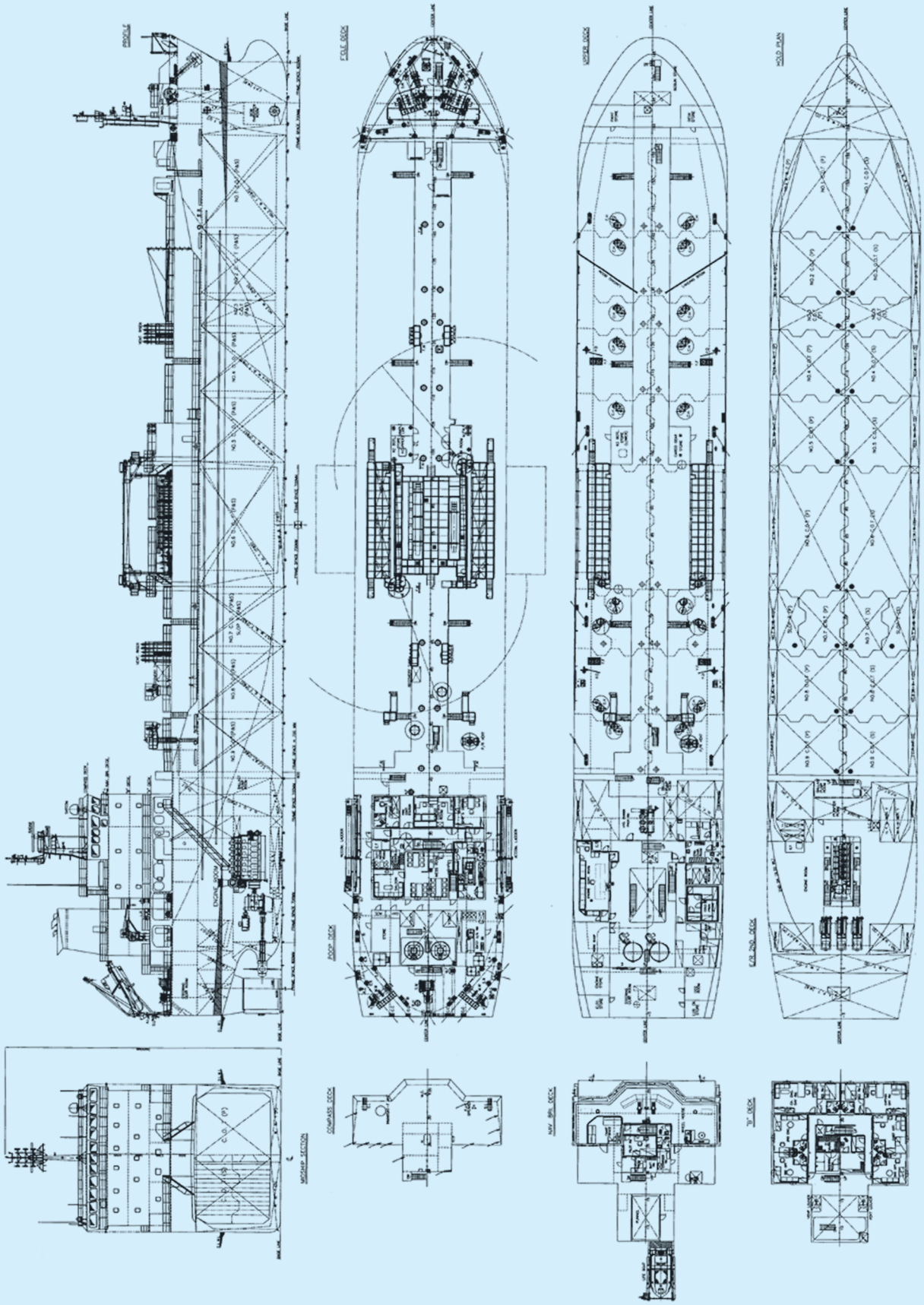
Like all paint manufacturers worldwide, KCC is feeling the effect of the dramatic price hikes in raw materials - reported in earlier editions of *The Naval Architect*. As a result, the company is carrying out intensive R&D work to try and develop alternative, more economic, formulae.



A diagram from the Korean Chemical Co, showing the benefits and disadvantages of conventional antifoulings compared with this manufacturer's new silicone-based product.

Meanwhile, KCC is extending its worldwide network to strengthen customer services. A new Dubai office will commence operations this month.

General arrangement plans of the 9950dwt chemical tankers with stainless-steel cargo tanks, being built for Crystal Pool by INP Heavy Industries.



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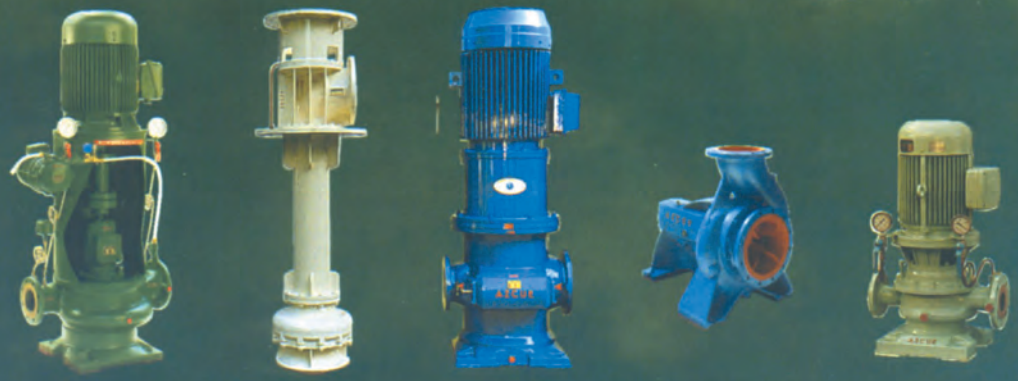

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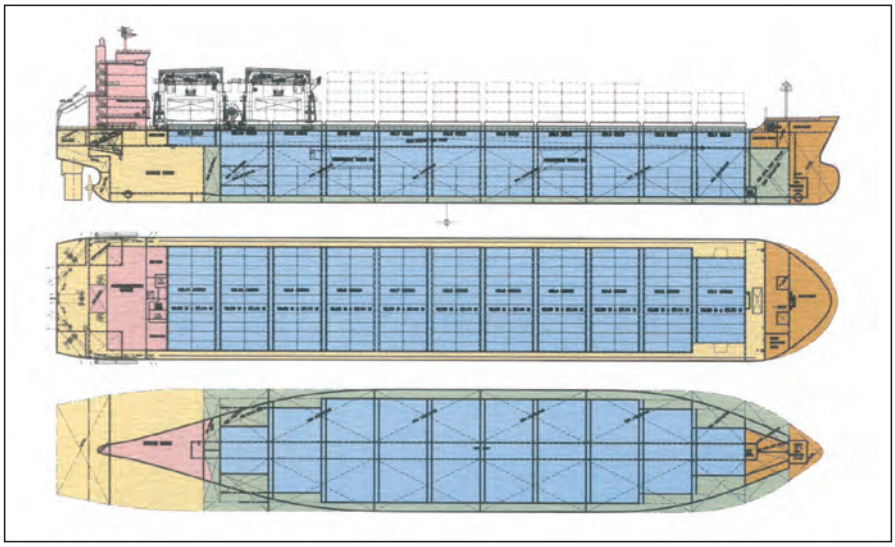
Moving into new sectors at Hyundai Mipo

HYUNDAI Mipo Dockyard continues to advance from strength to strength, holding a massive order book in June this year of almost 200 ships, with a backlog stretching through to 2010. Today, an efficient production system aims to deliver approximately 60 ships annually - five each month. Some years ago, this enterprising company concentrated on repairs and conversions but has now switched totally to newbuildings, with repair work shifted to its associate yard in Vietnam, Hyundai-Vinashin.

Up till now, most new ships have been medium-sized product/chemical tankers, and more recently container ships (although the company continues to promote its ability to construct specials such as drill ships and cable-layers).

Today, the yard finds that is competing strongly, not only with other Korean yards but also those from China, for relatively 'standard' ships such as product tankers and mid-size container ships. With this in mind, Mipo Dockyard is seeking new avenues, and has already developed a new 48,800dwt forest products/container design with box-shaped holds. Success has come in the form of a contract for four ships from Grieg Shipping.



Profile and plans of a new type of ship to be constructed by Hyundai Mipo: a 46,800dwt/48,800dwt forest products/general cargo carrier with box-shaped holds. An order for four vessels has been secured from Norwegian operator Grieg Shipping.

These vessels will have a cargo capacity of 64,500m^3 and will be fitted, in classic forest products fashion, with two sets of 70tonne capacity travelling gantry cranes and pontoon-type hatch covers. A Hyundai-MAN B&W 5S60MC-C main engine of 11,900kW should give a service speed of 16.00knots.

Another interesting plan is to enter the LPG carrier sector, and two fully refrigerated designs with reliquefaction plants have been drawn up, one of 22,500m^3 and the other of 35,000m^3. A further project envisages entering the market for medium-size car/truck carriers, and a design for a 3500-unit ship with 10 vehicle decks (two liftable) has been completed.

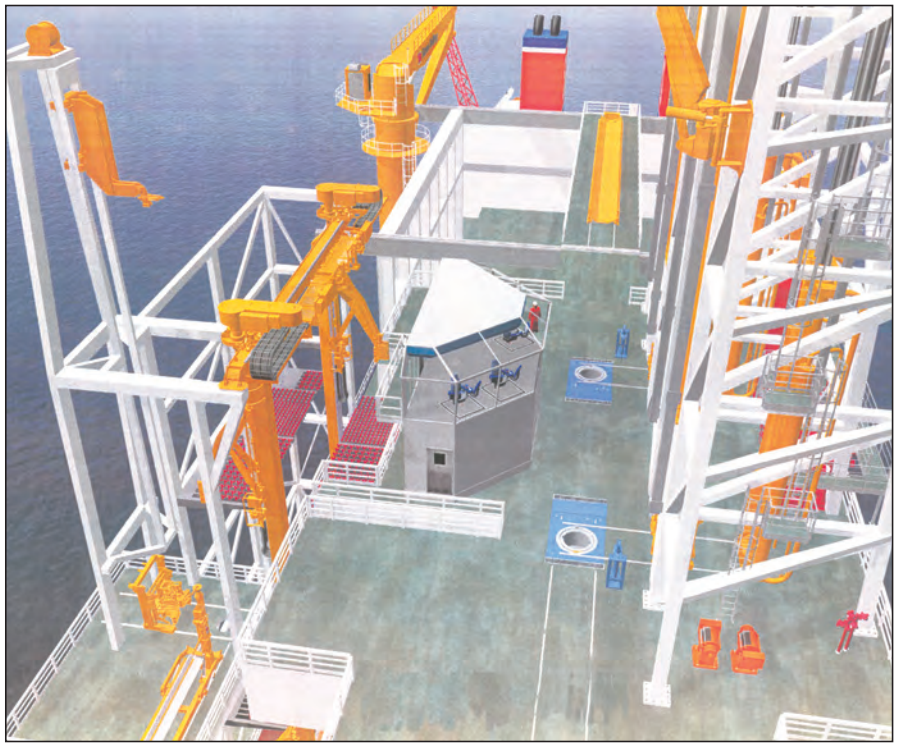
At the same time, Hyundai Mipo anticipates strong demand for container ships as owners try and beat IMO's August 1 2007 deadline for protectively located fuel tanks. This is almost certain to mean higher prices for owners.

Meanwhile, on the tanker front, one interesting modification is a change for this shipbuilder's 37,000dwt IMO Type III product/chemical tanker. This is the only one in the yard's range which does not feature a bulbous bow, since this particular size was primarily conceived for UK-Continent trading, which included ice strengthening for Baltic voyages. Now, model tests have determined that a bulbous bow will give improved speed performance (currently 14.50knots), and so such a bow will now become standard for all ships of this size.

New-generation drill ships for Stena and Mosvold

SEVERAL large modern drill ships have already been built by Samsung's Koje Island shipyard - notably the *Deepwater Pathfinder* class, presented in *Significant Ships of 1998*, which were believed to be first such vessels able to work in water depths down to 3000m. Now, this shipbuilder has even more advanced ships on order - for Stena and for Mosvold.

The most notable feature of the Stena 96,000tonne displacement design, which is being specially engineered to work year-round in inhospitable environments and to drill to depths of 11,000m, is its twin drill derricks - believed to be the first time that these have been specified. As can be seen in the accompanying impression, the derricks are actually offset from the 25.60m x 12.50m moonpool in a new arrangement, and the hydraulically operated drilling system will be fully automated. *continued*



An impression of the principal working area on the main deck of the new 96,000tonne displacement drill ships, which are order at Samsung for Stena Drilling. As can be seen, the twin derricks (an innovation) are offset to port; most existing ships have their derricks directly above the moonpool.

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Second Notice

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

To meet demands for this new generation of container ships, naval architects and operators are constantly striving for innovation. This conference will explore the very latest in container ship thinking.

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Known as the Stena DrillMax class, the new ship will be able to cope with temperatures down to -20°C, such as experienced in the Norwegian and Barents Seas, and special features will be in-built, such as heat-tracing lines and a steam blowing system for the fire mains. However, the ships will not be ice-classed.

Apart from exploration, appraisal and development drilling, the new vessel will also be able to carry out well testing and install subsea components, as well as other associated tasks. The hull and dynamic positioning system (DP3 class) will be designed to survive significant wave heights up to 16m, while drilling can continue in 6.70m waves, and equipment can remain connected on standby in waves of 11.50m height and wind speeds of 31.00m/sec.

Six 5500kW azimuthing thrusters, of the Rolls-Royce UUC45 type with FP blades, will be fitted (for comparison, the six thrusters on *Deepwater Pathfinder* were each of 4000kW). Electric current will be supplied by six alternators driven by Wärtsilä 16V32 engines, each developing 7290kW; current will be generated at 11kV. Transit speeds of 12knots will be possible. Classification will be to DNV standards to comply with the following notations: +1A1, Ship-shaped Drilling Unit (N), Drill (N), CRANE, HELDK-SH, DYNPOS-AUTRO, F-AM, E0. Those ships for Mosvold will have ABS class.

While the hull has been entirely designed by Samsung, a consortium of companies from Norway, and of which Samsung is also a member, will supply the topside structures and equipment. Because of modern operating regulations and the difficult working conditions, DNV Consulting is assisting Samsung with some aspects of these new giants, particularly regarding the strict Norwegian Continental Shelf rules.

Sovcomflot Arctic shuttle tankers to be constructed by Samsung

As reported earlier this year in our February edition, Samsung Heavy Industries is building an interesting trio of Arctic tankers for the Russian owner Sovcomflot, to run a shuttle service from the Varandey terminal, in the new oilfields of the Pechora Sea, to Murmansk. These 70,000dwt vessels are being designed in association with the Finnish consultancy Aker Arctic Technology under a cooperation and licence agreement between Aker Arctic and Samsung and, although not formally featuring Aker's patent double-acting hull form, they are, says Samsung, capable on breaking ice both forward and astern. The three ships will each be powered by twin Azipod propulsors (2 x 10,000kW). The Russian Central Marine Research and Design Institute (CNIIMF) has also assisted with design work.

These new designs will be able to break ice up to 1.50m thick with a 0.2m snow covering at a speed of approximately 3knots either forward or astern. Primary power will be supplied by three main diesel-alternators: two of 11,200kW and one of 4200kW. Two other generators will also be installed, a 1000kW set for harbour use and a 640kW emergency unit. Current will be generated at 6.6kV but transformed to 440V and 220V, 60Hz, for some duties, and control will be by the PWM converter system.

Individual deepwell pumps will be installed in all 10 cargo tanks (10 x 800m³/h) and the two slop tanks (2 x 400m³/h). Stainless steel heating coils will be fitted in all these spaces, and the bottom and deckhead of each tank will be coated with pure epoxy, while loading will take place over the bow at a rate of 10,000m³/h. The ships will be fully winterised to cope with temperatures of -40°C - or even -45°C, and the underwater hull will be coated with abrasion-resistant solvent-free epoxy. Samsung has already delivered 48 ice-class ships, and with the assistance of Aker Arctic Technology, the construction of these pioneering vessels should proceed smoothly.

TECHNICAL PARTICULARS SOVCOMFLOT ARCTIC TANKERS

Length, oa	257.00m
Length, bp	234.70m
Breadth, moulded	34.00m
Depth, moulded	21.00m
Draught, design/scantling	14.00m
Deadweight	70,000dwt
Speed, service, open water	16.00knots
Speed, heavy ice	3.00knots
Cargo capacity	85,300m³
Water ballast	38,000m³
Heavy fuel	3500m³
Diesel oil	200m³
Fresh water	400m³
Main diesel-alternators	2 x 11,200kW + 1 x 4200kW
Propulsion	2 x Azipods (2 x 10,000kW)
Flag	Russia
Joint classification	Russian Maritime Register of Shipping (RS)+JIU6, 1A1 Oil Tanker (ESP), with exclusive approval for shaft power *also* ABS +1A1 (E), Oil Carrier, SH, SHCM, +AMS, +ACCU, VEC, SPM, NIBS, ESP, Baltic Ice Class Equivalent to RS JIU6

An impression of the three 70,000dwt Arctic tankers to be built by Samsung for Sovcomflot. Each will be powered by an ABB electric plant, whose main components are three main alternators, 6.6kV switchboard, two 11,700kVA transformers, two frequency converters, and twin 10MW Azipod propulsors.

Product/chemical tankers from re-activated STX Busan yard

IN today's shipbuilding world where the focus generally is on ships and yards becoming ever larger, it is refreshing to visit a small yard that has recently been re-activated. The Busan site of the giant STX Shipbuilding company - more well known for its 'greenfield' Jinhae complex - is the former home of the company (when it was known as Daedong). Since the move to Jinhae, the site has been leased out for shiprepairing but with the recent boom in new ships, STX decided to revive shipbuilding activities at Busan to capture any contracts in suitable sectors.

The site is constricted and surrounded by narrow streets (the area is 20,000m^2), and was originally planned for constructing smaller types of naval vessels; that has not stopped the company making a number of new investments worth some US$15 million. Perhaps the most important is a gantry crane spanning the two berths and the adjacent block area; this has hook for lifting up to 70 tonnes. Because of the restricted space, nearly all block fabrication is subcontracted to STX Heavy Industries, at Changwon, and brought in by barge. Most of the 500 staff have previously worked at Jinhae.

One of the Clipper product/chemical tankers, *Clipper Kate*, is seen here, following her launch from the Busan shipyard of STX.

TECHNICAL PARTICULARS
PRODUCT/CHEMICAL TANKER
(lengthened version)

Length, oa	116.50m
Length, bp	109.00m
Breadth, moulded	20.00m
Depth, moulded	11.70m
Draught, design	8.05m
Draught, scantling	8.40m
Deadweight, design draught	9900dwt
Deadweight, scantling draught	10,600dwt
Cargo capacity, including slops tanks	12,500m^3
Heavy fuel, including settling and service tanks	800m^3
Marine diesel oil, including settling and service tanks	55m^3
Fresh water	100m^3
Water ballast, including peak tanks	3500m^3
Fresh water for tankcleaning	220m^3
Complement	20 + 4 Suez crew
Main engine	STX-MAN B&W 6S35MC
Output, MCR	4440kW at 173rev/min
Output, NCR	4005kW
Speed, service, design draught, NCR, 10% sea margin	13.60knots
Flag	Bahamas
Classification	ABS+A1 (E), Oil and Chemical Carrier, ESP (IMO Type II and III), +AMS, +ACCU, RES, VEC (without vapour-processing unit)

The effective berth length is 120m but some of the first ships ordered have a length overall of 116.50m. The normal technique used is to assemble the fore and aft sections, then jack the forward end with its bulbous bow to the head of the berth (with the bow overhanging). Following this, a 20m mid-body can be lifted into position, and then the three parts are jacked together and welded. STX believes that it could actually build ships up to a maximum of 125m using this method.

In this manner, STX plans to complete eight ships during the current year but with experience, this is expected to rise to nine in 2007, and 10 - the maximum - in 2008. Time on the berth is currently around three months but this figure is expected to fall to two-and-a-half months next year.

The yard's first vessels are a long series of 14 product/chemical tankers for the Danish Clipper group. To date, a total of seven of these designs has been completed; the first was named *Clipper Karina*. Apart from these, the yard holds orders for two slightly lengthened versions of the same design (116.50m length) for a Japanese operator, Nakagawa, also contracts for eight 9000m^3 LPG/ethylene carriers for three owners - Bernhard Schulte (three ships), Benelux (three ships), and BLT (two ships). The general philosophy is to aim for high-value tonnage wherever possible, and the Clipper tankers feature Sigma phenolic-epoxy coated cargo tanks, each served by a Framo submerged hydraulic pump.

For the LPG carriers, a special manufacturing plant in Ulsan will fabricate each ship's two Tractebel-design insulated cargo tanks (earlier tanks came from China). These will be brought to Busan by barge and lifted into the hulls by a floating crane. It will be recalled that STX has already built two larger LPG carriers of 23,000m^3 at its Jinhae yard (*Almarona*, presented in *Significant Ships of 2005*), thus experience in gas tanker construction has already been accumulated. The first of the 16knot DNV-classed LPG tankers, which will each be powered by a MAN B&W 8S35MC two-stroke engine, is expected to be delivered next May.

Skid-launching addition for Jinhae

THE current massive order books at shipyards in the Far East have led some shipbuilders to develop all sorts of ingenious methods to boost production. At the Jinhae yard of STX - a very modern complex - this has been achieved by constructing an on-ground building site to complement the existing dock. The latter is already most efficient, using a semi-tandem construction method for speedy assembly of hulls up to Panamax width.

Named the SLS or skid-launching system, the new advance is an economic alternative to constructing a new dock, and an international patent has been applied for the technique. This involves building a hull in two parts horizontally on a prepared berth, the split being approximately midships. When both are fully complete, each is jacked hydraulically to the seaward end of the construction site and on to a special floating dock (named a skid barge), which is 200m long and 48m wide.

Here, the two parts are welded together. The dock can then be towed away from the quay and submerged, whereupon the completed ship can be floated out. A new 450tonne gantry crane has been erected over the SLS construction site. By using this method, STX expects to boost its annual production at Jinhae to 40 ships annually.

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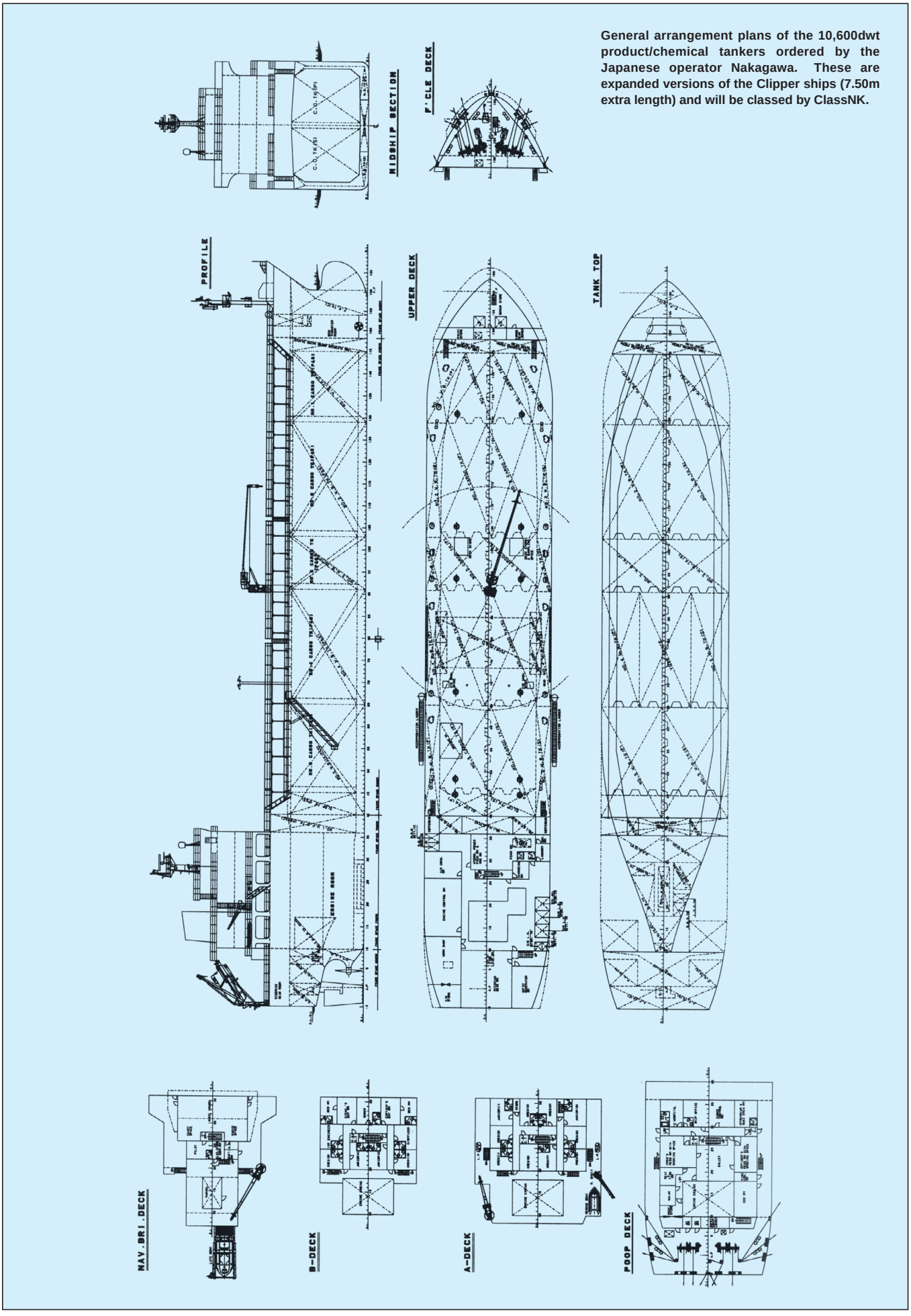
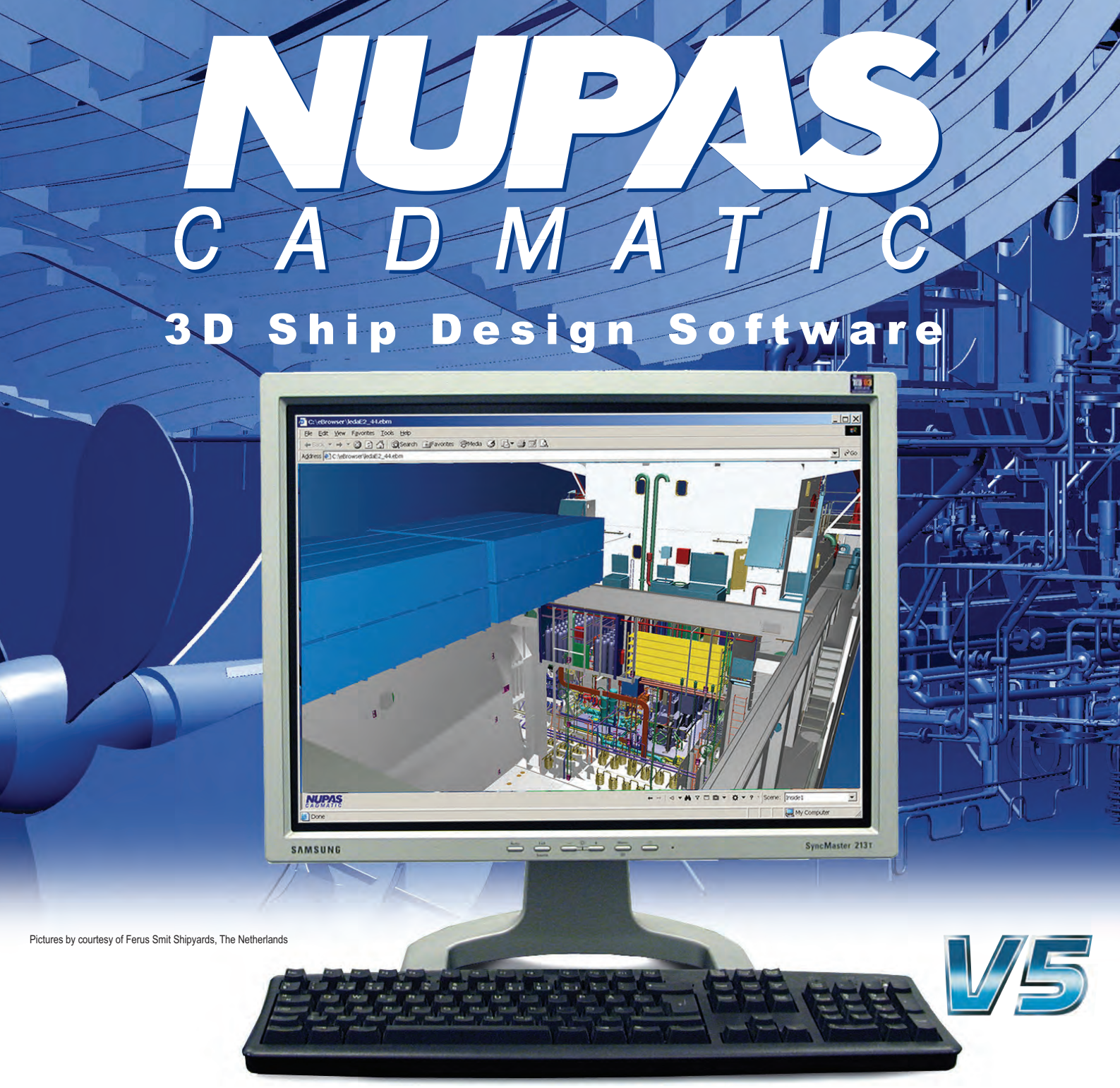


General arrangement plans of the 10,600dwt product/chemical tankers ordered by the Japanese operator Nakagawa. These are expanded versions of the Clipper ships (7.50m extra length) and will be classed by ClassNK.

NUPAS CADMATIC

3D Ship Design Software



Pictures by courtesy of Ferus Smit Shipyards, The Netherlands

V5

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The informative and easy-to-use 3D modeling capabilities can be used for the basic design, detailed engineering, and the production of workshop drawings and generation of ready-to-use production data for production machinery.

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We improve your shipbuilding

8000-unit vehicle carriers under construction at DSME

A MAJOR plank in the portfolio of the giant Korean shipbuilder DSME (Daewoo) is, of course, large modern LNG carriers. This aspect of the company's work is discussed in detail in the supplement that accompanies this issue; however, DSME is equally famous for the construction of large container liners, tankers, and ro-ro vehicle carriers.

The company's naval architectural teams have already developed the design for a mega container liner of 12,000TEU, which - despite the size - will be powered by a single propeller driven by one of the newest two-stroke engines with 14 cylinders in-line. Prospects seem very favourable, following the very recent delivery from the Odense yard in Denmark of A P Møller's 11,000TEU *Emma Maersk* and the very new order at Hyundai Heavy Industries (see our article elsewhere in this issue) for 11,400TEU ships.

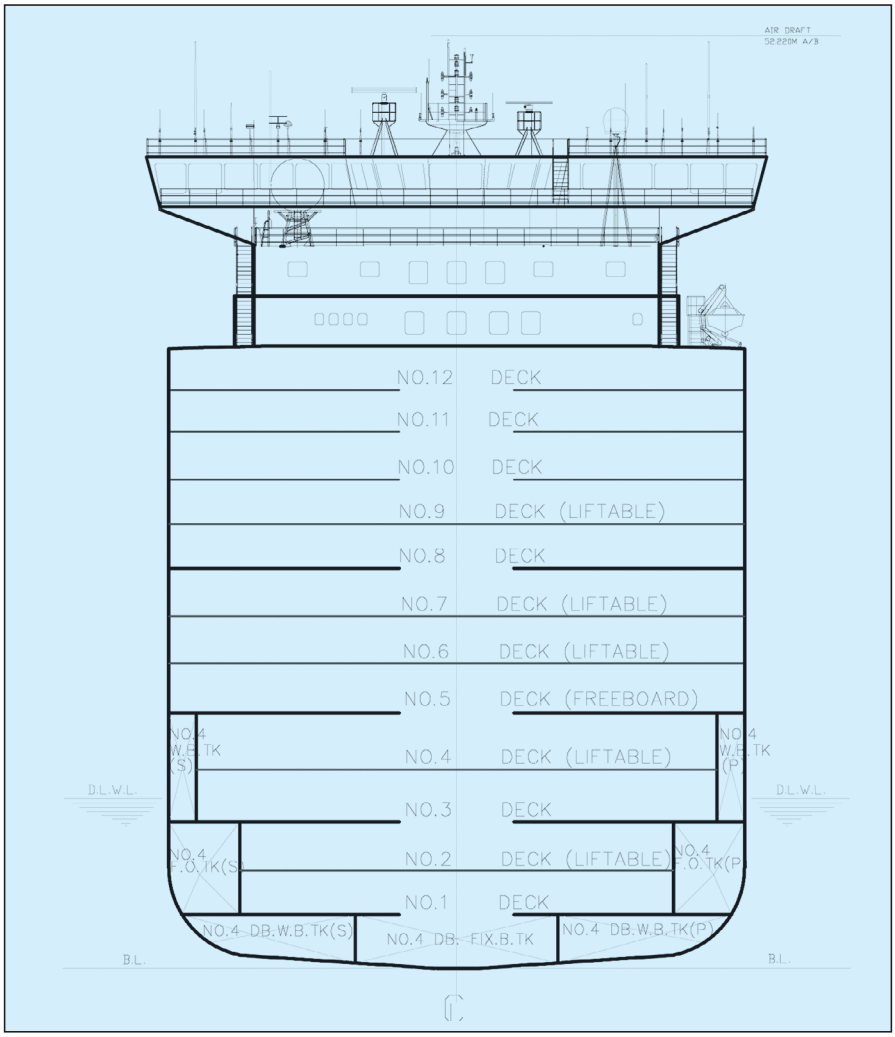
Perhaps of more immediate interest at DSME's Okpo yard is Wallenius' newest series of giant ro-ro ships able to load 8000 cars. These seven ships will operate in the Wallenius Wilhelmsen Logistics joint service (which also includes Eukor) and follow a slightly smaller series of 6700 cars, the last of which was delivered in August, and even earlier, smaller types.

The largest versions are of special interest in that they feature two watertight decks for additional damage stability - a reflection of the total loss in the English Channel of Wilhelmsen's *Tricolor* with a full load of new cars, following a collision. To ensure a very high level of integrity, a double-skin hull below the watertight freeboard deck (deck 5) is assisted by a second watertight level on deck 8 - probably one of the few times that this has been done in a commercial vessel.

At the same time, five hoistable decks will be installed, to offer maximum space for tall vehicles and construction equipment - maximum clear height will be 6.5m. By careful design, it has been possible to fit only one row of pillars on all 13 decks, instead of two. This equates to an extra 300 cars that can be loaded, while the whole ship can load an extra 800 cars (a 13% increase) compared with the preceding series.

At one stage early in the project, Wallenius considered twin propellers for these new giants but this was rejected on cost grounds, despite the improved efficiency. Nevertheless, the hull lines have been carefully honed to ensure that, despite the larger hull, no increased resistance resulted. As a result of the specification of a Becker flap rudder with a twisted leading edge (featured in *The Naval Architect* September 2004, page 49), fuel consumption is expected to decrease by around 4.5%, while there should be less cavitation erosion. Another feature will be an ergonomically designed enclosed wheelhouse with 360deg views.

As reported in our September Editorial Comment, Wallenius Wilhelmsen is making major strides to ensure that all its ships operate to the highest possible environment-friendly standards. They will burn low-sulphur fuel whenever possible, have bilge water treatment systems able to achieve 5ppm separation, use biodegradable oil in all hydraulic systems, and the latest ships (starting from the last of the preceding series) will obtain a Green Passport for eventual recycling, from Lloyd's Register, the society which will class the new series.



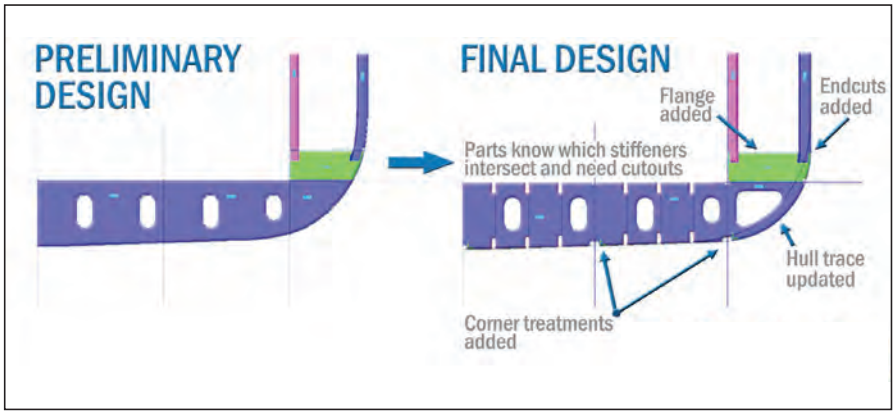
Cross-section of the latest and largest ro-ro car/truck carriers ordered from DSME by Wallenius; they will be able to load up to 8000 cars. An innovative feature will be the inclusion of two watertight decks (Nos 5 and 8), to ensure a high level of damage stability. The stern ramp will have a capacity of 250tonnes.

***Aida* (delivered in May) is one of the newest vehicle carriers from DSME to join the Wallenius fleet. She can load up to 6700 cars. To date, DSME has delivered 13 ships to Wallenius.**

New software combines parametric modelling and relational database

CANADIAN company ShipConstructor Software Inc, developer of the AutoCAD-based 3D product modelling and production planning software suite ShipConstructor, recently announced the release of its latest software version: ShipConstructor 2006.

This database-driven relational object model (DDROM) manages complex interactions between associated parts as well as creating transparency and collaboration in the shipbuilding process. Reacting to clients' needs, ShipConstructor Software married the power of a relational database with parametric functionality. This is claimed to be an industry first.



With DDROM, users can now utilise ShipConstructor in the design process much earlier than previously.

DDROM SmartParts

With DDROM, users can make parts 'intelligent'; these are called 'SmartParts' because they automatically react to design changes of adjacent parts or pre-defined standards, updating themselves as well as the production drawings.

No manual programming is required on the SmartParts, due to a standard AutoCAD drafting technique, and the smartness is automatically recorded and executed in the database. All geometry is now stored in the database, which enables innovative features such as one-click part definition, the ability to design once and re-use, as well as quick and easy changes on the spot.

With DDROM, all related 3D model drawings update as well as all production drawings containing the changed area. This can save thousands of tedious and very time-consuming modifications and it prevents out-of-date production documentation being used.

Being able to design a part once and re-use the core definition many times throughout the product model is also a unique feature. With DDROM, the user can simply design one frame and replicate the geometry to the other frames, only having to exchange the hull trace with a click of the mouse. On a large vessel, the time and cost saved is substantial. Best of all, the parts 'know' that they are related and users can change them all by changing one.

The ability to react to design changes quickly with DDROM now enables the designer to use ShipConstructor much earlier in the design process. Designers can use ShipConstructor to quickly generate 2D classification drawings from the 3D early design model and be off to a running start when it becomes time to start the detail production design. It is even possible to get a head start on it before final class approval, knowing that any changes are easily incorporated into the production detail model.

Other features

Numerous new features have also been added to ShipConstructor2006 in all ShipConstructor modules, such as Pipe, HVAC, Equipment, and Penetrations. In addition, an Application Programming Interface (API), which permits secure and stable access to the ShipConstructor database, has been included.

Innovation, of course, is a continual process; and the company is already working on more new features for the 2006 version and beyond. AutoCAD 2007 compatibility is planned for early next year, and the company also plans to release Project Split & Merge this year.

This new function will allow yards and designers to cooperate on a new level in a safe and controlled manner. It will be easy to outsource parts of a design job to subcontractors or to perform a timed release of a project from a design company to a shipyard.

Improvements made to project resource management solution

THE provider of plant design and engineering lifecycle solutions, Aveva, has announced a number of enhancements and improvements to its Vantage project resource management (VPRM) solution. VPRM 9.6.SP1 extends the integration with plant design management system (PDMS) and Vantage plant engineering (VPE), with improved despatch and shipping facilities and construction schedule reporting - plus further enhancements in the materials management and document management business areas. The release also provides significant improvements for existing users, especially those using PDMS and MDS, with enhanced integration. It also offers improved technical support for XP SP2 client, Windows Server 2003, and Oracle 10g.

Within the engineering section, notable features in the release include improved bulk processing of material take-offs (MTO); enhanced equipment list import (process tags); secure but flexible component description update via MTO; and easier maintenance of vendor document distributions.

Within the procurement section, there is more effective control of despatch and shipping, plus a reduction of the effort of invoice matching in a corporate financial system. The construction section has benefited from easier work-pack generation, and improved construction reporting.

MasterShip integrates Chinese technology

THE Netherlands-based CAD/CAM software and services company, MasterShip, has added a new software module to its line, named MasterShip Plant Generator (SB3DS). The SB3DS software is a joint development of the Shanghai Shipyard & Chengxi Shipyard Co (SSCS) and Shanghai Shenbo Information Systems Engineering. Shenbo is part of STRI (Shipbuilding Technology Research Institute of the China State Shipbuilding Corp - CSSC).

SB3DS has been created to design all piping, HVAC, and electrical cabling for ships and to generate all necessary production information. MasterShip came across the system in China where it has its own office in Shanghai. Several of its clients use SB3DS for piping engineering in combination with the use of MasterShip software for a ship's structure.

MasterShip then started to cooperate with SSCS and Shenbo to integrate SB3DS in its own system and to market it under the name MasterShip Plant Generator (SB3DS). SB3DS has been specially developed for shipbuilding and is based on AutoCAD technology. It has proven itself in several large Chinese shipyards and at many design companies and, Autoship sees this as an advantage for its users.

MasterShip is integrating the Plant Generator (SB3DS) with three other generators: Shape, Parts, and NC. Together these four modules offer a complete shipbuilding solution within the AutoCAD environment.

MasterShip will concentrate on the development of its modules for work preparation for hull and structure, while its partners SSCS and Shenbo will take care of SB3DS. The quality of the entire system will be checked by MasterShip.

Plant Generator (SB3DS) is claimed as a very powerful 3D plant design tool. It produces all drawings and material lists required for manufacturing and installation. Practical operations such as insert and modify pipes, ducts, supports, coamings, and accessories will accelerate the engineering process, it is claimed.

Plant Generator (SB3DS) recognises ship-specific features. For example, users can position pipes in relation to a ship's actual structure. The 3D model allows a virtual walk-through to check a design and detect clashes. Calculation of weights and centre of gravity is also possible. Finally, work packages (pallets) for installation can be produced to organise the work by section and building stage.

New version allows quicker designing

INTERNAL structural design software has recently been released by Autoship Systems Corp (ASC), called Autostructure 3.1. This updated version includes several new features which allow users to work more quickly.

Master database backup/restore and system permissions are now included in a new system manager; these features were previously included in the project manager. The introduction of the system manager has created a natural division in work related specifically to a given project, and those features - such as permissions - which are common to all projects.

New tables are included in the database which allows the storing and deleting of materials, sheet types, also extrusion and bracket types. This data structure should result in fewer installation and data transfer problems.

Any group in the Autoship PR3 file which contains the hull data may be incorporated into an Autostructure project as a part. It will render and contribute to mass and centre-of-gravity calculations. Other parts may be trimmed to it.

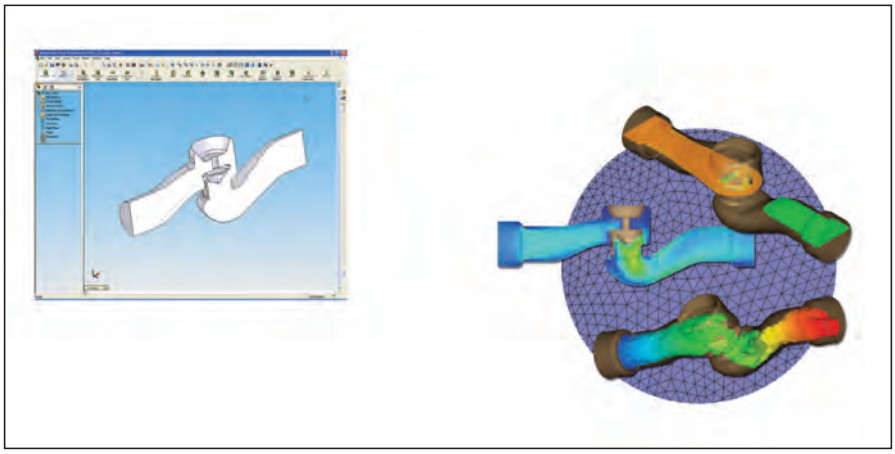
New releases assist CAD

THE global company specialising in simulation software and technologies designed to optimise product development processes, Fluent Inc, recently announced new releases of TGrid 4.0, GAMBIT 2.3, and 3Matic-for-Fluent 1.0 - all major upgrades to Fluent's preprocessing capabilities. These three products provide several new advantages that enable Fluent users to proceed from CAD geometries to Fluent CFD solvers in timescales claimed to be unprecedented.

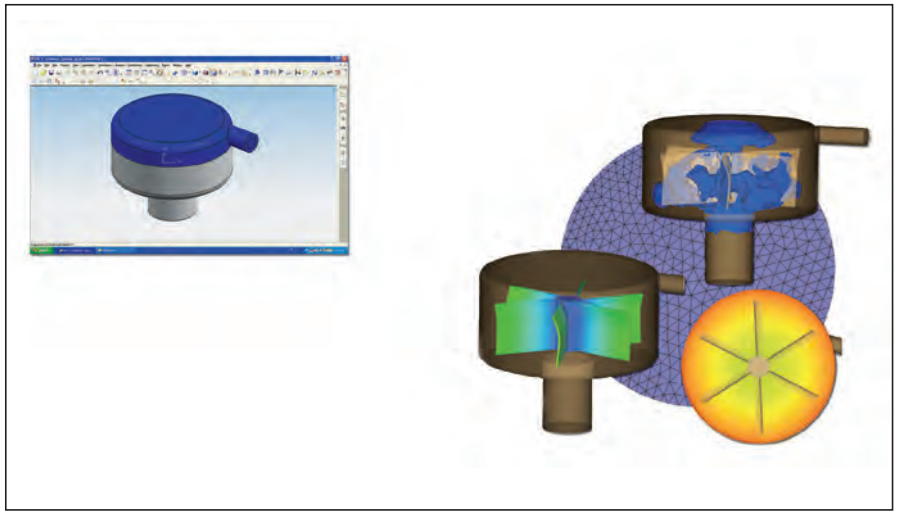
TGrid 4.0 has reportedly been substantially improved, with a powerful surface wrapper added to its existing surface and volume meshing capabilities. Users can now wrap multiple 'dirty' geometry files from several sources into single, connected, high-quality surface mesh in record times. A number of automated functions are available to optimise the process, depending on the problem at hand. The TGrid surface wrapper has reduced meshing times dramatically for a full range of industrial benchmark cases.

The 3Matic-for-Fluent software from Materialise Inc is a complementary conditioning module for converting hundreds of files from mixed geometry sources in native or standard CAD file formats (CATIA, UG, Pro/E, STEP, IGES), or in faceted formats (STL, WRML), into an optimal triangular meshing format for TGrid 4.0's new surface wrapper. This clean-up process ensures that each CAD part is fully connected, of minimal size, and with sufficient resolution to capture the underlying geometrical details. 3Matic-for-Fluent complements TGrid 4.0 by allowing users to work more efficiently during the pre-wrapping phase of their pre-processing efforts.

Additionally, a comprehensive new set of CAD readers in GAMBIT 2.3 allows users to bring native geometry into GAMBIT more effectively. For example, geometry operations such as clean-up, construction, design modification, and decomposition now work directly on all geometric representations. New, automated tools are claimed to lead to significant improvements in meshing speed, quality and size distribution. Several enhancements have also been made in the areas of size functions, boundary layers, and hybrid meshing.



The Fluent SolidWorks Connection V1.1 operates within the SolidWorks user environment and provides tools for checking and conditioning a 3D geometry model.



The Fluent UGS NX Connection V1.1 allows NX users to eliminate or repair geometry issues that would otherwise impede the simulation process.

Launch of Connection 1.1

Fluent Inc has also released the Fluent Connection 1.1 software that helps streamline the process of creating simulation models based on design data from leading CAD packages. The Fluent UGS NX(TM) Connection, Fluent Pro/ENGINEER(R) Wildfire(R) Connection, and Fluent SolidWorks(R) Connection products operate within CAD system user environments and provide tools for checking and conditioning the 3D geometry model in order to ensure that it has been properly prepared for the next step in the simulation process.

Using Fluent Connection, CAD users can eliminate or repair geometry issues that would otherwise impede the simulation process. By providing a well-defined way to check the CAD model for possible simulation-related issues, Fluent Connection aims to help engineering organisations ensure a streamlined hand-off between CAD and simulation.

Typically, 3D geometry models are created in CAD systems without full consideration for the requirements of automated and accurate simulation. Geometry models may include gaps between surfaces or overlaps and interferences that will make it more difficult to generate a high-quality simulation model. Using Fluent Connection, these issues can easily be identified and repaired. In addition, Fluent Connection takes into account the unique requirement of fluid flow simulations to include a description of the fluid volume inside or surrounding the 3D solid model. By helping the CAD user to identify and isolate this fluid region, Fluent Connection eliminates the need for the engineering analyst to perform this task outside of the CAD system, thus saving time and effort during the simulation process.

In addition to enhanced functionality for conditioning of the geometry, Fluent Connection provides the ability to launch Fluent's FloWizard 2.1 or GAMBIT 2.3 simulation environment directly from the CAD system. The CAD model will be automatically loaded into the Fluent environment using native readers that eliminate the need for translation of the geometry data.

The Fluent Connection software products have been built using development tools provided under the PTC Partner Advantage(TM) programme (Parametric Technologies Corporation - PTC(R) - develops Pro/ENGINEER Wildfire) and UGS and SolidWorks partnership programmes.

SIGNIFICANT SHIPS OF 2005

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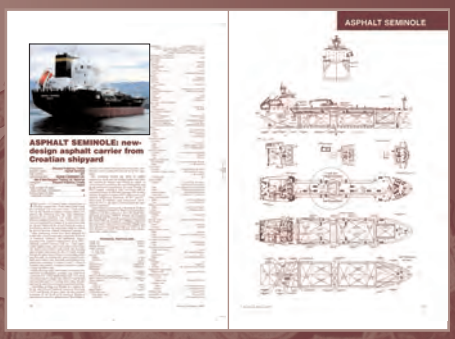

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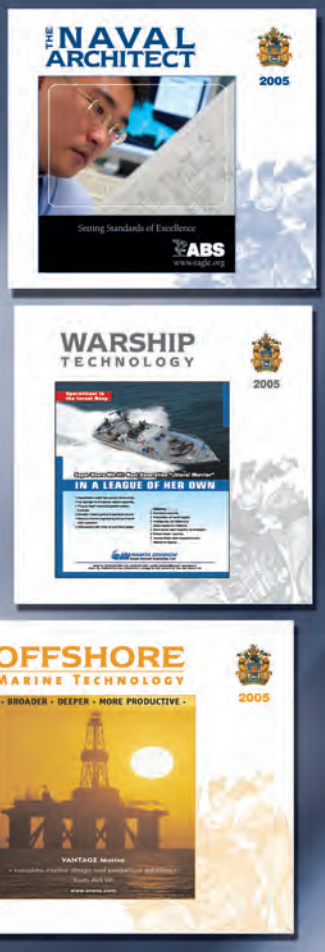

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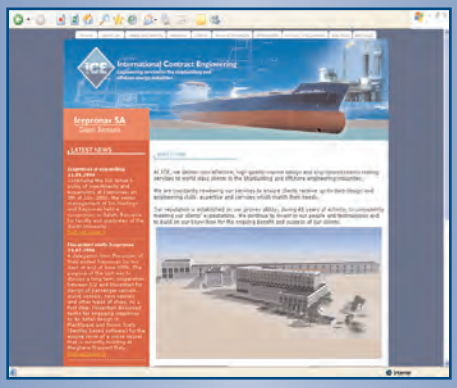

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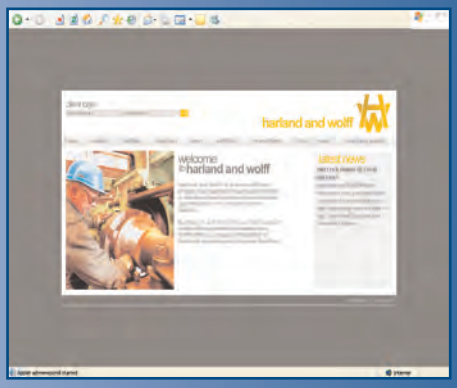

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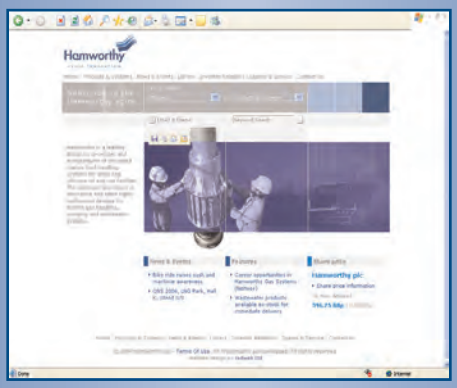

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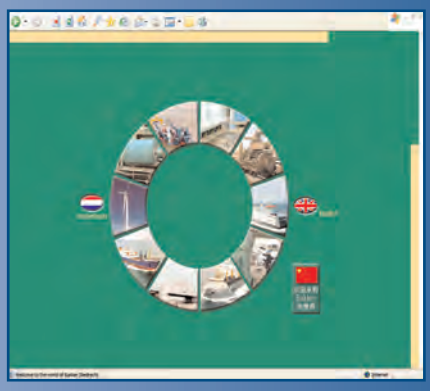

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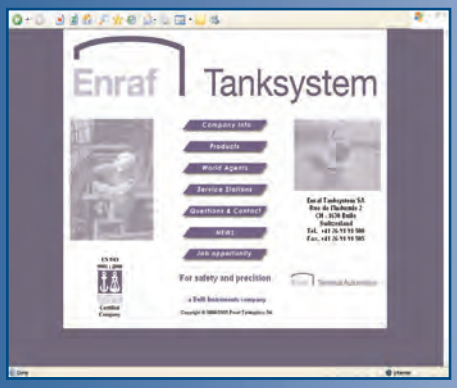

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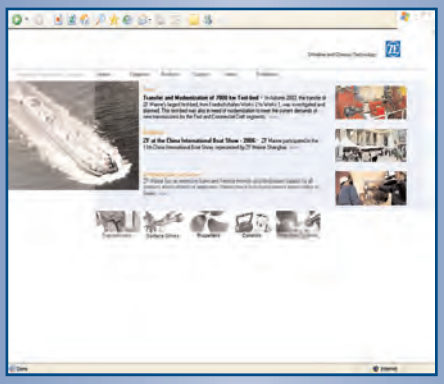

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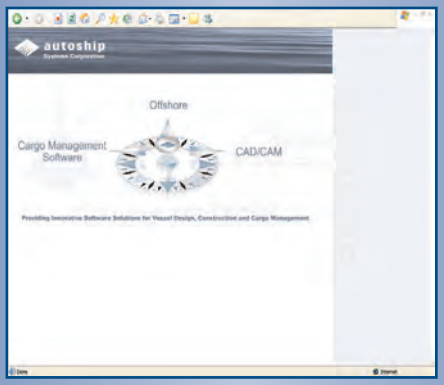

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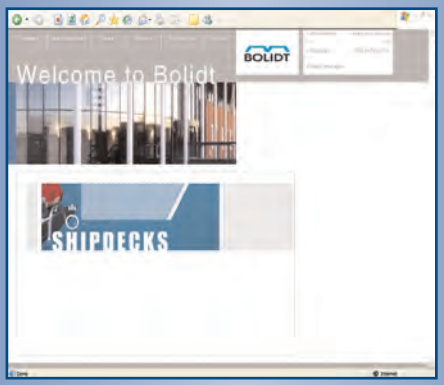

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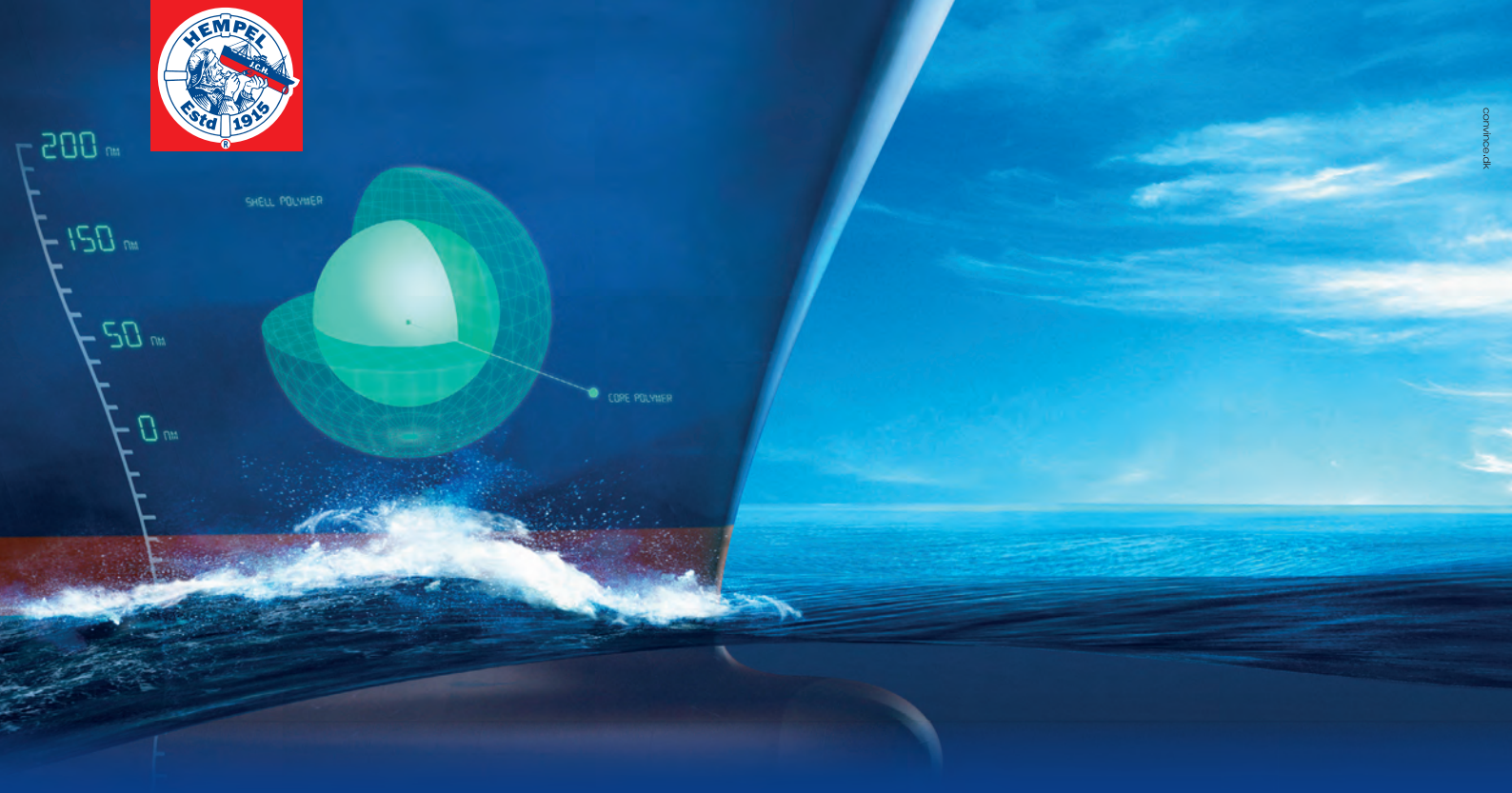
Germanischer Lloyd	5	K14	SEC Bremen GmbH	39	K32
Giro Engineering Ltd	18	K15	Seatrade Middle East Maritime	21	-
Hempel AS	IBC	K16	ShipConstructor Software Inc	53	K33
Houlder Offshore Engineering	26	K17	Veth Motoren BV	20	K34
Hyundai Heavy Industries	IFC	K18	Vuyk Engineering	9	K35
IHC Lagersmit	39	K19	Wolfson Unit	52	K36
Kawasaki Heavy Industries	33	K20	Zodiac International	13	K37



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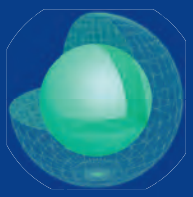

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