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There has been considerable interest recently in mini free-fall lifeboats. This one shown undergoing tests is a VG67FF model from Vanguard Composites Engineering, and is capable of holding 36 people. It can be dropped from a ramp 20m and above the sea. More details of this and other advances in the safety world appear in our special feature which begins on page 38.

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Korean shipyards in top gear

NOTWITHSTANDING the continuing complaints of shipbuilders in Europe, yards in Korea continue their amazing drive forward and upwards. At the time of writing this column, most yards have contract lists that make those in western Europe look decidedly pale and no doubt green with envy. The energy of Korea's marine industries has resulted in new orders being placed last year which totalled, according to the Korea Shipbuilders' Association, 16.7 million compensated gross tons - an increase of 120% over 2002 and the highest annual figure for 10 years.

This total made Korea's share of global new contracts 43.8%, compared with 28.6% for Japan, 12.6% for China, and 8.7% for members of the Association of West European Shipbuilders. At the year-end, the country's total order backlog stood at 26.4 million compensated gross tons, up an amazing 54.7% compared with the previous year.

Whatever the pros and cons of competitors' arguments, one cannot fail to admire the resounding achievements that have been made in Korea by dint of hard work and investment in the newest technology, and yes, highly competitive prices. Today, this country leads the world in construction of some of the most advanced merchant ships, such as LNG carriers and super-large container liners, as *The Naval Architect* was able to witness during a recent visit.

Nevertheless, it has not been roses all the way, as occasional violent strikes, the financial difficulties of Daedong (today much improved as STX), and the collapse of Halla a few years ago prove; the last-mentioned yard is, of course, today reformed under the Hyundai umbrella as Hyundai Samho. At the same time, the eye-popping achievements of Hyundai Mipo Dockyard, formerly a world leader in repairs and conversion, but today up amongst the top shipbuilders with, at

Symbol of Korean success: the 8100TEU container liner CSCL Europe, one of the first in the series of very large ships for Seaspans and for charter to the China Shipping Group, is seen here at the beginning of July at the outfitting quay of Samsung Heavy Industries.



August 1, a total order list of 147 ships, astound. Throughput is expected to be even better when a further drydock is released for new construction, and with the coming on stream of a brand-new section-building hall in another part of the country. In fact, it is the amazingly speedy throughput that is today achieved by Korean yards for most ship types which is one of the most stimulating features for owners in a hurry.

New moves such as those by Hyundai Mipo would appear to indicate that the country is still not satisfied and believes that further revenue can be squeezed from owners, especially on the back of the current tanker boom. Amazingly, new yards are still opening in the small ship sector - and winning orders from European owners.

A typical example is STX (the former Daedong company), which is resurrecting its featherweight and old yard in central Pusan (rented out for shiprepairs in recent years) to build smaller ships that it cannot construct economically at the large Chinhae 'greenfield' site - up to around 11,000dwt. A contract has already been secured from the Danish Clipper group for a series of 11,000dwt product/chemical tankers.

Another rising star is the new 21st Century Shipbuilding at Tongyoung; although not a member of the Korea Shipbuilders' Association, this modest yard has succeeded in winning chemical tanker contracts from Norwegian and Greek

owners. It has always been fascinating to this journal that respected European owners will often place orders for relatively advanced ships in Far East yards, including China, which have apparently only short experience or little international standing.

At the other end of scale, as we noted in two of our recent special supplements - *Samsung: Pioneering New Shipbuilding Technology* and *Design and Operation of Gas Carriers*, Korean yards are certainly among the very top worldwide as builders of technically complex LNG tonnage. This leading position as number one in the field is almost unquestionably to be maintained in the years ahead - particularly if the prime trio, Hyundai, Daewoo, and Samsung, win all or part of the much-heralded QatarGas contract for a series of 200,000m³ designs. These will be the largest ever LNG ships ordered anywhere. Also waiting in the wings are new designs for transporting compressed natural gas (CNG) or pressurised natural gas (PNG).

Despite this optimism, all yards will acknowledge the threat of China across the Yellow Sea and are keeping a wary eye open. Like others before them, some have tried to counter any rise in prices by opening factories or steelwork plants for hull sections in that country, although it is interesting to note that Shina Shipbuilding did not find this to be a success (apparently, owners refused to allow their steelwork to be welded there).

One threat to this rosy scene may be the alarming price increases that have been witnessed everywhere in the steel industry. The Korea Shipbuilders Association has been having meetings with Pohang Steel (POSCO) to try and persuade the company not to raise prices further and to increase throughput; at the beginning of July this year the price was around US\$450/tonne, compared with US\$300/tonne during the first quarter of 2002. According to the association, total demand in the current year for steel plate for Korean yards is 4.4 million tonnes and this is expected to peak in 2006 at 5 million tonnes. Domestic steelworks are expected to supply 75% of that, with the rest imported from Japan and Brazil. Steel represents 14% of most ships' cost, so controlling that portion is essential.

It should not be forgotten that the nine major yards that make up the Korea Shipbuilders Association, and those non-members, are ably supported by a band of domestic equipment manufacturers - apart from those machinery divisions within the major yards. Many of these, eg, KangRim and NK Co, are also actively exporting their wares. Today, more than 90% of a typical ship's equipment inventory can be produced locally.

It is true that the Korean government supports shipbuilding (if not directly then indirectly and certainly morally) but then so does the government of Japan, and the government of China. European shipbuilders should be pleased to note that The Korea Shipbuilders' Association has stated that all government subsidy and intervention should be eliminated, while a final report on the on-going trade disputes between Korea and the European Union and the World Trade Organisation, also on restructuring aid to shipyards, is expected by the beginning of November this year.

As Irek Karaskiewicz, from the Polish Remontowa yard, points out in his letter to the editor on page 37 of this issue, if European yards cannot compete on current terms, maybe they should be taking a leaf out of their competitors' book, or be canvassing for a cabotage similar to the US Jones Act. Alternatively, maybe they should study the investment and technology employed so successfully in Korea. 

A special report on Korea begins on page 13 of this issue.

20% less fuel for CRP Azipod ferries

FUEL savings of some 20% are being claimed for the new Japanese fast ferries *Akashia* and *Hamasu*, which are the first ships to be powered by the ABB contra-rotating (CRP) Azipod concept; one of the installations was illustrated on page 22 of our July/August issue. The new full-displacement duo for **Shin-Nihonkai Ferry** have only been in service since June when they were delivered from **Mitsubishi's** Nagasaki yard, and they are sailing on the Maiduru to Otaru route (Honshu to Hokkaido islands), a distance of 1061km; the voyage takes 20 hours on the outward leg and 21 on the return journey. Service speed is 30.5knots.

The figures obtained (after three months operation) have been made from a comparison with the operator's existing fast ferries *Suzuran* (*Significant Ships of 1996*) and *Suisen*. These have two conventional shaftlines each driven by a Pielstick 18PC4-2B medium-speed engine, and temporarily travelled on the same route as the new ships at a service speed of 29.40knots; however, ship capacity is around 20% less.

The new pair, which each has an Azipod with fixed blades mounted behind a mechanically driven CP propeller (two Wärtsilä 12V48C engines), plus two further engines of the same type driving alternators to generate current for the Azipod motor. Operating costs for the new ferries are expected to be further reduced through decreased maintenance and spare parts.

FAST FERRY ORDER FOR FINCANTIERI

- A contract to build a fast monohull ferry, with construction to the IMO HSC 2000 code, has been won by Fincantieri from the Swedish operator Rederi AB Gotland, which already runs a similar craft built in France. The new ferry will be assembled at the Riva Trigoso yard in Genoa and will be the fifth ship of this type for Baltic Sea operations; two are operating for the Finnish operator Silja Line, and two for the Estonian company Tallink.

The hull will be 122m long, 16.65m wide, and will be powered by four 9000kW MAN B&W 20RK280 diesel engines driving four Rolls-Royce Kamewa waterjets through ZF 6000 NRH gearboxes; catalytic converters will be fitted to the engine exhaust lines to meet Swedish environmental regulations. Service speed is expected to be 36knots, with a maximum of 40knots. Deadweight will be around 600tonnes, and the ferry will have capacity for 800 passengers, plus 160 cars and eight buses. Delivery is expected to be early in 2006.

US PATENT FOR COIL CRADLE - The special tweendeck invention from Langh Ship for transporting steel coils has been granted a US patent, following grants in Europe, Taiwan, and South Africa. This tweendeck cradle, developed in association with MacGregor, was featured in *The Naval Architect* February 2003, page 66; it

Langh Ship's interesting tweendeck cradles for efficient transport of steel coils, for which a US patent has just been granted, are seen here on one of the Swedish company's ships.



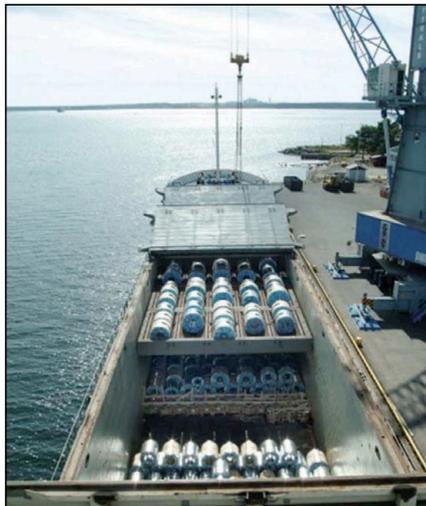
Seen here just prior to her launch in August at Admiralty Shipyards in St Petersburg, Russia is **Tower Bridge**, the third of six 47,200dwt products tankers ordered from this yard by Sovcomflot. She will be delivered in December. The lead ship in the series, **Troitsky Bridge**, was featured in *Significant Ships of 2003*.

has proved very efficient in practice and has speeded up cargo handling and reducing damage. Langh uses the system on its seven ships.

NEW NAME FOR FINNISH YARDS - As part of the restructured Aker and Kvaerner group shipyards in Finland, Masa-Yards and Finnyards will merge to become Aker Finnyards. Masa-Yards will acquire Aker Finnyards' share capital, and the present Aker Finnyards will change its name to Aker Finnyards Rauma and function as a subsidiary to Aker Finnyards until next year, when it will be merged into the main company.

At the same time, welcome and most interesting contract news comes in the form of an order from the Russian owner MMC Norilsk Nickel for a 14,500dwt Arctic container ship to operate along Russia's northern sea route, carrying minerals. The design has been developed by Masa-Yards using its Arctic expertise and knowledge gained with the SA-15 class built in the 1980s by the then Wärtsilä and Valmet yards.

This new ship will feature the ABB/Masa double-acting concept (navigating astern in ice and use of Azipod propulsion) and will be able to carry 650TEU. It will be built at the covered Helsinki site for delivery in early 2006, and is expected to be a prototype for an eventual series.



Classification will be to Russian Maritime Register standards, and the hull will be able to break ice 1.5m thick.

The new Finnish company has also confirmed that it will build a second Ultra Voyager cruise liner for Royal Caribbean International, and in addition will construct a new Arctic research centre with a 70m long ice model basin, possibly at the site of the former Vuosaari shipyard close to Helsinki. The main reason for the new investment is that the future of the current MARC laboratory is uncertain because the lease is running out.

NEW RECORD FOR PROPULSION SYSTEMS

- The current boom in newbuilding orders is reflected in a forecast by the UK consultancy Douglas-Westwood that the shipbuilding industry is likely to spend US\$5.3 billion on propulsion systems in 2004. Over the period up to 2008, US\$27.2 billion is likely to be spent, compared with US\$22.4 billion in the previous five-year period - an increase of 21%. Writing in its new survey, *The World Marine Propulsion Report 2004-2008*, the company believes that, by 2008, China will account for 13% by value of main engine installations.

NEW PRE-CALCULATION MODULE

- A new add-on module for performing pre-calculations in Logimatic's MARS shipyard production software is now available. This module supports the process of performing a smooth and effective pre-calculation for potential contracts based on estimates of prices for materials and time. Also in-built is a function for financial calculation, which will eventually form an offer than can be sent to a client. Next January, Logimatic also plans to release MARS v/6.1, which will feature various improvements. ☞

PEOPLE

CARL-HENRIK BJÖRK has been appointed vice-president, sales in Wärtsilä's ship power business, based in Trieste, Italy. ☞

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Tridock - a remarkable workhorse

This bold French design, which can be adapted to a variety of uses, is primarily intended for commercial operations, particularly in remote areas. The Tridock's three main variants are: ocean-going cargo carrier, landing barge, and floating dock*.

THE use of maritime transportation in isolated areas often faces the problem of accessing coastlines without any infrastructures. Away from port areas (with quaysides, sufficient draught, pontoons, and cranes), only special landing craft with shallow draughts have access to the coast to unload/load vehicles and cargo.

These types of unit usually have a limited deadweight and can only reach a coast within a small range in calm seas and at low speed. The repair and maintenance of these craft require a harbour/port close by with infrastructures or a floating dock.

The goal of the Tridock project is to provide a vessel capable of carrying heavy loads in rough seas whilst offering a landing capacity in isolated areas, without external support or infrastructure.

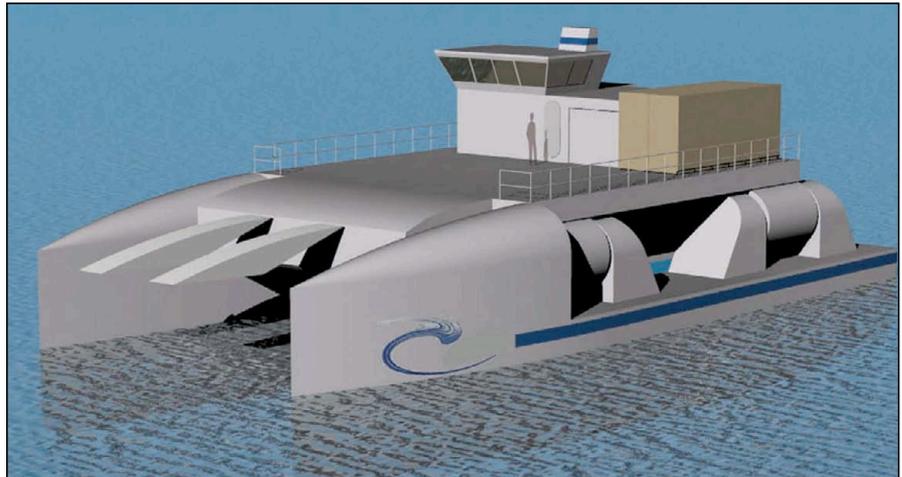
During the design development phase, the capacity of self-maintenance has been added to the two initial functions, hence giving birth to an 'all-in-one' unit, combining deep-sea catamaran, shallow-draught landing barge, and floating dock facility - also for self-docking.

Initial requirements

In order to increase the deadweight capacity for landing, the barge-type unit is a good compromise. The draught limitations of larger vessels with a heavy cargo do not enable them to unload directly onto the beach. The only way to counter the lack of capacity is to increase the waterplane area.

By using a very large platform with some trim aft, it is possible to approach the shore with heavy cargo. The slope of a landing beach is a constraint on calculating the maximum deadweight capacity of the barge. When loaded directly from the shore, the barge will release its forward water ballast to remain within draught allowances.

Conventional landing craft are neither designed to transit in heavy seas nor to make trans-ocean crossings. Their speed is usually limited around 10knots, and they operate at short range from other vessels under sea state 3 conditions. A small freeboard prevents these units from operating above such conditions and from accessing difficult beaches. A large barge with a significant freeboard and



The Tridock seen in its ocean-going catamaran form.

ALTHOUGH the adventurous French Tridock design was first presented (at The Royal Institution of Naval Architects' recent Warship 2004 conference) for military use, the prime intention of the inventor, Marc Lebrun, from Trides, based in Bolbec, near Le Havre, that this should be employed as a commercial concept. A Tridock comprises a rectangular barge-type hull, hinged to two side hulls, whose prime format would be ocean-going cargo carrier but which, by transferring ballast, can be metamorphosed into a landing barge, or even into a floating dock! Since operations are often expected to be in remote areas, no high levels of technology would be employed on board.

Ideal employment of this remarkable 'catamaran' type design (for which a patent has been applied; the patent includes the special control system) would be transporting one-off heavy project cargoes to remote locations or being used as a pipelayer, working right up to a beach - a principal technical feature is the very shallow draught (down to 1m or less depending on the hull length and trim). This ability is possible by employing what is probably a unique variable-geometry construction; the adjustable draught is achieved solely through the use of hydrostatics - no hydraulics are involved. At first glance, the impression might be gained of a short-haul shuttle vessel, but this is not true: a Tridock is intended to be a full ocean-going hull, with excellent lifting capacities.

Technically, there is no limit to the length of the two hulls, although Trides foresees the most attractive sizes falling within lengths of 50m and 150m, with larger sizes believed to be the most attractive to commercial operators. As an indication of possibilities, a 30m long Tridock could carry 150tonnes or eight 20ft containers, alternatively one of 120m length (10,000dwt) would have a payload of between 7000tonnes and 8000tonnes.

Another possibility is employing Tridocks as cruise liner tenders capable of amphibious movements. As the accompanying extracts from the paper reveal, a small 1000kg deadweight demonstrator has been built and tested - particularly for docking operations - on a lake. Financial support is being given by the French Ministry of Research.

Despite unusual looks of a Tridock, the whole concept is based on proven technology, particularly the hinges, which are modelled on those used by split hopper dredgers. Propulsion power is expected to come from waterjets, whose pumps can be harnessed for transferring ballast. Improvements from the basic concept are expected through eventual optimisation of the hulls, which are based on the displacement catamaran concept and featuring good stiffness characteristics. Trides emphasises that carrying performance is not degraded by transformation to any of the three alternative modes. ⚓

sufficient length is less dependent on the wave breaking conditions, and can land if the aft draught in the trimmed condition remains sufficient.

Tridock's concept

The objective of the project is to find a unit capable of matching the above requirements by carrying heavy loads by sea on long distances while having a landing capacity to

reach coasts in isolated areas, and this without external support or infrastructure. The unit should be based on existing technology and provide a reliable solution fulfilling these requirements. Initial investment cost and operational cost are also to be considered, and standards for commercial ships should be used.

The floating unit proposed to achieve this complex goal is a rectangular barge, equipped

* Extracts from the paper 'Tridock', presented by M Lebrun, of Trides, France, at The Royal Institution of Naval Architects' international conference Warship 2004: Littoral Warfare and the Expeditionary Force, held in London on June 8-9, 2004.



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with two side hulls rotating along a longitudinal axis, which, by a combination of ballast transfer, changes simultaneously into three different configurations.

The new concept named as Tridock is based on fundamental hydrostatic principles and commonly used technologies within the maritime environment. The innovative aspect is the fact that the Tridock brings together the advantages of various ship types while maintaining the performance of any individual configuration.

The advantages of a Tridock are numerous but rely mostly on the use of proven technologies, simplicity of design, and capacity to cover many fields of application in the same unit, thus providing a real advantage on operational savings. These benefits include:

- use of proven and conventional technology
- no large hydraulic power units (ballast system)
- heavy lift and ro-ro capacities
- reduction in mobilisation and demobilisation times
- simultaneous introduction of many applications up to now incompatible
- 'all in one' investment, reduction of construction and exploitation costs
- opening up new opportunities which up till now have not been exploited (access to isolated reef islands)
- autonomy of access to the shore and remote locations
- capacity to maintain other floating units
- capacity to move heavy loads from below the waterline to a quayside or onto the shore and viceversa.

Optimisation process

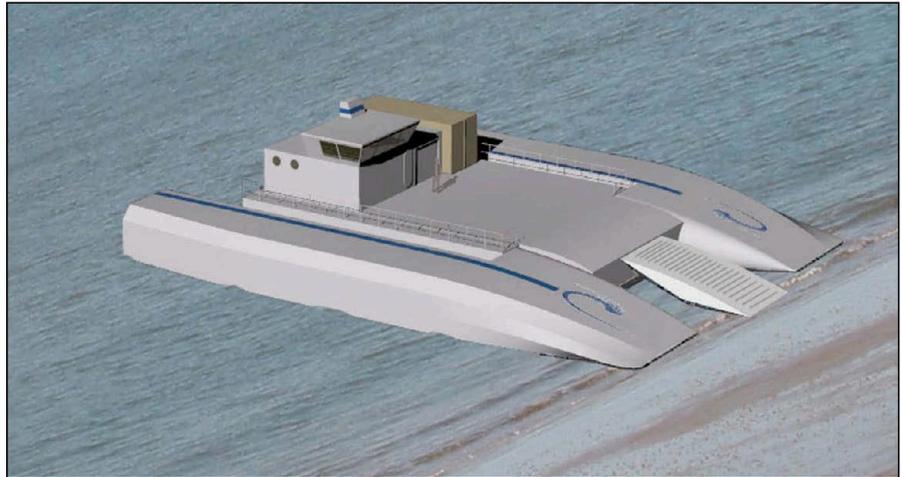
Referring to the initial requirements, the main dimensions of the Tridock had to be optimised in order to secure the maximum deadweight capacity simultaneously for the three configurations. Using a set of non-dimensional ratios, a solver is used to find optimum solutions for a given length.

The same process is used to find out the minimum length and related dimensions for a given deadweight. The set of equations is related to the hydrostatic and hydrodynamic behaviour for the various configurations, keeping in mind that speed and seakeeping performances of the catamaran prevail on the lifting capacity of the floating dock.

To optimise the Tridock and to visualise its dimensions, a parametric model was built. This model was used to calculate the hydrostatics and speed/power performances of the catamaran configuration. Some structural analyses were also performed to assess stresses in longitudinal bending for the landing barge configuration. Production drawings of the technology demonstrator were edited directly from the model.

Draught forward will be kept within the range 0.75m to 1.5m to be able to deploy the ramp. A forward draught of not more than 1m is required for the loading and unloading of vehicles.

The deadweight carrying capacity of a landing barge as a function of length is shown



An impression of the revolutionary Tridock, seen here in the barge format for loading or discharging cargoes on a beach.



The demonstrator Tridock seen during trials in its catamaran form.

in the accompanying illustration (page 11). The set of curves represent the maximum deadweight for a given forward draught in the trim condition.

The optimisation target of the solver was to find out the minimum standard deviation value for the deadweight capacity on each configuration for a given hull length. The maximum deadweight capacity is found for a 100m hull length, as shown in the illustration. The lightship is calculated for this length as well as the maximum displacement for every configuration: catamaran, barge and dock. The three curves then represent the best overall deadweight carrying capacity for the combined solutions. It may also be possible to use the same solver for only two of the above-mentioned configuration.

Technology demonstrator

During the design process, a technology demonstrator was required to validate the principles of this new concept. This helped to

visualise selected solutions and support the engineering team in finding the best alternative to demonstrate the technology. The Tridock demonstrator is capable of covering the three configurations.

The demonstrator proved the practical aspects of the concept, and assisted the marketing team in demonstrating for potential end users the practical benefits.

A wood/epoxy demonstrator, 5m long, with a 1tonne deadweight capacity has been built. Each component, platform, and two hulls, has three separate water ballast sections linked to a control system. An independent water pump is mounted on the bridge deck, and a separate outboard is fitted at the stern for propulsion. Each of the 12 water ballast tanks is manually controlled through a set of valves placed on the superstructure.

Trials

Earlier this year, the technology demonstrator was tested during a week of trials and

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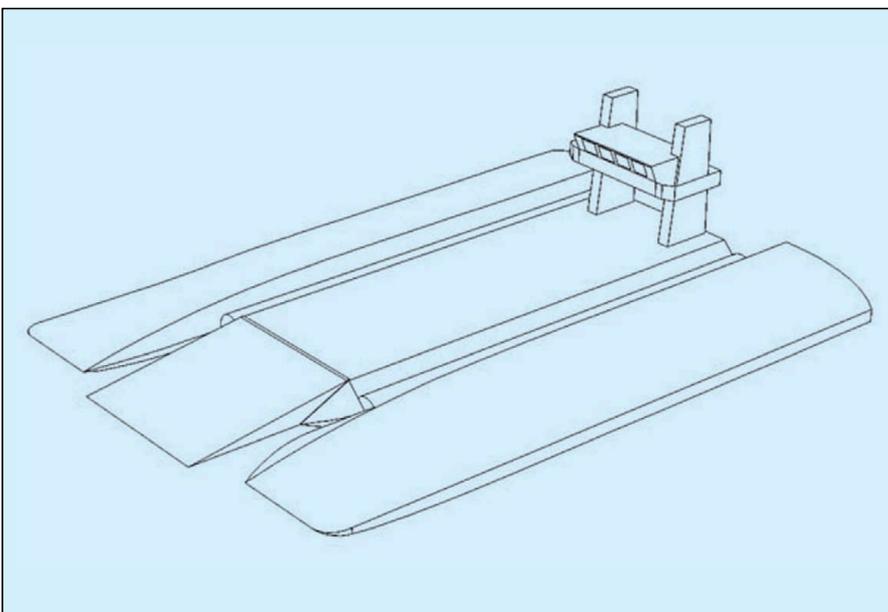
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The demonstrator berthed on the shore for cargo loading and discharge.



The demonstrator Tridock converted for use as a floating dock. The variable geometry is achieved through hydrostatics and uses similar hinges as used on split hopper dredgers.



performed even better than expectations. Each configuration was tried independently and every transition (both ways) was tested successfully.

The Tridock changes from its catamaran configuration to a landing barge through water ballast exchange only. No hydraulic assistance is required.

The trials have been performed in loaded condition for:

- navigation in the three configurations
- loading/unloading at quay level
- transition from catamaran to barge
- landing on a beach for loading/unloading
- transition from barge to catamaran
- transition from barge to floating dock
- floating dock lifting capabilities.

The deadweight capacity of a Tridock is given in the accompanying diagram (page 11). It represents the maximum deadweight carrying capacity for the three combined functions. Due to the large waterplane area provided by the combination of the platform and the two hulls, the carrying capacity of a Tridock is well above the deadweight capacity of any landing craft of the same length.

Lifting performance

A Tridock has outstanding lifting capacity. The position of the vessel's main deck can actually vary from below sea level up to the quay height. The only unit capable of such performance today is a shiplift, but that remains in a fixed position.

The Tridock can move around freely with its loaded cargo or vessel, and may be used in places where such lifts cannot be built. When considering investment cost, a Tridock represents only a fraction of the costs required for a fixed facility.

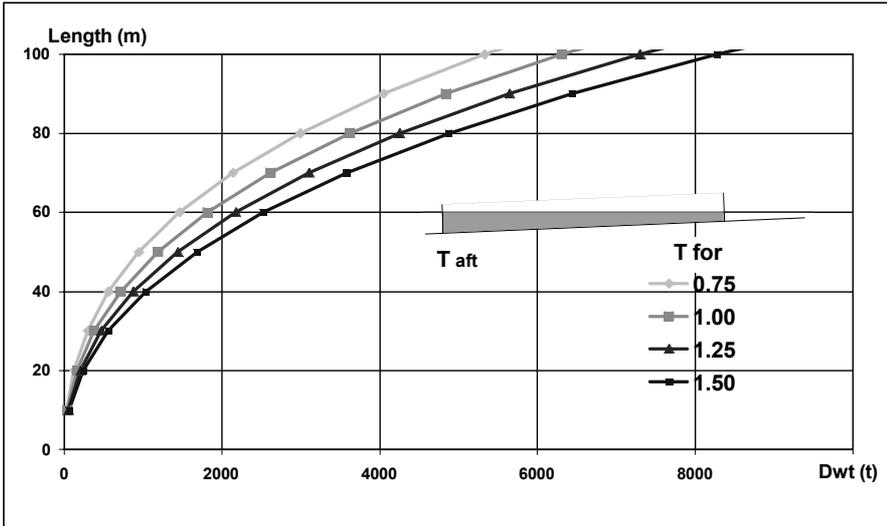
Maintenance and salvage

A Tridock has the full capacity to be used as a standard floating dock, within a port area or at sea, to lift vessels out of the water for drydocking, with the additional benefit of being able to do its own drydocking - and all this without any external support! Any part of its own hulls can actually be lifted out of the water for maintenance or repair. Assuming a proper stability requirement with a vessel on deck, a Tridock, in a catamaran configuration, can transit a loaded vessel anywhere in the world for repairs. Additionally, a Tridock may be used for ship salvage anywhere. It can also lift a damaged vessel to quay level.

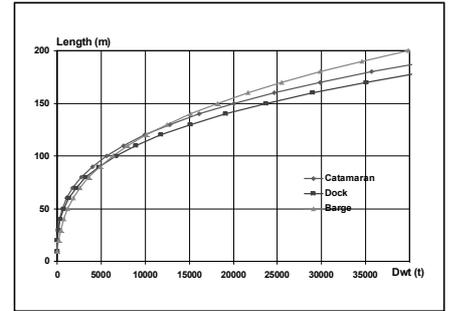
Application scope

The commercial prospects are as vast as the field of application. The issues are multiple and will now make it possible to transit any cargo and vehicles from developed countries to virgin areas. The applications cover any kind of industrial activities from military purposes to tourism, pipelaying activities, offshore contractors, dredging activities, and port and coastal engineering.

The sidehulls re-arranged by hydrostatics for the beach mode.



The deadweight carrying capacity of a landing barge as a function of length. The set of curves represents the maximum deadweight for a given forward draught in the trim condition.



The best overall deadweight carrying capacity for the three Tridock modes.

One of the major challenges is to provide a simple and inexpensive means of sea transportation to countries where initial investment for coastal engineering is a problem. Another application is to relieve congestion of road transportation by providing an ad-hoc coastal service.

Being able to drydock any ship anywhere could be attractive to many operators, without forgetting

the capacity of the Tridock to be used as a lifting platform, transferring heavy loads from a quay to the shore.

Conclusion

The Tridock concept offers a new way of looking at marine transport. The technology demonstrator has proven the viability of this

innovative concept and has also showed the performance of an outstanding means of transportation.

The concept relies on simple principles and requires only conventional and proven technologies. A Tridock covers functions simultaneously which were until now incompatible in an 'all-in-one' investment. It will reduce construction and exploitation costs when compared with conventional options currently available. Moreover, the Tridock shows increased operational safety and unrivalled maintenance capacity. Further studies are being undertaken to assess the operational limitations of the concept, especially regarding the sea state condition for landing.

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Almarona: first LPG tanker completed by STX

AS part of a continuing campaign to diversify into more value-added contracts, STX Shipbuilding was successful in winning orders for two LPG tankers from Qatar Shipping. The first of these, and the first such ship to be built in this medium-sized Korean yard based at Chinhae, was completed in May. *Almarona* is a 23,000m³ design and will be followed by her sister in December this year. The newly delivered vessel is sailing on a five-year charter with Qatar Fertiliser Co, transporting Qatari ammonia to India and countries in the Near East. STX, which had 100 vessels on order at July 1 this year, has already diversified from its bulk carrier and product tanker base into container ships, as we reported in our 2003 and 2002 features. Nevertheless, product tankers still form the main backlog - at July 1 the total was 71, plus six Panamax bulk carriers.



Almarona is the first of two new 23,000m³ LPG tankers - the first of this type to be built by STX - for Qatar Shipping.

The new LPG designs were created in association with the German gas handling specialist Tractebel Gas Engineering (TGE), which supplied a complete equipment package, including not only the pumps, valves, and skid-mounted modules but also the three prismatic IMO Type A cargo tanks able to load LPG as well as VCM and NH₃ cargoes. The tanks were fabricated at a special facility operated by Tractebel in the Jiangnan Shipyard, Shanghai, China.

In addition, TGE supervised construction of the cargo-handling plant and carried out pre-commissioning, commissioning, and performance tests. A subsidiary company, Tractebel Marine Engineering, additionally

designed the critical steel structures in the vicinity of the cargo area, as well the cargo tanks themselves.

TGE will supply a similar package for the sister tanker but this will differ in one aspect - the ship will additionally be fitted with deck tanks to allow gas changes between cargoes, thus increasing the ship's flexibility.

The tanks in the hull of each tanker are made from low-temperature carbon steel (NV2-4) and

TECHNICAL PARTICULARS QATAR 23,000M³ LPG TANKERS

Length, oa.....	164.80m
Breadth.....	26.20m
Depth.....	15.30m
Draught.....	8.40m
Deadweight, max.....	17,000dwt
Cargo capacity.....	23,000m ³
Main engine...STX-MAN B&W 6S50MC-C	
Output.....	9480kW at 127rev/min
Speed service at 85% MCR...	16.50knots
Classification.....	Det Norske Veritas

All three IMO Type A prismatic cargo tanks and the complete gas-handling package for *Almarona* were supplied by the German specialist Tractebel (TGE).



TECHNICAL PARTICULARS CLIPPER 11,000DWT TANKERS

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.....	10,250dwt
Deadweight, scantling.....	11,000dwt
Cargo tanks.....	12,400m ³
Slop tanks.....	600m ³
Water ballast.....	4500m ³
Heavy fuel.....	650m ³
Diesel oil.....	.55m ³
Tankcleaning fresh water.....	100m ³
Main engine.....STX-MAN B&W 6S35MC	
Output, MCR.....	4440kW at 173rev/min
Complement.....	20 plus 4 Suez crew
Flag.....	Bahamas
Classification.....	ABS

are designed for a working temperature of -48°C at 0.25bar pressure; the stainless steel AISI 316L piping is arranged so that two segregations are possible. Cargo is unloaded by six multi-stage deepwell pumps of 350m³/h and two 350m³/h booster pumps, all driven by deck-mounted motors.

The reliquefaction system is a direct-cycle type utilising three Sulzer compressors, and inert gas is generated in two plants: a combustion type of 2000Nm³/h capacity at 99.5% purity, and a membrane-type plant of 100Nm³/h. Both tankers are being classed with Det Norske Veritas, and model tests were carried out at the KRISO tank in Daejeon.

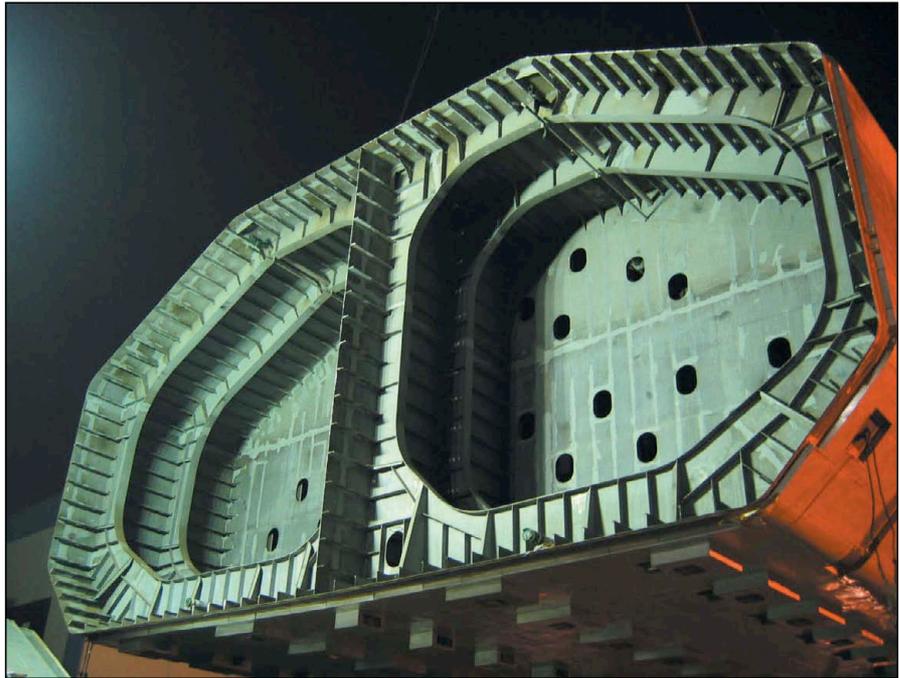
Busan yard to re-open for small-ship construction

Another notable move at STX is a recent decision to re-open its original shipyard in central Busan. This was the base yard of Daedong (as STX was formerly known) prior to the move to the greenfield site along the coast at Chinhae.

This is a small site with sloping berths and a maximum capacity of around 11,000dwt, and has for several years now been leased out for shiprepairs; however, in line with a booming tanker market, STX considered it to be useful to expand into the small-ship sector, where it anticipated opportunities to penetrate the niche sector for vessels such as small product and gas tankers under 10,000m³ capacity.

Remarkably, this decision already seems to have paid off, for the yard has secured a contract from the Danish Clipper group for four 11,000dwt product/chemical tankers, plus options, to be built at Busan. These high-specification ships, designed in association with the owner, will feature five pairs of pure-epoxy-coated tanks, plus two for slops, each served by a submerged hydraulic cargo pump (10 x 300m³/h and 2 x 100m³/h). Total cargo capacity, including the slop tanks, is 12,400m³. Water ballast tanks will be coated with ordinary epoxy paint.

A modest service speed of 13.70knots will be provided by an STX-MAN B&W 6S35MC engine of 4440kW MCR at 173rev/min, and



The prismatic cargo tanks for *Almarona* and her sister have been fabricated in China at a special site operated by Tractebel in the Jiangnan Shipyard, Shanghai.

three 450kW diesel-alternators will be fitted. Deadweight has been maximised on the limiting overall length of 116.50m and 20.00m breadth.

Recent investment at Busan has included covered sliding roofs for the two main berths (three smaller open ones are also available), and around 400 people will be directly employed on building the Clipper vessels. Delivery of the first tanker is planned for January 2006, with the remaining vessels following at two or three monthly intervals.

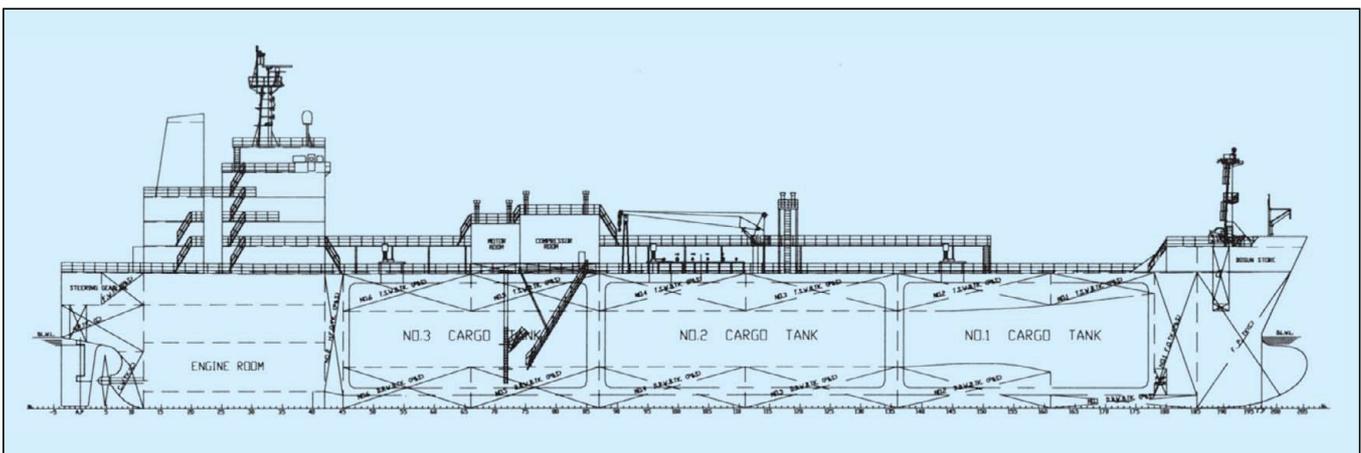
Plans for 5000TEU container liners

STX has already built five container ships of 2602TEU capacity, an example of which is *CMA CGM Claudel*, presented in *Significant Ships of 2002*, and has a substantial order book

for more ships of this size, plus others of 2800TEU and at least eight larger ones of 3500TEU - all for German owners. The total number of container ships at July 1 was 22. However, the yard is now planning much larger liners.

The yard's design office has drawn up plans for ships of 5000TEU (2254TEU in the holds and 2786TEU on deck), a size for which strong demand is anticipated; the 5000TEU includes space for 440FEU refrigerated boxes on deck. At a scantling draught of 13.65m, the deadweight is 68,100dwt. Service speed is planned to be 24.30knots on a design draught of 12.00m, with the main engine being an STX-built MAN B&W 9K90MC low-speed engine of 41,130kW.

Profile of the new 23,000m³ LPG tankers being built by STX for Qatar Shipping.



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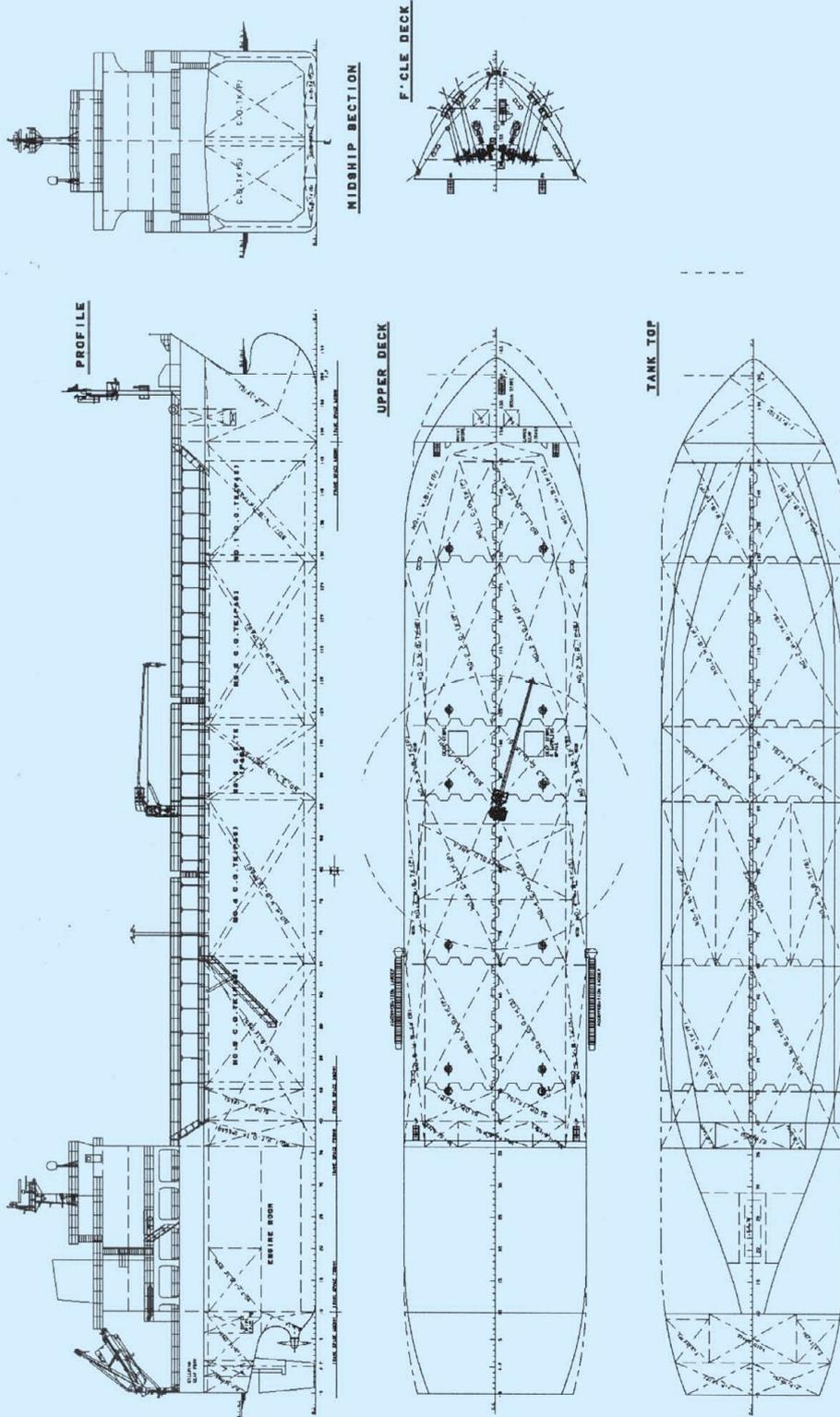
World Largest Container Ship
"CSCL ASIA"(8,500TEU)



SAMSUNG

SAMSUNG HEAVY INDUSTRIES

General arrangement plans of the new 11,000dwt product/chemical tankers to be built at STX's re-opened Busan yard for the Clipper Group, from Denmark.



The Royal Institution of Naval Architects

EUROPEAN SHIPBUILDING, REPAIR AND CONVERSION - THE FUTURE

2-3 November 2004, London, UK

Second Notice

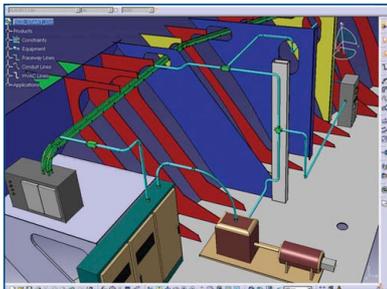


IMarEST



Organised by The Royal Institution of Naval Architects (RINA) and The Institute of Marine Engineering, Science and Technology (IMarEST) on behalf of the Confederation of European Maritime Technology Societies (CEMT) Supported by the EU, ESCA and CESA

Over the past 30 years, the European shipbuilding, and repair conversion industry has seen substantial rationalisations, mergers and consolidation. While there has been a reduction in market share, the industry has enjoyed relatively greater success in the high added value specialist vessel, shiprepair and the marine equipment sector.



Against a background of increasing shipbuilding capacity in China and South Korea continuing arguments on shipbuilding subsidies, how can the European maritime manufacturing sector maintain and increase its market share? Through the "LeaderSHIP 2015" initiative, the European shipbuilding and shiprepair industry has defined a long term strategy to develop appropriate policies to strengthen the competitiveness and ensure sustainable growth of the industry. This strategy envisages a knowledge-based industry for both product and production process, concentrating on more complex vessels. Research, Design and Innovation (RDI) is a key factor in this strategy.



In order for the European shipbuilding, repair and conversion industry to maintain and improve its competitiveness, it is essential that it develops and employs the latest technologies in design, engineering and production. The *European Shipbuilding, Repair and Conversion - The Future* conference will provide an opportunity to examine the future needs for RDI, and to present current work in that and related sectors.

This conference will cover such areas as:

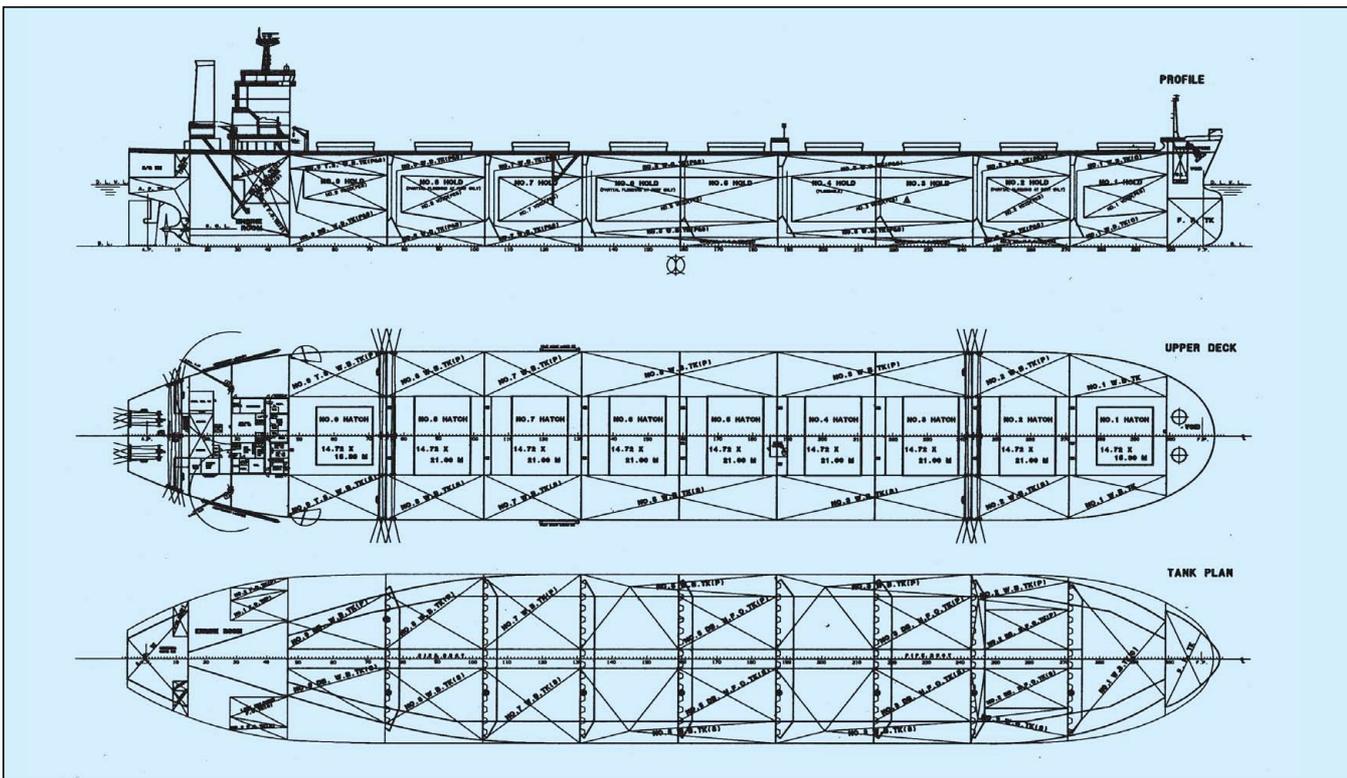
- Future demand for new construction, repair and conversion
- Research and innovation within the industry
- Design support technology
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New double-hulled bulkers from Daewoo



General arrangement plans of the double side-skin Capesize bulk carrier *Anangel Innovation*, delivered by Daewoo in July this year.

FOR a decade now, the leading Korean shipyard Daewoo Shipbuilding & Marine Engineering has been interested in the philosophy of double-skins for larger classes of bulk carrier. As noted in our March 2004 issue, page 28, two European companies, Louis Dreyfus, from France, and the Greek operator Anangel Maritime Service, have placed orders for a series of Capesize ships with double side-skins at this yard. Two other ships have since been ordered by Korea Line.

The first of these new-generation designs is the first of a quartet of 171,900dwt hulls for Anangel, named *Anangel Innovation*. This ship has the typical nine holds of a bulker of this size, with seven wing and double-bottom tanks port and starboard for water ballast. Heavy fuel is carried in engineroom side tanks and in the double bottom under hold Nos 2, 3, and 5; those tanks in the machinery space are separated by longitudinal bulkheads for environmental protection (a different philosophy for the position of fuel tanks is discussed in an article by Dr Peter Cheng in our May issue). Model testing was carried out at the SSPA tank in Gothenburg, Sweden.

The steel structure (55% of which is composed of high-tensile steel) is designed for a fatigue life of 30 years, in accordance with the 2003 rules of American Bureau of Shipping, with whom the Anangel series is being classed. The design also complies with the newest regulations of the International Association of Classification Societies - specifically UR S17, S18, S21, S25, S26, S27, and S28, as well as SOLAS Reg XII-

12/13. At the hold sides, the double-skin construction is 1.65m wide, and in the double bottom, 2.4m.

Unlike some competing models, this Daewoo bulker does have a short forecastle - a feature considered by some to be a most useful feature in preventing green seas breaking over Nos 1 and 2 hatch covers. Ballast water exchange management is based on heavy ballast conditions 'with half bunker' in No 4 hold (flow-through method) and water ballast tanks (sequential method).

All hatch covers are of the open web construction type and designed by MacGregor for side-rolling operation, and the deck machinery is of the low-pressure hydraulic type designed by Fukushima.

Hatch covers meet new IACS rules

These new Capesize designs for Anangel, Louis Dreyfus, and Korea Line are additionally among the first to be built to meet the new rules for hatch covers governing vertical and horizontal sea loads, according to IACS UR S21 Revision 3. MacGregor has designed the hatch cover systems and has delivered key components.

Each installation includes side-rolling twin-panel hatch cover panels opened and closed by a rack-and-pinion drive, once they have been raised into the rolling position by Roll-up-roll mechanisms. Other components are MacGregor's FlexiPad supports and FlexSeal-type rubber joint packing.

Cargo capacity is arranged in nine holds, each served by a MacGregor set operated by a

hydraulic motor and rack-and-pinion drive system. In the open position, the panels are stowed to port and starboard on transverse ramps,

TECHNICAL PARTICULARS ANANGEL INNOVATION

Length, oa	289.00m
Length, bp	279.00m
Breadth, moulded	45.00m
Depth, moulded to main deck	24.30m
Draught, design	16.50m
Draught, scantling	17.90m
Deadweight, design draught	155,200dwt
Deadweight, scantling draught	171,900dwt
Gross	88,000gt
Displacement	196,638tonnes
Cargo capacity, grain	187,000m ³
Heavy fuel	8,000m ³
Diesel oil	250m ³
Water ballast	67,000m ³
Main engine	MAN B&W 6S70MC-C
Output	18,620kW MCR at 91rev/min
Speed, service at 90% MCR, 15% sea margin	15.10knots
Complement	11 officers, 19 crew
Flag	Greece
Classification	American Bureau of Shipping+A1 (E), Bulk Carrier, ESP, Strengthened for Heavy Cargoes, BC-AC, Hold Nos 2, 4, 6, and 8 may be empty, FL(30), GRAB (35MT), SH, SHCM, + AMS, + ACCU, UWILD



has acquired



Environmental Solutions

Zodiac has acquired Evac Environmental Solutions in April 2004. As a consequence Evac Marine has been integrated into Zodiac Marine Segment. This integration enables Evac Marine to develop its worldwide marine business in co-operation with Zodiac.

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Corvettes 621 for Poland

The latest addition to the family is the propulsion gear system for this state-of-the-art design. These corvettes for the Polish Navy are to accommodate advanced MAAG CODAG gear units.



Offshore Patrol Vessels OPV-54 and OPV-64

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The first of this pioneering new Capesize series, *Anangel Innovation*, was delivered by Daewoo in July, and three more sisters will be delivered soon.

and when closing are automatically cleated and made weathertight with a cross-joint at the ship's centreline.

The forward and aft hatch cover sets (Nos 1 and 9 holds) each provide a clear opening 14.72m wide x 15.30m long, while those for Nos 2-8 holds yield openings 14.72m x 21m. The covers are designed in accordance with class rules for carrying bulk cargoes in the holds and for:

- weather loads of 17.2kN/m²
- vertical sea loads of 88.7kN/m² (hatch 1), 59.7kN/m² (hatch 2) and 34.3kN/m² (hatches 3-9)
- horizontal sea loads of 175kN/m².

Additionally, No 4 hold is suitable for carrying water ballast, filled to the top of the coaming; the maximum internal load is estimated at approximately 76.7kN/m².

Hydraulic motors operating the hatch cover panels are mounted at the longitudinal coamings and engaged via a pinion to a rack fitted underneath the panel. Hydraulically-operated self-locking Roll-up-roll mechanisms raise the covers into the rolling position. At each hatch end, a hydraulic

cylinder connected via mechanisms lifts both panels simultaneously up and away from each other into the rolling position; at the same time, the covers are freed from the cleats. Two hatches (four panels) can be operated at the same time.

Automatic wedge cleats batten the covers to the coaming. Heavy-duty wedge cleats are specified for the ballast water hold, No 4, which will also be secured by manually-operated 'hold-downs'. The Roll-up-roll mechanisms are self-locking and automatically secured, and battening in the meeting joints is automatically executed.

An optional mode - not exercised on the Louis Dreyfus ships or the Korea Line two newbuildings - allows the panels to be connected together and stowed to one side, thus leaving approximately half the opening free. Manually-pivoting rail flaps will be arranged to bridge the gaps in the wheel tracks. Furthermore, the hatch covers can be stowed at a position leaving one third of the opening free (but only in sheltered water or harbour conditions). Guidance of the panels during operation is by double-flanged wheels fitted on one end, while special plain wheels on the other end allow for coaming movement.

Sealing between hatch cover and coaming is achieved by MacGregor FlexSeal-type rubber packing, which is fitted to the panel and tightens against a stainless steel compression bar on top of the coaming. Similar packing is used to seal the gap between the cover panels, packing on one section tightening against a stainless steel compression bar on the other section.

The chosen main engine is a Hyundai-built MAN B&W 6S70MC-C. This develops 18,620kW at 91rev/min and drives a nickel-aluminium-bronze FP propeller of 8.3m diameter, which was cast by Hyundai. Electrical power is supplied by three diesel-driven alternators, comprising Yanmar 6N21AL-V engines of 880kW running at 900rev/min and driving Nishishiba alternators of 800kW output. ⚙

First French oil-recovery system fitted to tanker at Daewoo

THE clever JLMD pre-installed device for recovering oil from wrecked or sunk ships has been installed for the first time on a 105,000dwt Italian tanker *Valtamed*, nearing completion at Daewoo's Okpo yard for Navigazione Montanari (Tamoil). The JLMD system, invented by M Jean-Luc Dabi, from the French JLMD Ecologic Group and featured in *The Naval Architect* September 2003, page 128, is aimed at recovering most cargo and fuel oil, particularly from tankers, although the concept is suitable for any other ship type with oil bunker tanks.

Salvors can connect hoses to a system of prefabricated and in-built piping and valves in a ship's hull and pump the recovered oil to waiting tankers, barges, or salvage ships equipped with tanks for recovered oil. The angle of the casualty is not important - piping is installed at all four corners of a tank; water allowed into one pipe forces oil, by hydrostatic pressure, out of another pipe and up to the surface. The underwater connections are made by robot.

By the end of this year, four vessels should have been fitted with the JLMD system, including a tanker for the French operator Socotra; a further 30 ships are awaiting installation, and at the end of August contracts were being considered by owners, mainly Asian agents, for a further 50 ships. ⚙



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KangRim: a major marine boiler manufacturer

ONE of Korea's leading marine equipment manufacturers is KangRim Industries, whose main products are boilers (made in a multitude of formats), economisers, incinerators, and similar equipment. KangRim, visited recently by *The Naval Architect*, occupies a healthy position in supplies to the domestic industry - approximately 80% of each shipyard's requirement in this particular sector. The company's main factory is at Changwon, near Pusan, while a smaller sister company in Pusan, KangRim Insulation Co, deals mainly with insulation materials for gas tankers, as explained in our special supplement *Design and Operation of Gas Carriers*, published last month. This latter concern also makes a range of internal and external deck compositions for ships and offshore structures.

In addition to a positive domestic order book, many contracts are held for exports, and in line with this, a third factory is expected to open in the middle of next year at Changzhou city, near Shanghai, China. This will have an area of 65,000m². Already, boilers have been delivered to China from the Changwon site, to yards that include Wenchong, Jiangdu, and Yangzijiang. Other important markets are the China Shipbuilding Corp yards in Taiwan, and major Japanese companies such as IHI Marine United, Universal Shipbuilding, Mitsubishi, Sumitomo, and Kawasaki. In addition, boilers have also been shipped to Europe for Polish yards.

KangRim operates its own R&D centre to ensure continuing high quality and optimum performance of its products, as well as for the introduction of new models. During our inspection of the modern Changwon factory with its automatic and robotised welding, we saw

New types of auxiliary boiler on test at Changwon.



KangRim is currently developing a new model of waste-oil incinerator. This is seen here during experimental operation.



Part of a KangRim two-drum main boiler, seen under construction at the Changwon plant; this one will be exported to a major Japanese shipyard.

a new type of main two-drum boiler specifically for LNG carriers, also new models of pin-type boilers, new inert-gas and nitrogen generators, and a waste-oil incinerator. Most of these are fitted with burners designed by the UK company Hamworthy, under a technical agreement. KangRim has its own large shop for the production of pin-tubes on an automatic high-frequency line.

Waste-heat boilers and heat-recovery steam generators are products particularly likely to be

major components of new-generation LNG tankers with propulsion plant other than traditional steam turbines, as well as for the offshore industry; it is an emerging market in China for these types of vessel - construction of that country's first LNG carriers is just starting at the Hudong-Zhonghua yards - that was one of the catalysts behind the decision to open a factory in China. KangRim builds all its own control panels at Changwon for the company's various products. ⚓

KangRim occupies a special place in the Korea Marine Equipment Association, since the company's chairman, Mr Myung Sun Si, is also chairman of this association. Membership comprises 200 registered companies, although the grand total is actually 500. Three or four years ago, most leading companies embarked on a major drive to modernise their production facilities and improve quality; as a result, most equipment is now of first-class quality, employing the highest levels of technology, and is acceptable everywhere.

Equipment from these sources is expected to be especially attractive to the booming industry in China and in other nearby emerging shipbuilding countries such as Vietnam, as well as in eastern Europe; yards in the latter are currently enjoying buoyant days, thanks to investment by yards and owners in western Europe, as well as, of course, by Daewoo (at Mangalia in Romania). In 2003, total equipment exports, including engines, from Korea was US\$3.6 billion, plus US\$6.1 billion of local content. These figures are expected to rise in the current year and in 2005.

Apart from new-generation LNG tankers, many Korean manufacturers are interested in the offshore sector, particularly FPSOs and those designed for regasifying LNG. For its part, KangRim has developed new waste heat recovery units and is interested in promoting its filters, inert-gas generators, nitrogen generators, and chemical injection skids. ⚓

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solution orientation		

Preparing for super-large container liners at Hyundai

At the time of writing, the world's mightiest shipyard, Heavy Heavy Industries, had one or two cellular container liners of the 8000TEU class on order - an 8600TEU design for Hapag-Lloyd. These are most unlikely to be the only examples in the future, since this size of vessel is rapidly becoming the standard size for ultra-large designs.

At the same time, the shipyard's design teams are studying plans for the larger capacity liners now being projected by advanced owners, which in a first stage, will probably be 10,000TEU. Such sizes will need careful study, particularly if twin propellers are being considered, while hulls might also call for thicker plate up to 95mm, which in turn introduces welding problems.

These will, of course, be solved by Hyundai, particularly as it operates its own production R&D centre within the vast Ulsan shipyard - the Hyundai Industrial Research Institute, as well as the separate hydrodynamic centre with its towing tank (Hyundai Maritime Research Institute). Solutions are likely to include specification of high-tensile steels of the AHTS40 grade for hull parts such as the sheerstrake; this will help to minimise both weight and thickness - and relieve stresses.

Effort is also being put into more efficient bow designs, possibly with less flare if box capacity is not critical, to avoid the consequences of



Very large container liners under construction at Hyundai Heavy Industries' Ulsan yard. The largest designs currently on order are those of 8600TEU for Hapag-Lloyd, but ships of even greater capacity are likely to be built here in the future.

slamming - buckled internal structures. Part of the solution to avoiding such damage also lies in the hand of the master; he should reduce speed.

Hyundai has a huge pool of experience to call on; since 1979 and up to the end of last year, the

amazing total of 215 cellular container ships had been delivered. Until now, the largest liners to be delivered have been a series of 7200TEU (nominal) designs, one of which was *HongKong Express*, featured in *Significant Ships of 2001*. ⚓

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21st Century Shipbuilding: a new rising star

ARISING star in the already bright Korean shipbuilding firmament is Tongyoung-based 21st Century Shipbuilding Co, which is active in the smaller ship sizes. The company was founded in 1998 and in 2001 acquired the former Hanil shipbuilding site, following a technical cooperation agreement with Seoul National University for steelwork production; today, the company can build merchant ships up to around 15,000dwt.

This year the company has already delivered from its two berths a pair of 6700dwt cargo ships (*Canes* and *Hydra*) to domestic owners and built to Korean Register class, and a good order book stretches through to April 2007. This comprises three more 6700dwt cargo ships and 10 13,000dwt oil/chemical tankers - all the latter are for export.

The cargo ships have lengths overall of 105.50m and breadths of 16.60m, with a scantling draught of 6.85m. Cargo capacity is 7250m³ and the service speed is 12.80knots. Each of the two holds is closed by 29.40m x 11.10m hydraulically operated panels (four to each hatch). The main engine is an STX-MAN B&W 7S26MC model - the smallest of the designer's two-stroke range - developing 2800kW at 250rev/min, and two alternators are driven by 280kW engines.

All the tankers are for Greek (six) and Norwegian (four) owners, these being Nicholas G Moundreas and Perosea, from Greece, and P D Gram from Norway. Their design has been created by Far East Ship Design & Engineering Ltd to include 12 cargo tanks and two slop spaces, served, as is quite common today, by individual pumps of the submerged hydraulic type (12 x 300m³/h and 2 x 100m³/h). Cargo capacity is 14,200m³.

Those ships for the two Greek owners are being constructed to ABS class and those for the P D

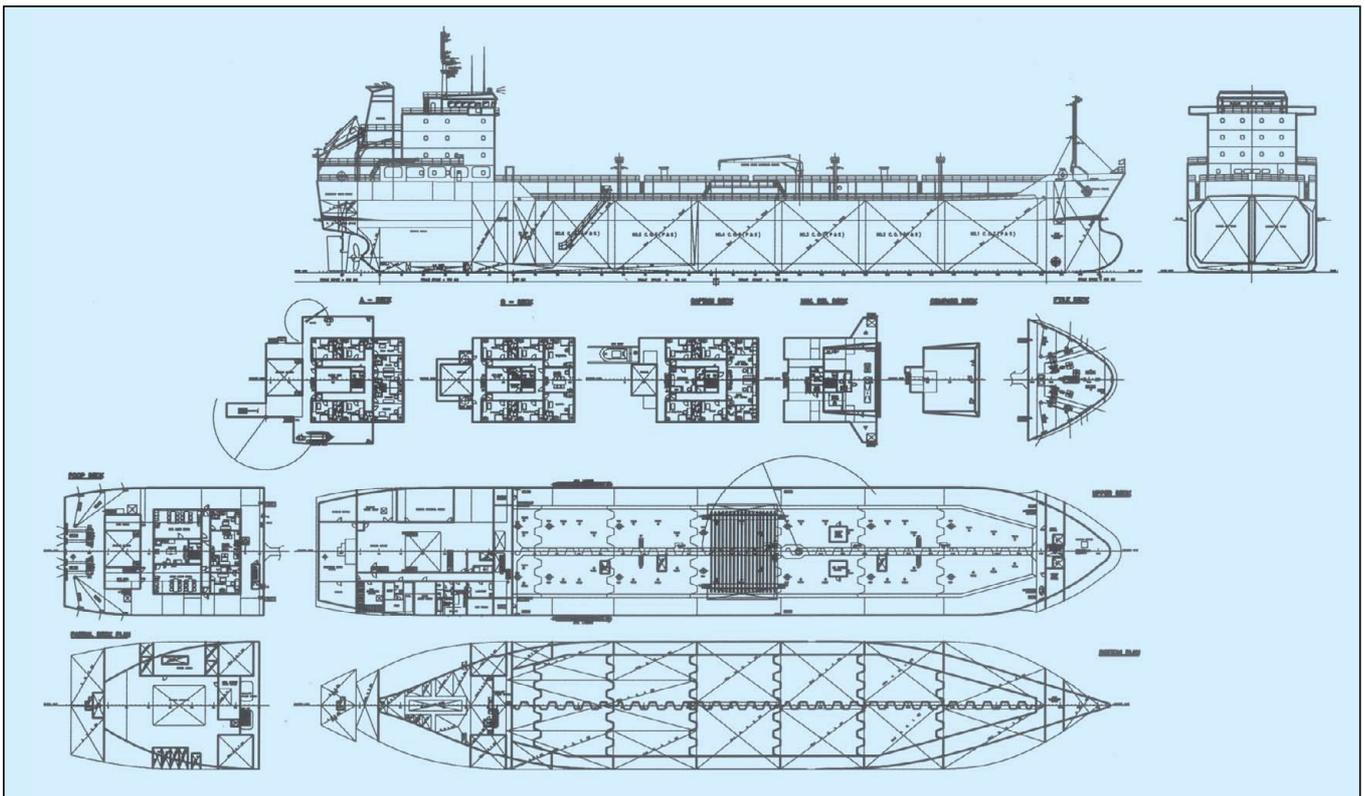


Part of the Tongyoung shipyard of 21st Century Shipbuilding, showing one of the 6700dwt cargo ships for domestic owners at the outfitting quay.

Gram are to Korean Register standards. On a length overall of 128.60m, the scantling draught is 8.70m.

Main propulsion machinery is again from the MAN B&W stable, but this time of the 6S35MC design, rated at 4440kW at 173rev/min. The three auxiliary sets are driven by 480kW engines, and a 12,000kg/h oil-fire boiler is included for cargo heating.

General arrangement plans of the 13,000dwt oil/chemical tankers being built by 21st Century Shipbuilding for Greek and Norwegian owners.



Massive series orderbook at Hyundai Mipo

HYUNDAI Mipo Dockyard continues to amaze. Since a decision in 1996 to make new ships its first target, the company has seen its order book grow in leaps and bounds; at the end of August this year, the Ulsan-based yard had 105 product tankers on order (42 of them ice-classed), together with 33 container ships under 3000TEU (mainly 2800TEU) and nine above this size - in all, a total of 147 hulls.

At the same date, 23 product tankers had been delivered this year - 12 of the 35,000dwt/37,000dwt class, and 11 of a larger 46,000dwt type. *British Tenacity*, illustrated here, is the first of 12 product tankers of 47,000dwt for BP Shipping. Amongst the yard's ice-strengthened vessels will be the last three of the BP series, which will be constructed to 1A standards. The recent interesting shift towards ice-strengthened tankers - a reflection of optimism over Russian oil exports - was discussed in our May 2004 Editorial Comment.

Recent new orders at Hyundai Mipo have included 16 container ships for Nordcapital, of Germany, and six further vessels for another German leader in the container-ship sector, Claus-Peter Offen. All are of the 2824TEU size and will be delivered by September 2007.

Meanwhile, major efforts to improve productivity are helping Hyundai Mipo Dockyard to offset rising material costs - and

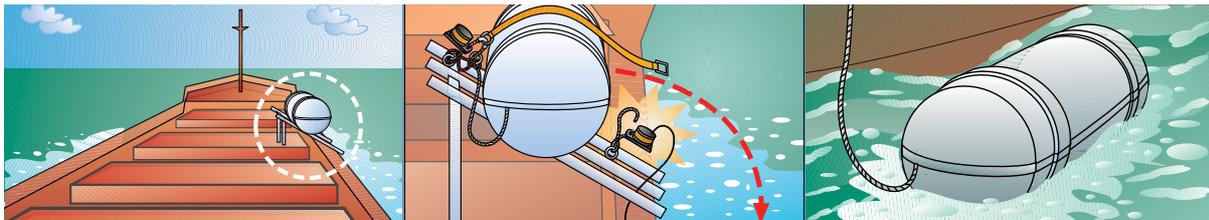


The 47,000dwt *British Tenacity*, delivered in April, is the first of 12 product tankers ordered from Hyundai Mipo Dockyard by BP Shipping. Series-production is a major goal of this Korean yard, which has seen a huge boost in its order book - at the end of August, an amazing 147 ships were on the list.

perhaps to compete effectively with Chinese yards. In addition, a new steel block plant, constructed at a cost of US\$17.5 million, was opened last month at Daebul, in the south-west part of the Korea. Such honing of the production process, plus the new investment, coupled with an emphasis on series-construction, should make this yard a model of the ultimate in optimised shipbuilding.

It seems that an even greater output could be achieved if more shiprepair activities were transferred, as is being considered, to the company's associate yard in Vietnam. This would release a further drydock for new ship construction and perhaps open up new opportunities for building small container ships and product tankers, alternatively bulk carriers up to Panamax size. ⚓

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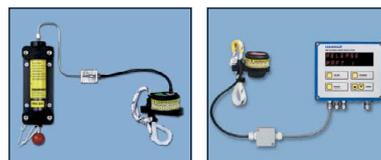
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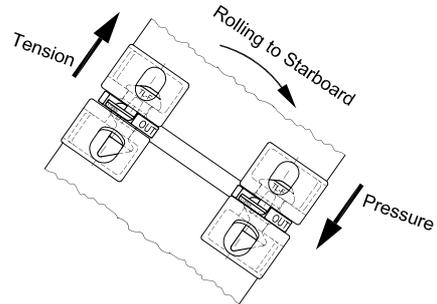
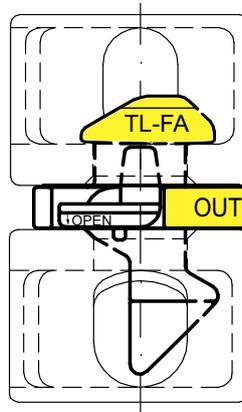
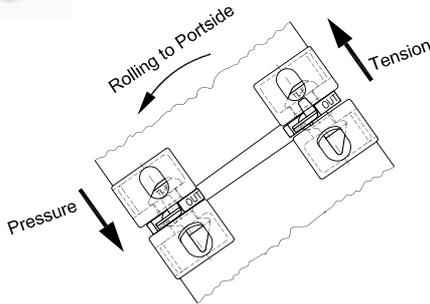
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Expanding production at Shina

DESPITE its modest size by Korean standards, Shina Shipbuilding, at Tongyoung, is rapidly increasing the size and number of ships that it can build. As *The Naval Architect* reported in June 2001 (page 27) following our first visit to this yard, the largest ships then being constructed were 37,000dwt product/chemical tankers. Today, vessels up to the yard's maximum limit of around 51,000dwt are being built - all for export. Currently, one of the two berths can accommodate ships of this size, but the second will also be able to handle the largest hulls soon. Since the Asian economic crisis of 1998, no contracts have been won from domestic owners.

Actually, some of the current 40 tankers on order have design deadweights of 40,000dwt but by small additions to the original length bp, breadth, and depth (176.00m x 31.00m x 17.20m), and by increasing the scantling draught from 12.20m to 13.20m, the maximum deadweight can be boosted to 51,000dwt. At the time of our new visit in July this year, four such product/chemical designs had been ordered - all by Fulltankers Srl for delivery between October 2006 and March 2008.

Classification for these particular ships will be to Registro Italiano Navale standards, and the hulls will be strengthened to ice class 1B, including compliance with the 2003 Finnish/Swedish ice regulations, as on other ice-class hulls. A special feature of the 51,000dwt



A recent example of a 40,000dwt product/chemical tanker from Shina Shipbuilding. This particular ship was built in 2002 for the Italian operator Fratelli D'Amato as the first of four sisters, the last of which will be delivered in August 2007.

designs includes a modified and optimised bulbous bow, also a modified and optimised stern section. These two alterations have resulted in a 0.2knot-0.3knot speed increase.

A further 12 hulls of a crude/product-only type and slightly reduced deadweight (49,700dwt) have been ordered by Ocean Tankers, from Singapore; these vessels will be constructed to ABS class. By various naval architectural alterations, including eliminating bulkhead stools, Shina's design team has been able to increase cargo capacity on these particular ships (the owner's request) to 62,000m³ instead of the standard 55,800m³ for this ship size in the yard's portfolio. The Ocean Tankers ships are also able to load caustic soda, and to comply with the IBC code for these cargoes; all will be installed with separate pumprooms, rather than the individual submerged pumps (from Frank Mohn or Marflex) that Shina normally fits.

As has occurred at other yards, owners who originally contracted non-ice-strengthened designs have subsequently re-negotiated the specification, in line with growing interest in export charters for oil and petroleum products from Russian ports in the Baltic and Far East. It is interesting to record that recently, two orders for 40,000dwt designs have been secured from the Russian operator Novoship, and that owner was said to be seeking two further vessels. Early delivery is anticipated from a 'squeezed' production schedule.

All these tankers are conceived by Shina's own design office, using CADRA 2D software, also the Korean EasyShip 3D modelling system from KRISO/EasiGraph, plus Tribon integrated production software. Being a small yard, Shina finds it relatively easy to adapt to owners' individual requests and in this respect is very flexible with regard to alterations.

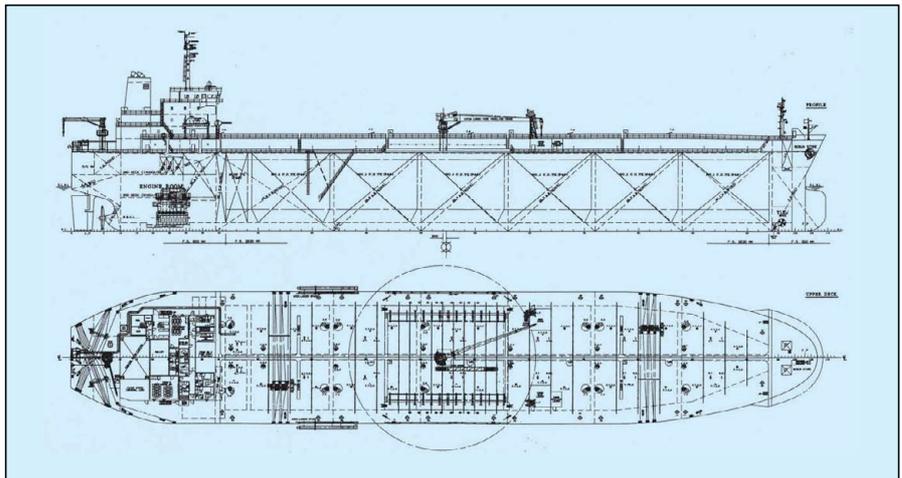
Cargo tanks are mainly of the coated type, using pure epoxy or phenolic epoxy, generally from Hempel, Sigma, or Jotun. Shina normally expects to include around 30% high-tensile steel in its tankers, although this rises to 40% for ice-classed hulls.

Despite the current boom in the tanker sector, Shina is seeking to cover its order book for the future and is again considering container and other designs for the future (the yard has already built a series of medium-size car carriers, also a new design of 28,700dwt log/bulk carrier, as well as - during the past 10 years or so - special-purpose steel carriers and a number of small container carriers). Meanwhile, investment in production improvements means that this year, 10 ships will be delivered, compared with nine in 2003, while in 2005 and 2006, the figure is expected to rise to 11, and to 12 in 2007. Shina did investigate the possibility of constructing hulls under subcontract in China to speed production even further, but apparently owners were not too keen on this production philosophy. 

TECHNICAL PARTICULARS 51,000DWT PRODUCT/CHEMICAL TANKER (ICE CLASS B)

Length, oa.....	183.00m
Length, bp.....	174.00m
Breadth, moulded.....	32.20m
Depth, moulded.....	19.10m
Draught, design moulded.....	11.00m
Draught, scantling moulded.....	13.20m
Deadweight, design draught...40,000dwt	
Deadweight,	
scantling draught.....	51,000dwt
Cargo capacity	
(including slop tanks).....	55,800m ³
Water ballast.....	22,000m ³
Heavy fuel.....	1600m ³
Diesel oil.....	220m ³
Fresh water.....	300m ³
Cargo tanks.....	12 plus 2 slop tanks
Cargo pumps.....	12 submerged;
	12 x 600m ³ /h
	2 submerged; 2 x 300m ³ /h
Main engine.....	MAN B&W 6S50MC-C
Output, MCR.....	9480kW at 127rev/min
Propeller.....	FP, nickel-aluminium-bronze
Diesel-alternators	
(electrical output).....	3 x 740kW
Speed, service (design draught, 90%	
MCR, 15% sea margin).....	15.00knots
Complement.....	26 + 6 Suez crew
Classification (typical).....	ABS +A1(E),
	Oil Product/Chemical Carrier,
	+AMS, +ACCU, SH, ESP,
	UWILD, IMO Type III, RES.CPP,
	VEC, Ice 1B

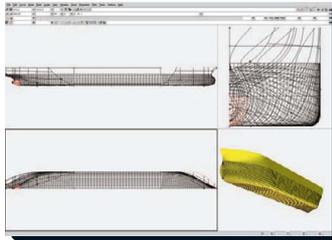
Profile and main deck plan of Shina's 51,000dwt product/chemical tanker design, seen here in its submerged cargo pump version. By optimising the bulbous bow and the stern, the yard's design team has been able to squeeze an extra 0.2knots/0.3knots from the hull.





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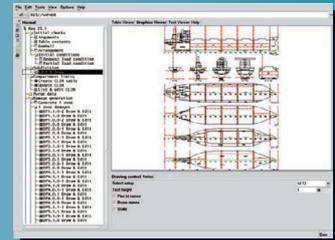
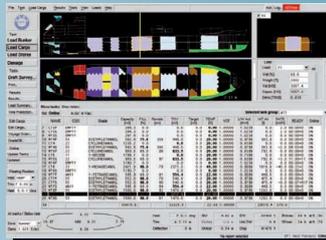
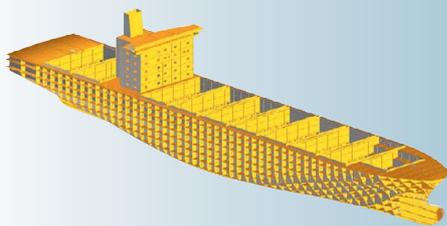
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Korean Register: helping with development of super-large container liners

WORK by the Korean Register of Shipping (KR) on the highly topical subject of next-generation LNG carriers was detailed in our special September supplement, *Design and Operation of Gas Carriers*; however, this classification society is working equally hard in other directions to ensure the technical safety of new and existing ships. In particular, studies are continuing into super-large container liners up to around 12,000TEU.

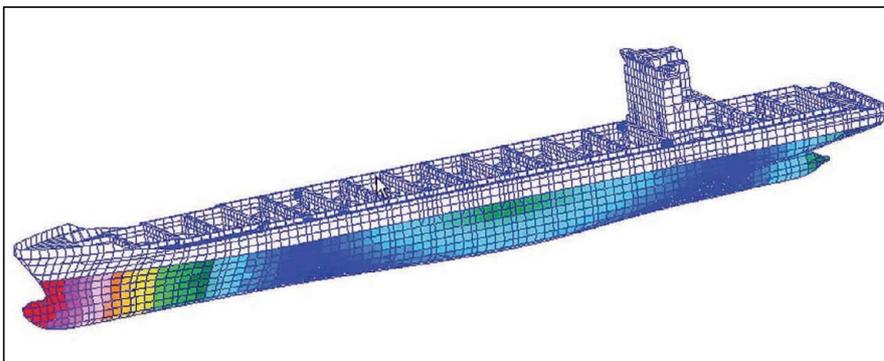
Such sizes represent the boundary where twin shaftlines will probably come into play and where wakefield characteristics need to be carefully studied (although it is possible that 14-cylinder low-speed diesel engines, mooted by at least one of the two leading manufacturers, may alter this scenario). Although no outcome has yet been determined by the society, it has developed tools for analysis of alignment and vibration of propulsion shafting for both single- and twin-screw variants.

At these capacities, both stability and manoeuvrability start to become critical, thus the Korean Register is working on wakefield studies into hulls with twin skegs and propellers, using concepts prepared by Korean shipyards. Two propellers are, of course, well known, but in such large hulls, it is possible that unexpected problems - such as slamming - may arise, while should a single-engine arrangement be continued, conflict might arise between a long engine bedplate (for 14 cylinders) mounted on a flexing hull.

To help solve such difficulties, the society can turn to its in-house SeaTrust software package, which comprises the ISTAS (integrated structural analysis system) and FANSYS (fatigue analysis system) modules, and to its software and pool of expertise for solving torsional vibration and shaft alignment problems. Fatigue strength is one of the most critical failure modes in a ship structure, but it can be studied through the three FANSYS techniques: simplified fatigue analysis, spectral fatigue analysis, and transfer function method. For container ships with lengths above 190m, the simplified method is normally satisfactory, but if a new hull form is to be employed, the spectral and transfer methods can be additionally used.

Determination of the ultimate hull girder strength could perhaps be a better basis for ship design, although it is difficult, says the Korean Register, to estimate the real safety margin. Nevertheless, the safety margin for ship structures can be estimated by a comparison of their ultimate strength with applied loads. The society has calculated the hull girder strength for 30 typical ships - 12 bulk carriers, nine tankers, and nine container ships. A simplified design formula to be used at the initial design stage has been suggested on the basis of these calculations, and verification can then be made.

An important event last year on the analytical front for KR was the completion of the second version of its SeaTrust-HOLDAN program. This is a hold structural analysis package comprising



The Korean Register is involved in developing new generations of container liners up to 12,000TEU, partly using its SeaTrust ISTAS and FANSYS structural and fatigue analysis software. Studies are also being made into the problems associated with bow slamming and consequent structural damage, and tools have been developed for analysis of alignment and vibration of propulsion shafting.

an automatic modeller, finite-element solver, and post-processor. It has been upgraded to include double-hull tankers and double-side-skin bulk carriers.

Solving the problems of bow flare slamming

Bow flare slamming is a key issue for very large container liners - the large flare angle on many ships increases the possibility of excessive pressure and consequent structural damage. In order to improve the design capability of Korean shipyards and to enhance structural safety at sea, KR has carried out a joint research project 'Development of evaluation procedure for the structural strength of bow flare' with major shipbuilders in the country.

As a first stage, a program for calculating bow impact pressure, also a structural design formula, has been drawn up. This program has been used for the structural damage analysis of several existing ships and has shown good results. In a second stage, the time history model for bow impact pressure has been developed and the dynamic structural response calculated.

Based on the damage analysis results for VLCCs and several container ships, a design standard for primary members has been proposed. At present, the dynamic elasto-viscoplastic response of a bow structure due to breaking wave impact pressure is being investigated.

Challenge of new offshore designs

The challenge of new ship types such as FPSOs and FSOs is another subject that is currently being addressed by the society. One of the difficulties is to secure hull structural integrity through direct structural analysis, alongside traditional class rule requirements. KR has

worked closely with shipyards in the construction of such vessels, for their hull structural analysis, and by providing several dedicated computer codes.

Problems of inspecting double skins

It is interesting to note that KR has experienced significant difficulties in the inspection of ballast tanks in the generation of tankers built since the early 1990s that has been fitted with double skins. Large tankers have been particularly troublesome. The society believes that the recent adoption of permanent means of access (PMA) arrangements by IMO (discussed in *The Naval Architect* June 2004, page 11), which entered into force on July 1 this year and which affect ships constructed on or after January 1, 2005, will be a great help. Nevertheless, it feels that future generations of double-skin vessels should be planned to be much more inspection- and maintenance-friendly. KR has actively participated in the IACS/Joint Industry Working Group on permanent means of access.

Japanese technical committee

An significant event in December last year was the first meeting of the society's new Japanese technical committee. It is anticipated that the establishment of this body will give KR even more exposure in the Japanese shipping and shipbuilding market. Approximately 40% of the society's current newbuilding work is outside Korea, and the greatest percentage of this is in Japan. Ships completed there last year to KR class included a car carrier for Cido Shipping from Toyohashi Shipbuilding, a chemical tanker for POS Ship Management from Shin Kurushima Dockyard, and a large container ship for Hyundai Merchant Marine from Mitsubishi. 



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New silicone-based antifouling for LNG carriers

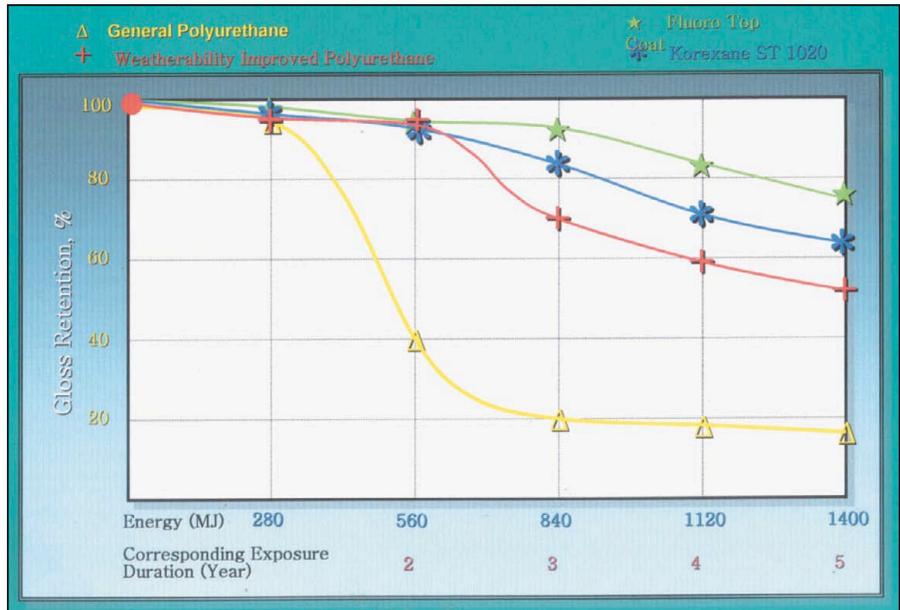
A LEADING manufacturer of marine coatings in Korea is Kungang Korea Chemical Co (KCC), some of whose interesting products were discussed in our June issue (page 32). During a recent meeting at the company's Seoul office, *The Naval Architect* was able to discuss in more detail the range of products and future plans.

An important event last year was the launch of a new product specially designed for Korean shipyards' ever-expanding LNG-carrier order book - a new silicone-based low-friction antifouling paint. Trials have been carried out on a barge but the product was not yet, at the time of writing, released for sale. It is based on a different concept to other paints: the silicone imparts low-surface energy and gives a smooth surface without any release of material. It will be an expensive treatment but would be ideal for fast and expensive LNG carriers operating on a liner-type service.

There is one technical problem to be overcome: silicone drifting during the paint application process can cause difficulties for adjacent hulls that have non-silicone coatings. Despite this, we are told that this product is in the specification for the large new proposed QatarGas/ExxonMobil LNG carriers - probably of 200,000m³ capacity and above - currently being planned (these ships are referred to in our special *Design and Operation of Gas Carriers* supplement, published with the September issue of *The Naval Architect*). It is believed that interested shipyards are trying to have the specification of this advanced product altered, not only to overcome spray-drift problems but also to shrink the cost.

New shop primer

One of a number of other new KCC products is a shop primer, designed to be compatible with today's fast construction times. This is an improved version of the IZ182 product but has a reduced level of zinc while still maintaining the necessary reaction and resistance properties; it was first used last year by Hyundai Heavy Industries following successful trials at two Chinese yards (KCC has a marine paints factory



Considerable demand exists for a high-quality heavy-duty top coat for ships. KCC's new Korexane ST 1020 is based on polysiloxane technology (a hybrid of organic/inorganic polysiloxane resins), which is said to offer excellent weatherability and workability, with high gloss retention and no chalking. This product succeeds earlier chlorinated rubber, epoxy, or urethane systems. Drying time, with an epoxy primer underneath, is fast, and costs are reasonable. This graph shows the very good gloss retention features after long-term exposure to sunlight.

in Kunshan, near Shanghai). At the same time, KCC chemists are seeking even better versions of this critical product for shipyards.

Like others, KCC is most interested in the Chinese market and has secured paint contracts for two or three ships there so far. It is very aware of the problems of severe water pollution in the large rivers on which many Chinese shipyards stand, and as we reported in June, has already found a solution: the Seacare A/F985(H) Red and Develop products. These are designed

to protect a hull during the months following launch but they must be washed with fresh water prior to final coating. To date, good experience with Seacare is reported.

Meanwhile, KCC chemists are working hard to develop new-generation biocide-free antifouling, and the company expects to launch the first of these very soon. We are told that these are unlikely to be water-based - these types are anticipated to be used primarily by the car industry.

Advanced features for Samsung's new Norfolk Line ro-pax ferries

A FURTHER important boost for Samsung's aim to become a leader in the ferry and cruise liner field was secured earlier this year with a contract to build a trio (originally a pair) of large ro-pax ferries for the European ferry operator Norfolk Line, a subsidiary of A P Möller. These 34,500gt designs will have space for 2000 lane metres of ro-ro freight (equivalent to 120 trailers), plus room for 200 cars. The access package is being designed by MacGregor, as reported in our April issue, page 18 - the company's first complete systems to be exported to Korea.

These UK-flag ferries, 186.66m long, 28.40m wide, and 9.70m deep, will also be the first ships to be built to comply with Lloyd's Register's new Integrated Fire Protection (IFP) notation. They will operate on Norfolk Line's expanding cross-Channel services. Originally, the company sailed between Scheveningen, in The Netherlands, and Great Yarmouth, on the UK east coast, but today routes cover: Dover to Dunkirk, Scheveningen to Felixstowe, Harwich to Esbjerg, and Immingham to Esbjerg.

It is believed that the new ships will sail on the relatively short Dover to Dunkirk route, therefore the luxurious amenities for the 780 passengers will only comprise pullman chairs, including first-class versions with associated features in a VIP lounge, while a massage service will be offered at the chairs in the truck drivers' lounge. Crew members, 70 in total, will also have a very high standard of accommodation, with single-berth cabins for everyone, and featuring a very low noise level. Crew public rooms have a skylight above. Large windows will be installed at the front and sides of the accommodation. All galleys, bars, pantries, and fast food outlets will be outfitted by MacGregor.

In line with current trends on the English Channel, these new ships will have a very high service speed of 25.00 knots on a design draught of 6.75m. The main machinery, which will comprise four MAN B&W 8L48/60B medium-speed diesel engines each developing 9600kW at 500rev/min, will be laid out to provide a high level of redundancy in case of a black-out, with separate

compartments for each pair of propulsion engines, and separate compartments for each diesel-alternator.

This arrangement will enable the new ferries to achieve a Lloyd's Register PSMR redundancy notation, which will be associated with an ICC notation for full machinery control. Other notations will cover environmental protection (ballast and grey water, also protection for fuel tanks - EP) and refrigeration details (BGPR). All engines and the oil-fired boiler will be designed to comply with 'invisible' exhaust regulations.

To meet the requirements of the new ISPS security code, features will be inbuilt to avoid piracy and to prevent access by passengers to crew areas, while the new Lloyds' Register IFP notation will be met by a computer-based system, which is able to provide monitoring of all facilities associated with fire safety. These include fire detectors, fire door status, fire pumps, control of HVAC air inlets and outlets, sprinklers, ventilation fans, and oil tanks and pumps. A master computer in the wheelhouse safety centre will be duplicated.

Pro-active problem-solving

Delivery of the first two ships is planned for next year, with the third to follow in 2006. It is expected that the new ferries will be covered by Samsung's PLUS system (Post-delivery Lifetime Ultimate Service system) for real-time information sharing through the Internet; to date, this has been adopted by more than 90 owners and 370 suppliers on some 400 ships already delivered. The PLUS system is based on service requests and technical enquiries through the Internet, rather than by telefax.

A normal new-ship warranty period is for one year, but with the PLUS arrangement, Samsung will provide the following for the lifetime of a ship: various technical advice and resources, solutions for any problems that arise, and periodic despatch of engineers for free vessel inspections. Flying squads and service teams based in eight countries, including Dubai, the USA, and Greece, are ready to leave within 24 hours of a PLUS request. The whole service aims to be pro-active in dealing with any problems. ⚓

THE notation IFP (integrated fire protection), which is believed to be applied for the first time on Samsung's new ferries for Norfolk Line, was first introduced by Lloyd's Register in 1990 as the Provisional Rules for Integrated Fire Protection. The requirements were revised in 1995, and again in 2000 to reflect IACS' Unified Requirements. Compliance with these Rules is not mandatory, but a ship provided with control and monitoring of fire protection and firefighting equipment in accordance with these rules will be eligible for the class notation IFP (Integrated Fire Protection).

The operational control and monitoring of all active fire protection and firefighting systems have to be centralised in an integrated fire-control station, and be arranged such that these functions can be carried out as

effectively as they would be under direct supervision. A system of alarm displays has to be provided that readily ensures identification of faults in the active fire protection and firefighting systems, and the control and monitoring equipment, to satisfy the requirements of the Rules for Control Engineering.

In the integrated fire-control station, means of two-way speech communication must be provided to all the accommodation and service spaces and other control stations, including the main machinery control station and bridge, if applicable. Active fire protection and firefighting systems have to be operated and supervised from the integrated fire-control station and are to be provided with the controls, alarms and monitoring systems required by the rules. ⚓

Ships' equipment for the world's fleet

Hamworthy is a leading manufacturer and supplier of equipment and systems to the shipping, naval and offshore industries worldwide. The company's products include gas and inert gas systems, pump systems and wastewater systems. Hamworthy employs over 600 people in 14 locations in the UK and rest of Europe, throughout the Far East and in North America. Hamworthy has an active programme of new product development including more effective means to treat waste on cruise ships and naval vessels and advanced gas systems to improve the environment.



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Modern firefighting systems from NK

SINCE its formation in 1982, NK Co, based in Busan, has built up considerable expertise in the fabrication of pressurised gas cylinders and systems for use by many industries; in the marine field, these are particularly appropriate for use in firefighting. The K in the company's name refers to the Kidde Co, in the UK, from whom the Korean manufacturer holds a technical licence and with whom NK retains close links.

An extensive range of firefighting systems is offered, as well as the essential re-testing of equipment throughout its life. These range from fixed high-pressure multi-bottle CO₂ extinguishing systems, commonly used to cover machinery spaces, pumprooms, paint stores, and cargo holds (available in total flood or semi-total flooding), to a low-pressure alternative where the CO₂ is stored as a liquid in one insulated pressure tank, which is maintained at 20bar and -20°C by refrigeration. High-pressure systems are considered to be more economical; today pressures are around 300bar but NK is planning to increase this further to 500bar in the future.

Following the Montreal Protocol, much effort has been put into developing new 'green' fire-extinguishing gases. One example is a new-type of inert-gas mixture, which is designed to reduce the ambient oxygen concentration in a protected space to between 10% and 14% - a level that is still breathable, but which will not support combustion. Such an inert-gas extinguishing plant was specified by BP for its *Thunderhorse* FPSO, built by Daewoo.

Another new environment-friendly gas being employed by NK is FM200, a very expensive

gas, but which has been installed on offshore platforms and FPSO ships, including the FPSO *Erha*, built for ExxonMobil by Hyundai Heavy Industries, with topsides currently being installed by Sembawang in Singapore.

For LNG and LPG tankers, NK Co builds dry chemical extinguishing equipment, which is mandatory for the upper decks of such ships. This is ejected from monitors and hand-held hoses. Also useful for gas tanker upper decks are pressurised water-fog-type spray systems, which can be used to cool decks. Somewhat similar is the relatively new water-mist concept, which is also supplied for accommodation areas, Class A machinery spaces, and specific hazard areas.

NK is very interested in the marine compressed natural gas (CNG) tanker sector, which may be opening up soon. The company already manufactures cylinders in either steel or composite versions to contain gas fuel for buses and cars, and believes that there could be a significant market in small island communities such as exist in the Philippine and Indonesian archipelagoes. At the same time, NK is currently working on an improved foam extinguishing system for the cargo-handling areas of CNG tankers (at present, of course, no ships to carry this cargo have yet been ordered); it is hoped to have this new foam ready by 2007.

The company's R&D department is always seeking new gases for fire extinguishing and hopes that next year it will be able to launch a new safe nitrogen/hydrogen mixture, which has been approved by Lloyd's Register. This is



A typical NK marine low-pressure CO₂ extinguishing arrangement, showing the two storage tanks where the gas is held at 20bar pressure and -20°C temperature by refrigeration.

expected to be more economical but initially the gas will have to be imported; its main use is expected to be in the offshore sector. ⚓

German container fittings for new Korean-built liners



A GERMAN company that specialises in container fittings has recently secured large orders for its equipment from Korean shipyards. Contracts for a total of 100 ship sets have been placed with Ship's Equipment Centre Bremen GmbH (SEC); 60 of these have been awarded by Hyundai Heavy Industries, Hyundai Samho Heavy Industries, and Hyundai Mipo Dockyard for installation on ships ranging in size from 2500TEU to 8200TEU - all for German owners.

In addition, six Hamburg-Süd liners at Daewoo will also be equipped with SEC fittings, as will 10 x 2600TEU and 8 x 3500TEU vessels for Hansa Treuhand and K Oldendorff at the STX yard. German owner C P Offen is scheduled to take delivery of 20 new container ships from various Korean yards, and all will have SEC fittings. The largest are ships under construction at Hanjin Heavy Industries (8100TEU) and at Samsung (9200TEU); all are expected to go on long-term charter to the Mediterranean Shipping Co (MSC).

Some of the twistlocks to be supplied in these giant orders will be of the company's new TL-FA automatic model, featured in the September issue of *The Naval Architect*. In order to ensure an efficient interface between containers, lashing bridges, hatch covers, fixed and loose container fittings, C P Offen requested SEC to build a test mock-up in 1:1 scale for all its large post-Panamax designs ordered in Korea and fitted with lashing bridges.

The accompanying illustration shows the mock-up, with a typical lashing arrangement for the outermost stack of the 9200TEU designs under construction at Samsung. This layout is for high-cube containers (40ft x 9ft 6in). This test confirmed the suitability of the arrangements and fittings under extreme loading conditions without a need for extension bars (eg, when only standard-height boxes or high-cube ones are loaded on deck). ⚓

The lashing mock-up specially built by Ship's Equipment Centre Bremen for C P Offen to test efficient working of components on all the company's new post-Panamax container liners on order in Korea and fitted with lashing bridges.

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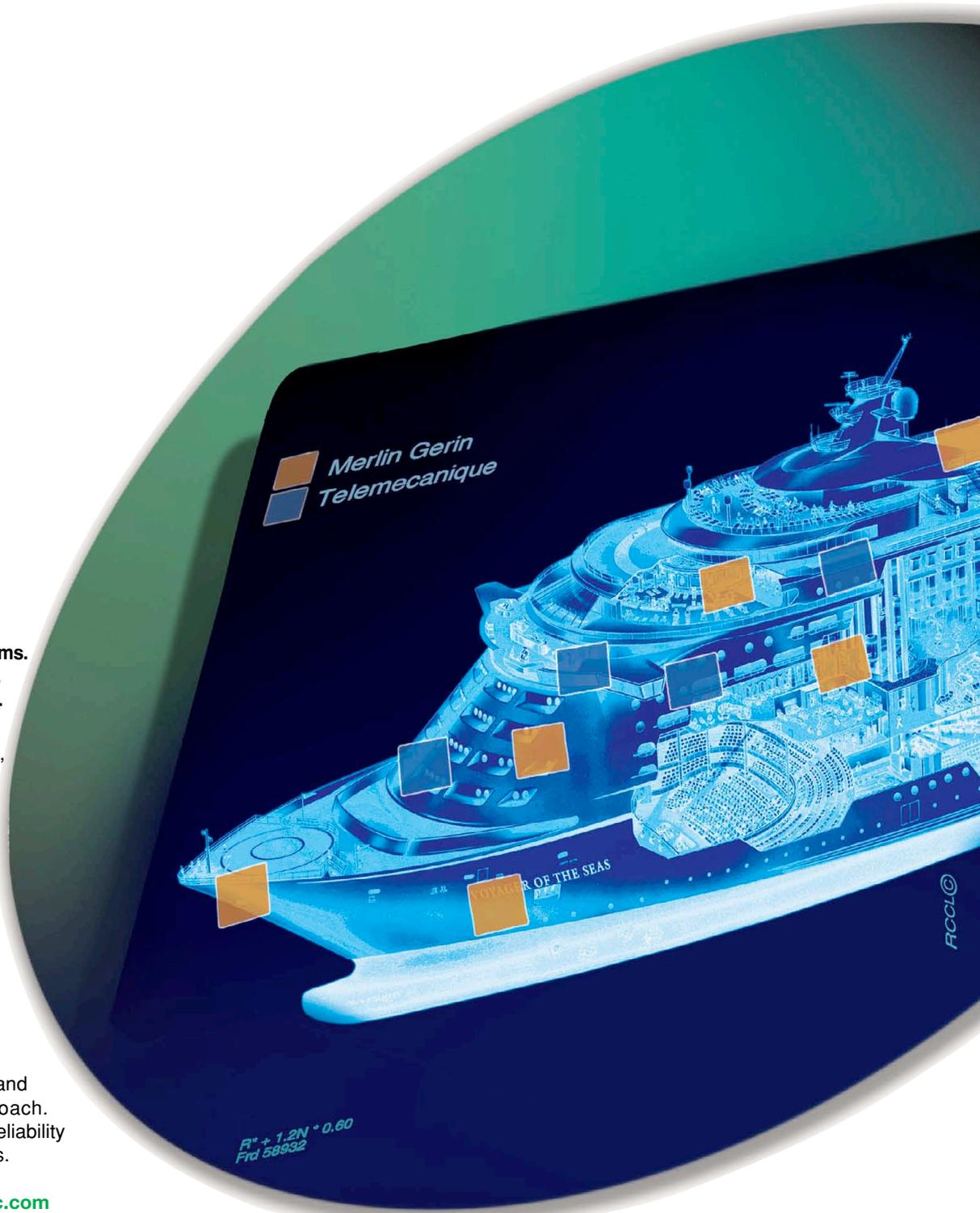
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Refining production processes at Hanjin

FOR several years now, Hanjin Heavy Industries has been a leading Korean builder of large container liners, and, as we reported last year, has secured a number of contracts - nine at the time of writing - for its largest designs, giant ships of 8000TEU/8100TEU for two owners, Mediterranean Shipping Co and C P Offen. The total present backlog at Hanjin is approximately 31 hulls, all of which are container designs - Hanjin lays prime emphasis on high levels of technology and high-value-added ships such as fast post-Panamax container liners.

Special features of the 8000TEU-class ships include lashing bridges with two-tier walkways. These are based on the exact calculation of individual accelerations for the lashing equipment and hatch covers. One dedicated heeling pump is fitted for use during cargo loading and discharge, and electric sockets will be provided on deck for up to 550FEU refrigerated containers. The first 8000TEU-class liner is expected to be delivered at the beginning of next year to MSC. In line with current trends, Hanjin has also developed a new hull form for a 9000TEU-class liner as well as versions up to 10,000TEU.

Ships with lengths of 325m, ie, 8100TEU designs, are too long to fit in the two 300m largest docks at the Youngdo site, so for these and larger hulls, Hanjin is employing its patent DAM technique. In essence, this entails fabricating the extra part of a hull separately and joining it to the main part afloat; thus, there is no longer any restriction of hull length.

At the same time, development of a so-called SKID fabrication method enables 1500tonne blocks to be lifted into a dock, which allows Hanjin to cut the time spent in dock by half. The aim is to build even larger blocks up to 2500tonnes as from next year.

Curved stern modules with the propeller shafting are more difficult to assemble by this technique; however, by erecting the stern section in the water, it is possible to shorten dock time by a further 20%. Further improvements have resulted from a new superstructure erection method; previously, the



MSC Linzie, completed in mid-2003 by Hanjin for the Mediterranean Shipping Co, was the prototype for a series of container liners based on the maximum length (rather than the maximum breadth) of the Panama Canal locks. With a length overall of 294.05m, she can load 5060TEU, with seven tiers and 13 rows on deck, and has plugs for 400 refrigerated containers. The design, claimed to offer the largest capacity of any conventional Panamax ship, has attracted at least 20 orders for Hanjin.

yard built a superstructure in three or four blocks, but by assembling this part of a ship in one complete 1000tonne module at a site at Dadaepo on the other side of Busan and transporting it by barge to Youngdo, further gains can be made.

At the same time, productivity will be enhanced by a decision to build larger blocks at the company's second yard in Ulsan. These are expected to be quite big - approximately one-third or one-quarter of a ship's length, which will then be transported by sea to Busan. Again, this will again reduce the time any hull spends in the construction docks at Youngdo.

Moves such as these confirm that Hanjin's goal is to maximise shipbuilding efficiencies at its existing sites, rather than move away from central Busan to a new 'greenfield' complex, as had been considered a few years ago. In addition, investment will be made in R&D work for the future, and in replacing and upgrading equipment.

In the same vein, Hanjin believes that better profits can be secured by the relatively speedy construction of container ships rather than re-entering the market for LNG tankers, which

need a long time for outfitting work. The company especially believes that the current price for LNG carriers is too low to tempt it back into this field - it will be recalled that Hanjin built Korea's first-ever membrane-type LNG carrier, *Hanjin Pyeong Taek*, in 1995 (presented in *Significant Ships of 1995*), and three further ships. The company will, however, watch the market sector closely in case new opportunities present themselves.

Hanjin still retains an interest in special-purpose ships such as icebreakers, oceanographic research ships, LPG tankers, and FPSO vessels; meanwhile, it must concentrate on the 30 or so 4800TEU/5100TEU container ships (plus the 8000TEU designs) on order. Hanjin claims to be a leader in the construction of 5000TEU vessels, using a new Panamax-max hull design of 294.10m - the maximum for transiting the Panama Canal. Approximately six of these have been delivered so far; one, *MSC Linzie*, was featured in *Significant Ships of 2003*. A new refrigeration system has been developed to cope with additional numbers of reefer boxes. 

First Energy Bridge LNG carrier for delivery soon

THERE is no doubt that Daewoo Shipbuilding & Marine Engineering is at the very pinnacle when it comes to construction of LNG carriers. As we reported in our special supplement last month, this yard will soon deliver a prototype LNG design specially adapted to re-gasify cargoes and discharge them to shore through a flexible pipeline. At present, the three ships ordered to date are designed to deliver gas to one dedicated terminal in the USA.

These so-called Energy Bridge designs, for El Paso and Exmar, are basically standard 138,000m³ membrane-type ships (installed with a GTT NO 96 membrane system) with

vaporisers and associated equipment at the forward end of the upper deck, plus a special internal bow structure fitted with a submerged turret cone space so that the ship can hook-up to a submerged buoy - in the same manner as already proven by North Sea oil shuttle tankers.

The buoy and associated platform metering station are positioned in 85.34m of water in the Gulf of Mexico. From the metering station, gas will be transferred to an existing underwater high-pressure network of pipelines to shore. The whole idea is intended to avoid construction or expansion of unpopular shore processing facilities. 

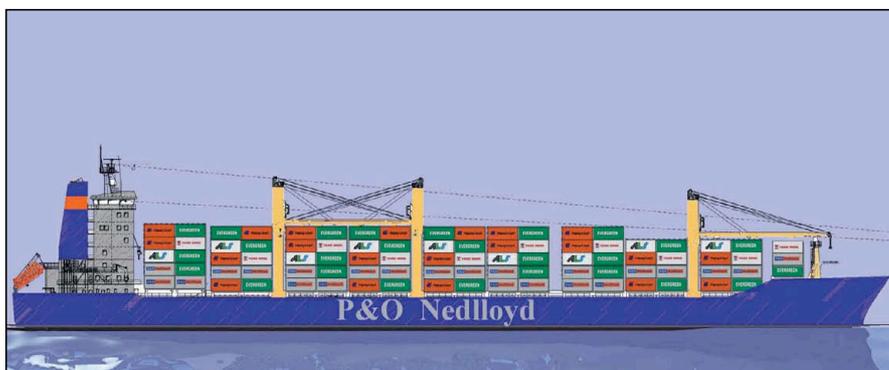
More detailed information on LNG carrier activities at Korean shipyards and other companies can be found in the special supplement *Design and Operation of Gas Carriers*, published with the September 2004 issue of *The Naval Architect*.

1700TEU Schiffko-designed container ships to be built in Brazil

FOLLOWING its work on a new series of container ships being built in Chinese yards - reported in our September issue, the German design consultancy Schiffko has drawn up the basic design and classification drawings for two further new container vessels, but this time to be built in Brazil. These 1721TEU ships, named the CV 1700 Plus design, have been specially developed to operate a feeder service along the South American coastline, with an ability to distribute containers to and from the many harbours in that part of the world which can only be accessed by large rivers.

The new ships - being built for Mercosul Line, a 100% Brazilian subsidiary of P&O Nedlloyd, of The Netherlands, at Estaleiro Itajai SA, in the town of the same name south of Sao Paulo - will be equipped with three MacGregor wire-luffing deck cranes, each of 40tonnes capacity. Each hull will have a length bp of 182.80m, a breadth moulded of 27.80m, a depth of 16.40m, and a design draught of 10.50m.

Main propulsion machinery will comprise a MAN B&W 7L70MC-C low-speed engine developing 22,915kW at 108rev/min and driving a shaft and propeller supplied by Wärtsilä Netherlands (Lips). The three auxiliary engines will be of the Wärtsilä 6L26A type and will each develop 1950kW at 900rev/min.



A computer-generated profile of the new 1721TEU container ships to be built at Estaleiro Itajai for Mercosul. They are specially designed to trade along the South American coastline, being able to access ports situated on large rivers in that region.

Schiffko is currently working closely with the yard on the detail design and production details, so that the first 24,650dwt vessel can be delivered in May 2006. Their construction in

Brazil is an interesting move and may hopefully point towards a revival of that country's fortunes in commercial mainstream shipbuilding. 

LETTER TO THE EDITOR

Quo Vadis shipbuilding in the EU?

Sir - Studying today the somewhat gloomy picture of shipbuilding in the European Union (EU), and the region's ever-declining share of total world production, there are some key questions to consider. These include: will such a situation last forever? Will this industry ever recover to compete effectively with Far East? Is it - in the long term - facing inevitable death?

The opinion of some vocal market rationalists is that labour prices in the EU are too high, which is, of course, a major problem for our manual labour-intensive industry. In other words, we simply cannot afford to keep competing with the low salaries of Far East countries. So what should we do? Should we patiently wait (for how long?) until the 'invisible hand of the market' performs some miracles, and when this finally happens, will we still be alive?

The truth is that labour prices are not constant anywhere, and are now rising in Asia, slowly narrowing the gap between Far East and Europe. Yet, there is still a long way to go before this gap is closed and it could take some time. The experience of some countries - once major shipbuilders - teaches us that it is almost impossible to revitalise a shipbuilding industry after a prolonged depression.

Before we jump to any conclusions, there is one more fundamental question to be answered: can the super-state EU (as we sometimes call it today), whose economy strongly depends on maritime trade, give up a strategically important shipbuilding industry? Can a super-power having global ambitions be so short-sighted? The obvious answer is: no.

The policy of LeaderSHIP 2015, introduced by the EU, is certainly a move in the right direction; however, is it sufficient to compete with Far East countries, which - it appears - continue to subsidise their shipyards excessively? It might also be possible to adopt similar measures undertaken years ago by the USA, world champion in rhetoric over free trade and an open economy, but which still keeps its internal market closed by the Jones Act, thus effectively prohibiting the import of vessels for use on domestic routes. Very few would say 'yes' to such an action, but what else - apart from relaxing industrial laws - can be done?

Implementing large subsidies is probably out of the question, bearing in mind that EU national governments have significant welfare commitments, an issue little known to Far East countries. However, we could use the American way of defending a strategically important industry. The EU

Commission could implement this, even temporarily, to revitalise our shipyards - its own 'Jones Act'; this could ensure that, eg, vessels operating between EU ports would have to be built or converted in EU shipyards. In the case of recent double-skin tankers, the legislative process proved to be swift and smooth.

Of course, this idea appears controversial, and I am aware that it will find very little sympathy among shipowners. 'Someone' could even say that it is turning back the clock of the history, as is the currently fashionable 'globalisation' movement, which is freeing trade barriers between countries and limiting government involvement in the economy. I would agree that this 'someone' could be right; however, looking again at the way our competitors conduct business, we can note that their practice is sometimes very different from their vocal rhetoric. If we are willing to stay alive in the game, we must adopt those rules played by our rivals. Therefore, I believe that it is worthwhile to consider these controversial proposals.

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Testing for fire safety in modern marine designs

The problems and solutions using lightweight passive fire protection (PFP) techniques, especially for high-speed ferries, are discussed by Microtherm.

INTERNATIONAL shipping has always faced a frightening assortment of potential dangers to which even the largest vessels are vulnerable. Indeed, it was soon after the loss of *Titanic* that the first international convention for marine safety was adopted in 1914. That convention, the International Convention for the Safety of Life at Sea (SOLAS) is still in existence. The present version, SOLAS 1974, published by the International Maritime Organisation (IMO), has now been in force for around a quarter of a century. During that period it has provided guidelines on wide ranging aspects for the safety of shipping, including fire safety.

Fire at sea is possible the most horrific of all the dangers that can be encountered. As a basic requirement for fire safety, SOLAS defines the principles of 'detection, containment, and extinction of any fire in the space of origin'. To achieve this, the convention also defines fire-resistant bulkheads and decks, and procedures to test their capabilities in simulated fire exposure tests.

Currently, SOLAS and the associated IMO publications, the HSC Code and the International Code for the Application of Fire Test Procedures (FTP Code), specify requirements for the fire testing of fire-resistant divisions with a clarity that has ensured a consistent standard of performance throughout Europe for many years. However, recent developments in the use of newer, lighter materials of construction in ferries, naval vessels, and superyachts, have shown up certain areas of difficulty regarding the validity of the pass criteria and interpretation of the test procedure requirements.

SOLAS regulations cover ships of more than 500gt that are involved in international voyages. The HSC Code covers high-speed passenger craft of more than 500gt that are involved in sea voyages of no more than four hours. The Code also covers high-speed cargo craft on voyages of up to eight hours duration. Each of these publications contains definitions of fire-resistant bulkheads and decks.

A deck or a bulkhead is normally protected from fire by the use of passive fire protection (PFP) systems. These are non-combustible, high-performance insulation layers capable of full fire exposure and responsible for limiting the surface temperature of the structure to within specified limits. SOLAS defines 'A', 'B', and 'C' class divisions according to the duration of the protection required. The HSC Code refers simply to 'fire-resisting divisions' capable of 30 minutes resistance for areas of moderate fire hazard, and 60 minutes resistance for high-risk areas. It also makes reference to evacuation times relative to the fire resistance duration.



Covering a bulkhead with a Microtherm passive fire protection system prior to a fire test at the Building Research Establishment (BRE).

The FTP Code is the final link that defines the test procedures required to demonstrate the performance in each case. There are two main test procedures that are of interest here and it should be remembered that both of these have been in existence since the mid-1990s.

IMO Res A754(18), which was adopted in November 1993, is the basic procedure used for the majority of fire tests on bulkheads and decks for both steel and aluminium ships. It defines the acceptance parameters for 'A' and 'B' class divisions and also specifies the details of the test specimens to be used, 4.5mm thick for steel and 6mm thick for aluminium. With the increasing use of 2mm and 3mm thick extruded aluminium planking in modern high-speed ferry design there is an immediate conflict with the specification from the test procedure. With a focus on weight for speed and operational economy, these lightweight structures will certainly become the norm.

Problems of composite materials

Also focusing on weight, composite materials are now increasingly in use in warships, patrol boats, and large yachts. These present an immediate problem as they have low-temperature tolerance and are clearly combustible. In theory, IMO Res MSC.45(65), adopted in May 1995, should

cover these materials. It sets out a procedure for testing fire-resisting divisions in high-speed craft under a load-bearing condition. Clause 1.6 of the procedure clearly identifies 'other load-bearing fire-resisting divisions' as an alternative to those having a structural metal core. Unfortunately, nothing is that straightforward and it is elementary physics - basic heat transfer theory - that help a designer to understand the nature of the problems.

Heat will move from a hot region to a cooler region in a material, creating a temperature gradient across the intervening space. In solid objects, heat is mainly transferred by conduction which occurs when atoms in a material are heated and increase their vibrational energy. Interactions with their neighbours pass the energy along chemical bonds from atom to atom through the structure, thus transferring energy away from the heat source.

Attractions of PFP

A good conductor transfers heat quickly whereas a good insulator blocks this heat transfer. The thermal conductivity of a material is a physical property which describes its ability to transfer heat. An insulation material has a low thermal conductivity. A microporous insulation such

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as Microtherm (*The Naval Architect* October 2003, page 11), which is optimised to resist all the modes of heat transfer has a thermal conductivity which is close to the lowest theoretically possible. This makes it an ideal material for thin, lightweight passive fire protection (PFP) systems. In an air gap system used extensively on the vehicle decks of aluminium high-speed craft, only 10mm thickness of Microtherm is required for full A60 protection.

In a fire scenario, the heat source becomes very hot very quickly and any surfaces exposed to this heat also rapidly increase in temperature. If that surface is an insulation material as part of a passive fire protection (PFP) system, it then resists the transfer of the heat across it and a large temperature gradient develops. This in turn means that the bulkhead or deck that is protected by a PFP system is exposed to a greatly reduced temperature. In a steel or aluminium conventional structure, heat is conducted rapidly through to the colder, unexposed face and it is on this face that temperatures are measured in a conventional fire test.

When a PFP system is protecting a composite structure, a dramatically different set of conditions exist due to the fact that the composite structure is an extremely effective insulation in its own right. Instead of conducting the advancing heat wave through to the colder unexposed surface, it actually resists the transfer and creates a large temperature gradient across itself. This causes a rapid build-up of temperature on the exposed surface but virtually no temperature change on the cold face.

With temperature increases of only around 20°C or less after 60 minutes exposure, conventional cold face temperature

measurements to assess system performance, as specified in the FTP Code, are meaningless. On both static and loaded fire tests of composite specimens, surface temperature measurements should be taken on the exposed surface at the interface with the PFP system. Normally, these surface temperatures are kept beneath the heat distortion temperature (HDT) of the resin used in the composite to ensure an adequate safety factor. But this can be viewed as an over-cautious approach if the mode of failure of a composite structure is considered.

When fire tested under load, laminated composite structures show a slow progressive structural failure as the heat from the fire penetrates adjacent layers and the inter-laminar bonds fail sequentially. This type of construction can still retain a high residual strength despite fairly high surface temperatures. A sandwich construction, with a core of balsa or PU foam faced with GRP or FRP facings, fails rather more quickly as the outer facing deteriorates and the bond with the core fails, thus destroying the basic box strength of the structure.

In an independent fire test on a balsa wood cored sandwich structure protected with a Microtherm PFP system, a temperature gradient of around 90°C was measured across the outer 3mm thick GRP facing layer. At the end of the test, the outer surface of the balsa core was 90°C cooler than the exposed surface of the test specimen.

Any sandwich or laminated composite structure designed solely on surface temperature limits would in truth be over designed. The PFP system would be unnecessarily thick and heavy.

The apparent solution is to test under load to Res MSC.45(65) and simply test until the stipulated flexural limits are exceeded,

effectively ignoring surface temperature measurements. Unfortunately, this approach is also flawed due to the fact that the test procedure was originally conceived with metallic test structures in mind. The failure modes of composites at temperature and under load are still not fully understood but it is generally believed that the flexural limits stipulated in Res MSC.45(65) are simply not relevant to composites.

In recent testing at the Microtherm test facility in Belgium, a specimen was tested first in a static condition limiting the exposed surface temperature to the HDT as a maximum. It was then tested in a load bearing condition. In the second test, a PFP system only 75% of the thickness necessary for the first test gave a measured deflection after 60 minutes that was only 40% of the maximum allowed in the standard. At the same time, the exposed surface temperature had risen to two and a half times the HDT.

Work still needed

Clearly, much is still needed to be done before an effective test procedure can be specified that will yield optimised results. What is clear is that the thicker the composite, and the greater its mass, the greater the performance demand on a PFP system. Any testing carried out on thick composites will have a built-in safety factor when used on thinner structures.

With lightweight extruded aluminium structures the opposite is true. Here we need to consider another property of a structure - its capacity to absorb heat, known as the volumetric heat capacity. This is directly related to the mass of the structure and is often referred to as the thermal mass although strictly speaking this is a term more relevant to building structures. The effect of greater thermal mass is to increase the time taken for heat to pass through, resulting in a time lag or thermal lag in structures of greater mass. In practical terms, this means that the less the mass of a metallic structure, the more rapid the increase in cold face temperatures during fire exposure.

A passive fire protection system that achieves a fire rating when tested on a conventional 6mm thick aluminium test specimen to Res A.754(18) will clearly not be adequate to protect a lightweight extruded aluminium plank construction of only 2mm or 3mm thickness. It is necessary to define the relationship of the weight per unit area of a structure to the thickness of insulation necessary in a PFP system for protection to SOLAS levels. Microtherm engineers have done this in a series of fire tests on different structures in an effort to fully understand the implications of the introduction of the new lightweight designs.

With the increasing use of new materials that fall outside the specifications given in SOLAS, the HSC Code, and the FTP Code, it is important that naval architects and designers understand the principles of fire protection for these materials. The advantages of a lightweight structure are partially lost if a heavy passive fire protection system is added to comply with a fire safety specification. 

A Microtherm PFP system protecting the vehicle deck of a SuperSeaCat high-speed ferry built by Fincantieri.





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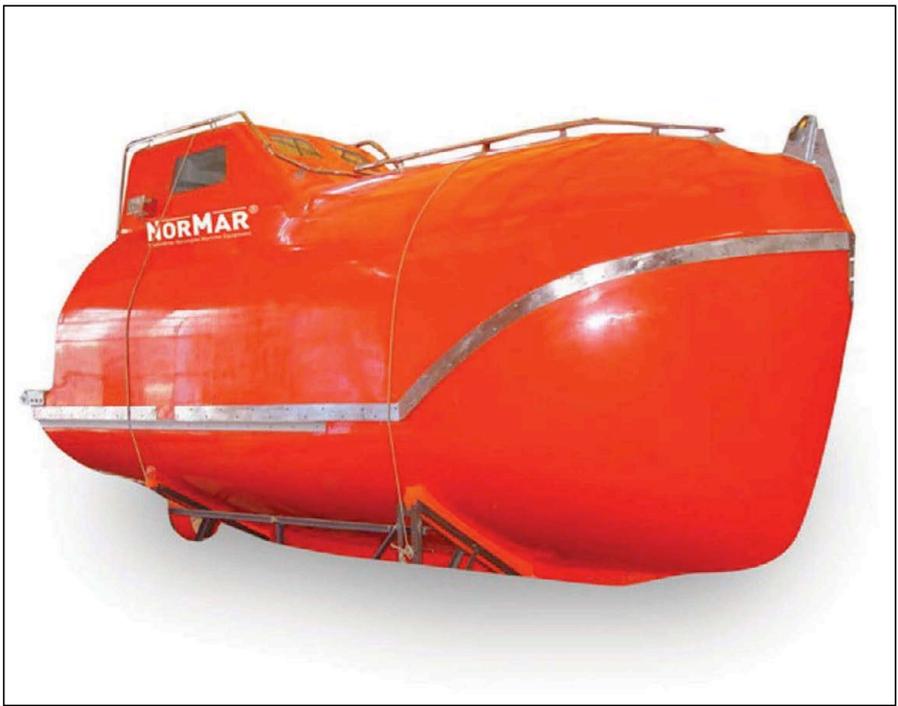


New-concept davits for North Sea duties

OVER the past few years, Vestdavit, a Norwegian leader in tailor-made boat-handling systems and davits, has been developing boat-handling systems that are both safe and easy to use, and take up less space than more traditional systems. The latest developments in hydraulic, electric, and electronic hardware have been incorporated.

After four years of working with a client on a new concept, Vestdavit has recently secured the contract for supplying all davits to BP's JIGSAW project, which is a totally new concept for offshore rescue and recovery operations in the North Sea. The first ships are under construction. BP is building four regional support vessels, each carrying two autonomous rescue and recovery craft (ARRC), and two fast rescue craft (FRC). Vestdavit is contracted to deliver eight two-point davits for the ARRCs and eight single-point telescopic davits for the FRCs.

The ARRC davits are fitted with both shock absorbers and dual winch systems including individual tension and automatic self-leveling. The davit is claimed to be the first to use fibre rope, instead of conventional steel wire. Lifting capacity is 32tonnes, and the ARRC vessel has a length of 18.8m. Power consumption of each ARRC davit is 226kW. ⚓



A 'big brother' has joined Norwegian Maritime Equipment's smallest free-fall lifeboat, the JY-FN/FF-4.9 (launched last year). This newest model, which forms part of the company's Normar range, has a length of only 5.8m but can carry up to 28 people. It comes in two versions, Freefall 5.8C and Freefall 5.8T, for cargo vessels and tankers respectively. The latter is fire-protected with an external water spray and an internal compressed air supply, to provide a very high level of protection for tanker and offshore platform crews.

The drop height is 16m, which is claimed to be more than any competitor can offer for a lifeboat of this size, and the boat has EC type-approval. It is fitted with a proven Bukh DV 29 diesel engine for propulsion, but can also be delivered with other type. ⚓

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Ships to be their own lifeboats?

A NEW project initiated in Sweden, DESSO - an acronym for design for survival on board, aims to develop a new passenger ship design concept incorporating state-of-the-art safety levels in respect of such aspects as resistance to sinking, methods of evacuation, and fire safety. The goal is that, in the event of a collision or fire, passengers should be able to remain on board in a 'safe haven'.

The ship should then be able to return to harbour under its own power, or allow its passengers to be safely evacuated. One possible method of evacuation to be investigated is that part of the superstructure should float free (as proposed by Capt Dennis Barber for bulk carriers in *The Naval Architect* February 2003, page 54).

Members of the project team are: SSPA as project leader, Chalmers University of Technology, Stena Line AB, Silja Line, The Swedish Club, Chalmers Lindholmen, Lloyd's Register, Globtech, Kockums Sonics, and SP Fire Technology.

For its parts, SP Fire Technology will concentrate on fire safety. Although the fire safety requirements for ships have been tightened in recent years, there are many ways in which safety can be improved. For example, these can be through the use of interior materials having better fire characteristics than those used today, and through the use of more reliable detection and fire suppression systems.

The new ship concept will be described either in the form of a visual model, eg, as a 3D drawing, or

in the form of a scale model. Another objective of the project is the establishment of a Swedish/European network of commercial companies, scientists, and public authorities for direct application of the project results, and to encourage continued development. This means that invited experts will be able to contribute an input.

DESSO started work at the beginning of 2004 and is intended to run for two years. It is under the overall management of SSPA, and financing has been provided by VINNOVA (the Swedish Agency for Innovation Systems), the Swedish Maritime Administration, and the Swedish Mercantile Marine Foundation. 

New mini free-fall lifeboats

SINGAPORE-based lifeboat manufacturer, Vanguard Composites Engineering, has released details of its latest free-fall lifeboat, the VG67FF. This craft has a carrying capacity of 36 persons, which, Vanguard claims, makes it the smallest free-fall lifeboat for its size. It has a ramp footprint of only 7.6m, again, the smallest of its size in this category, and with a drop height of 20m it is, yet again, claimed to be another first for its size.

To date, Vanguard has secured orders for more than 30 ship sets, with the latest order of 10 sets coming from a German owner building ships in Yangzijiang Shipyard in China.

This new design follows the earlier Vanguard VG49FF design, which is an even smaller version, for 21 people and only 4.90m long.

Vanguard has also recently been accepted by the International Lifesaving and Manufacturers Association, ILAMA. All boats feature the company's Spearhead range of release systems. 

Schat-Harding expands into Asia

LEADING lifeboat and davit specialist Schat-Harding has taken over the Chinese Beiyang Boatbuilding Co lifeboat manufacturing range and plant as part of a strategy to expand its market share in cargo ships built in Asian yards. The lifeboat factory, at Qingdao, currently produces a range of five models and 100 boats annually, and Schat-Harding will supply 250 boats from China annually, in sizes from six to 38 persons.

This acquisition, Schat-Harding hopes, will give it the ability to produce boats for a major segment of the conventional cargo ship market which does not want to import boats from Europe. 

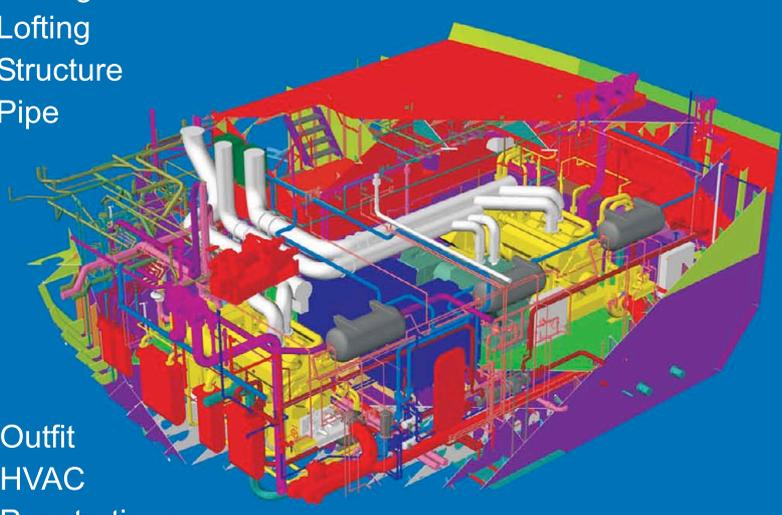
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Animated CD release-gear manual for safer lifeboat operation

A UNIQUE, animated CD version of the operation and maintenance manual for its Safelaunch lifeboat release gear has been introduced by Survival Craft Inspectorate, based in Aberdeen. The CD has been developed in response to the problems faced by multi-national crews whose ability to interpret written instructions may result in safety liabilities for a ship. It recognises that the personnel responsible for critical safety activities may find it easier to understand visual instructions rather than those that are not written in their native language. The Safelaunch gear was introduced early this year and can, for example, be fitted to Survival Craft Inspectorate's new SC59FF free-fall lifeboat for cargo ships, tankers, and offshore platforms, which was launched in May.

This CD uses a combination of animated graphics and text to explain the operation and maintenance of the release hook mechanism. By running the CD on a convenient PC or laptop, crews can be confident that they have understood the various procedures associated with the operation and maintenance of Safelaunch lifeboat release mechanisms. It is believed that this is the first time a lifeboat manufacturer has worked to assure the safety afforded by its product by including dependable communication with its users.

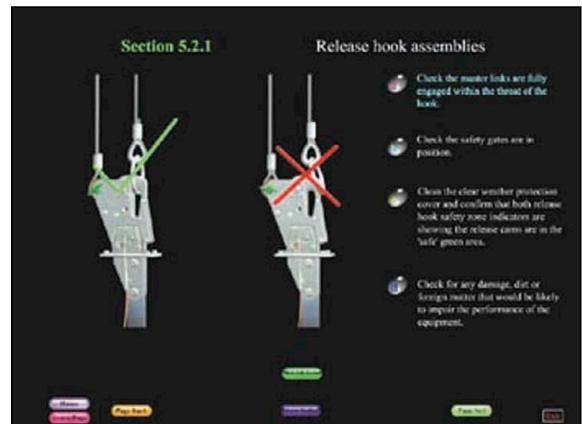
Angus Campbell, managing director of Survival Craft Inspectorate, says that much research was carried out, and a great deal of expertise invested in developing the Safelaunch release mechanism. The ultimate aim is to make lifeboats safer but it will all have been for nothing if the mechanisms are not operated and maintained correct.

The CD covers all aspects of the release mechanism's operation. It also includes detailed animations of the spare parts catalogue, with the specified item being revealed from the main component, so that it can be identified visually with its appropriate part number. This is expected to reduce errors in parts ordering and so avoid lifeboat downtime that can occur when this happens.

The Safelaunch release hook mechanism has been developed so that it is suitable for new or retrofit installations, in order to enhance safety. Its design arose from a study by Survival Craft Inspectorate of lifeboat accidents that unfortunately seem to occur with depressing frequency. This identified three key aspects of lifeboat release mechanism design that demanded significant improvement.

These included reducing the potential for accidental release, providing a clear, visual indication of the release mechanism's security status without entering the lifeboat itself, and eliminating the use of any materials that could be vulnerable to corrosion. The resulting design claims to have addressed all of these problem areas and is thus said to be attracting significant interest from ship and offshore platform operators.

An image taken from the new animated CD from Survival Craft Inspectorate, which is designed to help multi-national crews operate correctly the company's Safelaunch lifeboat release gear.



Regulation guidance from Maritime Progress

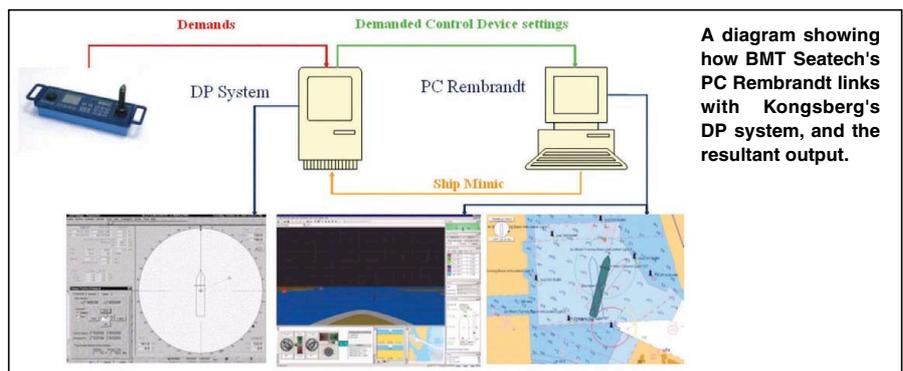
THE 2004 edition of the *Maritime Progress Book*, published by Maritime Progress Ltd, of Redhill, UK, continues to provide guidance on safety regulations as well as displaying products necessary to meet statutory requirements. Within the publication is a greatly increased range of items, claimed to represent the largest selection of dedicated marine signs and associated items available anywhere in the world.

Of special interest will be the range of signs developed to assist owners and operators comply with the very new requirements of IMO's International Ship and Port Facility Security (ISPS) legislation, which entered into force on July 1. In addition, to promote safety, a new range of 'Think safety' posters has been introduced, aimed at targeting the most common areas of accidents in the marine industry.

Rembrandt link with Kongsberg for enhanced safety

IN a move to boost the safe handling of even more vessels, BMT Seatech Ltd, a subsidiary of British Maritime Technology, has arranged for its PC Rembrandt ship manoeuvring simulator to link with the dynamic positioning systems designed by the Norwegian company Kongsberg, which specialises in such equipment. PC Rembrandt Version 4, launched in March this year, allows for realistic simulation of berthing and departure manoeuvres in a wide range of scenarios.

By linking with Kongsberg DP equipment, the end result is a simulator which combines Kongsberg's console and ship-specific DP algorithms with PC Rembrandt's advanced mathematical model, worldwide electronic chart coverage, and advanced 3D visuals. Whether simulating a manoeuvre before entering a port or training junior officers on shore, the combined capability of the DP hardware and PC Rembrandt will allow crews to better familiarise themselves with ship handling and the use of the Kongsberg console, thereby improving ship safety.



New virtual-reality tool from Spain

THE Spanish consultancy Sener, together with the University of Catalunya, have developed a new virtual-reality device for use in the shipbuilding industry. This consists of a basic module, composed of a screen which allows 3D immersive walkthrough and inspection of virtual models, with a high-quality image, by means of a passive stereo, using light circular polarisation.

A direct link between Sener's Foran integrated software design and production package, and the inspection software used in the virtual-reality device provides Foran users with high realism in interaction with Foran models. Additional options include user movement tracking and interactive 'gloves' for model manipulation.

The device, which is claimed to be highly competitive in price because it is based on standard Windows technology, is currently in use at universities and research institutes, which include the Polytechnica University of Catalunya, Universidad de Zaragoza, and Universidad de Castilla-La Mancha. It was presented with great success to marine software specialists from all over the world at Comptit 2004, which took place in May at Sigüenza. Furthermore, it will be tested at the third Foran users' meeting to be held on October 27-29 at Granada, Spain.

Improved website

Sener has completely redesigned its website (www.foran.es) in order to maintain it in line with the up-to-date products. It comprises four sections: learning (improved access to education and training), gallery ('stories'), Fgroup: covering the Foran users' group, looking towards the future using present knowledge and past experiences, and download zone.

New acquisition for Fleet Technology

THE Canadian subsidiary of British Maritime Technology (BMT), BMT Fleet Technology, has acquired the Vancouver-based naval architectural and marine engineering consultancy, Peter S Hatfield Ltd. This follows the opening earlier this year of a BMT office in Victoria on the Canadian west coast and the winning of new contracts in this region.

Through this deal, BMT obtains an extensive portfolio of vessel designs, including tugs, offshore supply ships, patrol and scientific craft, fireboats, ferries, fishing vessels, barges, and ice-strengthened designs. The company will now operate under the BMT Fleet Technology name as the Hatfield Division. Gordon Passmore, current engineering manager at Peter S Hatfield, will lead the Hatfield office as division manager, with Peter Hatfield retained as a senior consultant.

ShipConstructor in Vietnam

VINASHIN Engineering & Technology Joint Stock Co (Vinashin E&T) has been signed up by the Canadian CAD/CAM specialist Albacore Research Ltd as its dealer in Vietnam for the company's flagship ShipConstructor 3D software. Under an agreement, Vinashin E&T will be the sales, support, and training contact for ShipConstructor in Vietnam. Because the software runs inside AutoCAD and is fully scaleable to clients' needs, it offers several advantages over competing designs, as well as being flexible and needing minimal training, says Mr Nguyen Duy Hung, the Vietnamese company's director.

Vinashin E&T specialises in the creation, research, and transfer of scientific and technology applications for the country's newly

emerging shipbuilding industry, including the development of production design software for the company's subsidiaries, as well as the design and test production of high-tech shipbuilding equipment. The company is a member of the largest shipbuilding and repair state-owned company in Vietnam.

Three shipyards, Pha Rung, Ha Long, and Ben Kien, are already starting to use ShipConstructor for the following projects: a 6300dwt cargo ship at Pha Rung, a 12,500dwt cargo ship and a 53,000dwt bulk carrier at Ha Long, and a 564TEU container ship and a 6500dwt cargo ship at Ben Kien. As we noted in our July/August feature, Albacore has already established ARL Asia in Singapore as its solutions provider and training/technical centre for the company's software in Asia.



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High-speed design work at BMT Nigel Gee

THE Southampton-based consultancy BMT Nigel Gee & Associates Ltd, which mainly specialises in high-speed ship designs, is currently working on a number of interesting design projects for larger vessels. The first of these is a fast catamaran superferry for an as-yet unnamed customer, which will be a 99m-long hull able to travel at 40knots and carrying lorries, cars, and passengers in the open sea.

The hull design for this is based on lines developed for the United States Navy, Office of Naval Research X-Craft, which has been shown to give excellent motions in sea states 4 and 5, and meeting the US Navy's helicopter landing, and habitability requirements in these conditions. The superferry design will, however, be some 25% longer than X-Craft and will therefore have a further enhanced capability in these sea states.

The proposed vessel is expected to have a normal operating deadweight of 750tonnes, comprising a passenger capacity of 900, a vehicle capacity of 380 truck lane metres, or accommodation for 260 cars using mezzanine decks. The vessel will be propelled by four 20-cylinder Ruston RK270 or four Caterpillar 3618 engines driving Rolls-Royce Kamewa or Lips (Wärtsilä) steering and reversing jets. A Maritime Dynamics active T-foil and trim tab ride control system will be fitted.

SeaBridge pentamaran

A huge increase in projected demand for domestic freight transport has led US group SeaBridge to commission the design of a 300m, 42knot (service speed) vessel capable of carrying a large number of lorries, cars, and passengers. SeaBridge considered the full range of potential designs available worldwide and selected the Nigel Gee pentamaran as the only vessel able to meet its speed and deadweight requirements, combined with reasonable fuel economy plus excellent seakeeping and low speed loss in waves. Design and tank testing of the ship is now well advanced.

This pentamaran vessel will have a top speed capability of 45knots and can carry up to 400 passengers, 300 cars, and 150 lorries. The SeaBridge vision is of the ship as a bridge, with daily departures and arrivals at the same time - passengers or lorries driving onto the 'bridge' in Connecticut and driving off in Florida, although many other routes are also under consideration.

SeaBridge believes trucking companies will be attracted to this service by the reduced costs, ease of compliance with lorry drivers' hours-of-service regulations without making rest stops, and reduced accidents. The public should be attracted by the provision of a lower cost, stress-free ferry, avoiding interstate highways.

ADX Express

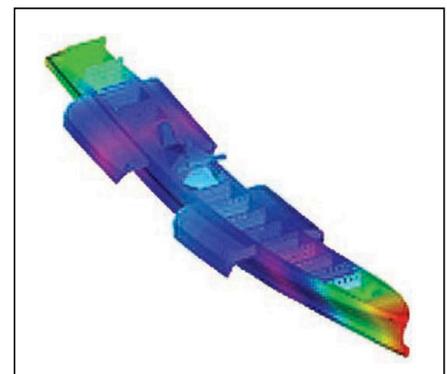
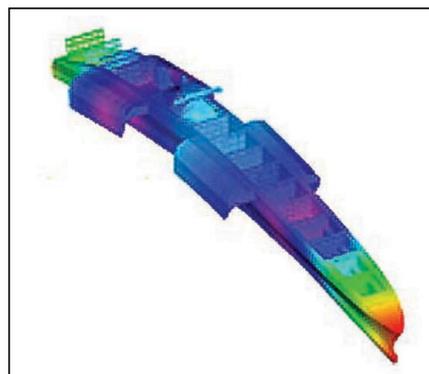
For some years, BMT Nigel Gee & Associates has been working on a high-speed transoceanic container ship, and many papers and articles have been published on this in *The Naval Architect* and elsewhere. Renewed interest to



Profile of a new 99m long passenger/vehicle ferry designed by Nigel Gee and based on lines first developed for the US Navy. It is capable of open-sea operation at speeds up to 40knots.



An impression of the interesting new SeaBridge proposal, which is aimed at relieving road congestion in the USA by providing a coastal ferry service. Such a 300m long ferry could sail on a service between, say, Connecticut and Florida, although many other routes are being considered.



Finite-element hogging and sagging analyses of Nigel Gee's ADX Express pentamaran container ship for ocean-going service.

use this ship design, both for long-haul transoceanic services and in a scaled-down form as a super-feeder, have enabled the

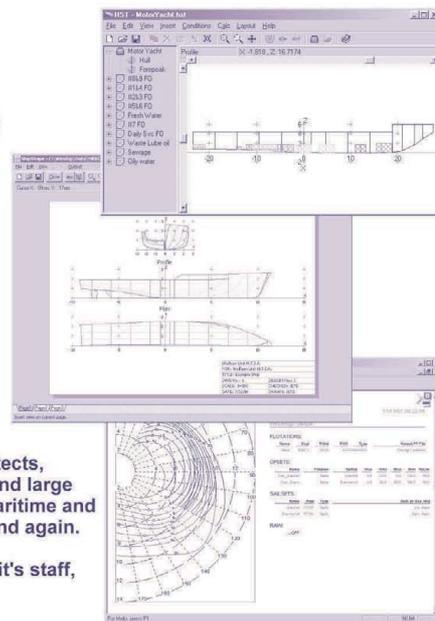
consultancy to obtain further design contract work to increase the level of design definition prior to a shipbuilding contract. ⚓

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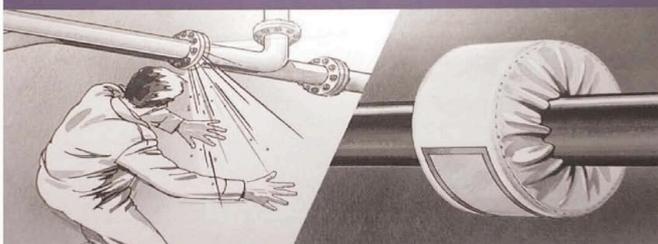
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MantaBridge systems for new Croatian tankers

TWO of the largest ships to be launched from a sloping berth in Croatia have been fitted with MantaBridge integrated bridge systems from Kelvin Hughes. The 166,739dwt crude oil tankers *Alan* and *Hrvatska* were built by Brodosplit for the Croatian owner Tankerska Plovidba, and their multi-functional systems operate, on each ship, through four Manta 2300 23in (584mm) thin-film-transistor (TFT) displays.

X-band or S-band radar signals, electronic charts, AIS and conning displays may be viewed at any workstation position using a Kelvin Hughes CanBus-based network. The conning display has the latest harbour approach and pilotage functionality, which allows it to show ship graphics relating to the performance and movements of the vessel, together with an head-up electronic 'chartlet' to provide a pilotage overview for port operations and berthing.

The highly advanced state-of-the-art MantaBridge concept includes AIS, DGPS, dual gyro compasses, adaptive autopilot, tri-axis speed log, paperless echosounder, solid-state anemometer, voyage data record, and a bridge watch and alarm monitoring system to meet the requirements of a Bureau Veritas SYS-NEQ1 one-man-bridge notation.

Consoles for the two new tankers were built by Brodosplit's contractor, and flexibility of the modular design and compactness of the Manta concept allowed units to be sited wherever they were required. Manta flat-panel



The wheelhouse of one of the two new Croatian tankers showing the four Manta 2300 displays, installed as part of a Kelvin Hughes MantaBridge integrated system.

displays can be supplied in a whole range of configurations to suit all types of ship. They continue to use a tracker ball and three-button man-machine interface, made popular on the Nucleus range of displays. They are capable of displaying any other system that may be needed on a modern bridge, including engine monitoring, dynamic positioning, and video

system information. The three main variants are: desktop display, console display, and flush display.

New programmable controller for cruise liner windscreen wiper system

PRINCESS Cruises' new cruise liner *Sapphire Princess*, recently delivered from Mitsubishi Heavy Industries, is the first ship to utilise the Series 3000 LCD touch-screen controller for its Type 1762 windscreen wiper system supplied by Wynn Marine (whose parent, Wynstruments, is today merged with Hepworth Marine International). The controller offers a fully programmable user interface for up to 50 wipers and associated bridge equipment, and allows wipers to be controlled singularly or in

groups. Ease of operations is further increased since wiper and wiper group icons can be positioned on screen to represent the physical shape of the bridge.

The Type 1762 wipers used on *Sapphire Princess* are internally mounted pantograph designs with an integral air purge feature that prevents line freezing, in addition to a window and wipe heater function. This is especially relevant for the new liner because her itinerary includes glacier cruising where temperatures can drop to low levels.

New oxygen analyser

FOLLOWING the success of its model 1800 marine oxygen analyser in inert-gas system controls, Servomex recently launched a new version. This new 1900MV model is specifically designed for marine use and is approved for use in hazardous areas; it is aimed at safety-critical oxygen monitoring in volatile emissions control and vapour recovery systems.

The device has a patented intrinsically-safe paramagnetic oxygen sensor and is compliant to ATEX category 2 certification; it has been submitted for Marine Equipment Directorate approval. Extra features on this new model include automatic flow control, solvent resistance cell, and optional stainless steel piping. At the same time as the launch of the new model, Servomex has renamed the 1800 model as the 1800MV, which has been improved. Servomex is based at Crowborough, East Sussex, but also has offices around the world.



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New vacuum toilet from Hamworthy

A NEW deck and bulkhead-mounted vacuum-flush toilet launched by Hamworthy Plc is said to be designed for ease of installation, low spares costs, minimum water consumption (approximately one litre for each flush), and quiet operation. The AVT04 range has been developed from the company's earlier model over the last 18 months or so, and components have been redesigned to ensure robust and efficient working.

The AVT04 is a modular system, incorporating an independent sewage discharge valve, flush control mechanism, and 'memory' push-button; individual elements can be replaced as necessary. Retrofit requirements have been carefully inbuilt; for example, the back section is 2mm larger than a conventional pan so that when a system is replaced, the old joints are disguised. Mounting centres and water connections are identical to competing designs, allowing for direct change-overs without the need for any alterations. A series of step-up and step-down adaptor pieces can be supplied to meet all pipe system requirements, but special needs can also be accommodated.

Hamworthy's new AVT04 vacuum toilet is designed around a modular concept, and all major components can be replaced individually.



A vacuum circuit automatically controls the flush cycle. Flushing is activated by pressing and releasing the integral push-button at the rear of the bowl, and no electrical supply is required. Maintenance can be carried out in situ, and the unit is

suitable for all types of vessel. The first contract was for 150 units to be retrofitted on the relief ship *Africa Mercy*, and Hamworthy has since secured three-year contracts with three Korean shipyards - Hyundai Mipo, Shina, and STX.

Impressed-current protection systems for Chinese-built tankers

A LARGE order - the largest single one from the Chinese market - has been secured by Cathelco Jotun Ltd. This is for impressed-current cathodic protection (ICCP) systems, as well as marine pipework antifouling equipment, for 19 ships to be built at the New Century Shipbuilding Co in Jiangsu province. All the vessels are 73,400dwt tankers, on which will be

fitted a 350A aft impressed-current system and a 150A forward system to protect the wetted surface of the hull against corrosion.

The aft system will utilise Cathelco's linear loop anodes, which are lightweight and produce a high-current output from a relatively small surface area. This means that fewer anodes are required to achieve optimum protection, plus

the advantage of fewer hull penetrations. That equipment at the forward end of each hull will use recessed elliptical anodes to maintain a streamlined hull profile.

Cathelco Jotun has also been successful in winning a number of orders from the Murmansk Trawl Fleet for retrofit seawater pipework antifouling systems. Five ships are involved.

New company for Burness Corlett

AS part of a strategy for growth and development, the UK consultancy Burness Corlett & Partners (a member of the International Maritime Group, based in Southampton, London, and the Isle of Man) has set up a new company in Newcastle upon Tyne to provide design and consultancy services complementary to those of the current network. The new company, known as Burness Corlett & Partners (Northern) Ltd, is led by Mr David Byrne, previously managing director of group company Transmarine Consultants, well known for its expertise in the design of ro-ro access ramps and linkspans.

All the technical capabilities of Transmarine Consultants have been transferred to the new company, which has already won work in Greece, Spain, Norway, and the Middle East, in addition to that in the UK. The creation of the new company has been principally stimulated by the requirements of clients who seek independent advice if they encounter technical or operational problems, or legal claims.

A new double-ended ferry for the domestic operator Jadrolinija has recently been delivered by the Croatian shipbuilder Kraljevica Shipyard, to serve various islands in the Dalmatian archipelago. The 2000gt *Sveti Krševan* has a length bp of 87.60m, a breadth of 17.50m, and a draught of 2.4m, and is powered by four azimuthing thrusters - one in each corner of the hull. Up to 103 cars can be loaded on the single vehicle deck, with passenger accommodation on one enclosed and one open level above. A sister ship is under construction for completion next year, when Kraljevica also anticipates to deliver its trio of new 9000dwt asphalt tankers for US interests.



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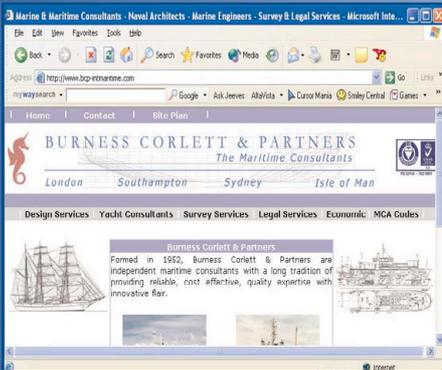
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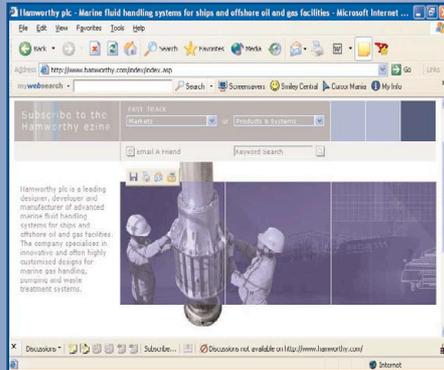
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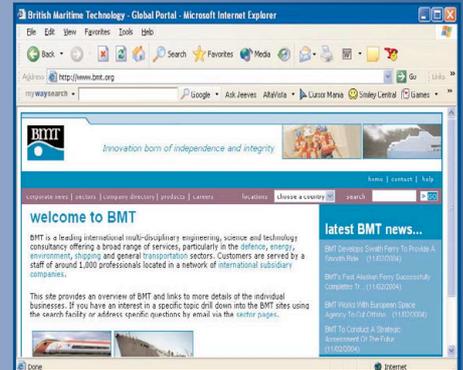
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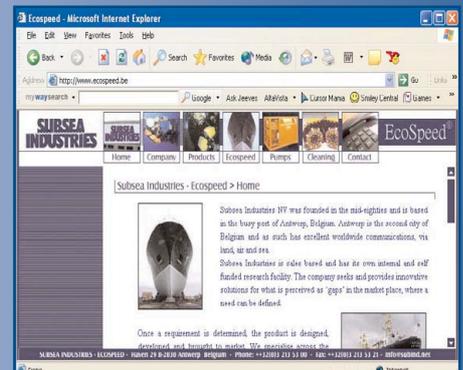
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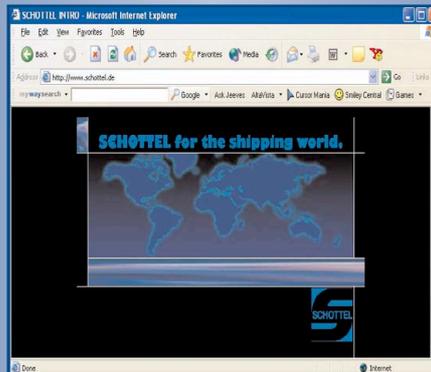
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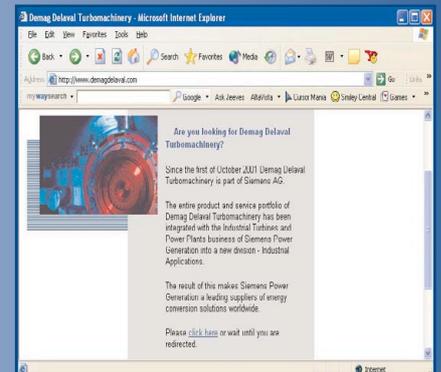
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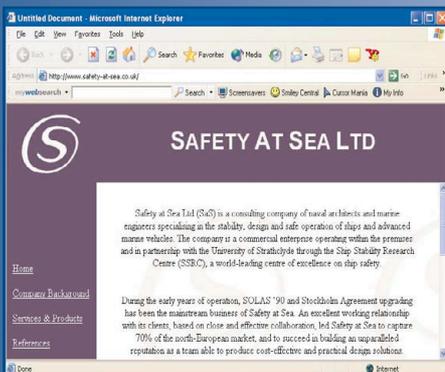
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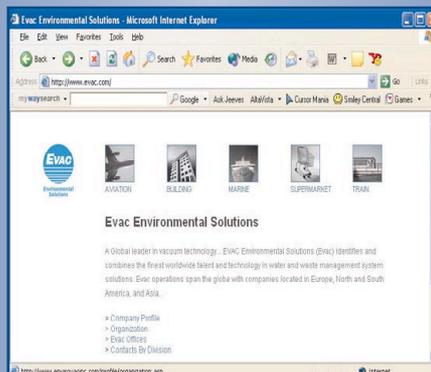
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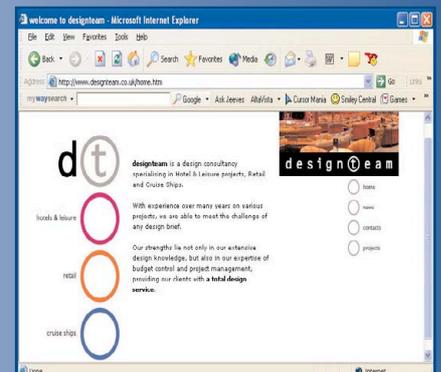
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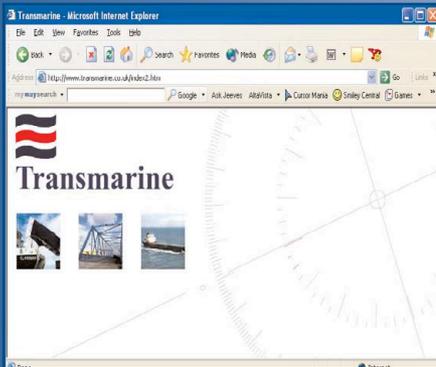
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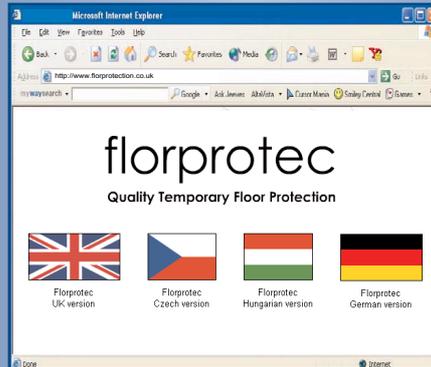
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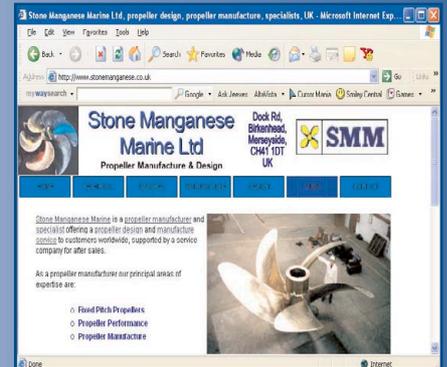
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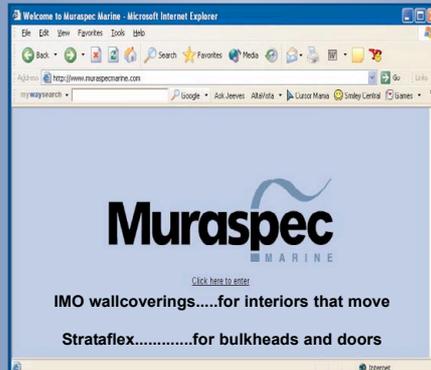
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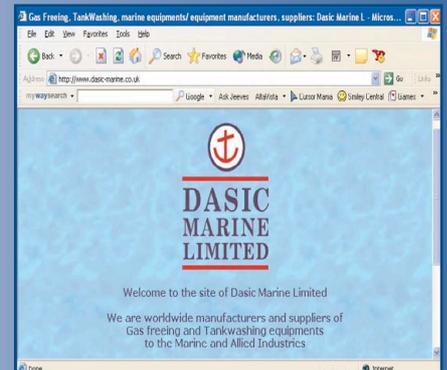
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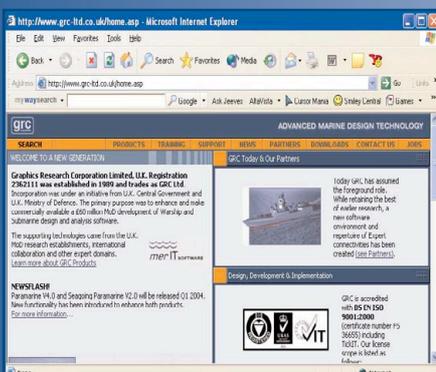
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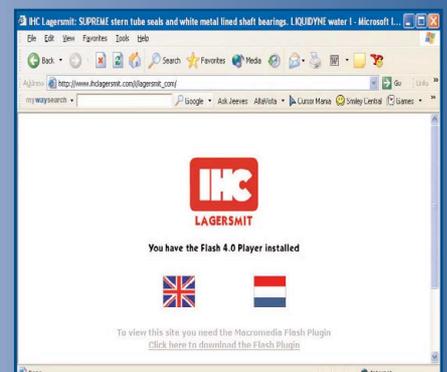
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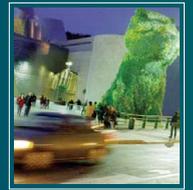
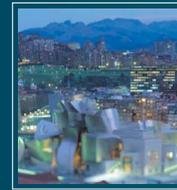
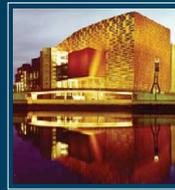
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