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THE NAVAL ARCHITECT

At the end of last month, Admiralty Shipyards, in St Petersburg, was scheduled to hand over to Sovcomflot the *Tuchkov Bridge*, third in its new series of 47,000dwt products tankers. This yard is also in the midst of a large investment programme designed to shrink production time and costs, as well as to increase annual output by up to 12%. Further details appear in our special feature on Russia, which begins on page 40.

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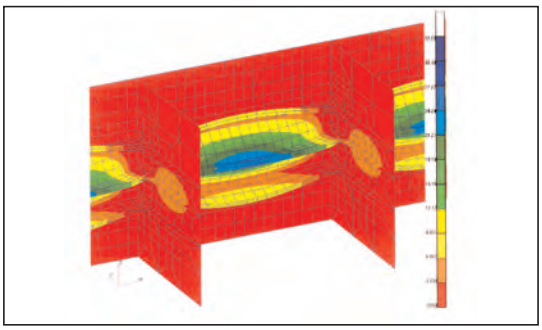
Ice challenge for a new generation of large tankers

READERS who follow the ups and downs of the new-ship contracting scene will almost certainly have noticed the numerous tankers that have recently been specified with ice strengthening; many of these are quite large - up to Aframax size and even to Suezmax dimensions in some cases. Most are being built in Korea at Hyundai, Daewoo, and Samsung. Until now, most ice-class cargo ships and tankers have been relatively small; many are paper and forest products carriers trading regularly to frozen parts of the Baltic Sea.

Primary catalyst behind this new dimension to the meaning of the word 'ice-classed' has been booming Baltic oil exports from Russia - 7.5 million tonnes at present with optimistic prospects of even more to follow in the future, particularly when current channel dredging is completed next year, and ships of 13m draught will be able to enter St Petersburg. Output is expected to increase by 50% despite lack of investment and some wells drying up, while current political difficulties in the Middle East may also make Russian oil very attractive in the near future.

While the centre of action is focused on the Gulf of Finland (with its so-called first-year ice) and particularly the port of Primorsk, many owners and operators are also keeping a keen eye on the Northern Sea Route and new oil and gas discoveries around the island of Sakhalin in the Russian Far East. With this in mind, IACS (the International Association of Classification Societies) is currently finalising new harmonised Polar rules for multi-year ice.

According to Lloyd's Register, many of these newly ordered tankers are options at yards in Korea that have been converted not only into firm orders but with the addition of ice strengthening up to 1A standards. Large ice-strengthened tankers are not, of course, totally new: the path has already been pioneered 30 years ago in the USA with the conversion (special bow) of *Manhattan* to test navigation of the North West Passage. In the mid-1970s the Finnish operator Neste built a trio of medium-size (16,000dwt) tankers at the Nobiskrug yard, headed by *Lunni*; two of these ships were later successfully re-built to accommodate an Azipod azimuthing propulsion unit and have been regularly trading to the Arctic.



Structural analysis in the forebody ice belt region for a typical large 1A ice-classed Aframax tanker in Korea, needed because yard production facilities are incompatible with Finnish/Swedish rules for frame spacing. The aim is to optimise the structure of such large hulls for easy fabrication, using a much wider longitudinal frame spacing than Finnish/Swedish rules recently specified. Such pioneering work has been carried out by Lloyd's Register, using Finnish Maritime Authority tentative guidelines, to launch new methodology for large hulls.

More recently, this company - today known as Fortum - invested in the largest modern ice-strengthened vessels ever: the revolutionary double-acting tankers *Tempera* and *Mastera*, of 106,000dwt (*Significant Ships of 2003*). This highly novel concept is one of a number of imaginative ideas from Kvaerner Masa-Yards in association with ABB (propulsion is by an Azipod which is turned through 180deg to 'drill' into the ice when going astern); the technique already been used on three small icebreakers. Both ships are strengthened to Lloyd's Register 1AS class.

Although certainly proven to be highly efficient at icebreaking, the design is very advanced, and investment must have been huge. Nevertheless, the pair could well form the future standard for cargo ships seeking reliable navigation in complex multi-year Arctic ice, such as found along the northern coast of Russia.

In parallel with all these developments are plans for a new fleet of Russian icebreakers, especially for operation in the Baltic with it first-year ice (most ice-strengthened merchant ships, in which ever country, are expected to only sail with an icebreaker in attendance). This proposal will be especially relevant to expansion at Primorsk and other Russian oil terminals, since lengthy delays can occur, it is understood, while waiting for icebreaker assistance - much to the frustration of Finland where four hours is considered the maximum wait and where the Maritime Authority aims for perfection in keeping freight ships moving year-round, and where ice maps are issued weekly. The technical problems to be overcome by future Russian Baltic icebreakers are outlined in a special article in this issue of *The Naval Architect*.

Those tankers currently being ordered are mainly planned for operation in first-year ice, as found in the Baltic. Therefore, they will be much more traditional than the Fortum duo, with exteriors largely indistinguishable from others of their breed. It is inside the hull structure and in the propulsion train that the essential upgrading can be found. The joint Finnish/Swedish ice rules are still accepted as the *de facto* standard for first-year ice by all major class societies (with the possible exception of the Russian Maritime Register, whose rules, *The Naval Architect* understands, are - surprisingly - considered to be less stringent). Lloyd's Register has recently re-aligned its rules with those of Finland and Sweden. This situation means – we are told – that no new international ice-strengthened tankers have yet been built to Russian Register rules, although things are different within that country, eg, the recent *Astrakhan*-class tankers for Lukoil, featured in *Significant Ships of 2000*. Finland is most concerned about pollution from insufficiently strengthened tankers - Primorsk and St Petersburg are very close - and last winter some tankers navigating to those ports were considered insufficiently strong.

Modelling ice-going tankers is a difficult operation, and much hull line refinement is made through observation - generally at the two leading commercial ice tanks, MARC, in Helsinki, and HSVA, in Hamburg. The familiar cutaway bow is unlikely to be seen on new Baltic tankers since the aim today is to achieve the highest ice class with the minimum increase in installed power using open-water hull lines. Because of these ice-modelling problems, Korean yards are understood to be considering development of standard hulls.

Typical of the Aframax ships being ordered and entering service today are four 1A-class designs at Daewoo for Teekay and Essberger (two each); four 1A ships at Samsung for BP; and joint 1A (hull) and 1C (machinery) ships at Hyundai's Samho yard for Greek owners. Two Suezmax tankers to ice 1C are also on order at Hyundai's Ulsan yard, again for Greek operators. All these ships mentioned are to Lloyd's Register class. Primorsk port is understood now to require only a minimum of 1C, which might explain the choice of that relatively low standard by some owners.

Today, net steel weights for new Baltic Aframax tankers would be expected to increase by approximately 2.5% (Ice 1C), 4% (Ice 1B), and more than 5% (Ice 1A). With steel prices currently rocketing (currently around US$700tonne for 2007 delivery, a figure which can be multiplied by 2.5 times to include fabrication and welding), ice-classed tankers are seen by Far East yards not only as highly prized value-added contracts but also as work that offers a real technical challenge.

IBM/Dassault PLM contract at Meyer Werft

A THREE-YEAR contract for the PLM (product lifecycle management) software technology of **IBM** and **Dassault Systèmes** has been signed by **Meyer Werft**, the leading German builder principally known for its cruise liners, ferries, and gas tankers (and most recently, container ships). The package will include Catia V5 for collaborative virtual product development and Enovia V5 for product data and lifecycle management. It is expected that, as a result of implementing this equipment, savings in design time of 30%, production time of 20%, and parts inventory of 50%, can be made - highly impressive figures in today's exceptionally competitive market.

This PLM solution should enable Meyer to develop its ships and track all design dependencies in a 3D virtual environment. In a typical large cruise liner project, where up to three million components are involved, Catia V5 powerful digital mock-up and analysis functions will allow the shipyard to produce virtual prototypes and therefore bypass traditional scale models that were formally used to verify the fit of complex assemblies. IBM's shipbuilding centre in Hamburg, and shipbuilding competency teams from Dassault in France and the USA will support the project.

Seen here during the final stages of outfitting at the Kinderdijk yard of IHC Holland is the new 10,028m³ Chinese suction hopper dredger *Wan Qing Sha*, which is the 141st ship to be built by IHC for that country! She has twin pipes fitted with new-generation dragheads and capable of working at a maximum depth of 39m. Two dredge pumps are driven off the free ends of the 6000kW Wärtsilä main engines. The new dredger will be delivered in June to CHEC-Guangzhou Dredging Co for capital work in the Pearl River delta. Further details can be found in our special feature on The Netherlands in this issue.

SECOND FRENCH LNG TANKER CONFIRMED - The option for a second identical 153,000m³ LNG tanker with diesel-electric propulsion and CS1 membrane technology at Alstom Chantiers de l'Atlantique has been confirmed by Gaz de France. A contract for the first ship, with a possible option, was signed last September; however, the second ship has been ordered in partnership with the Japanese operator NYK Line. Delivery is expected at end-October 2006. Meanwhile, the Atlantique yard is nearing completion of a smaller prototype diesel-electric ship of 75,000m³, also for Gaz de France.

REVISED IMO SEWAGE REGULATIONS - At the end of March, revised regulations - amendments to MARPOL 73/78, Annex IV - for the prevention of pollution by sewage from ships were adopted by IMO's Marine Environment Protection Committee. Existing ships will have to comply five years after the date of entry into force; they will have to have a sewage treatment plant, a sewage comminuting and disinfecting system, or a holding tank. Such ships will not be allowed to discharge less than 3nm from land, while non-comminuted or disinfected sewage has to be discharged more than 12miles from land. The rules (which apply to new ships of 400gt and above, certified to carry more than 15 persons, and engaged in international voyages) will enter into force on August 1 2005.

WÄRTSILÄ ENGINES FOR NEW ICEBREAKER - The new double-acting Russian icebreaker/standby/supply ship ordered by the Far Eastern Shipping Co from Kvaerner Masa-Yards is to be powered by Wärtsilä primary diesel machinery for the electric propulsion plant. Three eight-cylinder 38-type engines, each of 5800kW, will be installed, together with one six-cylinder 20-type engine of 1080kW. Electric current will be supplied to twin 6.5MW ABB Azipods.

FORMATION/ALBACORE LINK - The Canadian CAD specialist Albacore Research, and Formation Design Systems, of Australia, have agreed that the latter company is now an official distributor of ShipConstructor, Albacore's 3D product modelling tool for ships and offshore structures. The two companies have enjoyed a successful business alliance since last year when they initiated an interface between ShipConstructor and Formation's Maxsurf suite of ship construction software, so that a complete solution could be provided for naval architects, designers, and shipyards.

NEW MAN B&W ELECTRONIC ENGINE - A new seven-cylinder two-stroke engine from MAN B&W, the S65ME-C with electronic controls and an output of 17,990kW at 92rev/min, has been specially introduced as a tailor-made fuel-saving solution for powering new-generation Capesize bulk carriers and Suezmax tankers. The company took advice from Universal Shipbuilding, in Japan, that an increasing need existed for more dedicated engines for today's refined ship designs. The S65ME-C represents a seven-cylinder alternative to the well-established 6S70MC, 6S70MC-C, and 6S70ME-C model. This new model is also expected to be an ideal propulsion plant, in twin-engine formats, for large LNG tankers.

INTERSHIP: A NEW R&D PROJECT - Under the initiative of Euroyards and following the Leadership 2015 recommendations, the European shipbuilding industry has launched an integrated R&D project named INTERSHIP, which is part-funded by the European Commission. Objectives are to significantly increase shipyard competitiveness in cruise, ferry, and ro-pax designs, to develop safer and more environment-friendly ships over an entire lifecycle, and to achieve a drastic reduction in building and development costs, also in production times. Focus will also be put on improving vertical integration with owners, suppliers, and classification societies. Seven yards are involved: Kvaerner Masa-Yards, Fincantieri, Chantiers de l'Atlantique, IZAR, Meyer Werft, Flensburger Schiffbau, and Viana do Castelo. The project is expected to last four years.

CENTENARY FOR ROLLS-ROYCE - This month marks the 100th anniversary of the founding of the Rolls-Royce group. Although work in the early years concentrated on motor cars and reciprocating aero engines, the company later became famous for its jet engines to power aircraft, and later still many warships for the Royal Navy. Following the acquisition of Vickers, Rolls-Royce entered other sectors of the marine industry, including merchant ship design, propellers, podded systems, and deck machinery. Designs of new-generation gas turbines for future merchant ships are today well advanced.

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Mayflower Resolution: classification of a unique vessel

Design and construction of this wind-turbine installation ship called for special considerations, as Claudio Bittencourt, principal surveyor from classification society Det Norske Veritas, explains.

THE wind-turbine installation ship *Mayflower Resolution*, featured in a short article last month (page 28), is a unique special-purpose design - unique in that known technology is applied in a novel way. This is evident from just examining the vessel configuration. As reported, the vessel structure and marine systems were created by Knud E Hansen, in Denmark, while the jacking system design was carried out by IHC Gusto Engineering, in The Netherlands. The vessel was built by the Chinese company, Shanhaiguan Shipyard.

A prime challenge for Det Norske Veritas in the classification process was to apply a set of rule requirements that would cover the ship's unique operations. Since *Mayflower Resolution* is basically a ship in many aspects (although the hull is barge-like), well-established procedures and technology could be used. Additionally, the jacking system and all related aspects, not least integration of the jacking equipment with vessel systems and the hull, needed to be covered. In this case, offshore technology was applied.

The way forward was to use the best of both worlds. A start was made by applying the rules with the widest reach (the Mobile Offshore Units rules, now replaced by the DNV Offshore Standards), which consider all main aspects of such a vessel, and then considering the 'principle of equivalence', where alternative arrangements were necessary to satisfy the particular needs and class requirements.

***Mayflower Resolution* is seen here off Falmouth in her sailing mode, with legs retracted.**

MAYFLOWER RESOLUTION
OPERATIONAL SPECIFICATION

Service areas	unrestricted
Water depth, max for jacking	35.00m
Wave height, max	3.00m at 0deg heading
Associated period	All periods up to 16.00sec
Wind speed	15.30m/sec
Current speed	1.26m/sec
Survival (jacked up)	
Water depth, max	35.00m
Wave height, max	10.00m
Associated period	16.00sec
Wind speed	36.10m/sec
Current speed	1.60m/sec
Crane operation, max wind speed	16.00m/sec
Jacking speed, max	60.00m/h
Ship speed, service in transit, max	10.50knots
Jacking system	
Jacking	2500tonnes/leg
Pre-load	3750tonnes/leg
Holding	5000tonnes/leg

This was a major challenge. Rule requirements and solutions needed to be examined from first principles, which again require a deep understanding of rule requirements and objectives. This operation also needed to be performed not only during the design approval phase but again during fabrication. Additionally, it was essential that communications between all parties were open, forthright, and effective.

The UK owner, Mayflower Energy Ltd, selected the following class notations to cover the main aspects of its new vessel and to demonstrate her level of flexibility and sophistication: +1A1 Self-Elevating Unit, Crane, Dynpos, AUT, E0. One of *Mayflower Resolution's* characteristics is an ability to operate in water from very shallow water to 35m depth, carrying her own payload and using her 300tonne Kenz crane to install tower and wind turbines from her deck, once in jacked-up condition, thus reducing weather down-time. The ship has two modes of operation: cargo vessel and MODU mode, allowing for different maximum draughts when operating in different configurations.

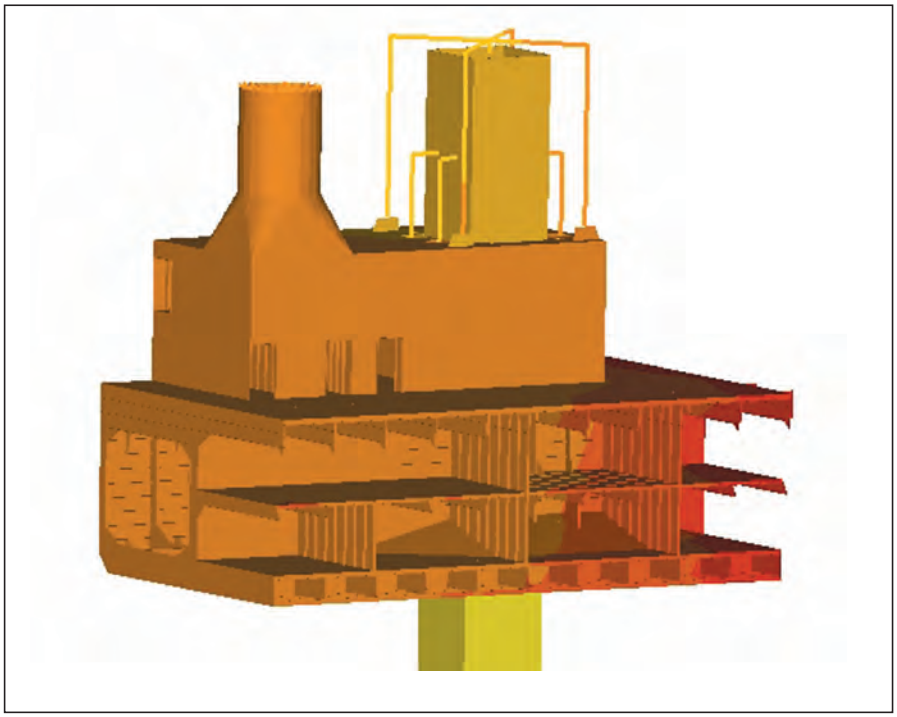
The flag state, the Isle of Man, adopted the IMO MODU Code as the framework for compliance with statutory requirements. DNV was appointed by the Isle of Man Marine Administration to survey, inspect, and certificate the ship on its behalf for most of the IMO MODU Code chapters during the newbuilding design approval and surveillance. Direct communication with the flag authority was important during all design and fabrication processes, to clarify and to interpret several requirements from the MODU Code, with due consideration of the vessel's special characteristics.

Detailed finite-element analysis of hull

Considering the complexity of the hull structure and requirements during the jacked-up condition, DNV undertook a complete independent finite-element analysis to identify the critical load paths during installation, jacked-up condition, and accidental conditions, from the legs to the hull through the moonpools. The model was executed in sufficient detail and refinement to allow identification of load paths and verification of levels of stress against rule requirements and Classification Note 30.1 (buckling of stiffened panels, recently replaced by RP C-201). For sailing condition, the scantlings were designed to satisfy the conditions given for ships.

The 300tonne and the 50tonne cranes' supporting structures were integrated into the

3D finite-element model, allowing verification of stresses at the supporting area and transition structure. In addition, DNV independently investigated fatigue at the hull and legs, taking advantage of the 3D finite-element model already developed for the strength verification. By using submodelling techniques, refinement of the mesh and addition of other structural elements, such as brackets and stiffeners using shell elements, was performed in the areas considered most relevant to fatigue investigation.



A finite-element detail of *Mayflower Resolution*, showing one of the six legs and the adjacent base for the 50tonne Kenz auxiliary crane.

Jacking system examination

The important jacking system was reviewed, having in mind the vessel's characteristics, ie, number of legs and motions. An envelope condition, considering maximum water depth and maximum environmental loading (during installation and in jacked-up condition) was verified in order to ascertain that the vessel's dynamic behaviour was taken into account in the design of the jacking systems. Once again, the 3D finite-element model was used to verify leg loading and interaction with the hull.

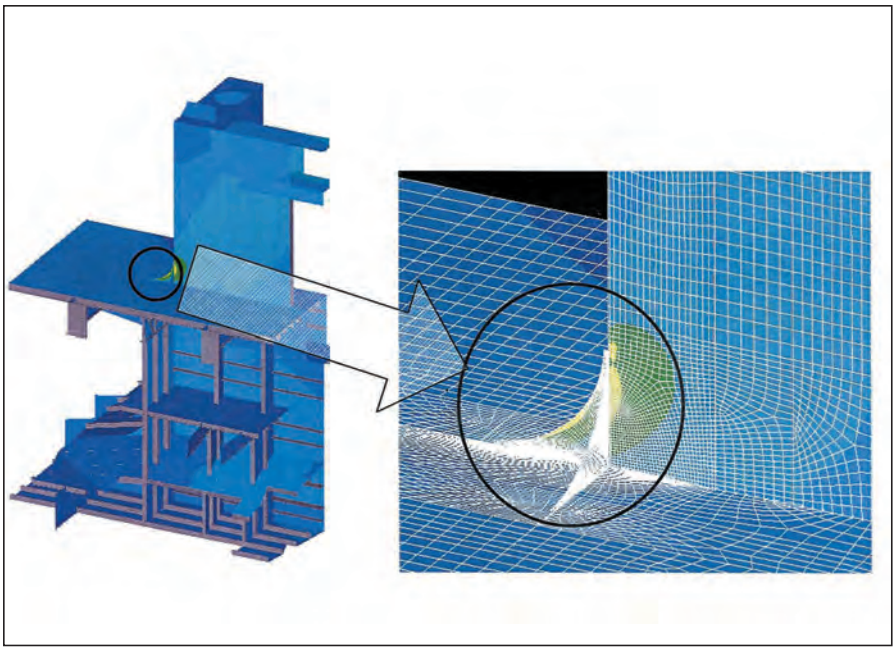
Principal components were certified as required in the DNV MOU rules, and power generation capacity was assessed as part of the load balance calculations for the whole vessel. The jacking system is provided with water jetting equipment and can cope with penetration into the seabed.

The software controlling the jacking system - which can operate in manual, semi-automatic and automatic modes - was reviewed and approved by DNV. Information from the jacking system's instrumentation and controls is integrated into the vessel's automation network. Principal information regarding jacking conditions is also logged separately for control and refinement of in-service inspection. The legs and main parts of the structure related to the jacking system were manufactured using very tight tolerances to allow for smooth operation, and extra-high-strength steel was used for both legs and main structural elements.

Marine systems and safety

During classification of the marine systems, the approach used was to identify the way that the systems would be used under the different conditions and, based on the MOU Rules requirements and statutory requirements, to accept alternative arrangements that would best suit the vessel application without affecting safety in any operating condition. The marine systems should also cope with a range of air gaps, providing flexibility to select an adequate air gap for different operations.

A detailed finite-element mesh from the corner of the jackhouse structure, used for fatigue assessment.



In-service phase

On completion, information from design and fabrication phases was used to develop a specific in-service inspection plan (IIP), which covers the general rule requirements for a ship with additional requirements to address the particular aspects of this vessel. Based on the IIP, the owner will further develop and organise inspections to satisfy the required level of monitoring.

During development of the IIP, special attention was taken to address uncertainties regarding *Mayflower Resolution's* pattern of use during in-service life and exposure to different environmental conditions and water depths while in a jacked-up condition. Identification of the monitoring parameters was carried out, not only to control future uncertainties, but also to allow for inspection optimisation, thus reducing operating costs and downtime.

Mayflower Resolution was recently believed to be performing her first job, installing 2MW turbines on the North Hoyle offshore windfarm, off the coast of Wales, where she faced, for the first time, real operating conditions. However, she has already proved herself for essential aspects of her life by sailing from China to the UK, facing a severe storm after transitting the Suez Canal, and by smooth performance during jacking trials.

Note: Mayflower Energy Ltd was recently in financial administration but is now back in business under a new name, Marine Projects International.

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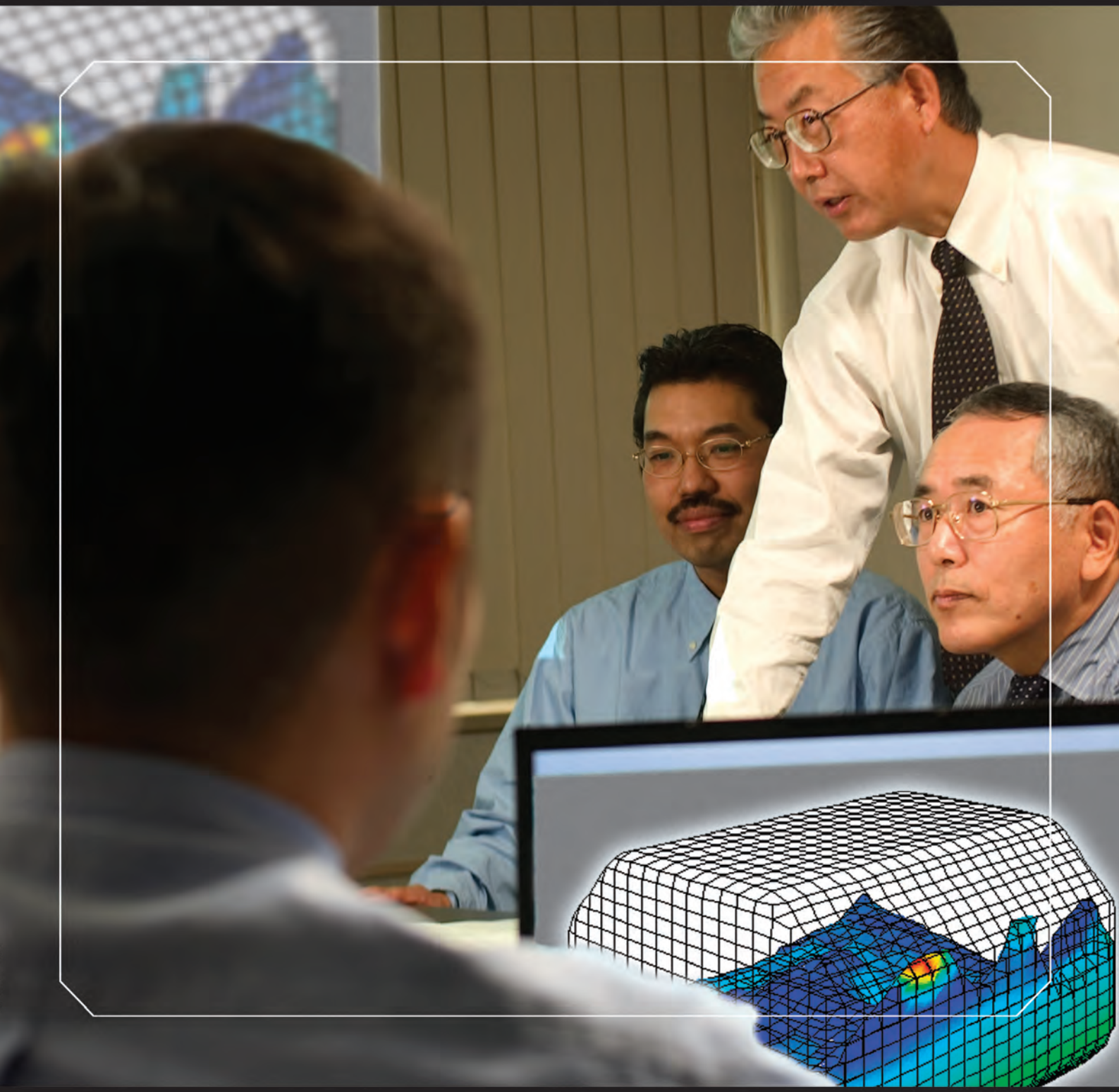

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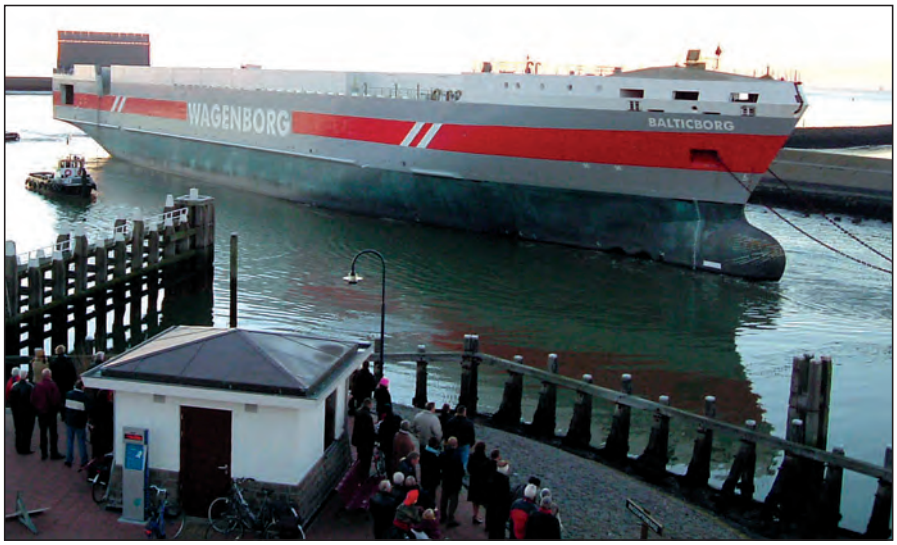
Busy times, but future uncertain for Volharding

On a special visit to The Netherlands, *The Naval Architect* had the opportunity to visit a number of shipyards and marine equipment companies, to produce a comprehensive report from this country.

The general feel from the companies visited is that business is picking up after the past few years of depression in the industry, however, things are still far from ideal. A great number of firms are using subsidiary companies in Eastern Europe, and in China, and foresee this trend continuing, with the eventual closure of Dutch bases.

However, despite this, most news from companies we visited did not reflect this negativity. Business is progressing and deliveries and installations are still continuing, and should do so for a number of years to come.



***Balticborg* is Volharding's first of two new sto-ro ferries. This 153.05m vessel will be delivered in six weeks time.**

TECHNICAL PARTICULARS
BALTICBORG* AND *BOTHNIABORG

Length, oa	153.05m
Length, bp	144.20m
Breadth, moulded	21.60m
Depth, to main deck	8.40m
Depth, to upper deck	15.20m
Draught, summer freeboard	7.10m
Deadweight	10,000dwt
Speed	16.50knots at 90% MCR
Main engine	9450kW at 500rev/min
Propeller	CP, 5000mm diameter
Bow thrusters	2 x 500kW
Stern thruster	1 x 500kW
Cargo holds	two cargo holds, box-shaped, with fixed ramps to weather deck and tanktop
Ramp slope	approx 7deg
Main hold	
Area	2258m²
Volume	462,400ft³
Width	19.60m
Free height	5.80m
Lower hold	
Area	1225m²
Volume	216,300ft³
Width	14.8m
Free height	5.0m
Weather deck	
Area	182m²
Loadings	
Weather deck	2.5tonnes/m²
Upper hold	5.0tonnes/m²
Lower hold	5.0tonnes/m²
Accommodation	14
Classification	Bureau Veritas +1 3/3 E, Unrestricted Navigation, Ro-Ro Cargo Ship, +Mach, +Hull, CNC-1, Aut-UMS, In-Water Survey, PFA, Clean sea 7, + Clean Air, +Veristar Hull, Ice class 1A (Swedish/Finnish rules)

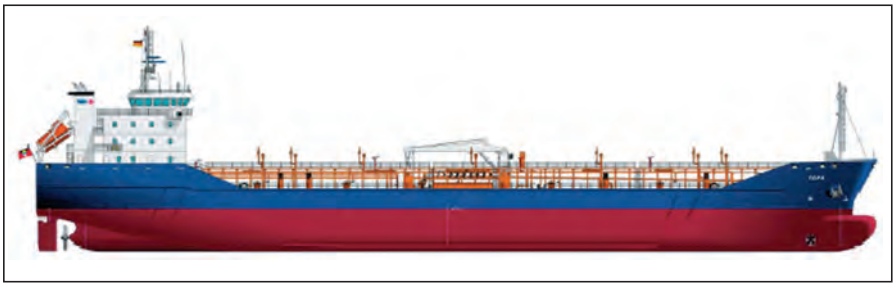
AT Volharding Shipyard's Harlingen site, finishing touches are being made to a new 153.05m long sto-ro freight ferry. This vessel, to be named *Balticborg*, has been built for the leading Dutch owner Wagenborg, and will be chartered by Kappa Packaging. It will be delivered in six weeks time, and a sister, *Bothniaborg*, will be completed in November. Both ships will run on a new service, starting in autumn this year, from Sweden to The Netherlands (Södertälje and Piteå to Terneuzen).

These single-screw designs will transport paper in reels and pulp packages on the main deck and tanktop, and up to 180TEU containers on trailers on the weather deck. They are designed for operation in the Baltic Sea, North Sea, and the Gulf of Bothnia. Both hulls were fabricated at Daewoo's Mangalia Heavy Industries yard, in Romania (Volharding has already taken delivery of around 30 hulls from this yard), and towed to The Netherlands for outfitting. Twin bow thrusters and a stern thruster will help to make the new ships highly manoeuvrable.

New tanker order series

Tanker owner W-O, from Germany, has recently ordered a new series of up to six IMO II chemical and oil tankers from Volharding; these are claimed to be of a unique type for highly flexible operation. The environment-friendly design, which will have optimised cargo handling, and complies with the needs of major traders, oil and chemical companies - including for the carriage of chemicals and petroleum, as well as meeting the latest regulations.

A view inside the ro-ro decks of *Balticborg*, showing the fixed ramp to the lower hold, which is closed by a watertight cover.



Profile of the new 10,000dwt IMO Type II product/chemical tankers being built by Volharding.

The new tanker series, nicknamed the IceCube class, is specially designed with a high cubic capacity, and strengthened to Ice Class 1A, with a shallow draught, and length restrictions. Key features include a deadweight of 14,000dwt, a cargo capacity of 19,000m^3, redundancy for the 3840kW main engine, a 940kVA shaft generator, and a 400kW bow thruster. All the ships will be built to Lloyd's Register's highest class.

Two 10,000dwt IMO II product tankers, of generally similar design, have already been contracted for a German owner. Those vessels were fabricated in the Ukraine and outfitted in Harlingen; they will be delivered this summer and are suitable for the carriage of both oil products and chemicals to which the IBC code does not apply. Like those for W-O, these ships have 13 epoxy-coated cargo tanks (including those for slops); all these tanks are fitted with electric deepwell pumps, each of 250m^3/h, while those for the slop tanks are each of 80m^3/h.

Other news

Other projects at Volharding include a series of four 900TEU container vessels building for Beluga Shipping, of Bremen, to a totally new design; these are being fabricated at Volharding's Ukraine yard. Although this ice-strengthened series is based on the yard's existing 750TEU design, the enlargement in container capacity is not just derived by lengthening. Of the yard's new and popular 750TEU design, three have already been delivered, and seven more are on order.

In order to maintain a speed of 18knots, the lines of the larger ship's forebody had to be faired to reduce any negative influence of the hull lengthening in such way that the installed power of 7200kW did not have to be increased. Containers are placed in and on four holds, which are closed with hydraulic folding hatches. The centre two holds are designed with movable cellguides in order to transport 40ft and 45ft containers.

One of the new 10,000dwt IMO Type II product/chemical tankers, two of which will be delivered in the summer to a German owner. They will be followed by further ice-strengthened versions of 14,000dwt for W-O.

Length overall of these vessels is 153.65m, with a length bp of 144.80m. Breadth moulded is 21.50m, and depth is 9.30m. Maximum deadweight is approximately 10,600dwt.

Volharding is currently looking at China for a possible new yard. It expects to finalise a deal there very soon with a partner. The company's orderbook is looking good at the moment, being fully booked until the first half of 2006; however, Volharding foresees that its Dutch yards will shut within the next five years.

TECHNICAL PARTICULARS
10,000DWT CHEMICAL TANKER

Length, oa	126.95m
Length, bp	121.40m
Breadth, moulded	19.60m
Depth, to main deck	9.35m
Draught, design	6.50m
Draught, scantling	6.80m
Deadweight, at design draught	9900dwt
Deadweight, at scantling draught	10,600dwt
Gross	6688gt
Net	2869nt
Speed	13.5knots at 90% MCR
Main engine	3840kW at 600rev/min
Propeller	CP, 3600mm
Bow thruster	400kW
Accommodation	14
Classification	Lloyd's Register +100 A1, Chemical Tanker Ship Type 2 with List of Defined Cargoes, Double Hull Oil Tanker ESP, LI, +LMC, UMS, IP

Better times ahead for Winel

SUPPLIER of hatches, watertight doors, tank-vent check valves, and many other products, Winel, from Assen, is busy in the cruise and ferry, naval, and yachting sectors. Over the past few years the company has seen some difficult times in a depressed marine industry, and staff levels have been cut by half since 2001, but Winel sees a change in this trend, and reports that the situation is improving.

It has recently supplied watertight sliding doors to Merwede's new vessels (see separate article in this report); three units were installed on each vessel. The company has also quoted for the new MSC cruise liners at Alstom's Chantiers de l'Atlantique, and is currently waiting for the results. In addition, Winel also supplied watertight and sliding doors to the dredger *Wan Qing Sha* (discussed in another article in this feature).

The company has a sales office in China, and produces its equipment there under licence. It produces and sells doors and hatches in that country, as well as valves, which are then brought into Europe to sell. The rest of its equipment is produced in Holland, and it has the capacity to build 300 doors annually.

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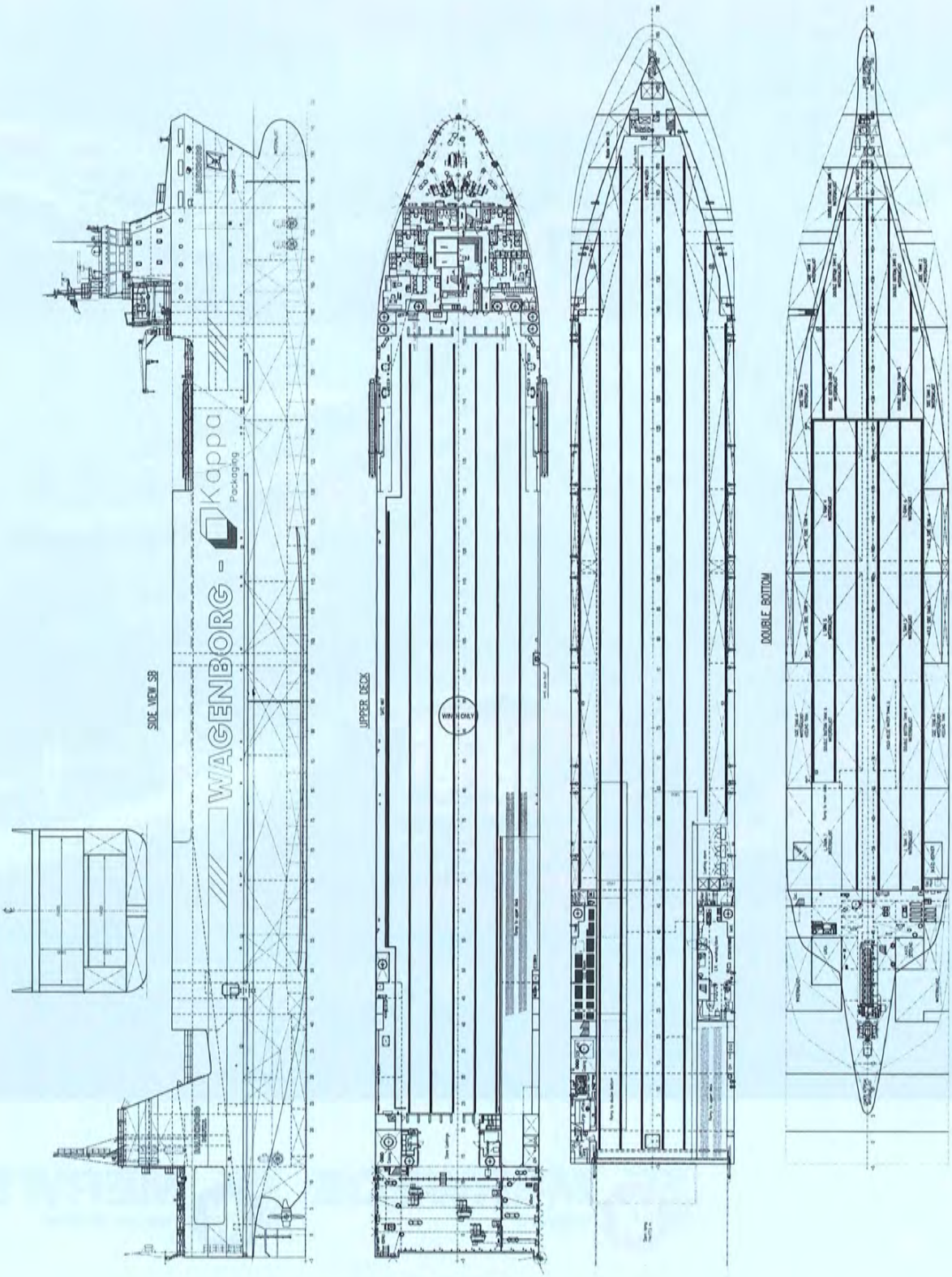
General arrangement of Volharding's new 153m sto-ro vessels for Wagenborg, the first of which is set for completion within the next six weeks. They have been chartered to run a new service from Sweden to The Netherlands for Kappa Packaging.



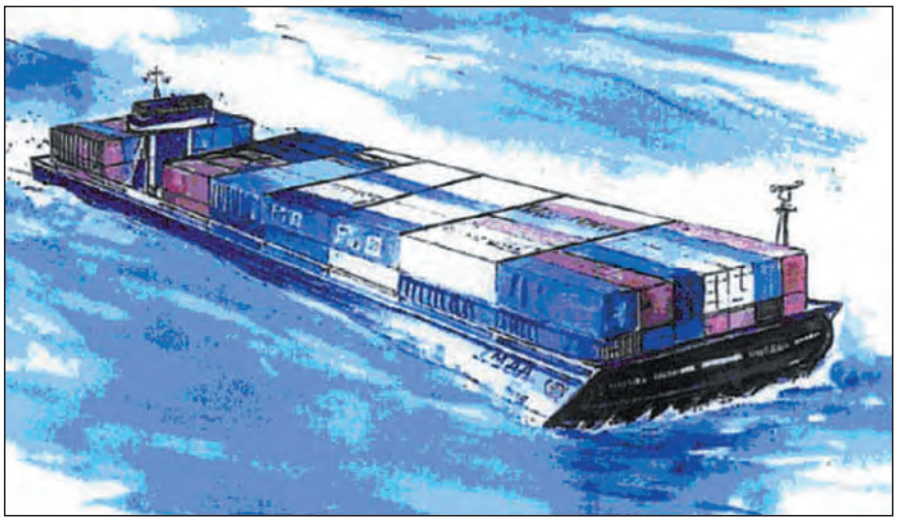
Interesting projects for R&D training company

CORE activities of Maritime Simulation Rotterdam BV (MSR) include consultancy, operational research, training, and promotions. The company has ISO 9001/9002 certification, as well as certification of simulators from the Dutch Ministry of Transport.

MSR's headquarters accommodates four ship bridge simulators - one with a view of 360deg, two of 225deg, one 'blind bridge', and one vessel traffic services (VTS) simulator. All simulators are of modular design, and bridges can be set to the requirements of a client. They can be operated stand-alone or interactive, in the same environment. At the time of *The Naval Architect's* visit, the 360deg simulator was an exact replica of a ship entering the Port of Curaçao, training pilots that would be navigating the difficult entrance to this harbour.

Training at MSR focuses on combining nautical and shore-related aspects. Programmes are designed to broaden and accelerate an individual's attitude, skills, and knowledge (ASK methodology), placing the trainee in a situation that will enable them to make decisions and learn from them. Courses include engineering resource management, bridge resource management, joystick manoeuvring, ship handling, marine pilot training, and crisis management and crowd control. In fact, so that the simulation is totally accurate, controls, for example, have been bought from Niigata and Schottel, so that trainees use the exact equipment they will be using in a 'real-life' situation. A recent part of this process has been the inclusion of podded propulsors in the simulator model.

MSR also carries out detailed research and development work. A recent task includes involvement in a European joint research project involving a 135m partially air-cushion supported catamaran with freight movements for use on the Rhine and the Danube. MSR is assessing the impact on local river traffic. There is a good chance, according to MSR, that this new system will be implemented, due to the growth of the Eastern European market. The project will be completed in a year's time.



An artist's impression of the partially air-cushion support catamaran (PACSCAT).

Another study involves tanker risk and control options. For example, the use of double-hull tankers, avoiding accidents, and controls which need to be implemented after accidents and spills. This is another European-funded project, which includes the University of Glasgow, Intertanko, Lloyd's Register, and Bureau Veritas.

MSR is also consortium leader in a feasibility study currently taking place in Brazil. This is looking into a national plan to implement port safety and create a maritime database in 18 major Brazilian ports.

An oil company recently came to MSR and requested simulator training to moor an FPSO newbuilding after it had been towed to its final location. FPSOs can behave erratically, due to poor weather conditions in the open sea, for example, so staff were trained to deal with unexpected situations. The main problem in this situation was a tension-leg platform that was located nearby, so trainees had to be familiar with the proper positioning procedures.

MSR's full-mission bridge simulator No 1 with a 360deg view. Seen here is *Nedlloyd America* entering the harbour of Curaçao.

Innovative diesel-electric system for new ferries

A DIESEL-electric propulsion concept featuring a reliable redundant energy generation, propulsion and control system, has been developed and engineered for two SWATH ferries built by Damen Shipyards for the Province of Zeeland. *Prinses Máxima* and *Prins Willem-Alexander*, designed by the British consultancy Nigel Gee & Associates, were put into service at the beginning of April this year.

The propulsion concept incorporates two main generator sets and a redundant propulsion system, consisting of two double-rotor electric motors for propulsion. Power supply consists of A van Kaick brushless main generators of 2 x 1560 kVA and two auxiliary generators for ship's services. The main propulsion system is powered and controlled by four Bakker custom-made AC frequency inverters of modular design. In combination with the control system, they provide optimum availability. The installation is delivered turn-key, including consoles and cabling.

***Snellius*, a new research vessel for the Dutch Navy, has a Bakker diesel-electric propulsion system.**

Redundant propulsion and control

These passenger ferries are designed for efficient operation in extreme weather conditions on a very busy shipping route. For this to be possible, it is necessary that each vessel features very reliable energy, propulsion, and control systems. Therefore, the entire vessel and its installation have to comply with the highest requirements in this field.

The propulsion train plays an important part in this. That is why the SWATH ferries are equipped with two low-speed Indar AC double-rotor propulsion motors in one housing, each with a power of 1320kW (2 x 660kW) with incorporated thrust bearing. Also, the AC drives are specially designed with, among other things, a system of brushless AC/DC generators. The rectifier part of the frequency drive is incorporated in the AC generator, which means no main switchboard and less components used. The system was designed in close cooperation with the owner.

***Prinses Máxima*, designed by the UK consultancy Nigel Gee & Associates and built by Damen Shipyards, has been installed with a diesel-electric propulsion concept featuring a reliable redundant energy generation, propulsion and control system.**

Other installations

In another Damen newbuilding, *Dokter Wagemaker*, a double-ended ferry for TESO, Bakker supplied a redundant diesel-electric propulsion and energy concept, divided over two separate enginerooms, two propulsion rooms, and two switchboard rooms.

This 130.40m long vessel, to be deployed on the Den Helder to Texel route, will have a main supply system comprising a 6000V network and a 400V auxiliary network. The former is fed by four generators, each of 3077kVA, which power the propulsion thruster motors - two forward and two aft, each of 1650kW. Two transformers, each of 600kVA, feed the 400V network, together with an auxiliary generator of 350kVA.

This solution was created by selecting two symmetrical 6000V supply systems, forward and aft, connected via so-called coupling switches. This system can operate as one, or be split into two independent half systems. The 400V auxiliary supply system is supplied from the 6000V circuit using 600kVA transformers.

This is an electric system that guarantees energy supply, under the most extreme conditions, to thrusters and shipboard mains. Thrusters are fed and controlled by the client-specific direct water-cooled Bakker frequency converters, executed in a completely enclosed modular construction.

In other news, *Snellius*, a hydrographic research vessel for the Dutch Navy, was installed with a diesel-electric propulsion system from Bakker. In addition, the company supplied bridge control and an energy generating system, as well as carrying out all engineering work.

Terra Marique, a multipurpose heavy load transport barge for Robert Wynn & Sons Ltd, (discussed in more detail in our sister publication *Ship & Boat International*), also built by Damen Shipyards, was supplied with diesel-electric propulsion drives and an energy generating system. This includes switchboards, control desks, automation, transformers, and cabling.

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Full order book and many new deliveries at Damen

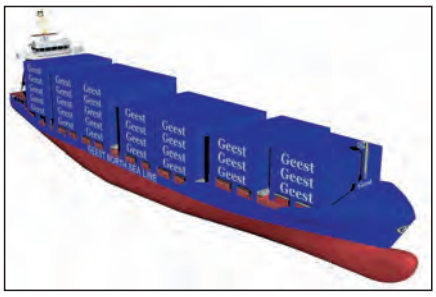
AT the end of last year Damen Shipyards Gorinchem laid the keel for the first of a new series of container vessels at its Galatz (Romania) yard. The Container Feeder Series 800 has a very high container intake, and is building for charter to Geest North Sea Line. The first of the two vessels ordered will be delivered in November this year, and the second in February 2005.

This 800TEU special design has been specially laid out for 45ft containers. This large box size has been fully optimised for road transport, and is the maximum size for the roads in Europe. Containers are 2m-2.5m high so that pallets can be put inside them. The vessels can also transport 8ft wide, plus 2m plus 2.6m containers, thus optimising the volume for road limits.

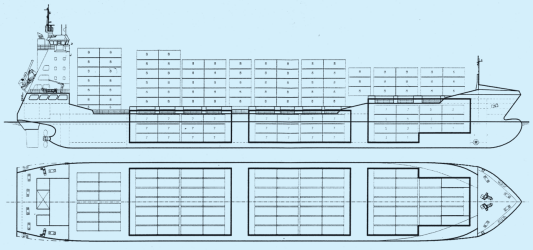
These Germanischer Lloyd-classed vessels have a length of 140m, a beam of 21.80m, and a design draught of 7.30m. The ships are propelled by a MaK 9M43 main engine, which has an output of 8400kW at 500rev/min. A CP propeller of 4.90m, and electric bow and stern thrusters ensure a speed of 18.5knots at 90% MCR. Also aiding manoeuvring is a balance type rudder and a rotary vane steering gear.

Other deliveries

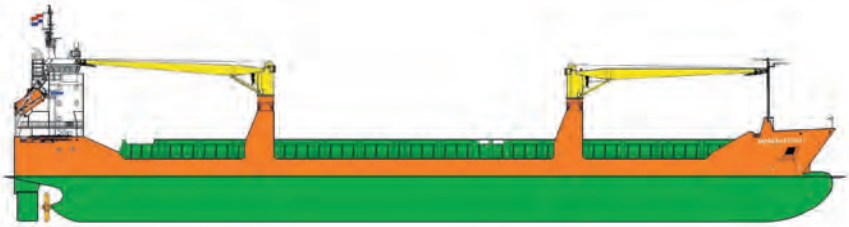
Set to be delivered in June this year is the first of three tankers for Darwin Shipping. The first vessel is 3100dwt, and the second two are 4500dwt. There were a great deal of restrictions of these ships, so these tankers are of a totally new design. The second vessels are set for delivery in the second half of 2004, and all were constructed at the Galatz yard.



An artist's impression of the new Container Feeder 800 series for Geest Line currently building at Damen Shipyard's Galatz, Romania, yard.

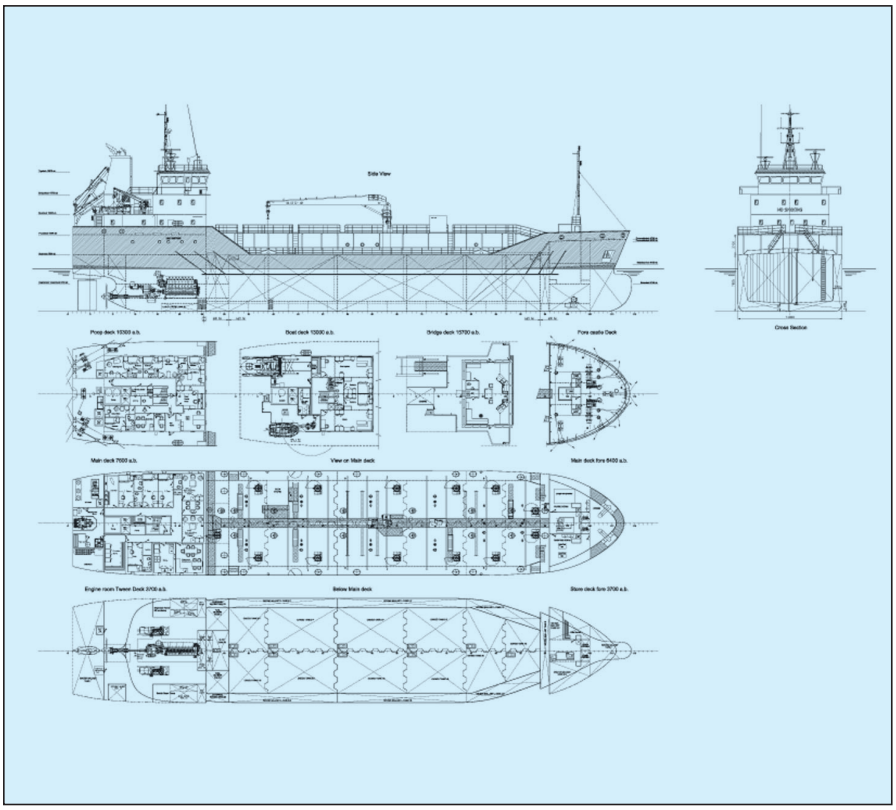


Profile and deck plan of the new 140m container ships for charterer Geest North Sea Line, ordered by a German owner. Geest is changing all its ships to accommodate 45ft containers.



An artist's impression of the new Combi Freighter 12000. The first vessel will be delivered at the end of next year.

General arrangement of a 3100dwt tanker which is a totally new Damen design.



TECHNICAL PARTICULARS
CONTAINER FEEDER 800

Length, oa	140.46m
Beam, moulded	21.80m
Depth	9.50m
Draught, design	7.30m
Deadweight	9300tonnes
Gross	7850gt
Trial speed at 90% MCR	18.5knots
Main engine	MaK 9M43
Output	8400kW at 500rev/min
Propeller	CP, 4.90m (approx)
Bow thruster	electric 700kW
Stern thruster	electric 500kW
Container capacities	
In hold	206TEU
On hatches	598TEU
Total	804TEU
45ft long	
in hold	97
on hatches	232
total	329
Container intake, each 14tonnes	514TEU
Accommodation	14 crew
Classification	Germanischer Lloyd +100A5, E3, +MC, AUT, IW, Finnish/Swedish Ice class 1A, container cargoes in holds and on hatch covers, equipped for dangerous goods acc, SOLAS Reg 19, Ch.11-2 except Class VII

TECHNICAL PARTICULARS
4500DWT TANKER

Length, oa	79.90m
Length, bp	75.80m
Beam moulded	17.00m
Beam, oa	17.04m
Depth to main deck	8.95m
Ballast draught	4.50m
Cargo draught	6.30m
Deadweight at draught 5.60m	3810tonnes
Deadweight at draught 6.30m	4500tonnes
Trial speed at 2400kW (100% MCR)	12knots
Minimum trial speed at PTI input of 400kW (100%MCR)	6knots
Gross	3190gt
Classification	Lloyd's Register of Shipping, 100 A1, Double Hull Oil Tanker, ESP, LMC, UMS, IP, LI, SEA (VDR), Maximum specific gravity 1.025, Flash Point above 60°C, Setting of the PV-valves: +14kPA/-3.5kPA, One man watch-keeping on the bridge, Bottom strengthened for loading and unloading aground
Flag	Bahamas

TECHNICAL PARTICULARS
3100DWT TANKER

Length, oa	75.00m
Length, bp	70.40m
Beam moulded	14.00m
Beam, oa	14.04m
Depth to main deck	7.60m
Ballast draught	4.20m
Cargo draught	5.75m
Deadweight at draught 4.60m	2230tonnes
Deadweight at draught 5.75m	3100tonnnes
Trial speed at 2400kW (100% MCR)	12knots
Minimum trial speed at PTI input 400kW (100% MCR)	6knots
Tonnage	2200gt
Classification	Lloyd's Register of Shipping, 100 A1, Double Hull Oil Tanker, ESP, LMC, UMS, P, LI, SEA (VDR), Maximum specific gravity 1.025 Flash Point above 60°C, Setting of the PV-valves: +14kPA/-3.5kPA, One man watch-keeping on the bridge, Bottom strengthened for loading and unloading aground
Flag	Bahamas

The building of all these vessels was in response to new regulations, and a need for smaller tanker tonnage, that is, double hulls up to 10,000dwt, and smaller container vessels up to 100TEU-2000TEU.

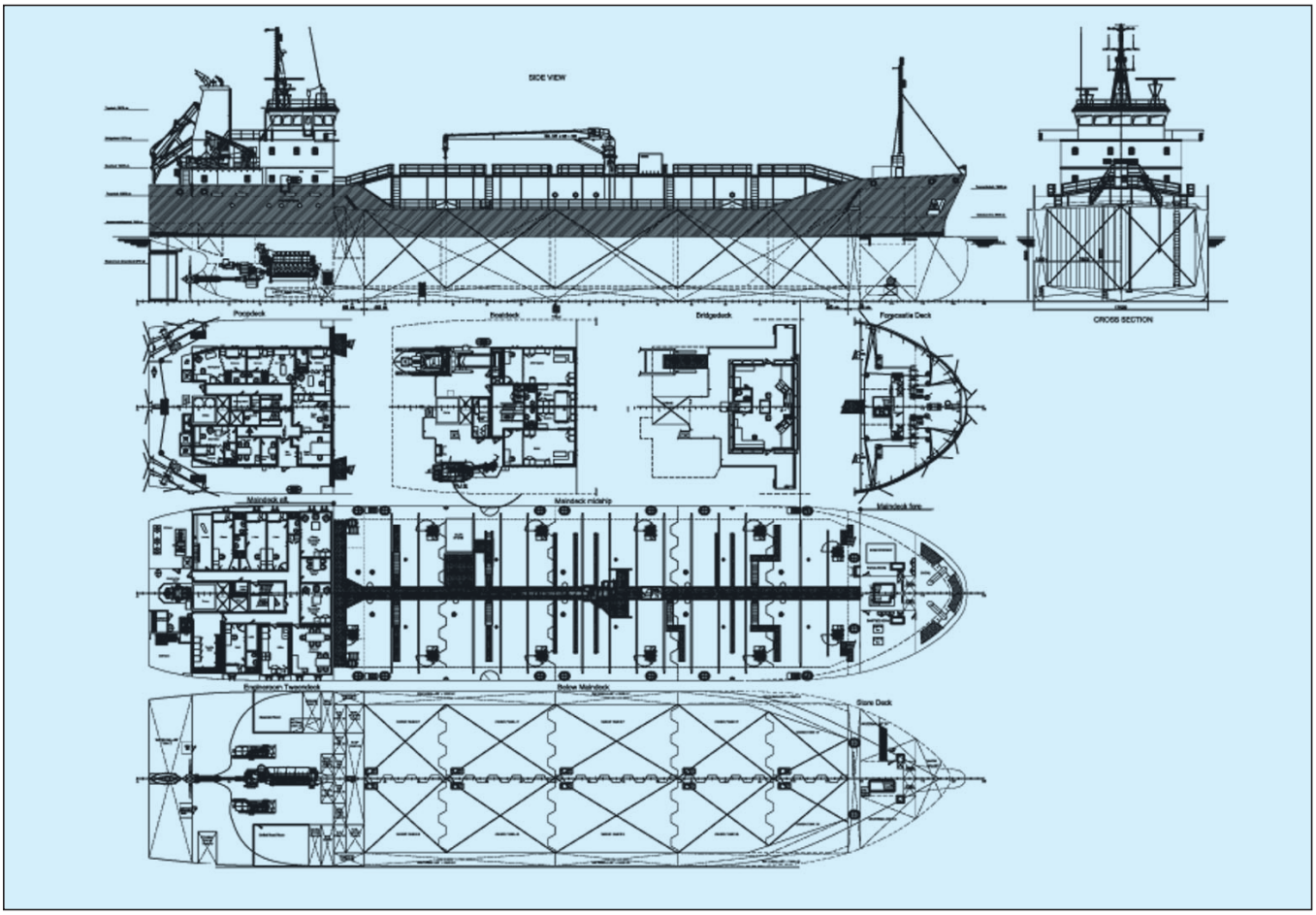
A double ended ro-ro ferry is also currently building for TESO (Texels Eigen Stoomboot Onderneming). The vessel has been specially designed for public ferry service between Den Helder and Texel, The Netherlands, and special attention has been paid to the redundancy of the vessel in order to provide 100% service availability. On each voyage it will be possible to transport approximately 300 cars and 1750 passengers at a maximum speed of 15knots.

Designed by BVS (Bureau Voor Scheepsbouw), the vessel is 130m in length, 23m wide and has a draught of 4.40m. She is classed by Lloyd's Register of Shipping + 100 A1 Ferry Extended Protected Water Service, 'Ice conditions according to RIZA code R', + LMC, UMS, IFP, PSMR, PCAC2.2. The ferry also meets the requirements of The Netherlands Shipping Inspectorate, Inland Waterway vessels.

The hull and superstructure are building at Damen Shipyards Galatz (Romania) while outfitting will take place at the Royal Schelde Yard in Vlissingen (The Netherlands). The keel was laid in December 2003 and the final delivery of the vessel will take place June 2005. Interiors and exteriors have been designed by Studio Yacht.

Other new designs include the Combi Freighter 12000, which is an upgrade of the 10500 model. The first of these vessels will be delivered in December 2005.

Damen has a full order book until 2006 at the moment, and is using its Chinese yard as much as possible. For example, a new order includes a Combi Freighter 10500 for a Dutch company.



General arrangement of the 4500dwt tanker, two of which will be delivered to Darwin Shipping in the second half of this year.

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New installations and concepts at crane manufacturer

THERE are mixed feelings about the future at Huisman-Itrec, a crane and offshore construction specialist. On one hand, a re-organisation has seen the loss of 25 staff in Holland, on the other, the company's factory in the Czech Republic has increased production gradually over the last six years. There is also a new business recently established in China, not for crane building however, but for the construction of roller coasters!

Recent installations of equipment include two 800tonne heavy-lift mast cranes for *Jumbo Javelin*, built at Damen Shipyards in Galatz, Romania (more details of this vessel can be seen in *Significant Ships of 2003*). This vessel, according to Huisman-Itrec, is approximately one year late in final delivery at present, consequently company employees are working 24 hours a day to finish a six-week job in five weeks.

Sister of this vessel, *Fairpartner*, will be fitted with the same lifting equipment. She is currently in Romania being completed, and Huisman-Itrec played a major part in the design and construction of these vessels, in that some of the crane base parts are already built-in to the vessel, ie, the cranes are fully integrated into the hull. Soon *Fairpartner* will sail to The Netherlands to have the second part of her cranes fitted.

Another on-going project is a pipelay system for Torch on a converted container vessel, now called *Midnight Express*. This ship will have a rigid reeling system, 22m in diameter, fitted. Conversion work is being carried out at the Davie yard in Quebec, Canada, and should be ready in June.

Seen here on *Jumbo Javelin* are her two Huisman-Itrec 800tonne heavy-lift mast cranes. They are fully integrated into the hull.

New catamaran heavy-lift concept

Huisman-Itrec also has a number of new concepts ready to be fabricated. A semi-submersible multipurpose catamaran has been developed for the transport and installation of spars and mono-hull tension-leg platforms (TLPs), as its primary function. Thus, the vessel could be available for (de)commissioning, extreme transport, and field development projects.

The catamaran can load and dock all existing drilling semi-submersibles and dock them for thruster repair. Stability is adequate for a 35,000tonnes load at 32.5m above the main deck of the barge. This assumes docking blocks of 5.8m height, allowing thruster repairs. High cargo centres of gravity have been assumed so that a variety of other loads could be carried as well.

The hook with sheave block. Its own weight is 26tonnes.

TECHNICAL PARTICULARS SEMI-SUBMERSIBLE CATAMARAN CONCEPT

Length, oa	197.00m
Length, bp	196.00m
Breadth, oa	88.00m
Breadth, of each hull	30.00m
Space between each hull	28.00m
Depth, to main deck	19.95m
Depth, of deck box	4.50m
Depth to underside of deck box	15.45m
Draught (summer)	12.00m
Draught, lightship	+/- 4.5m
Deadweight, transit condition	40,000dwt
Submerged depth	36.00m
Max water depth above deck	16.00m
Towers (2, fixed)	Length 18m x beam 19m x height 20m
Towers (4, movable)	Length 13.5m x beam 18m x height 20m
Tower freeboard	4.00m
Local deck strengthening for fork-shaped stern	40tonnes/m^2

The hull is 197m long, with a beam of 88m, and the deck has a free space of 10,444m^2. Hoisting capacity (with a special gantry) is 15,000tonnes. The vessel has a lifting capacity up to 30,000tonnes and carrying capacity up to 90,000tonnes. An added A-frame lifts up to 9000tonnes at 150m. This design's motion behaviour and competitive speed (service speed 12knots - free sailing), in cooperation with the submerging capability (also in transit) makes it possibly unique. The motions of this vessel have been tested at MARIN, using different loads, waves and winds (directions, height and frequency), and results have been promising. However, no customer has been found for the catamaran, as yet.

This 197m semi-submersible multipurpose catamaran concept has been developed for the transport and installation of spars and mono-hull tension-leg platforms.

New trailing suction hopper dredger for China

THE 10,028m³ twin-screw, environment-friendly trailing suction hopper dredger, *Wan Qing Sha*, was recently launched at IHC Holland's yard in Kinderdijk. The contract for the design and construction of this vessel was signed in March 2002, and the keel laid in June 2003.

This is IHC's 141st vessel built for the Chinese market, and the yard's relationship with this country goes back to 1895. Since then IHC has supplied a great deal of equipment to China, including bucket dredgers, cutter dredgers, wheel dredgers, and trailing suction hopper dredgers. IHC does a great deal of business with China and India - 80% of its work, is in fact, for customers outside Europe. The company has one office in Beijing, and a service centre, as well as an office, in India and the USA.

Wan Qing Sha will be delivered to owner CHEC-Guangzhou Dredging Co, in June this year, after trials in The Netherlands, and sailing under her own power to China. This ship will be used for capital dredging in the Pearl River delta.

Float-out of *Wan Qing Sha*, built by IHC Holland at its Kinderdijk yard, for CHEC-Guangzhou Dredging Co, China.

TECHNICAL PARTICULARS
WAN QING SHA

Length, oa	128.00m
Length, bp	121.00m
Beam, moulded	24.50m
Deadweight(dredging mark)	15,814dwt
Hopper capacity	10,028m³
Loading capacity	14,684tonnes
Dredging depth	28m/39m
Internal diameter, suction pipes	1000mm
Propulsion/dredge pump power	2 x 6000kW
Total installed power	13,287kW
Loaded speed	15.20knots
Accommodation	45
Classification	Bureau Veritas +Hull, +Mach, Hopper Dredger (Unrestricted Navigation); and special survey and supervision of China Classification Society of the People's Republic of China

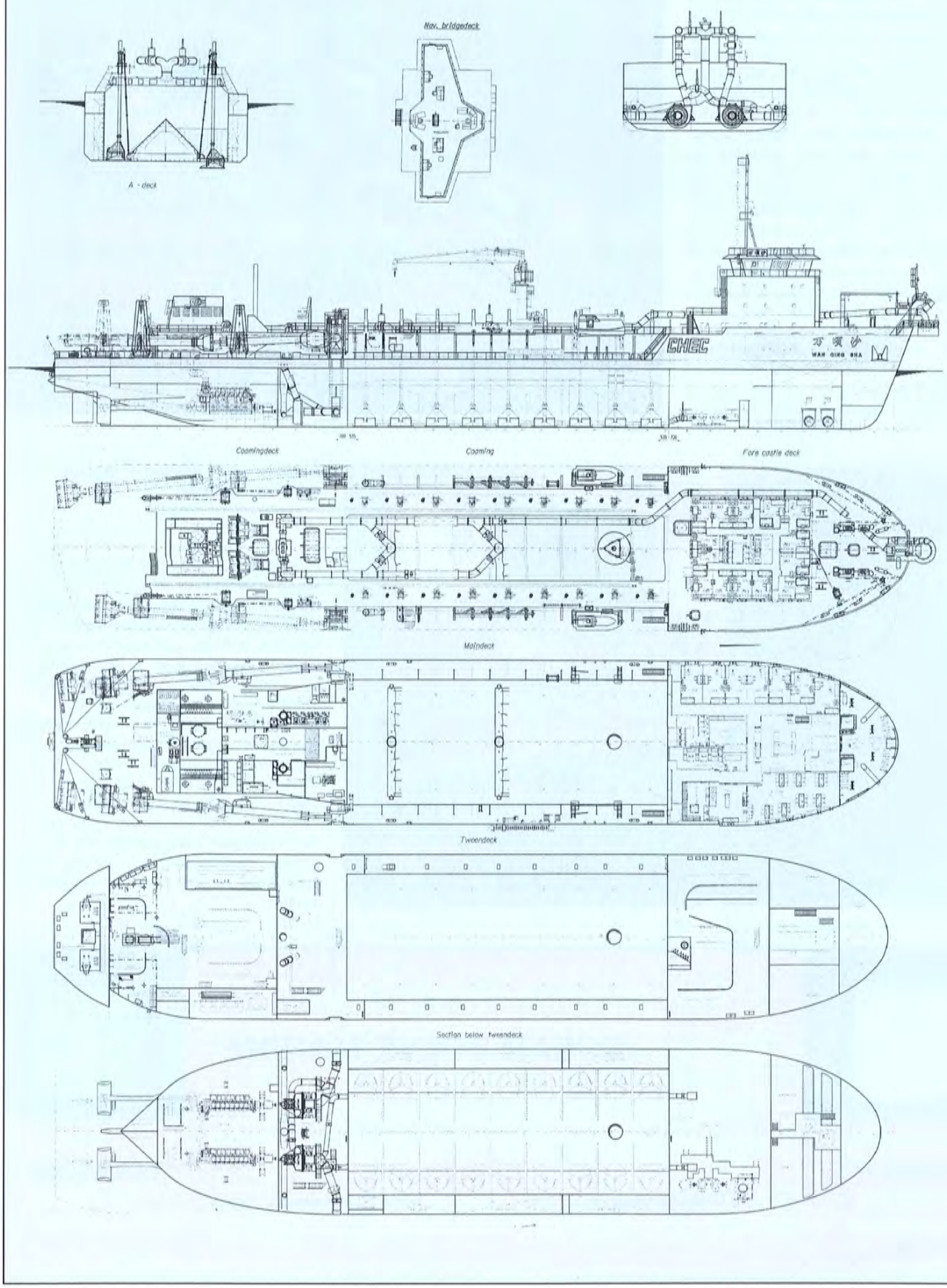
The dredger is fitted with two trailing suction pipes towards the aft end, one to port and the other to starboad. Both have an internal diameter of 1000mm, enabling *Wan Qing Sha* to dredge to a depth of 28m at 45deg. By filling the hopper with water, a maximum depth of 39m at 55deg can be reached with the help of an extended suction pipe.

Both suction pipes are equipped with new-generation, excavating-type, IHC dragheads. Each dredge pump is directly driven off the free end of a main engine, through a Jahnel-Kestermann two-speed reduction gearbox. A gas removal system has also been provided for each of the pumps.

Wan Qing Sha is installed with two 6000kW Wärtsilä main diesel engines, and two auxiliary diesel engines supplied by Caterpillar. Twin ducted CP propellers and a pair of bow thrusters were supplied by Rolls-Royce Benelux. Dreggen Crane supplied the only deck crane - used for handling dredge components.

Maximum loading capacity is 14,684tonnes of soil at a draught of approximately 8.75m. The hopper load can be dumped directly into the sea through two rows of conical bottom doors. Alternatively, the self-emptying system allows *Wan Qing Sha* to discharge spoil ashore, either by 'rainbowing' with a bow-mounted jet nozzle, or through a bow connection to a floating pipeline.

General arrangement of *Wan Qing Sha*, A NEW 10,028m³ trailing suction hopper dredger, built by IHC Holland for CHEC-Guangzhou Dredging Co.

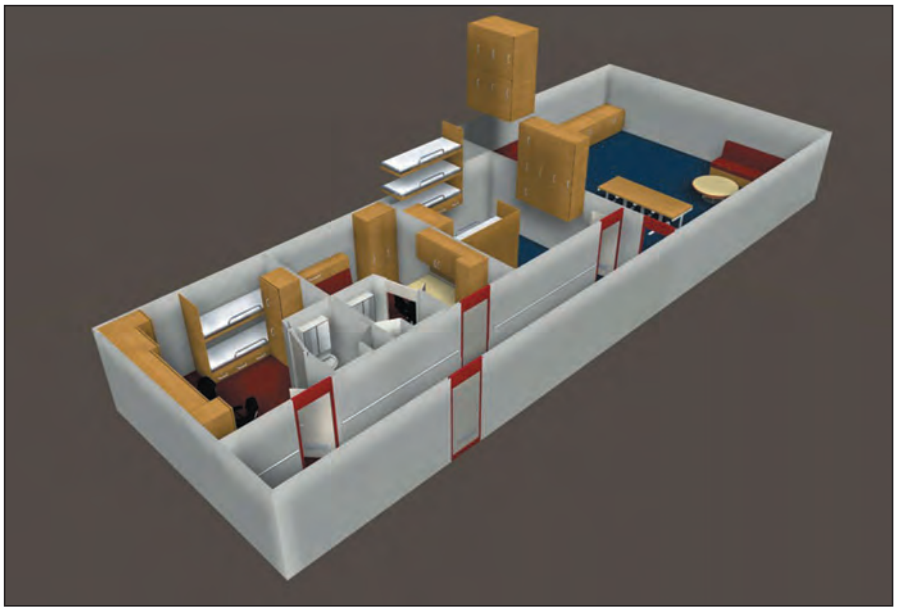


New systems allow for quick and economic cabin installation

CORE business at Hertel is the engineering, supply, and installation of architectural outfitting and insulation systems for marine and offshore projects. A new system has recently been developed to improve performance, cut costs, and optimise the schedule of the work.

SHARP, the Standard Hertel Accommodation Refurbishment Panel, is a way of renovation that was developed by two of Hertel's project managers when they were assigned the seemingly-impossible task of fully renovating the offshore rig, *Glomar Labrador 1*, with little time and money. Thin metal refurbishment panels are installed in front of existing walls while a vessel or an offshore unit remains in full operation. There is no need for demolition, no waste disposal problems, no loss of time, and the result is a quality finished product at a relatively low cost.

MASH, the Modular Accommodation System, is based on the new Naval Standard of the Royal Netherlands Navy. It is a modular accommodation system for both vessels and offshore units. Standardisation enables minimisation of costs while maximising quality, and a wide variety of options and details enables solutions to virtually any requirements. At an early stage of planning, Hertel Marine Services provides customers with accurate budget figures, and there are no interface risks or overhead costs because the company coordinates all of its projects directly.



A 3D model of Hertel's MASH system.

A luxury cabin onboard a Blue Star ferry, engineered by Hertel.

The complete Hertel Marine Services MASH system is also fully certified and approved by all relevant regulatory bodies. Prior to commencement of any construction, Hertel Marine Services provides customers with a detailed 3D real-time model of the project's custom-designed living quarters. This facilitates concept visualisation and provides sample opportunity for fine-tuning of the proposed solution.

Healthy dredger and river cruise-ship order book at Merwede

FOR the past year, Merwede Shipyard, based in Hardinxveld-Giessendam, has been very busy with two new dredgers (*Prins der Nederlanden* and *Oranje*) and has had a useful 150% occupancy. The yard specialises in engineered to order, mainly seagoing tonnage, and the recent closure of fellow IHC Caland group member Van der Giessen-de Noord has meant that Merwede has taken over some of the latter's building activities, such as ferries and offshore vessels. The yard has a strong order book for the coming year and is rumoured to have a new order for two 1200lane metre 400-passenger ro-pax ferries for a Danish owner.

The christening and launch of the new trailing suction hopper dredger *Oranje* took place at the end of March. This ship is being built for Westminster Dredging Co, the British subsidiary of Royal Boskalis Westminster NV. *Oranje* is the second of a pair that Boskalis is currently having built (more details of these vessels can be found in *The Naval Architect*, May 2002, page 34). Her sister, *Prins der Nederlanden*, was launched in August 2003, and has recently been delivered.

Both ships are 156m in length with a hopper capacity of approximately 16,000m³, and are the largest such ships ever built at Hardinxveld-Giessendam. They have been especially designed for dredging and transporting sand and silt, and will be deployed by Boskalis on projects throughout the world, such as land reclamation and port construction.

The construction of *Oranje* and *Prins der Nederlanden* fits into Boskalis' multi-annual fleet planning. In the light of market trends, these plans partly allow for an expansion of capacity and partly for the replacement of older tonnage by highly efficient, state-of-the-art ships. For example, in February 2002 the innovative mid-size hopper dredger *Coastway* (4900m³) was completed (*Significant Ships of 2002*), to be preceded by a sister *Waterway*, and in that same year the jumbo hopper dredger *WD Fairway* was lengthened to provide a mega capacity of 35,500m³. *Oranje* and *Prins der Nederlanden* are claimed to be cost-effective designs in their class. *Oranje* will go into service during the second half of this year

This new trailing suction hopper dredger *Prins der Nederlanden*, built for Westminster Dredging Co, was launched in August 2003, and has recently been delivered. Sistership *Oranje* is currently building.

TECHNICAL PARTICULARS
ORANJE

Length, oa	156.00m
Length, bp	135.95m
Breadth, moulded	28.00m
Depth moulded	15.00m
Draught, dredging	12.02m
Maximum dredging depth	81.50m
Hopper capacity	15,850m³
Carrying capacity, deadweight	27,480dwt
Speed	16.40knots
Total installed power	19,500kW
Main engine-driven generators	2 x 8000kW
Auxiliary generator	1540kW
Bow thruster	1500kW
Dredge pump motor	2 x 4400kW
Jet pump motor	3 x 1000kW
Diameter of suction pipes	1000mm
Complement	40
Classification	Bureau Veritas

Like her predecessors, *Oranje* is of an extremely innovative and efficient design, using a hull form developed by Merwede and tested at MARIN. The ship has a large carrying capacity on a relatively shallow draught and is able to dredge down to a great depth of 81.50m. In order to minimise maintenance, gravity-type suction-pipe gantries are used, almost completely omitting the hydraulic system normally required; and, thanks to her innovative hopper shape, the ship needs fewer bottom doors than usual for quick unloading. The two 4400kW dredge pumps will be driven by electric motors supplied with current by 8000kW alternators driven off the front end of the Wärtsilä 12V38B main engines.

Damage stability is higher than required by international standards, and the ship has four principal control and monitoring systems: a DP/DT (dynamic positioning and dynamic tracking) system, which enables the ship to maintain a fixed position with extreme accuracy, a dredge control system, a hopper monitoring system, and an alarm and monitoring system.

New inland cruise vessel

Another recently completed vessel at Merwede is a luxurious inland cruise vessel for Dunav Tours AD, Rousse, Bulgaria. *Rousse Prestige* is the first of two units to possibly be completed, as the contract contains an option for a second vessel. She was built in 11 months from contract signing to delivery and will be operated on Europe's main rivers and waterways from Amsterdam to the Danube estuary on the Black Sea.

Rousse Prestige has been designed to the rules and regulations of Lloyd's Register, with the notations Passenger Ship Inland Waterways, A1, IWW, Zone 3, LMC, UMS. She also complies with the requirements of The Netherlands Shipping Inspectorate (NSI) and is suitable for one-man radar navigation on the River Rhine.

Like other typical inland cruise ships, *Rousse Prestige* has been designed with twin azimuthing contra-rotating propellers, supplied for this installation by Veth. There are three principal decks, with the lowest level accommodating crew cabins, some passenger cabins, domestic stores, and technical rooms. Located on the main deck is the engineroom with built-in switchboard room, galley, laundry, linen store, crew messroom/dayroom, crew cabins, more passenger cabins, an airconditioning room, domestic stores, technical room, vacuum sewage treatment plant area, and bow thruster compartment.

The upper deck houses the aft mooring deck, restaurant, another airconditioning room, domestic store, passenger cabins, main hall with reception desk, office, toilets, lounge, passenger outdoor deck with stairs to the sun deck, and the forward mooring deck. *Rousse Prestige's* sun deck accommodates the wheelhouse with all navigation and communication equipment, and a passenger outdoor deck with an awning, aft of the

TECHNICAL PARTICULARS
ROUSSE PRESTIGE

Length, oa	110.00m
Length, bp	106.57m
Breadth, moulded	11.00m
Breadth, oa	11.40m
Depth to middle deck	2.75m
Draught (max)	1.85m
Air draught	5.70m
Main engines	2 x Caterpillar 3508B SCAC
Output	2 x 783kW
Service speed	11.50knots
Maximum speed	13.50knots
Complement	45
Passengers	161
Tank capacities	
Gas oil	91.00m³
Lube oil	2.00m³
Potable water	198.00m³
Ballast water	320.00m³
Sewage	77.00m³
Classification	Lloyd's Register Passenger Ship Inland Waterways, A1, IWW, Zone 3, LMC, UMS

Rousse Prestige **is a luxurious inland cruise vessel built for Dunav Tours AD, Rousse, Bulgaria. She was built in 11 months and will be operated on Europe's main rivers and waterways from Amsterdam to the Danube estuary on the Black Sea.**

wheelhouse. The upper deck outside has wall-mounted wooden benches, and *Rousse Prestige's* sun deck features chairs and tables. Sun protection is provided by a retractable sun awning, and eight umbrellas.

The vessel's hull is of all-welded steel construction, and special attention has been given to continuity of the structure to minimise noise and vibration levels. *Rousse Prestige's* double bottom is of the cellular type and accommodates tanks and dry compartments. Her hull has been strengthened by means of longitudinal framing and transverse webs throughout, except at the fore and aft ends where it is framed transversely. The design of the stern section has been carefully adapted for the fitting of the two azimuth stern-drive units.

Rousse Prestige's foreship section features transverse and longitudinal ducts for the bow thruster unit, and the underwater part of the hull is protected against corrosion by an Ampak cathodic system, supplied by Chemetall. This consists of a number of magnesium sacrificial anodes fitted on the hull, inlet chests, and at the bow thruster ducts.

As mentioned, passenger cabins are distributed over lower deck, main deck, and upper deck. *Rousse Prestige's* lower deck accommodates 10 twin-berth standard cabins, while the main deck has 24 twin-berth luxury cabins, twin-berth suites, a three-berth suite, and 18 standard cabins. Twenty-four twin-berth luxury cabins are situated on the upper deck. Merwede Interiors supplied the carpentry work and furniture.

Public spaces and facilities for the passengers include the main hall, ship's restaurant, a spacious lounge with bar, a 16-person capacity library, and outdoor decks. The lounge has seating arranged for 168 people, together with a bar, pantry, and a dance floor. *Rousse Prestige* also features a hospital, massage salon, and hairdresser's room. The restaurant, with 160 seats, is arranged with cabinets and a buffet with ice sink. Galley and pantry equipment is designed for servicing the full number of passengers and crew in one seating.

Crew are accommodated in two single-berth officers' cabins and 20 twin-berth crew cabins. All the accommodation features ample noise-reducing materials, limiting engineroom noise levels to a maximum of 50dB(A)-55dB(A) in the cabins, to 64dB(A) in working spaces such as galley, mess room/dayroom, and to 59dB(A) in the wheelhouse. Vibration levels are restrained by employing resiliently mounted engines and by refining the propeller design. In addition, the complete aft part of the accommodation is flexibly mounted to prevent industrial noise from penetrating the restaurant area. To assist with reduction of noise and vibration, exhaust lines are also flexibly mounted and compensators are included, both supplied by Rubber Design.

Accommodation areas are provided with a tailor-made heating, ventilation and air-conditioning (HVAC) installation, designed and manufactured by the HVAC division of Imtech Marine & Industry. This is designed to maintain rooms at 22°C/-26°C at 45% relative humidity, under ambient conditions of -10°C in winter and 35°C/50% relative humidity in summer.

The installation incorporates individual air-handling units for the restaurant and crew mess, lounge, reception, and guest cabins, crew cabins; each consists of a filter section, supply fan section, chilled water coil, and hot water coil. Individual room temperature control (cooling and heating) can be established through locally installed fan coil recirculation units (126 in total), each connected to the chilled water distribution network and provided with electric heaters.

Main engines, auxiliary engines, and bow thruster engine were supplied by Geveke Motoren. The propulsion plant consists of two Caterpillar 3508B SCAC main engines, each developing 783kW at 1600rev/min, which are remotely controlled from the wheelhouse. The Veth Z-drive azimuthing rudder propeller units are each driven through a cardan shaft and elastic coupling. The Veth bow thruster consists of a waterjet pump driven by a diesel engine, again through a cardan shaft and flexible coupling.

Auxiliary power is derived from two 350kVA Caterpillar C8 generator sets, running at 1500rev/min. An emergency generator set consists of a high-speed Dolderman John Deere 4039T set of 60kVA, while the bow thruster is directly driven by a 287kW high-speed Caterpillar 3196 DITA engine.

In order to pass low bridges, *Rousse Prestige's* wheelhouse, manufactured by Kampers, consists of a retractable all-aluminium superstructure mounted on a steel substructure equipped with a bottom door section. Synchronous lifting and lowering of the superstructure is via a chain-type lift mechanism, while a hydraulic cylinder is used for the operation of the unit.

Guiding the wheelhouse during raising and lowering is carried out by a mechanical system consisting of stainless steel guide bars and rods. Once in raised position, the superstructure is locked by stainless-steel safety and locking pins. Lifting and lowering is controlled from a central panel on the navigation console. All ship controls, which include monitoring of a closed-circuit TV system, are centralised, with stations in the wheelhouse and on the bridge wings.

Anchor handling and mooring gear includes a Van Wijk windlass/mooring winch fitted on the forecastle and a windlass/mooring winch aft. The forward unit is of variable speed, with a combined double anchor/mooring winch featuring two cable lifters in cast steel for stud-link chain, and two declutchable mooring drums each suitable for 120m steel wire of 22mm diameter.

The aft winch features a single declutchable mooring drum for 120mm wire of 22mm diameter, and a single declutchable anchor drum for 72m steel wire of 20mm diameter. The three anchors are of the stockless d'Hone type. Anchor chain cables consist of two stud link chain cables of grade U2, and one steel wire at the stern. Anchors and anchor chain cables were supplied by Prohand. Also included are small deck cranes for the handling of provisions, boats, and gangways. These cranes are fitted on the sun deck and consist of two gangway cranes and one provision unit.

Rousse Prestige is fitted with life-saving appliances for all passengers and crew. Equipment includes a GRP Deba man-overboard boat with davit, eight lifebuoys, and lifejackets. Fire-fighting systems - supplied by Ajax Fire Protection - include water systems and portable

extinguishers for the engineroom, bow thruster room, and accommodation spaces. A Scana automatic fire detection and alarm system is installed to cover all principal rooms, corridors, and cabins.

New river cruise ship contract

Merwede Shipyard has recently signed a new contract for building of a further inland cruise vessel - plus four options - for Viking River Cruises, a company owned by a Scandinavian and Dutch consortium. The first vessel will be delivered for 2005's cruising season. The second, third, fourth, and fifth vessels will be delivered for the 2006 season.

The restaurant onboard *Rousse Prestige* is designed to serve the full passenger complement in one sitting.

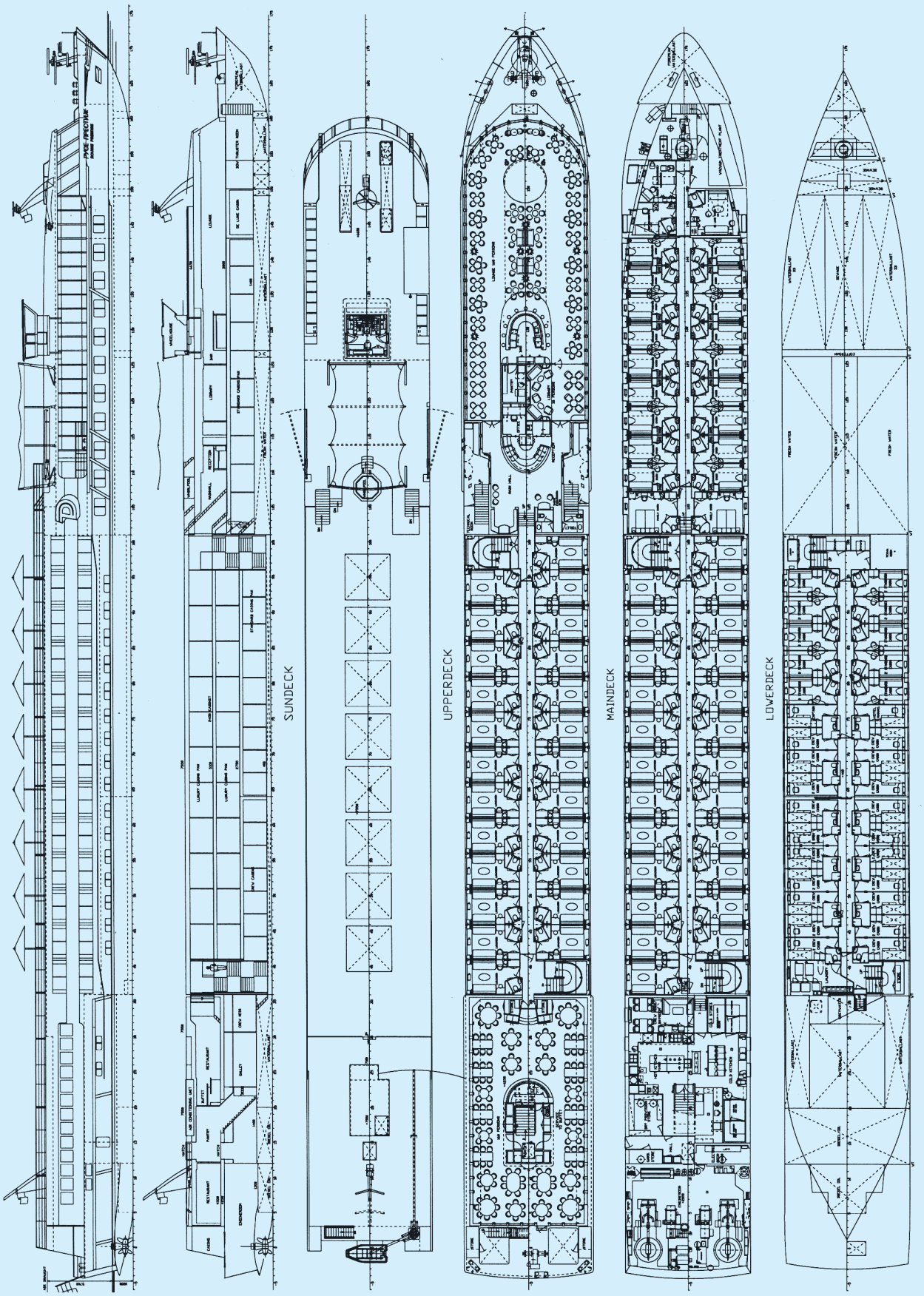
TECHNICAL PARTICULARS
131M INLAND CRUISE VESSELS

Length, oa	131.80m
Length, bp	125.80 m
Breadth, moulded	11.00m
Breadth, oa	11.40m
Draught, design	1.60m
Draught, maximum	2.00m
Air draught (at max draught)	7.02m
Propulsion power	2 x 783kW
Trial speed at 1.60m draught	approx 23km/h
Complement	50
Passengers	198

These vessels will sail the inland waterways between Amsterdam and Basel. They will be considerably larger than those currently operating on these waters and are designed according to the latest two-compartment damage stability principles, substantially increasing safety margins in case of damage. Furthermore, they will be equipped with an emergency propulsion unit in order to take them safely into port in case of main engine failure.

These vessels are, at 131.80m length overall, some of the first to exceed the traditional inland hull restriction of 110m (the former maximum length allowed on the River Rhine), and are claimed to be the largest vessels trading the European waterways. The yard saw a challenge in designing this series since, despite the extra length, there were other length, width, and depth constraints. In addition, the draught needed to be as low as possible, due to water levels in some parts of the inland waterway system. Height was also, as always, a consideration, due to the many bridges across the river and canal network. The new ships, it is additionally claimed, will offer the ultimate in river cruising, with a very high standard of cuisine and accommodation.

General arrangement of the 110m inland cruise vessel, *Rousse Prestige*.



Growing lift business for Airborne

THE Heerenveen-based company Airborne Systems specialises in developing, producing, and maintaining any type of 'mechantronic' (the link between mechanics and electronics) product, regardless of size or complexity. However, in September last year, Airborne Systems acquired the activities of ThyssenKrupp Marine & Industry Elevators, and is therefore now concentrating a great deal of activity in the elevator (lift) sector. Since last summer the company has doubled its staff, and is now growing even further.

Today, Airborne is responsible for supplying lifts to the international marine market, and has been re-named 'Airborne Elevators', which includes engineering and product support activities. Airborne still has a close working relationship with ThyssenKrupp Nederland, and uses its components and support network.

The first order for this new lift company was on a fast ferry, building at FBMA Babcock in the Philippines. This 64m long catamaran has capacity for 1300 passengers and 58 cars, and will operate at a service speed of 15knots. Airborne Elevators will deliver three lifts: a passenger unit, a service unit, and a platform elevator for wheelchairs. These lifts are of low weight, and the passenger unit will move up and down not vertically but at a small angle. This vessel is set to be delivered at the start of next year.

Airborne Systems has also supplied lifts to two new Merwede ferries. Equipment to be supplied includes a passengers lift with an 18 person capacity and one food lift (a dumbwaiter).

With ThyssenKrupp, Airborne has additionally developed the innovative 'backbone concept'. Because of minimal available space for lifts onboard ships, and the difficulty of moving all necessary parts to the shaft, a great deal of logistical organisation is required, and this results in the need for much involvement of yard personnel.

The backbone concept claims to have many advantages over the current arrangement. Prefabricated units can now be used in order to minimise the number of elements needed to be taken onboard, while the design reduces the number of interfaces between the lift and the surroundings in which it is installed. This results in less involvement by the yard during installation and no adjustments of the ship structure. Installation thus becomes a virtual 'plug and play' operation; because of this, a lift can be installed in a short time without the need for scaffolding. This concept makes a very clear distinction between shipbuilding technology and lift technology, unlike other types of prefabricated systems, claims Airborne.

Here a backbone structure of a lift is being hoisted onboard a ship (hull no I 32) being built by Alstom (the order and delivery for this lift however, was from ThyssenKrupp). This backbone procedure is simple and quick, as the whole guidance structure, electrical systems, and lights, for example, can be installed all at once.

An example of a service lift.

As yet, this company has not received any orders for cruise ships, but has supplied to the offshore industry, and is currently in talks regarding some naval vessels. Lifts for offshore use and on tankers, are, of course, explosion-proof.

An order has just been received from Kampers for lifts on two inland freight ships. Kampers is a renowned supplier of wheelhouses, which can be raised so that those in the wheelhouse can see over the cargo, and lowered for passing bridges. Lifts will be supplied for one of these liftable wheelhouses.

Also in the pipeline - in association with sister company Airborne Products, which specialises in composites - is the development of a very lightweight lift. This new design will be specifically aimed at the fast ferry and megayacht sectors.

This lift was delivered by ThyssenKrupp, however, Airborne currently has two outstanding orders for this unit.

Carpet firm active in cruise ship sector

LAST year, Desso, the Dutch manufacturer and supplier of woven and tufted broadloom carpets and carpet tiles to the marine industry, integrated its operations with the resilient flooring manufacturer, Armstrong DLW AG, to form Armstrong Floor Products - said to be one of the world's largest flooring manufacturers. Over the past 20 years, Desso carpets have been supplied to a vast number of cruise vessels all over the world.

Besides the generally custom-made character of cruise-ship carpets, Armstrong Floor Products also has under the Desso brand an extensive range of collection broadloom carpets, which can be delivered from stock. With its vertically integrated ISO 9001 certified manufacturing process, Armstrong Floor Products enjoys a high degree of flexibility in planning and quality control. All carpets supplied to its marine clients fulfil maritime regulations.

The range of Armstrong floor products suitable for this market has also recently been extended to resilient products. New resilient marine offerings include PVC flooring products for specific heavy wear-and-tear applications such as crew areas, since this type of flooring combines durability with the ease of wet-cleaning. Luxury vinyl tile (LVT) is also available, the top finish of which is claimed to look like real wood or stone. A specific LVT, being a frequent hardfloor design solution for public spaces, is currently under development for unrestricted onboard application.

Recent references at European shipyards include among others, *Carnival Miracle* at Kvaerner Masa-Yards, Helsinki, RCCL's *Mariner of the Seas* at Kvaerner Masa-Yards' Turku yard; RCCL's *Serenade of the Seas* at Meyer Werft, *MSC Opera* and *MSC Lirica* at Chantiers de l'Atlantique; *Costa Fortuna*, *Carnival Glory*, *Caribbean Princess*, and Holland America Line's *Westerdam*, all at Fincantieri; as well as *Costa Magica*, *Carnival Valor*, and Cunard's *Queen Victoria*, all currently under construction at Fincantieri.

Desso supplied carpets in the piano bar onboard *Carnival Miracle*, built at Kvaerner Masa-Yards in Helsinki, and delivered to Carnival Cruise Lines earlier this year.

The dance club onboard *Carnival Miracle*. Specially designed carpets were supplied by Desso.

New designs and concepts from Vuyk Engineering Groningen

THE naval architect, marine engineering and consultancy firm, Vuyk Engineering Groningen BV, has been providing engineering services to the shipping and shipbuilding industry since 1972. At the northern Dutch office, in Groningen, this consultancy focuses on cargo vessels, tankers, and container ships. A sister company, with offices in Rotterdam, deals with dredgers, semi-submersibles, and more specialised types of ships, and further offices are located in Galatz (Romania).

At present, Vuyk Groningen is heavily marketing the VG4500 multi purpose vessel design. This is intended as the successor to the 3500dwt to 4500dwt series built from the mid-1980s to the early 1990s, of which many are now reaching the end of their economic lives. The VG4500 has a totally new hull form for increased speed, and it is beamier, allowing a higher cubic intake and five containers abreast, a feature uncommon to most comparable designs. No firm orders have yet been secured for this design, but Vuyk Engineering Groningen is in advanced talks with European shipowners, and the design is said to be attracting a great deal of attention.

Another new design is the VC Feeder 400. This has a 17knot trial speed, and is claimed to be the fastest in its class of small feeders. In addition, the new VC Feeder 1200 has a trial speed of 1knot-2knots greater than comparable designs. Both container feeder designs couple high speed with typical high loaded container intake. For over four years now, Vuyk has been designing container ships especially suited to 45ft boxes, which were once seen as rather too far ahead of their time. Now however, with changes in EU road freight regulations, there should be more of a call for these large containers. Vuyk Engineering Groningen is currently in talks regarding the building of one of these vessels.

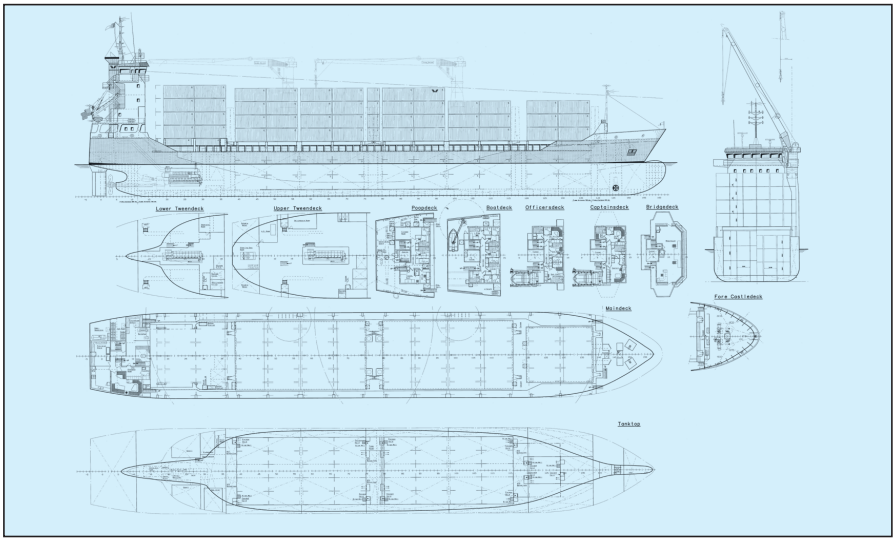
The company also creates special one-off designs. An innovative coastal/seagoing cruise vessel concept has been conceived, in conjunction with an owner, for creating itineraries combining deep inland cruising with coastal exploration tours. This vessel would be planned for sea-going conditions up to sea state 6; since duration of the trips would be short, speed would be high, for example, allowing sailing from Rotterdam to London overnight.

A new project that is nearing completion is Vuyk's involvement in 8000m³ double-hull (to Ice class 1A standard) oil tankers nearing completion at the Ferus Smit yard, at Foxhol, The Netherlands. The design of these vessels is fully optimised, allowing the yard to spend less time on building the vessel, thus increasing construction efficiency. Here Vuyk supplied detailed construction plans.

An artist's impression of a 135m coastal/seagoing cruise vessel concept.

A quarter-view impression of the VG-4500 multipurpose cargo design. Note the beam, which allows a higher cubic intake than its predecessor.

General arrangement of the VC Feeder 400, the fastest in the class of small feeder ships, with a 17knot trial speed.



TECHNICAL PARTICULARS COASTAL/SEAGOING CRUISE SHIP

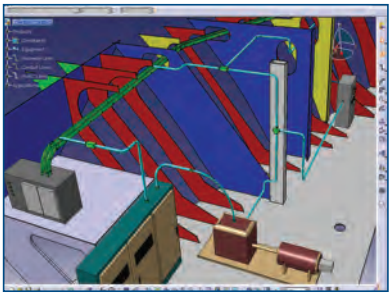
Length, oa	135.00m
Breadth	16.60m
Depth, moulded	5.70m
Draught, design	2.50m
Air draught	8.50m
Main engines	2 x 1800kW at 1800rev/min
Propellers	2 x contra-rotating Z-drive units
Speed	15.00knots
Complement	20

The Royal Institution of Naval Architects

EUROPEAN SHIPBUILDING, REPAIR AND CONVERSION - THE FUTURE

2-3 November 2004, London, UK

Second Notice



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 E*uropean 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.

Papers are therefore invited on the following areas:
•Future demand for new construction, repair and conversation•Research and innovation within the industry•Design support technology•Development of new and improved products•Manufacture and assembly technology•Improving the production process•Supply chain logistics•Financial and legislative framework•Education and training

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Full order book for Niestern Sander

SHIPYARD Royal Niestern Sander, at Delfzijl, has secured a new order for three dry multipurpose cargo vessels; they will be 6100dwt and are for Wagenborg Shipping BV, also based at Delfzijl.

Design is based on six existing newbuilding orders for the German owner Intersee, the contract for which was signed in December 2003 and January this year; however, the hull of the Wagenborg vessels will be lengthened by 7.65m. Those 5780dwt hulls for the Intersee ships are to be built in Poland, but the hull fabricator for the Wagenborg vessels had not, at the time of writing, been chosen.

The Intersee ships will have a traditional construction of double bottom and side tanks enclosing two cargo holds, with those spaces designated for water ballast and fuel. Construction is based on a combination of longitudinal and transverse framing, and the structure will be considerably strengthened to meet Finnish/Swedish ice class 1A rules, also those rules of Bureau Veritas.

Propulsion will be provided by a medium-speed engine, with an MCR of 2700kW at 750rev/min, driving a CP propeller via a reduction gearbox. There will be a spade-type rudder as well as an electrically-driven, frequency controlled, FP bow thruster, with a capacity of 350kW. The gearbox will be fitted with a power take-off for a 450kVA alternator. In addition, there will be two generator sets of 144kW at 1500rev/min each and an emergency/harbour generator set supplying 85kW, also at 1500rev/min.

Equipment onboard includes six pontoon-type hatch cover panels for each cargo hold, which will be handled, in typical Dutch fashion, by a travelling electric-hydraulic gantry crane, and two movable grain bulkheads, each consisting of two parts, which are stowed amidships. Mooring equipment comprises an electric-hydraulic anchor windlass with two warping heads and mooring drum, together with one electric-hydraulic mooring winch aft with one warping head. Both cargo holds and cargo deck area are equipped for carriage of dangerous goods, according to Part X, SOLAS II-2 Reg.54.

Safety and firefighting equipment includes a freefall lifeboat, rescue boat, and liferafts according to class requirements, a CO_2 system, and a water-mist local protection system for the machinery space. Air-conditioned accommodation for eight crew is arranged aft.

With the new Wagenborg orders, Royal Niestern Sander now has nine multi-purpose/container ships on order. In addition, a research vessel for the French operator Compagnie Nationale de Navigation, will be delivered later this year.

TECHNICAL PARTICULARS
5800DWT GENERAL CARGO SHIP

Length, oa	106.12m
Length, bp	99.99m
Breadth, moulded	14.40m
Depth, to main deck	8.10m
Draught, summer	6.14m
Deadweight, 6.14m draught	5780dwt
Gross	3900gt
Cargo capacity	273,000ft³
Hatch opening, forward hold	37.50m x 11.70m
Hatch opening, aft hold	37.50m x 11.70m
Heavy fuel	255m³
Diesel oil	88m³
Ballast water	2665m³
Potable water	67m³
Tanktop capacity	15.0tonnes/m²
Container capacity	236TEU
Speed (trial), 6.14m draught, 100% MCR, 150kW on shaft alternator	13.00knots
Classification	Bureau Veritas +Hull, +Mach, General Cargo/Container Ship, Unrestricted Navigation, +AUT-UMS, SYS-NEQ, Ice class 1A, also Finnish/Swedish Ice Class 1A

Ring-type compact thruster launched

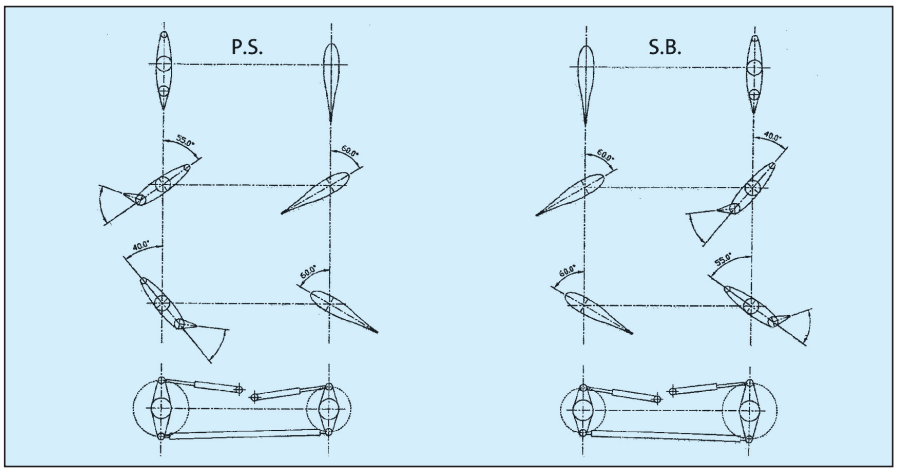
A SPECIALIST in steering gears and rudders is Van der Velden, which claims to supply an impressive 60% of all inland ship newbuildings with its rudders and systems. The Van der Velden Group of companies, which includes Barkemeyer GmbH, recently announced that Barkemeyer, a leading manufacturer of ocean-going manoeuvring equipment, will operate under the name Van der Velden Marine Systems.

The company has recently introduced a new EPS thruster. This design is said to offer major benefits to shipowners and naval architects in terms of power-performance, noise, weight, and robustness. The EPS thruster is of a revolutionary construction without a gear and propeller shaft. Its blades are connected to an outer ring, rather than to a hub, as is the case with conventional thrusters. Having no clearance between the propeller and tube removes a likely source of cavitation, resulting in very quiet operation.

Benefits of this thruster include a good power-performance ratio, very low noise levels, CFD-optimised propeller geometry, higher power at similar cross-sections, simple and robust construction, high-performance ceramic bearings, exchangeable blades, and low weight; it is also extremely compact.

New ferry steering installations

A recent project for Van der Velden Marine Systems is the supply a comprehensive steering package for a new ferry, which is being built by FBMA Babcock in the Philippines, for Doeksen.



The configuration of the Van der Velden asymmetric rudder arrangement in FBMA Babcock's new catamaran ferry to operate in the Waddenzee area.

Its operational area will be the Waddenzee, so the vessel can be used both in inland shipping areas and on the sea. Being a catamaran, it is equipped with four propellers each with a rudder. The outer rudders are Barke flap types, and the inside ones have no flap. The steering gear operates the rudders at asymmetric rudder angles, as is usual for vessels operating in inland waterways, although the rudder angles have been adapted for this special case.

In another recent project, Van der Velden worked on a research vessel, built in Germany, which is currently on sea trials. Here, the company supplied rudders and a steering gear. The system used ensures very low noise and vibration levels.

A coupling system for barges is another current undertaking. This special system can be used in open seas, a relatively unusual specification.

New fuel-separator performance standard

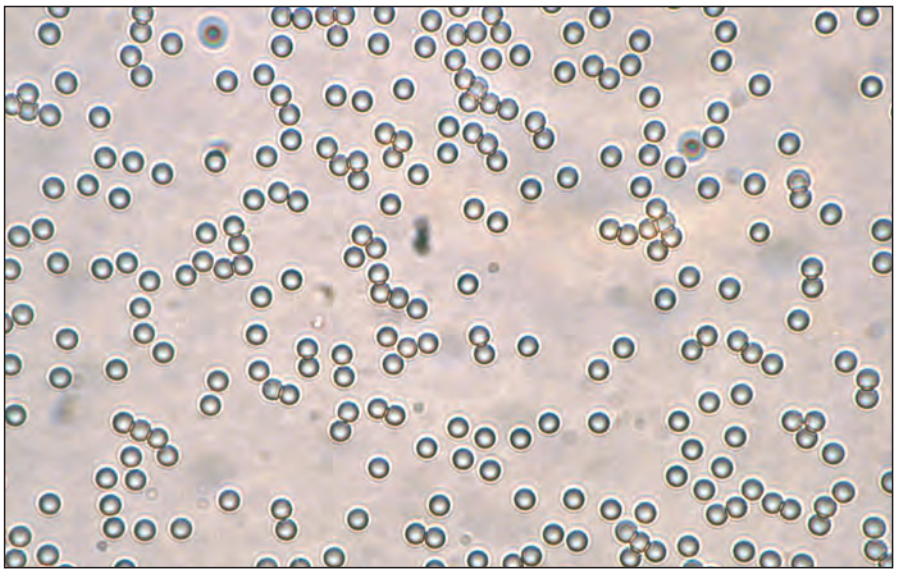
FOR many years, contaminated heavy fuel has been the bane of marine engineers' lives. In worst-case scenarios, contaminants - especially catalytic fines introduced during the refinery process - can cause premature wear of components and complete engine breakdown. As part of a long-standing battle to combat this problem, a new classification-approved standard for fuel separation performance has recently been launched.

To prevent contaminant problems, fuel is normally passed through a centrifugal separator, the model of which is selected according to maximum recommended capacity (known as MRC) tables provided by individual manufacturers. ISO 8217 specifies a maximum level of 80ppm catalytic fines in bunker fuel, and engine builders normally demand 15ppm at the engine injection point; reduction to this level is currently an unclear area, and it is difficult for centrifuge manufacturers to prove that they can reach the lower point.

It is known that separation efficiency is a function of a separator's flow rate - the higher the flow, the more particles pass through the unit into the engine, and thus separation is less efficient. However, at present, there is no recognised reproducible method for measuring the relationship between capacity and separation performance; therefore, even though an apparently suitable model has been selected by an operator, there is no guarantee that harmful particles will be removed. Even installation of a downstream filter is not guaranteed to remove particles smaller than 10microns.

These problems have not been helped by pressure on the three leading separator manufacturers and others to produce cost-effective equipment, which has sometimes equated to higher throughputs, which in turn results in inferior fuel processing. In certain cases, operators have claimed against engine builders over excessive component wear.

In an important move to resolve this undesirable situation, one of the leading centrifuge manufacturers, Alfa Laval, working in cooperation with a number of classification societies, has taken a lead in drawing up a *de facto* standard for independent verification of separation performance. This is based on a so-called Dyno test method, approved by Det Norske Veritas and set up in association with Germanischer Lloyd; in this, a synthetic oil is used, along with specially manufactured identical 5micron particles, to test a particular separator (real catalytic fines and fuels are not used because of their variable parameters).



A magnified illustration of the specially manufactured Dyno particles, which are mixed with synthetic oil for the new centrifugal separator test. They have a diameter of 5microns and are entirely spherical.

The test result is expressed as certified flow rate (CFR), which is considered as a safe level for continuous, efficient separation of heavy fuel; thus purchasers can compare individual separators based on separation rather than throughput and can then choose the correct model for each particular application. Owners are already using this new test when specifying separators for new ships.

As a result of all this, it is hoped that a new international standard on separation performance will be established soon. Work, being headed by the Swedish Standards Institute, starts soon, and the new standard could be ready within a few years.

It should be noted that, alongside this process, Det Norske Veritas already has (since January 2003) a voluntary class notation, FUEL, which represents a total system approach to fuel treatment and conditioning, to help achieve a predictable performance. Naval architects need to know that this includes careful arrangement of bunker tanks to avoid risks of mixing incompatible fuels, correct arrangement and size of settling tanks to ensure good separation of water and sludge, heater capacity, and performance of temperature and viscosity controls.

TTS Ships Equipment to demonstrate involvement in IPSI

AT the RoRo 2004 exhibition, to be held from May 25-27 in Gothenburg, Sweden, TTS Ships Equipment is to demonstrate the results of its involvement in the IPSI project (Improved Port Ship Interface), in which the company has been a leading player since 1996. Some features of the original IPSI feasibility study, which was completed during 1999, were pioneered on the Cobelfret ferries *Spaarneborg* and her sisters, as discussed in an article in *The Naval Architect* February 2000, page 49. The IPSI project has led to the INTEGRATION study, taking onboard all the lessons learnt from IPSI and integrating them into a 'demonstration' project to develop an economic door-to-door short-sea shipping service using the ro-ro concept. An update on this and the planned use of automated guided vehicles (AGVs) for efficient cargo handling was published in last month's issue.

The design and manufacture of ro-ro equipment such as ramps, doors, and lifts for all types and sizes of vessels, forms a significant part of the TTS Ships Equipment' dry cargo handling portfolio. Enhancing safety of ro-ro vessels by internal subdivision is a requirement for which TTS Ships Equipment has designed an arrangement of bulkhead doors, providing watertight subdivision of the hull amidships for cargo spaces below main deck level.

Fully aware of the changing bases for international shipbuilding, the dry cargo division now has design and manufacturing facilities in prime newbuilding areas, including China. In Norway, the TTS Group comprises three divisions - material handling (Bergen), marine cranes (Bergen), and dry cargo handling, although part of the latter, TTS Ships Equipment AB, is located in Gothenburg, Sweden.

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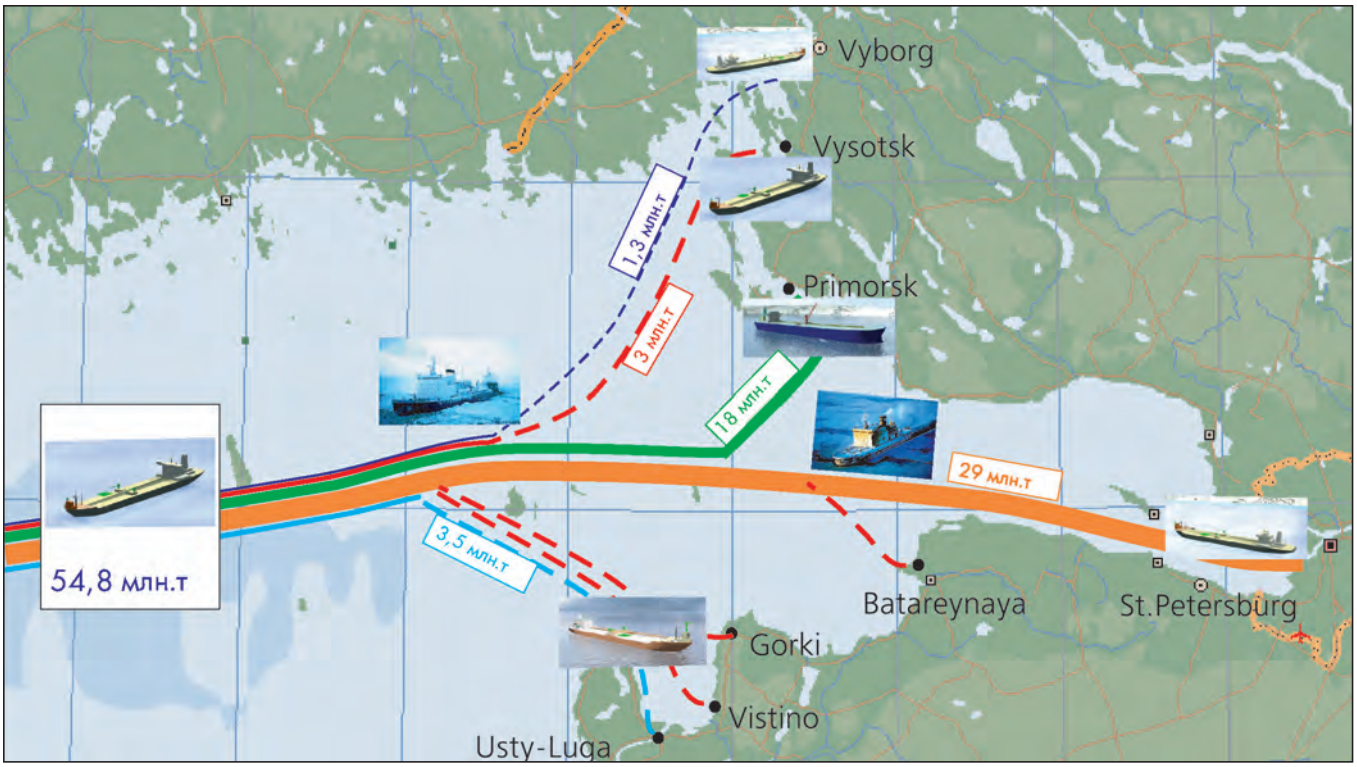

Fig 1. A map of the Gulf of Finland, showing the export volumes of oil transported in 2003 from various terminals. The solid lines show existing routes and the broken lines represent future planned services. These figures indicate the importance of ensuring year-round operation and the need for a new fleet of icebreakers.

Planning for new-generation Baltic icebreakers

Experts from three leading Russian organisations have linked to jointly promote a new class of icebreaker especially for working in the Baltic Sea. B P Ionov, PhD, Dr Sc, from Severnaya Shipyard, Yu A Simovov, PhD, and VA Belyashov, PhD, both from the Krylov Shipbuilding Research Institute, and V A Starshinov, from the Iceberg Design Bureau, consider the parameters of such a design.

UNDER the aegis of the Ministry of Transport of Russia, a new generation of Baltic icebreakers is being developed by both the state and - for the first time ever - by private companies. Reasons for this include the following:

- a sharp increase of real and planned volumes of cargoes, mainly oil and petroleum products, especially under ice conditions not only in the Baltic Sea, but also the Barents Sea, as well as in the waters off the island of Sakhalin
- a corresponding increase in the numbers of large ice-classed tankers
- the age of the current icebreaker fleet, which has not been renewed for a long time.

The last icebreakers of the *Moscow* type, built in Finland in the 1960s, have been decommissioned. Only domestic port icebreakers - *Kruzenshtern*, *Semion Dezhnev*, and *Yuri Lisyansky* (project 97), which were constructed at Admiralty Shipyards approximately during the same years, are still working in the Baltic Sea. Meanwhile, as an interim measure, the diesel-based pair, *Ermak* and *Yuri Lisyansky*, have undergone a life extension, with their diesel engines overhauled.

Primary factors

1. *Navigational area*. This parameter is important, because it defines the ice conditions and hence, the ice class. For icebreakers in the Baltic region, the range should be unlimited, since during summer it would be expedient to provide an opportunity for a transfer to the Arctic, for various duties. This constitutes a basic difference when compared with icebreaker operators in most other countries.

2. *Cargo flows and parameters of cargo ships*. An analysis of vessels calling at Baltic ports during the 1990s has shown that more than 86% had a breadth of up to 20m. Only around 9% had a breadth of more than 25m, and the vessels having a breadth of more than 30m made less than 2% of the total.

During recent years, the structure of cargo flows has been changing. Volumes of cargo in the Gulf of Finland and the Baltic Sea, as a whole, began to grow quickly, and this tendency will continue with developments at the sea port of St Petersburg, and with the introduction of new wharves at Primorsk, Visotsk, Ust-Luga, and other ports and terminals in the region.

The volume of export cargoes in the eastern part of the Gulf of Finland, according to results for 2003, is illustrated in Fig. 1. After deepening of the channel during 2004 and 2005 to 13m, St Petersburg will be capable of accepting ships having displacements of up to 70,000tonnes or 80,000tonnes, instead of 30,000tonnes-40,000tonnes at present. This will allow annual exports of oil to rise from 7.5 million tonnes to 14 million tonnes. New terminals are also planned.

With such progressive growth, cargo traffic in the Gulf of Finland could double by 2006, and will continue to grow further. It is obvious that a critical level could, however, be reached, limited by the capacity of the Öresund between Denmark and Sweden, and by ecological considerations.

Such a significant growth in oil exports would be impossible with the use of existing ice-strengthened tankers, generally of modest displacement. Their loading time takes almost as much time as for large vessels, which limits already constrained frameworks; therefore, larger ships can be expected in the future, such as Fortum Shipping's new double-acting Aframax tankers, *Tempera* and *Mastera*, which have already sailed into Primorsk. This port can actually accept ships up to 150,000dwt, 307m length, 52m breadth, and 15m draught.

At present, practically all Russian shipping companies, especially Sovcomflot, Novoship, and Prisco, have active plans to upgrade their fleets, and in the first place, with special reference to ice conditions of the Baltic Sea, Barents Sea, and off Sakhalin, using both Aframax and Suezmax classes. Some of these ships are shown in Table 1.

Company	Deadweight, tonnes	Length, m	Breadth, m	Draught, m	Number of vessels/ice class
Fortum	106,000	252	44	14.5	2/1A Super
Sovcomflot	100,000	240	42	15.0	2/1A
Sovcomflot	159,000	274	48	17.2	4/1C
Sovcomflot	162,000	-	-	-	Minimum 1C
Novoship	115,000	-	-	-	8/-
Prisco	170,000	-	-	-	2-4/1A
Prisco	108,000	-	-	-	2/1C
Prisco	100,000	-	-	-	3/1A

Table 1. Details of some new and proposed tankers for Finnish and Russian owners, planned up to 2007.

Special requirements for Baltic Sea icebreakers

Ice in the Gulf of Finland can last as long as 160 days. The number of calls by ships in Russian ports here during winter exceeds 600 and in future will grow intensively. Ice conditions are characterised by the following basic parameters. The thickness of level ice can reach 0.7m-1.0m, with snow cover of 0.3m-0.4m. Such ice does not represent a huge problem for existing icebreakers such as the Arctic-class *Ermak* type and others, which can deal with ice up to 1.9m thick. However, it should be remembered that during the severe winter of 2002 these icebreakers could not ensure an uninterrupted traffic, and large queues formed outside and in St Petersburg, with resulting massive reductions in cargo flows (up to 49% at Vysotsk).

Level ice is an important, but not determining, factor for the choice of capacity, principal particulars, and other characteristics of Baltic Sea icebreakers, since, in practical terms, they do not work under such conditions. This is explained by the predominance of deformed ice on navigable routes - ice hummocks, stratified ice, and ice fields under compression conditions. It is exactly for these conditions that new-generation Baltic icebreakers should be designed. Furthermore, it is also necessary to take into account the need for a high-intensity service.

Vessel movement in the Baltic Sea, especially in the Gulf of Finland, is performed mainly along navigable waterways. During winter, these channels are filled with ice broken into small pieces. According to modern requirements, cargo ships should have reinforced hulls and propulsion trains, also sufficient propulsion power, to maintain independent motion in channels. Icebreakers should form and continuously maintain these navigable channels, not allowing freezing and excessive consolidation of the top layer, and assist navigation within areas of local ice compression and hummocking, formed during ice movement and drift.

The width of navigable ice channels should be maintained sufficiently for the passing of two large ships. Since there has been an increase in the number of escorts along these channels, also of large tankers, plus a continuous growth in traffic, an increase of the width of sea navigable channels in the Gulf of Finland should be a requirement in the near future. At present, the waterways of navigable channels have limited width; thus, new Baltic icebreakers should have an opportunity to carry out work on releasing of vessels from ice outside of deep water, ie, to work in shallow waters. Therefore, any new design should be of limited draught.

Because of practically continuous traffic along navigable channels during winter, these channels will become filled with a layer of ground ice, also ice broken into small pieces. The thickness of such broken ice substantially exceeds the thickness of shore ice. On some sectors of routes, it reaches 3.0m-3.5m. At channel sides, under the ice, ice barriers form to a considerable depth (up to 4.5m-6.0m), which become an obstacle for channel widening by icebreakers.

During navigation by large vessels, the depth of these lateral barriers can increase. Such barriers, due to their structure, are close to hummocked ridges with a consolidated layer, with a thickness equal to the thickness of level ice. Therefore they represent a complex problem for icebreakers, for example, when extracting a tanker trapped in ice.

Stoppage of ships mainly occurs because areas of compression appear periodically along routes during ice movement and drift in the Gulf of Finland, especially near islands. Under such conditions, large tankers can become trapped and can only be released by an icebreaker.

Under conditions of long-duration compression, channel edges can join together, and in that case, the navigable channel, filled with crashed ice, will be completely blocked. Furthermore, a hummock will be formed in its place, having a considerable depth - formed due to submerging of the ice broken into small pieces and earlier on the surface. In such a case, an icebreaker would have to move a tanker to an area of more favourable ice conditions - an area of level ice.

Endurance of such icebreakers in distorted broken ice would exceed considerably operating time in level continuous ice. Therefore, new icebreakers (parameters, hull form, and propulsion plant) should be planned for efficient operation under conditions not so much of continuous ice, but mostly in channels blocked with ice, hummocked ice, and compressed ice - but of course, also for working in any conditions. Thus, for a new Baltic icebreaker, the following ice conditions should be anticipated:

- continuous level ice (as the characteristic for a technical certificate)
- repeatedly restored channel, filled with ice broken into small pieces, having a thickness of up to 2.5m-3.5m
- hummocked ridges with the draught of keel of up to 5.0m-6.0m.

Intended use of icebreakers

A modern icebreaker should possibly have multifunctional capabilities, to ensure that it can also find work during spring, summer, and autumn months. Taking this into account, new designs should be ice-strengthened to the LL7 class of the Russian Maritime Register. As regards breadth, cargo ships would not generally be escorted in continuous level ice, since they are sailing along navigable channels, which normally never fuse into a frozen mass, and the channel is normally kept open by continual passing of ships.

If navigation in continuous ice is considered, the increase in breadth of a new icebreaker to more than 20m, would not be acceptable, since an increase from 20m to 25m would result in an increased capacity by a factor of 1.6, and a further increase up to 33m would require an enhancement of capacity, of more than by a factor of 2.7. However, the breadth of new-generation tankers, as shown in Table 1, considerably exceeds this size, reaching 44m, and in future it can reach 52m. Retaining a standard approach to icebreaker breadth, the growth up to unreal values of 55m-65m would be required.

A qualitative re-consideration of approaches to the development of all elements of a transport system, including icebreakers, tankers, and methods of escorting, would be required. While sailing along navigable channels, tankers should move independently, and icebreakers are only obliged to maintain the channel, preventing its closure due to compression and transposition of ice. For this purpose, any new icebreaker should

Name of icebreaker	*Arctica*	*Ermak*	*Fennica*	*Botnica*	*Captain Belousov*
Length, design waterline, **L**, m	136.0	130.0	96.7	77.9	77.5
Breadth, design waterline, **B**, m	28.0	25.6	25.2	23.1	18.7
Displacement, **D** tonnes	23,460	20,240	4870 (DW)	2850 (DW)	4500
Type of propulsors	3 FPP	3FPP	2 Azimuth CP+Nozzles	2 AZIPOD	2 Bow FP+ 2 stern FP
Power capacity of propulsors, $\mathbf{N_p}$, MW	55.2	30.4	20.3	15.0	8.8
Available power capacity, $\mathbf{N_p/D}$, kW/m^3	2.35	1.5	4.16*	5.26*	1.9
Propulsor thrust, $\mathbf{T_w}$,t	480.0	320.0	234.0	117.0	-
Ultimate ice passability $\mathbf{h_i}$, m	2.3	1.8	1.8	1.6	1.1
$\mathbf{N_p/Bh_i}$, MW/m^2	0.9	0.7	0.5	0.4	0.4
$\mathbf{T_w/ (B\ h_i)}$, t/m^2	7.4	6.9	5.2	3.1	-

*D = deadweight

Table 2. Comparison of propulsion values for various types of icebreaker.

confidently move under any conditions occurring within the water area, and for that reason their breadth should not be excessively large.

From the above, a very important conclusion follows, that with an increase in breadth of tankers, a proportional increase in icebreaker breadth is economically unprofitable and technically irrational. Meanwhile, for the Baltic Sea, icebreakers should have a draught of around 8.0m, since the Gulf of Finland, which represents the basic operating area, is fairly shallow.

Machinery powers

Experience from the winter of 2002 shows that even powerful diesel-electric Arctic icebreakers of the *Ermak* type had difficulty in maintaining channels, therefore this aspect will have to be carefully considered. Analysis of the ratio of capacity − ice 'passability' − shows, that with an increased power capacity by a factor of 7.5, ice 'passability' was only increased by a factor of 2.1-2.5. Therefore, it follows that the power of new ships should be around 15MW-20MW.

The choice of a propulsion plant and its thrust is very important. Therefore, on icebreakers, it would be expedient to use propulsors with the highest thrust parameters and possibly enclosed in steerable nozzles. Such a plant can be compared with that of large-scale tests on icebreakers of the Finnish *Fennica* and *Botnica* type [Refs 1 and 2]. *Fennica* was built by Finnyards in 1993 and presented in *Significant Ships of 1993*.

It is known, that in case of a uniform motion in ice, propulsor thrust is equal to the resistance to the motion of a vessel:

$$\mathbf{Ti = Ri + Rw}, \quad (1)$$

where **Ti** - stands for the thrust of the propulsors while operation of the vessel in ice, **Ri** - ice resistance, **Rw** - resistance of water.

Under ice conditions the draught of the propulsors decreases in comparison against the thrust available with a clear water [Ref 3]:

$$\mathbf{Ti = k_1 T_w = k_2 k_3 (1 - k_w t) P_w \le T_w}, \quad (2)$$

where $\mathbf{T_w}$ - stands for the thrust of the propulsors during operation of the vessel on clear water; $\mathbf{k_1}$ - stands for a coefficient, taking into account the influence of ice on thrust propulsors; $\mathbf{k_2}$ - stands fore a co-efficient, taking into account the influence of ice on the propulsors' supports, owing to changing hydrodynamics; $\mathbf{k_3}$ - stands for a co-efficient, taking into account the effect of propellers stopping, due to the mechanical influence of ice; $\mathbf{k_w}$ - stands for a co-efficient, taking into account the influence of ice upon the suction force of the propulsors, with a change of the picture of the flow about the hull. The values of these coefficients have not been determined until the present time.

In the case of open propellers, a more significant influence is the decrease in the propeller speed in the case of blade interaction with ice fragments. For a propulsion plant using steerable nozzles and hydro-jet propulsors, changing hydrodynamics of water flow around the blades and nozzle, should they become blocked by ice, becomes influential.

The most vivid example for the illustration of a similar influence is the plant on *Fennica* and *Botnica*. These designs have practically identical hull contours of the hull, only differing in the size and type of propulsors. *Fennica* and her sister *Nordica* are equipped with two VRK nozzled units from Aquamaster, while the later *Botnica* is equipped with two VRK units of the Azipod type using open propellers.

The value of $\mathbf{T_w/ (Bh_i)}$ can be considered, describing the efficiency of use of the thrust for destruction of ice, where $\mathbf{h_i}$ = hull thickness and **B** = breadth. The comparison of these values for the vessels is presented in Table 2.

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As can be seen from Table 2, propeller thrust of *Botnica* in clear water is two times less that of the nozzled installation on *Fennica*. Despite this, the ice-going qualities of each are close. This is explained by the fact that the efficiency of open propellers of *Botnica* during operation in ice is kept practically at the level of the values available on clear water; the thrust characteristics of *Fennica*, when operating in heavy ice, decrease considerably, due to blocking of the nozzles by ice. Therefore, *Botnica* utilises her thrust almost 70% more effectively than *Fennica*.

It also follows from Table 2, that the power capacity of the propulsion plant on *Botnica* is also used more productively for icebreaking, but in a smaller degree, than for thrust. Simultaneously, it is possible to note that the parameter of available power capacity, widely used in designing, poorly reflects icebreaking efficiency of a vessel.

Proceeding from the above statement, it would be possible to conclude, that on a new Baltic icebreaker, it would be expedient to use open propellers, well protected against ice influence, unless a reliable way of preventing ice blockage of nozzles, and consequent thrust maintenance at clear-water levels, can be found. To help solve this problem, the propulsion plant of a new icebreaker should be an up-to-date AC diesel-electric plant with FP propellers. In addition, to ensure enhanced manoeuvring and to provide better clearing of navigable channels, it would be also expedient to consider installation of azimuthing propellers, at the same time ensuring that they are fully protected against large ice floes, in order to provide unconditional reliability.

Propulsion plant for dealing with ice

The ultimate ice 'passability' of a new icebreaker, taking into account possible extra work in the western Arctic, should not be less than 1.5m thickness, including distorted ice. Actually, as mentioned above, any new Baltic icebreaker should be able to overcome and break up mainly distorted ice, in the following formations:

- lateral barriers of broken ice, formed by the edges of repeatedly used channels, reaching a depth of up to 5m-6m, with the object of widening the channel
- hummocking connections with a depth of the keel of no less than 6.0m, formed along a vessel route during ice drifting
- compressed ice, forming a hindrance to the passage of cargo ships.

However, a simple increase of power capacity should be acknowledged as irrational - it would not only be necessary to use an optimised hull form, but also to undertake all measures to limit ice resistance and improve propeller operation. For this purpose, not only would new systems be required, but also reconsideration of earlier approaches and technical solutions, taking into account the latest knowledge.

For example, it is known that the well-known system of pneumo-envelope washing (hull lubrication) is only effective when the icebreaker is moving in broken ice, or in a channel filled with a plenty of snow or ground ice. During progress in thicker ice, or where ice is compressed, when the fragments of ice are so tightly compressed against a hull that the air cannot organise a flow of water adjacent to it, hull lubrication proves to be insufficiently effective. A similar conclusion can be made as regards superficial wetting of ice, offered by Canadian specialists.

To provide enhanced propulsion qualities of a vessel in hummocking ice, in repeatedly restored channels filled with broken and ground ice, as well as for enhanced manoeuvrability, it would be expedient to equip a new icebreaker with such an hydraulic washing device (a contemporary analogue of forward-facing propellers). The reliability of such an arrangement, under such ice conditions, in well-known, particularly on ships such as *Captain Belousov*, which were equipped with two bow propellers in addition to two stern ones.

For the purpose of estimating the influence of such bow propellers, it is necessary to revert to the results of calculations as regards the comparison of utilisation efficiency of the propulsion plant $\mathbf{N_p}$ on various icebreakers. The relative power consumption of power capacity required for the destruction of ice having the thickness of $\mathbf{h_i}$ at a location, equal to the breadth **B** of the vessel (Table 2), can be considered.

The results presented show that even the most up-to-date icebreakers, in terms of power efficiency utilisation for the purpose of ice destruction, cannot exceed the characteristics of those icebreakers constructed more than half-a-century ago, including designs equipped with bow propellers - examples of these have been decommissioned a long time ago. This is explained by the fact that bow propellers provided reliable hydraulic washing of the hull and promoted the good propulsion characteristics of a vessel in deformed ice.

However, also well-known are the drawbacks of these bow propellers, which were actually first offered more than 100 years ago (on icebreakers of the 'American' type). These drawbacks include poor reliability, resulting in frequent breakage of blades and even of propeller shafts. Therefore, on the majority of vessels, including on the first of the *Ermak* class, bow propellers were not used.

At the same time, as was shown by the experience of model and large-scale tests of various constructive solutions, it would be very difficult to provide effective hydraulic washing of a hull by other means. Attempts to realise this on Canadian icebreakers at the expense of installation and using bow steering devices in ice have not resulted in success, because of blocking of apertures by ice fragments. Nevertheless, it would be necessary to acknowledge that only hydraulic washing of a hull could appreciably increase all operational parameters of a new-generation icebreaker, including the provision of a reliable and efficient stern propulsion/steering plant under ice conditions peculiar to the Baltic Sea. Therefore, on any new design for this region, new technical solutions should, in the main, be developed, for providing hydraulic hull washing.

Hull form possibilities

Analysis of modern concepts for icebreaker hulls shows a number of interesting possibilities. In Canada, a hull form has been developed with two or three chines over the surface. The reduction of ice resistance was supposed to be reached only in level ice - at the expense of a spoon-shaped bow extremity, and with the midships part of the hull in the form of a cylindrical insert with vertical sides; furthermore, the breadth amdships (0.1B) should be less than the breadth of the bow extremity, having special reamers in the zone of transition between the prow extremity and the cylindrical part of the hull. Clearing a channel and protection of the propellers would be reached at the expense of application of steering devices or pumps at the bow, which direct water flow for removal of ice fragments penetrating under the bottom.

A relatively modern icebreaker, designed on the basis of Canadian experience, is represented by Sweden's *Oden* (built in 1989 by Götaverken and featured in *The Naval Architect* February 1989, page E71). This design unites a combination of properties: a shallow-draught spoon-shaped form, reamers, icebreaking projection under the prow extremity (plough) and underwater-cutaway stern. These characteristics should have provided a minimum of ice resistance, a short time cycle for operation by incursions, good manoeuvrability, effective destruction of hummocks, and good icebreaking qualities with a clean channel. However, further icebreakers were not constructed, due to a number of revealed drawbacks. The Canadians themselves quickly stopped using those contours and applied more conservative lines to *Terry Fox*.

German concept

In Russia, two icebreakers of a German type are in operation. These are *Moudyug* (rebuilt at Thyssen Nordseewerke with a different bow) and *Captain Sorokin*, which have box-type bow extremities, with lateral reamers and ice knifes, located separately, for stage-by-stage destruction of level ice, into sections of predetermined sizes. These designs have confirmed their high propulsion qualities in level ice; however, in hummocks, broken and ridged ice, they operate poorly, especially in compressions. They can hardly work astern properly or when turning, which has created a number of difficulties.

Finnish possibilities

The refurbished *Captain Nikolayev* (originally built by Kvaerner Masa-Yards but fitted with an improved bow in 1990) has a flat spoon-shaped bow extremity. Other alternatives are Masa-Yards' proposed oblique-type icebreaker, which breaks ice while moving sideways, and those using the double-acting principle to break ice while travelling astern.

Although the principal claimed benefit of an 'oblique' icebreaker is an increased channel width, in fact, this approach does not comply with the modern concept of Finnish-Swedish rules, incorporated in the determination of the minimal level of power capacity of cargo ships. The concept assumes that vessels operating during winter in the Baltic Sea should have hull and propulsion plant characteristics, which allow them to independently move in repeatedly restored channels full of ice. Icebreakers should only help to maintain the breadth of the channel and keep traffic moving when complicated ice conditions develop, with compression of ice fields, and other situations.

In case of such situations, an 'oblique' icebreaker would not prove to be efficient,

because the channel behind the icebreaker would become closed, and the vessel will be exposed to lateral compression. Under such ice conditions, even the provision of sideways motion is expected to be problematic. At the same time, the stopping of an icebreaker from moving straight ahead, for example, due to meeting a ridge or hummock, will result in danger of damage by any large tanker moving behind, such a tanker having considerable inertia.

In addition, an 'oblique' icebreaker has a number of other obvious drawbacks, such as course instability, especially during movement in ice. It is also clear that such a vessel could not transfer to the Arctic, where ice conditions, even in summer, can be more difficult than those of the Baltic Sea.

The concept of a dual-role vessel, from the authors' point of view, is only applicable to cargo ships of the double-acting type, whose bow is optimised for the movement in clear water, for which purpose the vessels are normally equipped with a bulb. Such an approach is not applicable to icebreakers, otherwise the stern should be called the bow and *vice versa*. An icebreaker should primarily be designed for operation in ice. At the same time, it would be impossible to assert, at present, that azimuthing pods of the Azipod type fitted to an icebreaker can comply with reliability requirements under such kinds of operation (with propeller blade length equal approximately to ice-floe thickness).

Analysis of specified modern approaches shows that while creating an icebreaker of a new generation for the Baltic Sea, the above-mentioned drawbacks should be taken into account. Thus, it is possible to conclude, that the hull form of a new icebreaker for the Baltic Sea should be close to classical, without reamers and sharp breaks and should be based on the rich domestic experience of icebreaker construction. The fulfilment of requirements towards the ice qualities of any new designn should be implemented at the account of:

- providing sufficient power capacity and thrust of the propulsors
- optimisation of the hull form, ensuring reduction of the various components of ice resistance under the specified conditions
- development and application of systems allowing a fundamental influence upon the character of hull interaction with ice, not so much in level ice, but in distorted ice, thus reducing ice resistance and increasing ice efficiency of the propulsion plant, by improving the operational conditions.

On this basis, a new design could have a length of 100m-120m, a breadth between 20m and 24m, and a draught between 8.00m and 8.50m.

Conclusions

At the present time, there are no ready projects, which could be used for a new generation of Baltic icebreakers. Analysis of foreign experience shows that non-traditional contours of the hull have appeared to be not only inefficient in practice, but frequently even problematical. All foreign icebreakers have essential drawbacks while operating in distorted ice and under compression, typical for the Baltic Sea, and also while moving astern.

In view of this, a project for a multifunctional icebreaker (Project 11040), developed by the Central Design Bureau ICEBERG, could perhaps prove to be a suitable compromise for Baltic Sea conditions, while requiring minimum upgrading. At present, Severnaya Verf is preparing for the construction of a prototype of this design, which is expected to be recommended for the Ministry of Transport of the Russian Federation.

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Note: Readers are also referred to the article 'Optimising the Design of New-generation Russian Icebreakers', *The Naval Architect* June 2003, page 46.

The Royal Institution of Naval Architects

WARSHIP 2004: LITTORAL WARFARE & THE EXPEDITIONARY FORCE

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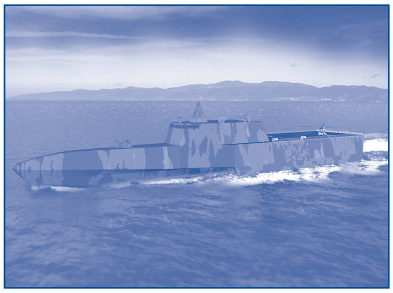
Second Notice



As military doctrines around the world begin to shift towards out-of-area operations, the requirements for naval vessels have also begun to change. The focus of naval operations is shifting inshore and many traditionally blue-water navies are beginning to re-focus on their littoral and expeditionary force capabilities.

This attention has lead to a huge increase in work on amphibious and assault vessels. Countries including the UK and USA have new classes of large dock-ships in construction and all over the world, from Italy to Australia, navies are looking into the modernisation of their amphibious and logistics forces. This includes proposed large air-capable ships and designs with dual civil and military roles.

At the same time, there have been a number of major combat vessel projects. The most prominent of these is the US Littoral Combat Ship, a novel and highly potent warship optimised for operations in the littoral. This will be able to capitalise on the experience of a number of recent advanced designs, including Sweden's *Visby* Corvettes and Norway's *Skjold* SES Fast Attack Craft.

Warship 2004 aims to explore all of these trends: looking at the modern idea of a littoral warship, exploring the capabilities of the new-generation amphibious assault ships and landing craft and investigating the associated support requirements of modern out of area operations, including mine warfare, hospital and logistics vessels.

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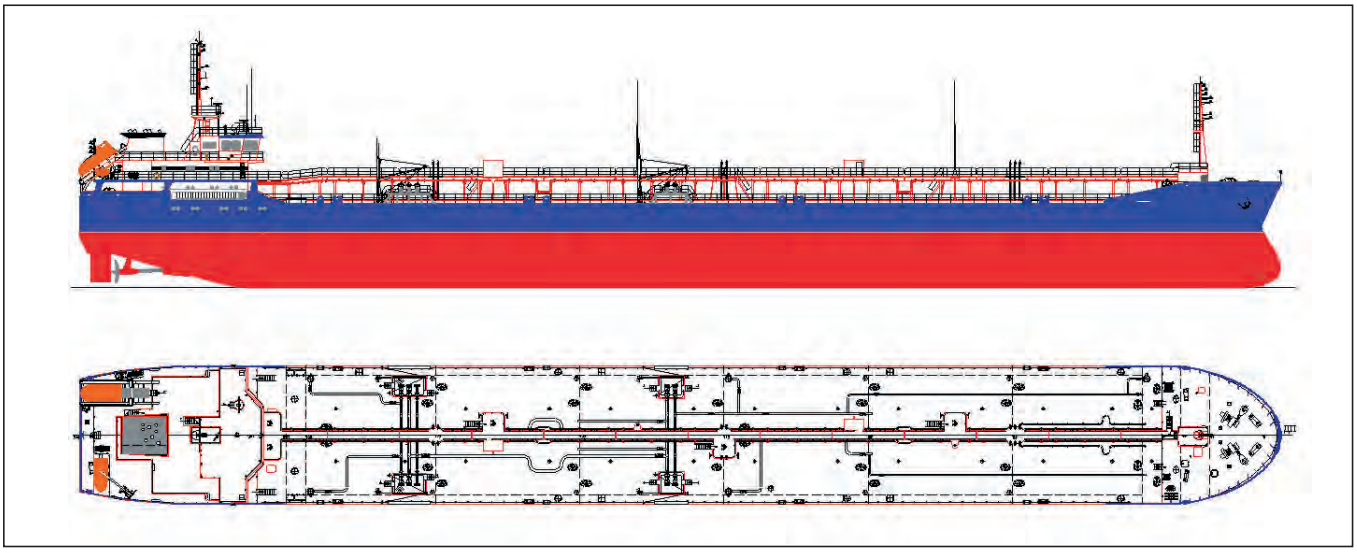


Profile and deck plan of Krasnoye Sormovo's new Project 19619 tankers - at 13,000dwt, the largest yet from this yard. They are principally planned for work on the Caspian Sea but can reach the Black Sea and elsewhere through the Volga-Don canal.

Large new tanker design from Krasnoye Sormovo

IN our September 2002 feature on Russia, we reported that the Krasnoye Sormovo shipyard, based at Nizhny Novgorod (Gorkiy), forecast an upswing in interest for new ships from operators bordering the Caspian Sea, largely as a result of activities in oil exploration. In light of this, the shipyard has developed a very large new crude/products tanker design of 13,000dwt - the largest ever conceived and known as Project 19619 - it is based on the principle that owners are seeking increased capacity within a given hull.

This size would also be the maximum acceptable at local ports without any modifications or need for dredging; maximum possible width for reaching the Caspian Sea is 25.00m. To date, four contracts have been secured from the Caspian Shipping Co, based at Baku, and the first ship is planned for completion this year.

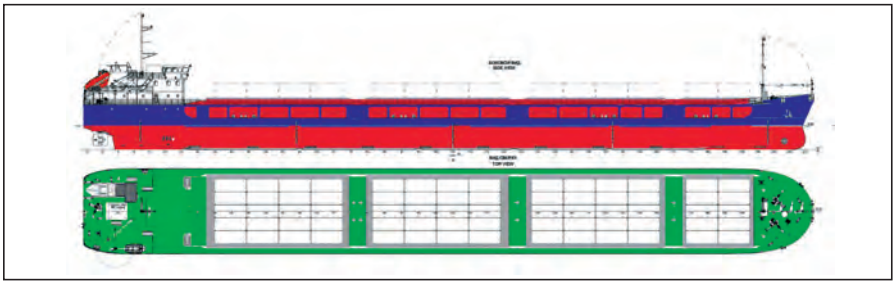
Earlier tankers have included the 19614 river/sea type, of 5400dwt, which was illustrated in our September 2002 article (page 39). Four examples of this class have now been delivered to KSS Shipping, and more are planned for completion through to 2007. Yet another design is the Type 00101 cargo ship; a total of nine 5149dwt hulls are on order for Better Overseas; the first two will be handed over this year - the second, *Rusisch-2*, was launched in February - and the last should be delivered in 2007.

Both Krasnoye Sormovo and Volgograd are members of OMZ, a large Russian conglomerate - it claims to be the largest of its kind in the federation - that includes shipbuilding in its portfolio. The group is involved in both marine and land activities and has fabrication sites in the Ukraine, Romania, and the USA, as well as Russia. Capacity to build commercial and military ships, as well as special designs, is available at five yards: Almaz, Volgograd, 3rd International, and Nizegorodsky Teplokhod, in addition to Krasnoye Sormovo.

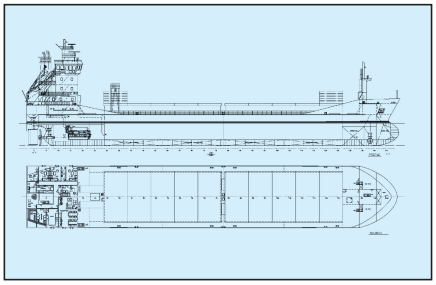
Healthy order book at Volgograd

VOLGOGRAD Shipyard is well-known for its merchant ships up to 7000dwt, both tankers and cargo designs with maximum dimensions up to 141m x 18m. Current orders include seven PK608-type chemical tankers of 5800dwt, believed to be for Brovigs, two tankers of the 17103 type for TT Shipping, and eight PK-122 two-hold cargo ships of 99.00m length for Clean Seas Holding. Additionally, the order book includes 139.60m long river/sea cargo ships of the 006RSD05 type with four holds inside double side-skins suitable for general and bulk cargoes, as well as 8ft 5in-high containers. These last-mentioned vessels are fitted with twin azimuthing propellers and are being built to Russian Maritime Register classification. The prototype vessel is under construction. Also on order is the prototype of a new chemical tanker, the 002 type, with nine cargo tanks contained within double side-skins and a double bottom, and a cargo capacity of 3400m^3 on a length of 110.00m and a draught of 3.20m. These tankers are being built to Lloyd's Register Tanker Type C class. The single propeller is placed in a nozzle.

The PK608 tankers are of traditional single-screw sea-going design, with a length of 110.50m, designed to carry oil and oil products with flashpoints less than 60°C in 10 grades. The hulls are strengthened to ice class 1A with Det Norske Veritas. Overall, this interesting collection of contracts will keep Volgograd busy until 2008.



Profile and deck plan of Volgograd Shipyard's new 006RSD05 river/sea cargo ship. The prototype hull is currently under construction to Russian Maritime Register class for Palmali Shipping. Length is 139.60m and breadth is 16.50m, and the maximum deadweight is above 5000dwt. A notable feature is twin azimuthing propellers, which are driven by 1100kW engines for a speed of 10.50knots.



Eight of these PK-122 cargo ships are on order for Clean Seas Holding at the Volgograd Shipyard. The 5200dwt design has two holds and a service speed of 14.00knots.

Arctic challenges highlight need for strong propulsion lines

The Russian Maritime Register of Shipping discusses some of the major tasks that lie ahead, especially regarding Arctic ship and platform design.

TO ensure sufficient strength for propulsion trains of ice-navigation cargo ships and icebreakers is one of the major challenges facing those engaged in the design and construction of such vessels, and of course, in classifying them. This is primarily due to the large ice loads acting on propeller components. Trouble-free operation of propeller systems in ice is not only cost-effective but provides for safe operation.

Intensification of oil and gas developments on the Arctic shelf, both on and offshore, has highlighted this challenge. At present, CP propellers and azimuth thrusters are fitted in ice-strengthened ships as main propulsion units, and now the first double-acting icebreakers with Azipod azimuth thrusters have been put in service. Kvaerner Masa-Yards is also engaged in the design of a double-acting container ship of the ЛУ7 category, to Russian Maritime Register class, for collecting cargoes from the port of Igarka. This vessel will also be fitted with Azipod thrusters.

As noted in various articles in *The Naval Architect*, a double-acting vessel is designed to sail astern when in heavy ice, thus significantly decreasing ice resistance and enhancing operational efficiency. In this case, the azimuth thruster is turned 180deg to operate as a bow propeller, 'drilling' ahead into the ice.

Ensuring the safety of such state-of-the-art propeller units is, in Russia, beyond any previous experience of operating and designing traditional icebreaker propulsion systems. Therefore, updating of existing requirements for CP (and FP - double-acting tankers normally have FP models) propellers and azimuth thrusters of ice-breaking cargo ships and icebreakers, and evolution of new ones, is required. Already, The Russian Maritime Register of Shipping (RS) is constantly updating its database through R&D, as well as through experience gained in technical supervision.

At present, the following rules are undergoing trial operation with a view to verifying them:

- new requirements of RS Rules for FP and CP propeller blades, and for the strength of CP mechanism components for icebreakers of ЛЛ6-ЛЛ9 categories and for other ships having ice strengthening
- requirements of RS Rules for the strength of main components of azimuth thrusters, with regard to thickness of components, visco plastic characteristics of component materials, and stress concentrations.

Offshore platforms for the Baltic, Arctic, and Far East

The Russian Maritime Register of Shipping is engaged in several projects connected with developments in the seas off the Russian Federation. Among the most interesting ones are: an ice-resistant platform for the Kravtsovskoye field (D-6) in the Baltic Sea, an ice-resistant platform for the Prirazlomnoye field in the Barents Sea, and the ice-resistant platform *Orlan*, intended for oil extraction offshore Sakhalin island. These are all fixed structures.

The D-6 design is an oil production unit consisting of two separate stability blocks on which upper hulls are fitted, spaced 70m apart and spanned by a bridge. The project incorporates an existing accommodation block that was designed in 1982 at PO Gipromorneftegaz and was positioned at the oilfield in 1986. The new stability block includes an energy module, a production module, and a drilling complex.

To enable MI-8 and KA-32 helicopters to take off and land, the accommodation module is fitted with a helicopter landing area, helicopter control station, all necessary facilities, and production spaces. Construction and repairing of wells will be effected using an HRI-320 rig intended for drilling wells of up to 4000m in length. Four diesel-generators each having an output of 2130kW are provided as main sources of electrical power. This platform is designed to extract oil in water depths of up to 31m, north of Kaliningrad, at latitude 55deg 21 minutes north, longitude 20deg 32 minutes east.

The second ice-resistant platform *Prirazlomnaya* is intended for development of the Prirazlomnoye oilfield in the Pechora Sea, whose extractable reserves are estimated at 83 million tonnes. The platform base was positioned in late 1995. This is a steel gravity platform consisting of a caisson (foundation) of 57,000tonnes weight, with dimensions of 126m x 126m x 24.3m, which contains oil storage facilities for 130,000tonnes, along with fuel tanks, water tanks, and solid ballast, also a variety of pumps.

An upper hull of around 28,000tonnes weight for drilling, oil extraction, and primary processing, is installed on a deck measuring 93m x 93m. After processing, oil is transferred to a storage unit, and from there, via cargo gear, to ice-class tankers of 60,000dwt.

A supporting foundation is currently being constructed under the supervision of the Russian Maritime Register of Shipping. On top of this will be fitted the purchased upper hull of the Norwegian platform formerly used in the Hutton field. Its new home will be in the East Barents Sea at a point in latitude 69deg 15 minutes north, longitude 57deg 18 minutes east.

The drilling platform *Orlan*, to be positioned at the Chaivo field (which forms part of Sakhalin-1 project), is currently being upgraded at the Amursky shipyard. *Orlan* is a gravity structure that is to be positioned in water depths of 14m. The platform comprises four main components: a steel foundation, a concrete middle section, and two steel deck sections on which a new world-class drilling rig, together with production and accommodation modules, will be fitted.

In 2001, *Orlan* (Russian for erne) was towed from Alaska to the port of Sovetskaya Gavan. This platform was named after the sea eagle that is found on Sakhalin and that symbolises speed, strength, and courage. From 1984 on, the platform was operated by ExxonMobil in the Beaufort Sea off the Alaska coast, where its structure demonstrated its suitability for year-round operation in severe Arctic conditions.

Accent on limiting emission levels

Great emphasis is placed by the Russian Maritime Register on issues of environmental protection. Using many years' experience gained by the society in this field, the Russian Federation Government has authorised it to direct the implementation of those regulations imposed today on emission levels from Russian Register-classed ships.

Based upon the results of thorough research, in December 2003 the society published new Rules for Surveys of Ship Propulsion Plants for Compliance with Technical Standards for Emissions of Harmful Substances into the Air. The requirements are even stricter than those imposed by Annex VI of MARPOL 73/78.

The Rules cover ocean-going ships, river-sea vessels, and sea-going pleasure boats having a carrying capacity of more than 12 persons, flying the flag of the Russian Federation and fitted with main engines of 55kW and above. Among controlled parameters are weighted average emissions of nitrogen oxides (NOx), carbon oxides (CO), hydrocarbons (CH), and exhaust opacity.

General provisions are also included for technical standards of survey types and methods, both those performed on a testbed at the manufacturer, and on board, measured parameters and types of measurement equipment, measurement performance, and simplified methods for engine survey. To process the results, the society has evolved a calculation program, including one for use with gas and dual-fuel engines. The program is multi-purpose, since it can also be used in calculations under the IMO Technical Code on Control of Emission of Nitrogen Oxides from Marine Diesel Engines.

Software for offshore analytical tasks

As illustrated in *The Naval Architect* September 2003, page 26, The Russian Maritime Register has developed a new software package, Anchored Structures, designed for calculation of statics and dynamics of floating anchored structures, such as semi-submersible mobile drilling units, fixed offshore platforms, drilling ships, floating cranes, floating docks, pipe-laying ships, and barges. This software, which has already been used by various Russian companies, employs modern methods for:

- calculation of loads applied by wind, current, waves and ice to the hull of a floating structure

- non-linear analysis of floating structure statics and dynamics
- spectral and probabilistic calculation of floating structure movement, considering six degrees of freedom.

Software capabilities include:

- calculation of draught, displacement, centre of buoyancy coordinates, water-plane area, metacentric height of a floating structure with due regard for anchoring and mooring influence
- calculation of strength characteristics of members (anchoring, mooring, towing)
- calculation of' hydrodynamic characteristics (considering the influence of other hulls in the close vicinity)
- calculation of loads applied by wind, current, waves and ice to floating or fixed structures
- initial positioning of a structure at a specified point
- calculation of anchored structures' shift and members' tensioning caused by static loads
- calculation of dynamic oscillations of structures under regular and irregular external impacts
- full probability simulation of a structure's dynamics over its service life
- simulation of a structure's dynamics considering anchor members' dynamics
- simulation of a towed structure's dynamics.

Benefits for users include:

- evaluation of a structural design's dynamics without expensive experiments, considering operational conditions and analysing different variants of design decisions
- evaluation of the reliability and lifespan of a structure on the basis of simulation of its behaviour throughout its service life
- evaluation of the reliability and forecast of an anchoring system's service life by means of simulation of operating and fatigue effects
- determination of the optimal parameters of anchoring systems under various external impacts
- determination of the optimal characteristics of technical installations as well as structural operation modes under real conditions
- possibility of adapting software to the specific needs of customers.

Finally, methods backed by research are required to enhance safety of ship operation. Formal safety assessment is one of such methods. FSA can essentially be viewed as a tool for obtaining a quantitative assessment of potential casualties and taking relevant measures for eliminating hazards.

FSA methodology developed by IMO is general by nature. However, use of basic FSA provisions can help to resolve a specific task, for example, to provide a means of forecasting marine diesel engine remaining life through development of an engine formal model. Such a model and its implementation should help to guarantee enhanced trouble-free engine operation and, consequently, contribute to overall ship safety.

Shrinking production time and costs at Admiralty Shipyards

ADMIRALTY Shipyards is planning to invest around €90 million (a combination of its own and outside funds) in development and technical renewal of yard equipment up to the year of 2010; the greater part of this - more than €80 million - will be spent in the period between 2005 and 2010. Up till 2005, €6.5 million will be spent on buying equipment for primary steel processing and for automated production lines.

When this programme is complete, annual output is anticipated to be increased by 10%-12%. The new equipment will also help to reduce ship costs, shorten construction times, and improve quality. However, the total requirement for reconstruction and upgrading is assessed at around US$350 million. Production load at Admiralty Shipyards in 2003 was estimated at 55%, but this year this figure is expected to rise to 70%.

Meanwhile, at the end of April, Admiralty Shipyards was scheduled to hand over to Sovcomflot the 47,000dwt products tanker *Tuchkov Bridge*, the third in the series of six ordered by this owner. In late July or early August the fourth hull, *Tower Bridge*, will be launched; she is planned to be delivered to the customer in mid-January 2005, equalling a construction time of only 13 months - an important and satisfying reduction when compared with the lead ship, *Troitsky Bridge*, which took 18 months to complete.

The series is based on a design originally made by the Trogir yard in Croatia for Laurin Maritime, but which was modified and upgraded for the Russian operator. *Troitsky Bridge* was presented in *Significant Ships of 2003*.

Eight days after *Tower Bridge* is launched, the first blocks of the fifth tanker will be laid on the berth. This hull and the final one are planned for delivery in early and late 2006 respectively.

The contract with Sovcomflot for construction of the complete series was signed on September 7, 2001, with the prototype, *Troitsky Bridge*, laid down on January 29, 2002, floated in February 2003, and handed over to the customer on November 22 last year. She is currently being operated out of Italy.

The total contract is assessed at US$160 million, with *Tuchkov Bridge* costing approximately US$27 million. Construction is financed partially from the shipyard's own resources (30%-40%) and partially from foreign bank credits. Bank guarantees are provided by St.Petersburg-based National Reserve Bank and Industrial-Construction Bank. Currently, Admiralty Shipyards is consulting with Sovcomflot over placing more orders in the future.

The 47,000dwt products tanker *Tuchkov Bridge* is the third in a new series of six high-specification vessels from Admiralty Shipyards for Russian owner Sovcomflot. Up to five grades can be handled simultaneously in 10 cargo tanks and two slop tanks, all coated with Jotun Tankguard HB. Cargo handling is by individual Frank Mohn hydraulic submerged pumps (10 x 550m³/h and 2 x 200m³/h).

New Projects of Severnoye Design Bureau

Given the recent trends in shipping market Severnoye Design Bureau is offering new projects.

Currently on the basis of cargo-and-passenger shipping operations analysis the idea of multipurpose ferries construction has emerged. The Bureau has developed the project of vessel intended for carrying railway cars, motor vehicles, passengers, and dangerous cargos on shipping lines provided with special moorings. Unlike seagoing cargo vessels, for instance palletized or container type running on cargo sea-lines, the railway ferries require both special architectonic justification on their design and special shore facilities. Besides, depending on specific sea-lane special engineering solutions are in demand.

The ferry is a two-shaft vessel fitted with two cargo decks, double side in holds, and aft watertight closure of "guillotine" type. The vessel features speed with a cargo of 16 knots. It is equipped with all necessary devices, such as bow thruster and general stabilization equipment. For handling this ferry is fitted with railing, switch, braking and car fastening devices, and also automated careen preventative system, which provides keeping careen not more than 3 degrees.

On the basis of given prototype the Bureau has carried out the development of pre-contract design of ferry that has bigger tonnage. This vessel can carry more than 130 railway cars and other vehicles.

The other line of Bureau's activity is design of fire and patrol boats.

The patrol boat is intended for customs/police service in littoral waters and harbors, rescue operations, preservation of the environment, and patrolling the 200-miles economic area. This boat has a displacement of 360t and a draft of 2.0m. Two geared-diesel machines and water-jets with reverse-steering devices provide speed not less than 35 knots. Cruising range of 1.500 nautical miles under patrolling speed of 18 knots.

To provide customs examination the boat is mounted with cockboat equipped with necessary navigation system. It can gain speed of up to 50 knots. This boat is also equipped with communication means that provide receiving and transmission of messages which regarding to urgency and safety meet the requirements of Global Marine System. To provide safe navigation the boat has radars. Location is determined with GPS.

For rescue operations the boat is equipped with carriage monitor of "Purga-40" type with output capacity of 2.500 l/min and delivery distance of water/foam of 50m, and fire extinguishing system of oil spill, besides that the skin-diving and other rescue means are provided on boat.

The fireboat is intended for extinguishing of any kind of fire occurred on vessels and shore sites, as well as for rescue operations. It can carry out rescue operations at sea with a use of skin-diving equipment. This boat has a displacement of 235t, mean draft of 1.85m, main propulsion system of two-shaft diesel type of 4.100kW power output, cruising range of 400 nautical miles under full speed of 21 knots.

Fire extinguishing operations are provided with two carriage monitors of Purga-330M type that can deliver the foam of medium/low expansion ratio at a distance of up to 120m and height of up to 22m; and also carriage monitor of Purga-90 type of 90 m delivery distance. Total productivity of 45.000 l/min. to provide a passageway of 60m wide the boat is equipped with oil spill fire extinguishing system provided with 4 monitors of Purga-10 type. To protect the boat from impact from outside fire the water/foam spraying system is applied.

The fireboat has capacity to take on board up to 200 victims, for their recovery the boat is equipped with aft folding small area; 50 life jackets, 40 ring buoys and 4 skin-diving sets are provided.

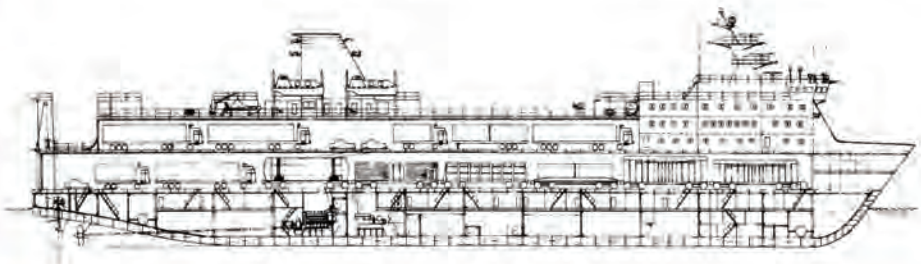
Severnoye Design Bureau with its high scientific potential provides services in the following directions: developing of engineering documentation for designing, construction and exploitation - establishment of infrastructure for maintenance and repair. The Bureau promptly cooperates with any potential customer, taking into account their requirements for accessory equipment. Reliable ties with oversea shipbuilding companies assure prompt respond to any partner's wishes, as well as chief-installation of equipment, training of personnel, and after-sales servicing.

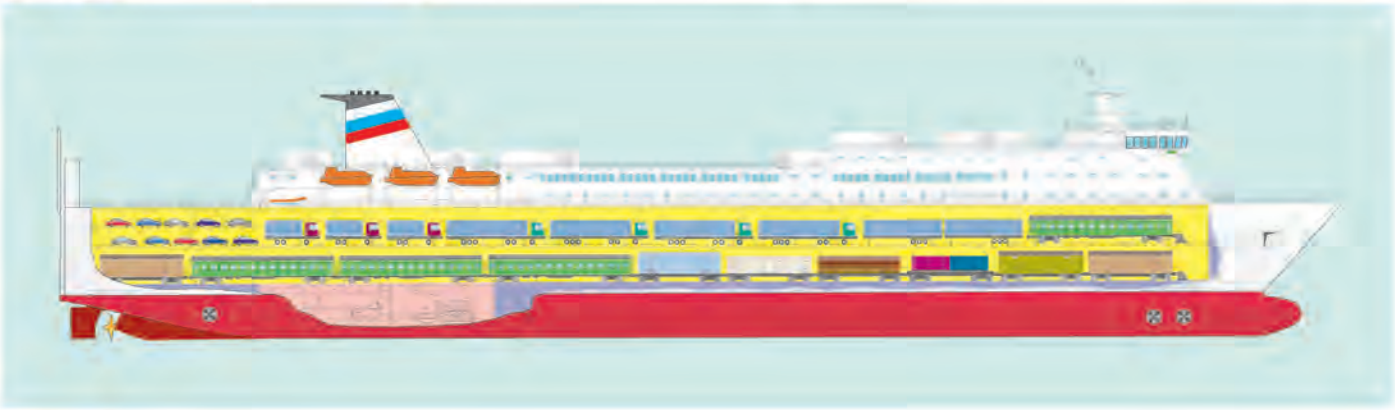
Main characteristics

Overall length	144.9m
Breadth	22.6m
Draft	5.4m
Dead-weight Tonnage	4.500t

Shipload

On main deck	
Railway cars	30
or highway freighters	40
or passenger cars	144
On weather deck	
Highway freighters	18
or passenger cars	72
passengers	142





Perfecting fire protection regulations

THE IMO sub-committee on fire protection met at its 48th session in London from January 12-16 2004. Delegates from BIMCO participated together with 48 member governments and 14 associate members, representatives from UN and specialised agencies, and observers from other non-governmental organisations. The agenda for the meeting included a range of technical items, and hence a number of the delegations at the meeting comprised representatives of manufacturers and industry.

A working group on performance testing and approval standards for fire safety systems discussed technical issues. A number of participants in the group were from the fire equipment industry, and in general the issues covered appeared to be mostly of interest to those involved in manufacturing and testing.

One issue does, however, require some attention, namely a proposal to ban the use of CO2 total flooding fire-extinguishing systems in occupied spaces (machinery spaces) due to personal injury considerations.

The delegations did not reach an agreement on this issue and it was decided to continue discussions at the next committee meeting. Neither could the work group agree on criteria for testing water-mist installations as the sole fixed fire-extinguishing installation for large machinery spaces of more than 3000m3. The work is targeted for completion in 2005.

A working group on large passenger ship safety discussed issues relating to, among others, the concept of 'safe havens'. Safe havens are protected areas onboard large passenger ships. The idea behind the safe-haven concept is the notion that the ship is its own best lifeboat. Hence large passenger vessels should continue to be able to take care of all persons on board during and following a 'major casualty' until the vessel reaches a port. The work group decided to limit their work on safe havens to fire casualties, leaving the provision of other casualty types to other sub-committees. Details regarding requirements to safe havens still remain to be agreed.

'Unified interpretations of SOLAS chapter 2-II, the FSS code and related fire test procedures' was the title of a working group under this sub-committee. As the title implies, this group works on the interpretation of regulations already agreed. Most notably under this group's agenda was a request for clarification of SOLAS 2-II/10.7.2. The latest revision of this regulation opens up the possibility of carrying dangerous goods on deck of vessels not fitted with fixed gas fire extinguishing installations in the cargo hold. While the work group decided to submit an interpretation that would require such vessels to be fitted with fixed gas installations, there was some disagreement on the subject and it was questioned if this was an interpretation or an amendment to SOLAS.

There are a number of issues arising out of inconsistencies in the wording and interpretation of the regulations regarding fire extinguishing arrangements in cargo spaces (SOLAS II-2/10.7), the regulations pertaining to the carriage of dangerous goods (SOLAS II-2/19.3 & 4), and in particular regarding the issuance and content of the certificates for these regulations. The issue raised at this FP meeting is one of those, however, and therefore the full contents of these regulations need to be reviewed to permanently resolve the situation.

At present, the regulations permit a vessel of more than 2000gt without fixed fire extinguishing installation to be loaded with coal or direct-reduced iron, both clearly dangerous and combustible cargoes, but the same vessel is not permitted to load sand or steel, or other non-combustible products.

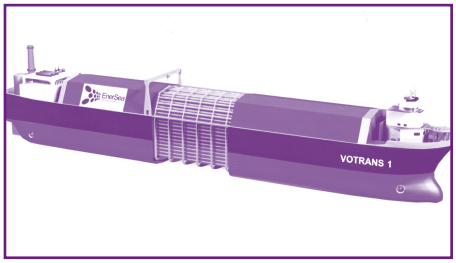
This article is produced in association with BIMCO (the Baltic and International Maritime Council).

The Royal Institution of Naval Architects

DESIGN & OPERATION OF GAS CARRIERS

22 - 23 September 2004, London, UK

Second Notice



There is currently considerable optimism about the future growth of the natural gas market and while not all the proposed LNG schemes may materialise, many still expect a significant increase in the number of vessels in the world LNG fleet. Recently, there has been both an increase in orders and an increased programme of scrapping of older vessels. The market is also moving away from the traditional long term 20-year time charter and greater use is being made of spot market vessel charters.

While some companies are looking at the possible economies of scale of larger vessels (in the range of 175,000- 250,000 cu.m.) others are looking to develop options for developing small vessels to exploit shortsea and coastal trades in LNG.

New alternatives including compressed/pressurised natural gas (CNG/PNG), where the gas is stored under pressure at ambient or semi-refrigeration temperatures, are also being developed. There is also a growing interest in LNG Floating production, storage and offloading systems for offshore oil & gas developments and re-gasification tankers and plants designed to avoid the need to construct huge land-based processing and distribution centres.

Steam turbines have traditionally been the preferred power plant for LNG carriers; however, other options such as medium speed diesel electric or slow-speed diesel engines, with reliquefaction plants to reclaim boil-off gas, are being developed.

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Green Cape: a new standard for Capesize bulkers?

The first examples of a new-generation, but single-skin, Capesize bulk carrier are now entering service from Shanghai Waigaoqiao Shipyard in China. They were designed by a Hong Kong consultancy and feature a number of innovations.

To date, a total of 28 orders have been secured for Peter Cheng's double-skin Capesize bulk carrier. The prototype from Shanghai Waigaoqiao Shipyard, *CSK Fortune*, is seen here.

IT was perhaps fitting that the first ships to be delivered from China's showpiece 'greenfield' yard, Shanghai Waigaoqiao, should be a new-generation Capesize bulk carrier - not only because of the new ship design but also because bulkers have come to symbolise the new economy of China. They are involved in importing large quantities of iron ore for booming industry.

Some details of *CSK Fortune*, the lead ship, were given in our February 2002 article on Shanghai Waigaoqiao Shipyard (page 13), but more comprehensive information has now been received from the Hong Kong designer Peter Cheng Naval Architect & Marine Consultant Ltd. Although not with double skins (as currently being proposed and acted on in many quarters), this new so-called Green Cape design is claimed by Dr Peter Cheng to offer a number of benefits over traditional concepts, whose basic structure has changed little in recent years (but which will almost certainly do so in future, with probably introduction of double skins for ships of more than 150m length).

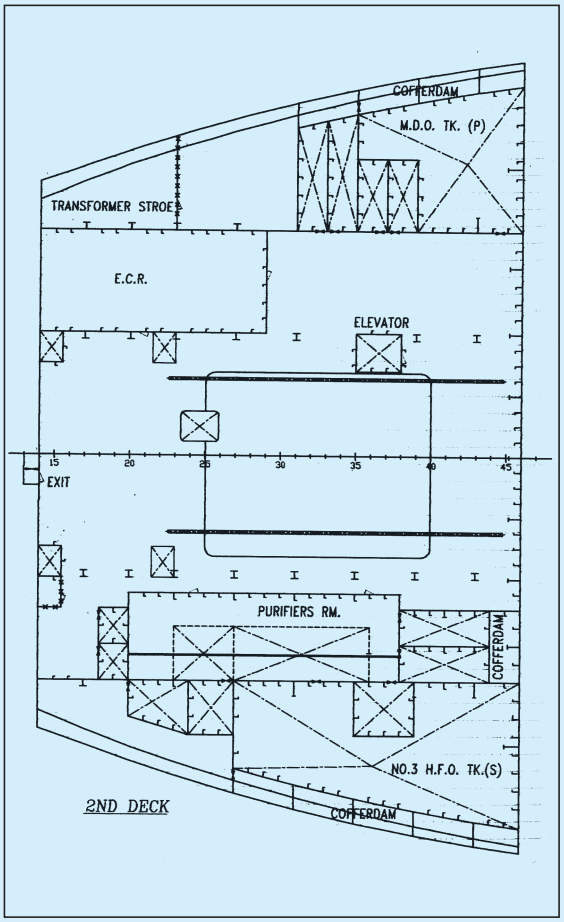
When Shanghai Waigaoqiao and owner Tai Chong Cheang asked Dr Cheng's company in early-2000 to design a Capesize bulker which at least could compete with the market leaders, all major Hong Kong operators were consulted and accumulated data from many years was analysed. Findings indicated that operational restrictions apply to many designs, which are partly due to the traditional arrangement of nine holds and the position of heavy fuel tanks in the engineroom. These restrictions are also partly due to designers and yards' intention to limit building costs by providing minimum strength - just sufficient for typical operating conditions but which limits loading patterns. Also, according to Dr Cheng, the majority of Capesize designs are planned with the French port of Dunkerque in mind, with a maximum length of 290m and a beam restriction of 45m. Although one of the post-*Derbyshire* recommendations was that forecastles were desirable, one is not included in this design.

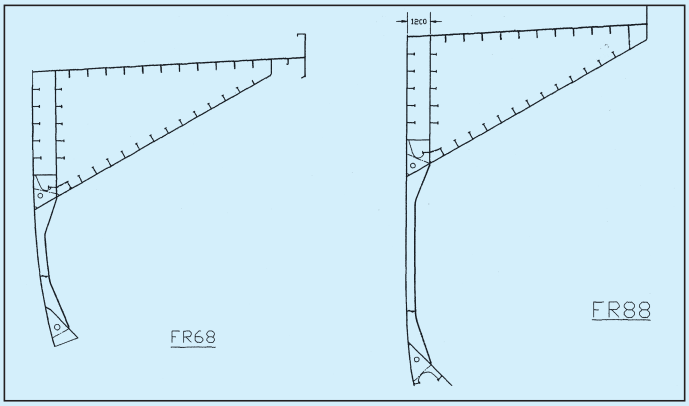
As a result of all this, Peter Cheng set his sights on a design which would overcome the shortcomings of current models. Around 70% of the construction is comprised of high-tensile steel - AH36 (18.5%) for the upper deck plating and deck longitudinals in the parallel midbody, and

TECHNICAL PARTICULARS
GREEN CAPE BULK CARRIER

Length, oa	289.00m
Length, bp	279.00m
Breadth, moulded	45.00m
Depth, moulded	24.50m
Draught, design moulded	16.50m
Draught, scantling moulded	18.10m
Deadweight, design draught	156,000dwt
Deadweight, scantling draught	175,500dwt
Cargo capacity (grain)	193,000m³
Water ballast (100% full, including No 6 hold)	193,000m³
Heavy fuel (100% full)	5000m³
Diesel oil (100% full)	310m³
Fresh water (100% full)	530m³
Gross	88,600gt
Net	56,900nt
Main engine	MAN B&W 6S70MC
Output (MCR)	16,860kW at 91rev/min
Fuel consumption (daily)	approx 56.90tonnes
Speed, service at 85% MCR and 15% sea margin, design draught	15.07knots
Sheer, on upper deck at forward perpendicular (centreline)	approx 1.10m
Sheer, at aft perpendicular	due to camber
Deck camber of moulded breadth (upper deck)	1000mm, straight at side hatch coaming, horizontal in the centre
Complement	28
Flag	Hong Kong
Classification	American Bureau of Shipping +A1(E), Bulk Carrier, ESP, Strengthened for Heavy Cargoes, Hold Nos 2, 4, 6, and 8 may be empty, SH, +AMS, +ACCU, UWILD

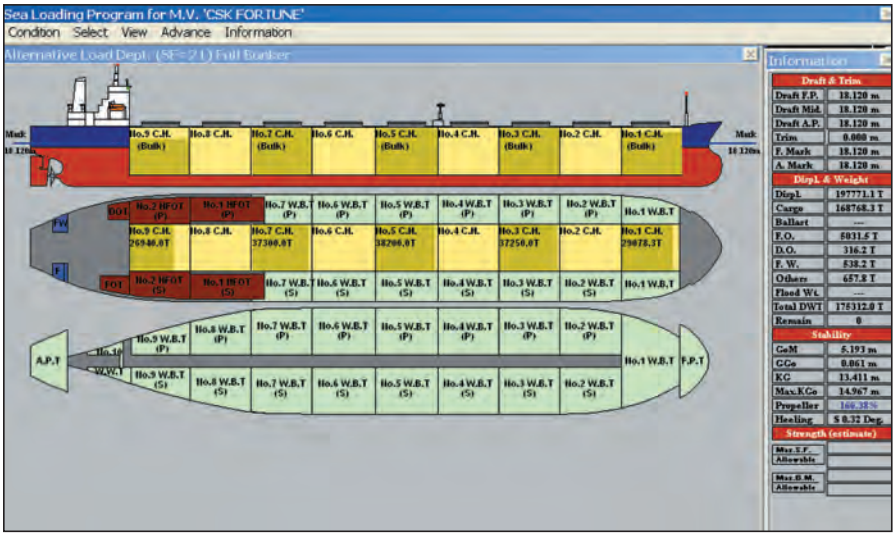
A key feature of the new design is transfer of most engineroom heavy fuel tanks to short wing tanks in way of Nos 8 and 9 holds (and part of No 7 hold), protected by cofferdams from the outer shell. A number of benefits are expected to result.





Cross-section through the fuel saddle tanks in No 8 and 9 holds, showing the inclusion of a cofferdam against the side shell to help prevent any spillage in the event of an accident.

Plan view of the machinery space at 2nd deck level, showing how some fuel tanks have been retained here: diesel oil to port and heavy fuel to starboard. Note the inclusion of cofferdams.The heavy fuel tank can hold 530m³ as a normal service tank or be used as an intermediate tank during fuel transfer. All remaining fuel is carried in saddle tanks in way of Nos 8 and 9 holds, and partly in No 7 hold.



Loading condition for the new bulk carrier design, with alternative holds loaded and full bunker tanks - in their unusual position in way of Nos 8 and 9 holds.

Side-rolling hatch covers by MacGregor are fitted to all holds.

AH32 grade (52%) for other longitudinal members, including plating and built-up sections. Both grades are also used where high stress was indicated by finite-element analysis.

Short hopper and saddle tanks for improved structural efficiency

The resulting Green Cape model was completed in the middle of 2001, and it is hoped that the design will present a new model to which future designers can aspire. One of the primary features is separate water-ballast saddle and hopper tanks for each hold - there are no long tanks spanning two holds. This is planned to reduce shear forces and bending moments during ballast exchange and to allow ballast exchange to take place even in poor weather conditions. It will be seen from the accompanying plans that the saddle tanks in No 8 hold actually extend slightly in the next hold forward, No 7.

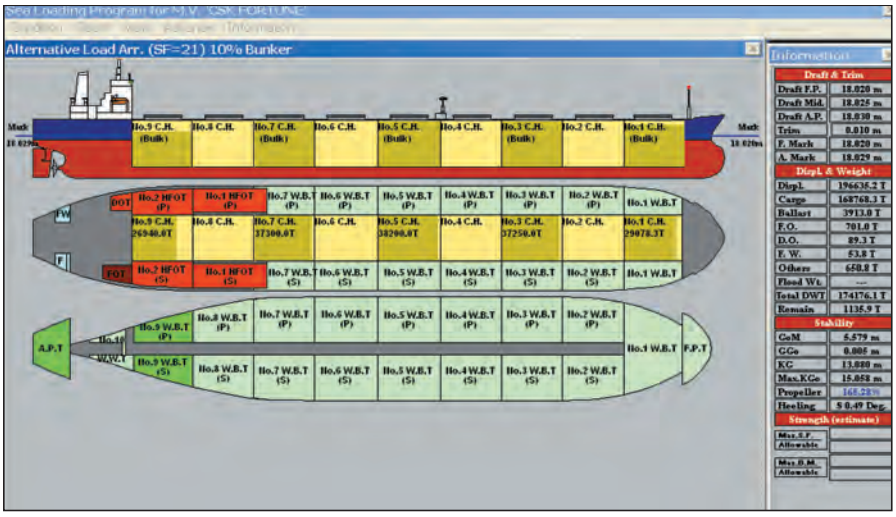
Special overflow arrangements have been built-in to the forepeak tanks and No 6 hold (which can be used for water ballast) to ensure that no over-pressuring of tanks can take place and to relieve crew members from any stress during ballast exchange. During both normal and heavy ballast conditions, all ballast tanks are fully utilised, with the strength of the hull fully considered for such conditions.

Fuel tanks shifted forward

By moving most heavy fuel tanks from their traditional position at the port and starboard of the machinery space to wing tanks built in way of Nos 8 and 9 holds, two important benefits are achieved. These are firstly, a reduction in bending moment - the transfer of almost 4000tonnes of weight from the aft end of the hull towards amidships reduces the bending moment in most conditions. Secondly, an almost even keel can be achieved at both departure and arrival without sacrificing cargo.

With heavy fuel tanks alongside the engineroom, it is not possible to balance consumed fuel by adding ballast water since they are in the same position; in the Green Cape design, such a balance is possible because consumed fuel can be replaced by water ballast in the same position. In detail, fuel is carried in port and starboard wing tanks (No 1 and No 2, in way of hold Nos 8 and 9), and when consumed, ballast is pumped into the aft peak tank and No 9 ballast tanks (port and starboard). Ballast exchange at sea will only be on an empty-and-fill basis, and no ballast is to be shifted between tanks at any time.

Loading condition with alternate holds loaded but with only 10% bunkers remaining. Water ballast tanks have been filled to compensate for the consumed fuel. The trim difference is almost negligible.



Cofferdams for all fuel tanks

The new ship also lays claim to being environmentally friendly since all fuel tanks, wing tanks, and engineroom tanks, including lubricating oil tanks, are provided with a 1200mm cofferdam, including against the side shell. In the machinery space, cofferdams are provided for all fuel tanks, including service and settling tanks, diesel oil, lubricating oil, and cylinder oil tanks. In addition, no oil tanks are fitted in the engineroom double bottom, and all fuel and lubricating oil tanks can be emptied by portable pumps in case of emergency.

Side-rolling weathertight hatch covers, designed by MacGregor, are of the two-panel type operated by chain and wire, with electro-hydraulic motors; they are of single-skin construction with peaked tops, using mainly mild steel. That cover for No 6 hold (ballast hold) is modified to withstand water movement in a fully filled condition.

Alternate loading of ore cargoes in hold Nos 1, 3, 5, 7, and 9 is possible, and all hold bottoms are reinforced for grab discharge, based on a grab weight of 20tonnes. If necessary, hold Nos 2, 4, and 8 may be partially filled with water ballast in port (only) to comply with air draught requirements of 13.70m to the top of the hatch covers.

A main engine of MAN B&W 6S70MC (Mk 6) type provides a propulsion speed of around 15.00knots, when turning at the normal continuous rating of 86.2rev/min. This drives an aerofoil nickel-aluminium-bronze four-bladed FP propeller, cast by Nakashima and rotating clockwise when viewed from aft; the design is of the keyless type secured with a hydraulic nut. Three heavy-fuel-burning diesel gensets, each of 750kW output, provide electrical power and are driven by Yanmar engines.

As of mid-March, a remarkable total of 28 orders for this advanced design had been confirmed, with three delivered - two to Tai Chong Cheang and one to COSCO. Owners also include Bocimar, from Belgium; Foremost, from the USA; CMT, from Taiwan; and four Hong Kong owners: Oak, Cape Asia, Tak Ho, and Unique.

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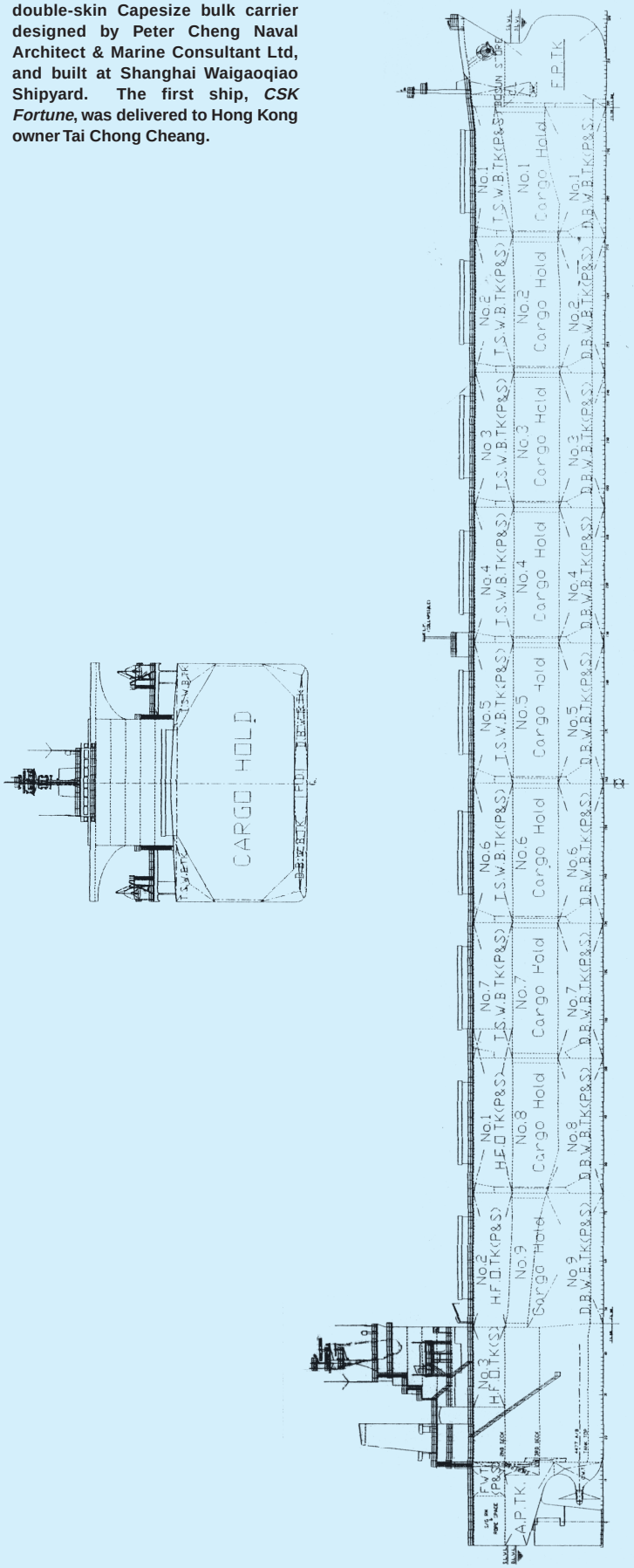
General arrangement plan of the new double-skin Capesize bulk carrier designed by Peter Cheng Naval Architect & Marine Consultant Ltd, and built at Shanghai Waigaoqiao Shipyard. The first ship, *CSK Fortune*, was delivered to Hong Kong owner Tai Chong Cheang.



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LA NOUVELLE VAGUE

Diamond Princess delivered in Japan

IN Nagasaki, Japan, at the end of February this year, *Diamond Princess* was named in a ceremony which featured traditional Japanese festivities. The ship was delivered earlier the same day to Princess Cruises by Mitsubishi Heavy Industries Ltd, builder of the 116,000gt vessel. *Diamond Princess* then sailed to Los Angeles for its inaugural season of Mexico cruises, which began on March 13. The ship will be based in Seattle this summer for seven-day round-trip cruises to Alaska.

Although a member of the Grand class, the 2670-passenger *Diamond Princess* launches a new ship design for Princess and will be notable as the first large cruise ship built in Japan in more than a decade. Unfortunately, the project, which involves two ships, was marred by a disasterous fire in October 2002, which resulted in the second hull being delivered first.

The design includes a 30,200kW GE LM2500+ aero-derivative gas turbine-generator set as part of a combined diesel and gas turbine (CODAG) configuration, with four diesel generator-sets (4 x 4500kW and 2 x 5000kW).

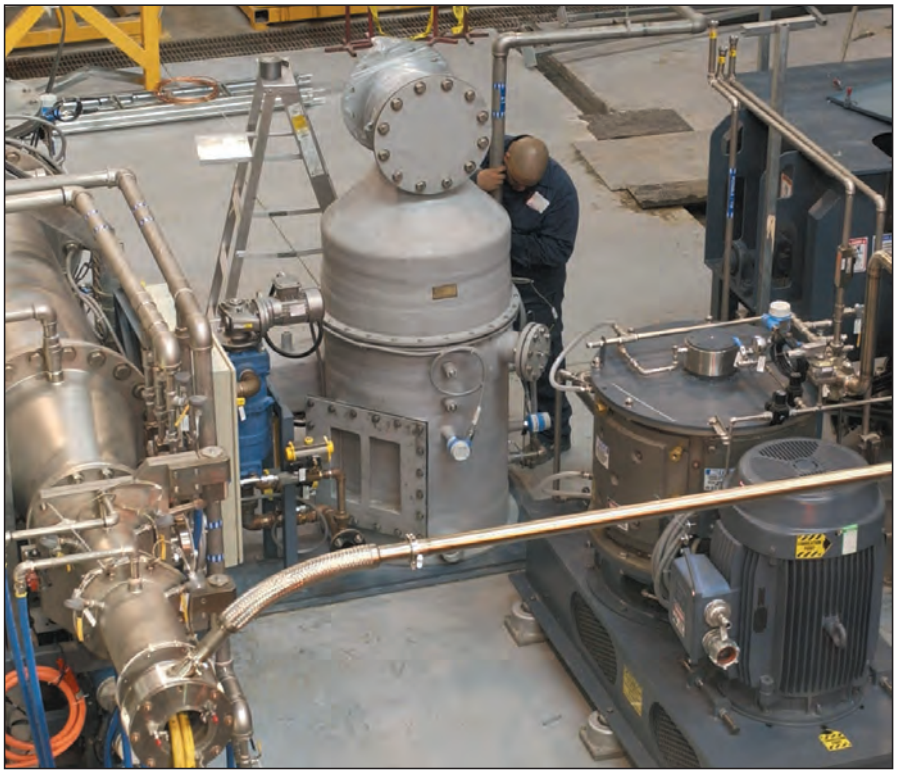
Diamond Princess includes a number of balcony cabins, and flexibility in dining and entertainment options. The ship offers passengers what is claimed as a unique dining programme with four themed dining rooms, complimenting the main restaurant and Sabatini's trattoria - Princess' trademark alternative restaurant; a new Princess Concierge Service; the fleet's largest Internet Café; and the debut of Club Fusion, a new high-tech dance lounge. More technical details can be found in *The Naval Architect January 2001*, page 27.

***Diamond Princess* is the first large cruise ship built in Japan for 10 years.**

Innovative plasma waste treatment on Carnival cruise ship

A COMPACT plasma waste elimination system from PyroGenesis was installed on Carnival Cruise Lines' *Fantasy* near the end of last year. This novel system, which is understood to be an alternative to a conventional incinerator, takes up 700ft^2 of space and is located on only a single deck of the ship. The unit is claimed to be able to treat a variety of waste generated onboard, including cardboard, food, food-contaminated waste, plastics, and cabin waste. PyroGenesis Inc and Carnival are currently in discussion regarding more installations on other ships.

PyroGenesis is a leader in plasma technology and originally developed this compact waste system under contract to the US Navy to respond to tight naval requirements for waste disposal. It features a compact size, has low life cycle costs, good environmental performance, and it is said to be easy to operate and maintain.



A possible alternative to the traditional incinerator is this plasma waste elimination system, developed by the US company PyroGenesis. A prototype merchant ship plant is currently installed on Carnival's liner *Fantasy*.

Extensive equipment packages for newbuildings

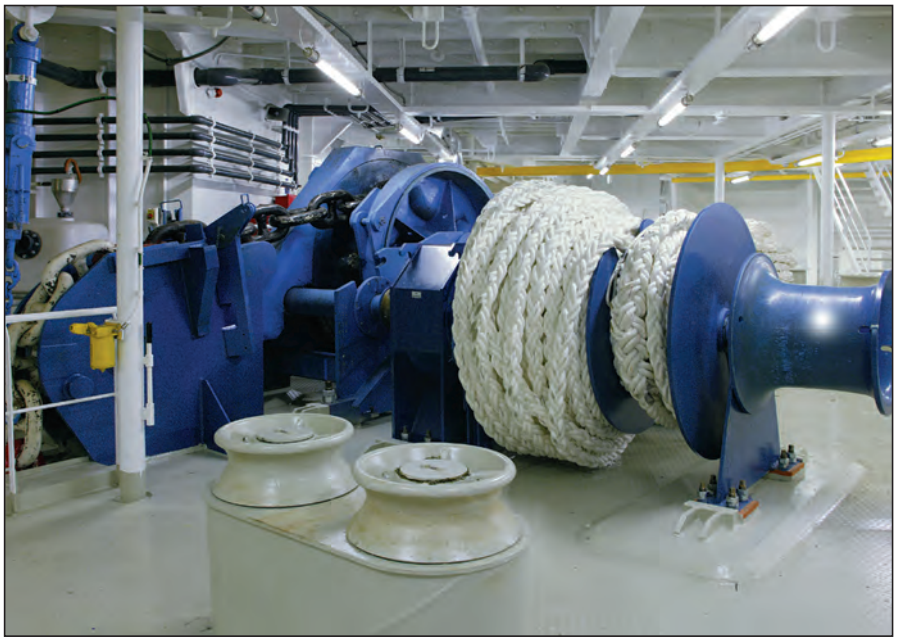
PASSENGER vessels for two different Scandinavian routes will use propulsion packages supplied by Rolls-Royce Kamewa Ulstein. In each case, the units will include shafting, hydraulic pitch setting systems, digital electronic controls, and operator stations on the bridge. Other types of Rolls-Royce equipment will also be supplied.

Color Fantasy, building at Kvaerner Masa-Yards and claimed as the largest ever cruise-ferry (*The Naval Architect* February 2004, pages 22 and 25), for Color Line's route between Oslo and Kiel, is massive at 74,000gt. She has been supplied with Kamewa Ulstein twin CP propellers and a tunnel thruster outfit.

The 5.2m four-bladed propellers will each transmit 15,135kW at maximum continuous engine rating, giving a top speed of approximately 23knots. Ice class 1A strengthening was specified, together with strict limits on pressure pulses. A total of five tunnel thrusters have been installed: three at the bow, and two at the stern, driven by 6.6kV electric motors. Bow thrusters are of the TT2650 AUX CP type, each rated at 2200kW, while the smaller stern thrusters are each of 1000kW rating.

A cruise ship under construction at Aker Finnyards for Birka Line, *Birka Paradise*, with delivery scheduled for this autumn, will operate between Stockholm and Mariehamn in the high season, and on other Baltic routes the rest of the year. There will be no vehicles on this ship, and included onboard are extensive relaxation facilities.

This 177m long design will have twin-screw propulsion with Kamewa Ice Class 1A Super propellers, giving a maximum speed of over 21knots. Each 4.6m diameter stainless steel four-bladed propeller will transmit up to 11,400kW, and again there were strict requirements to minimise pressure pulses to reduce noise and vibration, thus ensuring compliance with Det Norske Veritas Comfort class rules. The high ice class will allow this cruise ship to run scheduled services during the Baltic winter. Two Kamewa Ulstein tunnel bow thrusters and a single stern thruster, of 2 x 1500kW and 1000kW respectively, will enhance manoeuvring.



Combined windlasses and mooring winches from Rauma Brattvaag with AC electric drive and frequency-converter control, such as those shown here, have been specified for Birka Line's new cruise liner *Birka Paradise*, nearing completion at Aker Finnyards, and for one of Carnival's latest ships, *Carnival Miracle*, from Kvaerner Masa-Yards.

Rolls-Royce has also supplied Rauma Brattvaag AC-electric deck machinery to this vessel. Key elements of the frequency-controlled stepless-drive outfit will be two combined mooring winch/windlasses and four mooring winches. Winches are of auto-tensioning type. A similar, but more powerful package, has also been specified for *Color Fantasy*.

The cruise liner *Carnival Miracle*, just completed by Kvaerner Masa-Yards, is the sixth in a series of Panamax-sized vessels. All ships in this series have been equipped with Rauma Brattvaag frequency converter-controlled deck machinery outfits embracing two combined anchoring and mooring winches, two chain stoppers, and five mooring winches.

Electric propulsion on Italy's largest cruise ship

RECENTLY delivered *Costa Fortuna*, built in Fincantieri's Genova-Sestri yard for Costa Crociere, is the largest cruise ship ever built for an Italian company. With a length of 272m, a width of 38m, and a gross tonnage of 105,000gt, *Costa Fortuna* can accommodate 3470 passengers in 1358 cabins (857 external, 64 suites, 458 with a balcony, and 335 with a window).

The power generation system onboard comprises six alternators producing altogether 90MVA of power (enough for a city of 50,000 inhabitants), connected to a medium-voltage 6.6kV distribution system, to supply the hotel and ship propulsion services. The latter consists of two synchronous electric motors, each producing 20MW at 140rev/min, able to provide the ship with a speed of 23knots.

The speed of the electric motors is controlled by variable-frequency static drives (cyclo converters) which permit fine adjustment of the entire speed range, in both forward and reverse direction. Electric propulsion has shown itself to be excellent in terms of both high performance standards and substantial reduction of noise and vibrations and considerably reducing exhaust emissions into the atmosphere. The installation, and the ship itself, has been certified in the highest class in the Registro Italiano Navale (RINa).

ABB, in line with its customer-back up strategy covering the entire product life cycle, has provided onboard operating personnel training and will also furnish the technical assistance required for periodical maintenance and service along the routes of *Costa Fortuna*.

Largest cruise ship so far from Italian yard handed over

AT the end of March this year, Italian shipbuilder Fincantieri handed-over the newly-built *Caribbean Princess* to P&O Princess Cruises at its Monfalcone yard. This vessel is a development of the Grand-class series (the 109,000gt *Grand Princess*, *Golden Princess*, and *Star Princess*, delivered in 1998, 2001, and 2002 respectively), and has a sister which will be delivered mid-2006. At the time of her completion in 1998, *Grand Princess* was claimed as the largest cruise liner ever (*Significant Ships of 1998*), able to carry 2992 passengers and a crew of 1209.

The difference between these two sets of cruise ships, and the earlier Grand class, is an extra passenger deck, which has added approximately 255 extra cabins, a passenger capacity increase of 20%. In addition, the top two of the 17 decks have been built entirely of light alloy, which weighs around 1100tonnes. This has allowed a lowering of the centre of gravity and has limited the draught to 8.45m (8.50m on *Grand Princess*).

Caribbean Princess, which was launched last July, is Fincantieri's largest cruise ship to date, with a length of 290m and a width of 36m (the same dimensions as the earlier vessels), but with an increased depth of 67m, and a tonnage of 116,000gt. She can travel at a maximum speed of 23knots, and has a capacity for 3600 passengers in 1557 cabins, with 1205 crew.

A wide range of entertainment can be found onboard, including theatres, swimming pools, shops, fitness centre, library, casino, and a discotheque that is suspended 40m above the stern - in a 'spoiler', as used on the previous series, giving excellent ocean views.

Ultra Voyager liner to feature weight saving lifts

THE MacGregor Group's Passenger Ship division has won a contract to supply and install 28 lifts and two dumb waiters on the first ship in Royal Caribbean Cruises' new and largest Ultra Voyager class (more details of this ship can be seen elsewhere in this feature). Ultra Voyager liners will be around 15% larger than the previous Voyager class, and at 100% occupancy will carry 3600 passengers and 1400 crew. MacGregor will supply and install:

- 14 passenger lifts, 6 Kone MiniSpace scenic lifts with a capacity of 1800kg or 24 passengers, 8 Kone MiniSpace ordinary lifts with a capacity of 1800kg or 24 passengers
- 14 service lifts, 12 Kone MiniSpace lifts with a capacity of 1000kg or 13 passengers, 2 Kone MonoSpace lifts with a lifting capacity of 1000kg or 8 passengers
- 2 dumb waiters with a capacity of 300kg
- 1 wheelchair elevator with a capacity of 300kg.

All lifts will be installed using MacGregor's plug-in technology. MonoSpace and MiniSpace elevators both employ the super-compact gearless EcoDisc hoisting drive (from Kone), introduced a few years ago. This concept is claimed to occupy less space and weigh less than conventional traction lifts, offering benefits to both owner and yard.

Space savings inside machinery rooms of up to 50% are said to be possible using this system, as well as weight savings of 10%, in addition to a 40% reduction in power consumption.

MonoSpace is claimed as the first practical lift that does not require a machinery room. The design also benefits from Kone MX operating machinery and Kone LCE control systems.

New blackout safety lamp for the cruise industry

A NEW blackout light for use in cabins has recently been developed by Caretaker AS, of Rygge, Norway, in close cooperation with the cruise industry. Outlight, as it is named, will enable passengers to have clear visibility during exit from their cabins, in case of an incident onboard when power has been lost.

This product is based on a plug-in system for 110V and 220V outlets. It has been designed to continue to serve as an outlet after installation and requires no cabling. Outlight is tamper-proof and can also be used as a flashlight by crew in an emergency situation.

The system includes: LED lights with battery back-up, low power consumption - four LEDs using 150mA only, rechargeable batteries, test button, a light output of 8lumens-10lumens, and an operational span from three to five hours in a black-out.

Another new product recently launched by Caretaker is a ship security alarm system (SSAS), which complies with SOLAS, that allows a ship to initiate and transmit a ship-to-shore security alert, identifying the ship, its location, and indicating a security threat. The system makes use of Inmarsat communication satellites and other such systems that can transmit a distress signal.

In the near future, Caretaker will also introduce a surveillance centre, aimed at supplying the maritime industry with an alarm monitoring service. The company also offers a wide range of services within the ISPS code, including one-year control of the SSAS, as well as ship emergency plans, for example.

New catamaran tender/lifeboat for cruise ships

A PARTNERSHIP between Alexander/Ryan Marine & Safety Co, (whose offices are in the USA, London, and China), and Beihai Qingdao Shipyard has resulted in a new 150-person combined tender/semi-enclosed lifeboat for cruise liners. This is a catamaran design, ensuring speed and comfort for passengers and crew.

Design features include the provision of fender skates in case of any impact with a ship's hull during launching at adverse list and trim, and a corrosion-resistant release hook system that is claimed to be simple to operate and easy to maintain. Embarkation is relatively easy: two large side doors and optional rear doors are fitted for boarding and exit. In addition, provision for handicapped and wheelchair accessibility have been built-in.

The tender is made from stainless steel and marine grade aluminium, which should reduce maintenance. Interiors are designed for safety and comfort, and are said to be easy to clean. Several optional extras are also available to customise this lifeboat, including air conditioning, nautical instruments, toilets, rear door access/exit, television and entertainment centres, and public address system, for example.

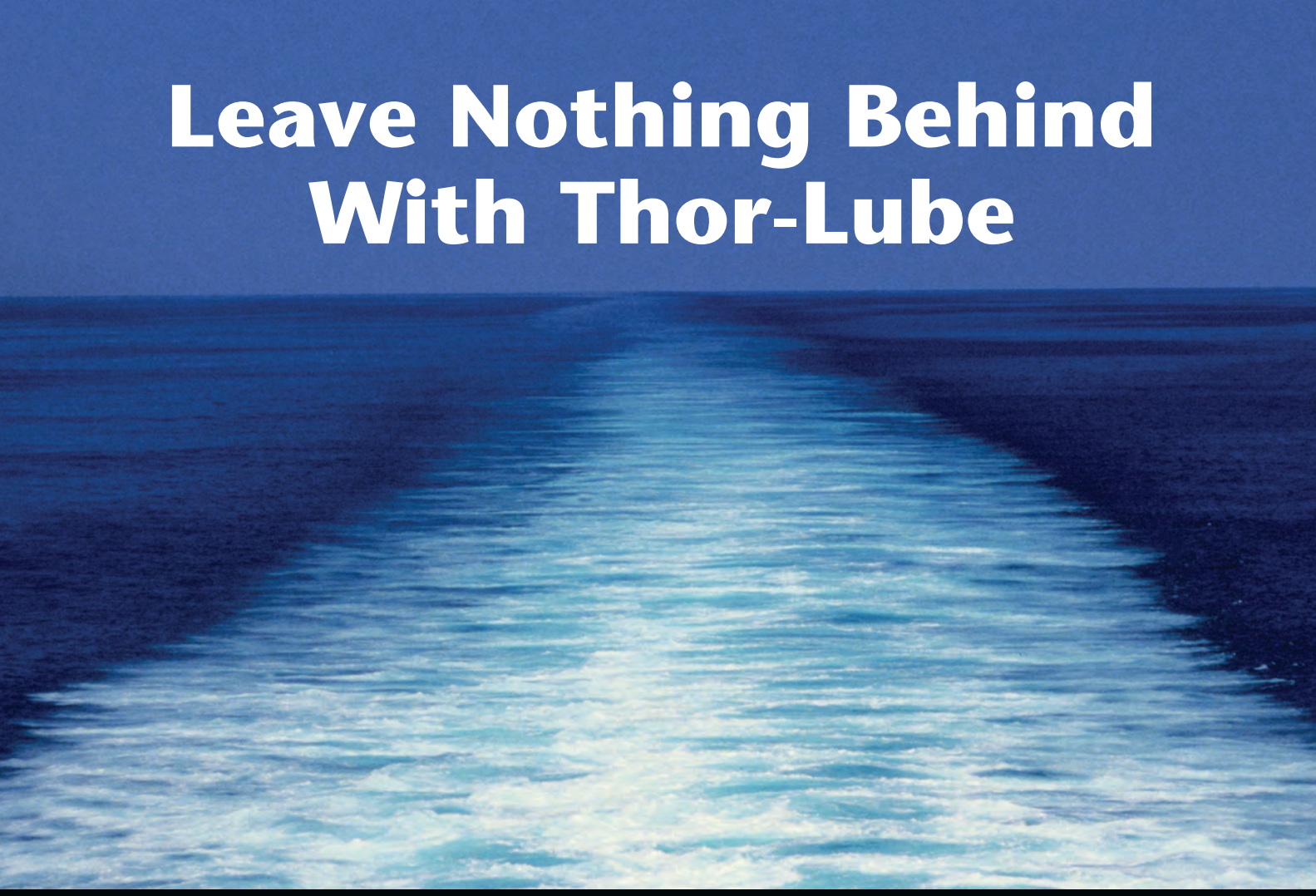
Two new liners to be built at Alstom Marine

AN order for a new generation of vessels has been signed between Mediterranean Shipping Co (MSC) and Alstom Marine (Chantiers de l'Atlantique) for two cruise ships, and the option for a third. The first of the new vessels will be delivered in June 2006, and the second in spring 2007. This new order, which will provide a welcome boost to the French shipyard, increases MSC's fleet to seven by 2007, with an eighth ship as option. Both liners will be used in the Mediterranean and Caribbean cruise markets.

With a length of 294m, a width of 32.2m and 1275 cabins, the new ships boast an innovative design and competitive size and speed, and are in conformity with Panamax standard. A sea view is one of the strong points of the concept, with 80% of cabins facing outwards, three-quarters of which are fitted with balconies. The ships will each have capacity for approximately 3000 passengers and 1000 crew.

Alstom Marine also built the most recent two ships in MSC Crociere's fleet, *MSC Lirica*, delivered in March 2003, and *MSC Opera*, which is set to be delivered this month (May). Some features of *MSC Lirica* were presented in *The Naval Architect* May 2003, page 17.

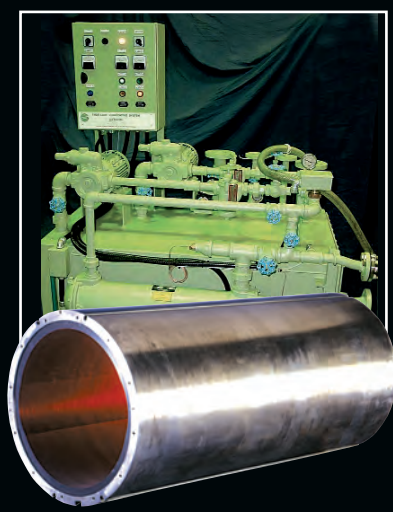
Leave Nothing Behind With Thor-Lube



Thordon's Non-Metallic Bearings And No-Sheen Lubricant Establish Thor-Lube As The Proven Alternative To Oil Lubricated Stern Tube Bearings

The environmental goal for ship owners and managers has never been clearer! All sources of ship-based oil pollution must be evaluated and eliminated, and when it comes to eliminating stern tube oil, Thordon Bearings is playing a key role.

Developed by Thordon Bearings, the environmentally friendly Thor-Lube stern tube bearing system offers ship owners a proven alternative to oil lubricated stern tube bearings. The Thor-Lube system consists of non-metallic Thordon XL bearings, TL3G biodegradable water-based lubricant and a lubricant circulation and monitoring package.



Approved by all major Classification Societies, commercial acceptance of the Thor-Lube system continues to grow.

Contact us for a copy of our references and new Thor-Lube brochure. And... never worry again about environmental issues caused by an oil sheen from even a small amount of stern tube oil leakage.

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Enviro engines specified for Princess Cruises' new liner

AN agreement was recently reached between Princess Cruises, engine builder Wärtsilä, and shipyard Fincantieri, that hull No 6100 (building at this Italian yard) will be equipped with Wärtsilä common-rail fuel-injection Enviro engines. The engine configuration will comprise four 12-cylinder engines and two 8-cylinder engines, all of Wärtsilä's 46 type in a diesel-electric configuration, giving the ship the total installed power of 67.2MW. This liner is a modified version of earlier ships at the same shipyard, namely the *Caribbean Princess* class (reported elsewhere in this feature).

The first newbuilding with common-rail engines, *Coral Princess* (built by Chantiers de l'Atlantique) has now been in operation for a year and a half, and the engines have been running for 10,000 hours. Her sister ship, *Island Princess*, has reached more than 5000 hours of operation. *Diamond Princess*, built at Mitsubishi's Nagasaki Shipyard, has recently entered service (see elsewhere in this report). Cunard's *Queen Mary 2* is also equipped with Wärtsilä 46 common-rail machinery. In addition, Wärtsilä 38 and Wärtsilä 32 models are available with common-rail injection.

Since the first common-rail engines were delivered, technology has been developed for still lower smoke values on the Filter Smoke Number scale (FSN). The new engines will have a FSN of <0.1 on normal heavy fuel and below 0.2 on high-ash fuels, where the visibility limit is around 0.3. A further advantage is lower total fuel consumption at all loads.

A new method of NOx reduction is also being developed by Wärtsilä, ie, the combustion air saturation technique, and this will be available for future installations, if needed. Enviro common-rail engines are (in the original version) compliant with the Marpol Annex VI NOx curve, and an EIAPP certificate is provided.

New Pyro-Foam insulated panels

ENVIRONMENT-friendly A60 self-supporting foam-filled panels newly developed by MacGregor's Passenger Ship division should eliminate the need for steel bulkheads to protect provisions and cold stores. By removing a steel structure, the new system claims to offer savings in weight, cost, and installation times. Classification approvals have been granted on a case-by-case basis, so MacGgregor is encouraging owners to consider the advantages of Pyro-Foam panelling during early ship planning stages.

The new panels are the result of research by MacGregor - begun in 1999 - to find an alternative to traditional steel/Rockwool insulation materials for provisions stores. This has resulted in introduction of the Pyro-Foam system, which uses an environment-friendly modified phenolic foam that does not contain any CFCs and has a zero oxygen-depletion potential (ODP). The foam has a fine cell structure which has a consistent thermal conductivity that is said to remain unchanged throughout the foam's lifetime.

Unlike some alternative options, Pyro-Foam is claimed as inherently fire-resistant, and therefore separate fire retardants are not required. Tests show that a foam-filled 100mm-thick panel has more than 60 minutes of fire resistance.

Fire, heat and moisture-resistant

In addition to having good thermal properties and fire resistance, a major advantage of Pyro-Foam over traditional Rockwool insulation is said to be its resistance to humidity. Unlike mineral wool-based alternatives, which are absorbent, the new foam-based panels are moisture-resistant.

The development of this product for marine applications was undertaken in close cooperation with Lloyd's Register. This classification society provided guidance and assistance for the necessary tests in accordance with IMO's international code for application of fire test procedures.

In all fire tests completed to date, Pyro-Foam panels have obtained positive results, and the panels are now approved by LR for use as A-60-equivalent fire-resisting units for refrigerated spaces. More recently, Det Norske Veritas has also accepted the new system for A-60 applications without the need for surrounding steel bulkheads, on a case-by-case basis, for use in walk-in rooms, galleys, and pantries.

Compared with other foams, Pyro-Foam's phenolic base should ensure a low burning rate and a low rate of heat generation. The volume of smoke generated is also minimal, particularly compared with traditional polyurethane and poly-isocyanurate-based foams. In the event of a fire, visibility is still moderate and minimal amounts of toxic gas are emitted, making evacuation safer and fire-fighting easier.

Pyro-Foam panels are constructed in compliance with US Public Health requirements. Visible internal surfaces are covered in stainless steel with a 0.6mm-0.8mm thickness, and galvanised steel or polyester-coated galvanised steel of the same thickness on the outside surfaces.

Panels are manufactured by injecting the foam under pressure between the metal skins. The resulting panel is thereby chemically bonded as a single unit. Modular panels can be up to 6m in length and 1.2m in width; they are connected using standard Camlock mechanical locking fasteners.

Because the panels can be used as a stand-alone fabrication without additional steel structure, they also make more efficient use of available space. This is a major advantage in many of today's cruise ships where large cold stores are required and space is always a premium.

Pyro-Foam doors

Whilst the new foam has been developed specially for panels for provisions stores and walk-in refrigerators, it is also available in a range of fire-resistant doors intended for use in cold stores. Here, significant cost advantages can also be made, claims MacGregor, by choosing the Pyro-Foam system. While the cost for the new panel itself is higher than that for a polyurethane design, Pyro-Foam provides both thermal insulation and fire insulation in one unit, thereby reducing overall costs in terms of both capital and installation.

Green Star to cover operational and management criteria

THE Italian classification society Registro Italiano Navale (RINa) is tightening the requirements of its voluntary environmental certification scheme, Green Star. New operational and management criteria for environmental certification of ships will be introduced for the CLEAN SEA and CLEAN AIR class notations, which together make up the Green Star scheme. A new notation, Green Star Design, will signify compliance with the stricter criteria.

New requirements include:

- definition of a ship environmental management plan in a manual, where all necessary procedures for environmental protection are set out. The manual must include at least:
  - specification of person(s) in charge for each procedure to be carried out
  - documents and manuals required
  - log books/records to be filled in
  - time schedule when applicable (for example, checking, and sampling)
- appointment of an environmental officer, responsible for application of the procedures aimed at safeguarding the environment. Onboard cruise ships, the environmental officer will be an exclusively dedicated officer
- periodical analysis (every six months) of samples of the sewage effluent to verify proper operation of the system, if a grey water treatment plant is installed
- periodical calibration (every six months) of the bilge separator to guarantee quality of the effluent
- periodical monitoring (every three months) of the oil consumption of systems and machinery which interface oil/sea water (sea-water-cooled engines, bow propellers, CP propellers, tailshaft systems)
- for cruise ships, definition of an environmentally-conscious policy for recycling of waste, and control of the quantity of total waste landed for recycling
- for passenger ships and ro-ro ferries, the discharge at sea of grey water must be beyond the four-mile shore limit, and a record book of discharges must be kept onboard.

New ships which comply with these additional standards, and those existing ships already granted with the notations CLEAN SEA and CLEAN AIR, which upgrade to the new requirements, will be granted with the new additional class notation Green Star Design.

Bespoke wipers for new Baltic cruise ship

BIRKA Line's new cruise liner, *Birka Paradise*, nearing completion at Aker Finnyards (*The Naval Architect* February 2004, page 18), will be supplied with a bespoke window wiper system for its wheelhouse, based on the Type C internal-motor straight-line wiper, from Wynn Marine. The stroke length on this wiper enables 90% of a window to be cleared.

High-powered AC induction motors help provide reliable operation, as well as providing quiet running, and needing no maintenance. Current options available for Type C include a two-speed operation, self-parking, intermittent wipe, heater switch, master group control, and wash/air purge functions.

Installation is performed with the drive shaft taken through the bulkhead, and the motor is then attached with a single bolt clamp. When more requirements are needed, technicians from Wynn can customise the wiper control systems. The Wynn Marine Series 1000 wiper controller is claimed to be suitable for the Type C, and it can be used on single-phase supplies of 100V, 115V, and 230V AC, and DC supplies of 12V and 24V.

Trimline tasks on *Queen Mary 2*

SOUTHAMPTON-based outfitting company Trimline secured the largest soft furnishings contract in its history when various components were supplied and installed for some 2000 passenger and crew cabins on the new Cunard liner *Queen Mary 2*; in addition, other interior tasks were completed for this operator's brand-new flagship (which was the subject of a special publication from *The Naval Architect* in January this year, *Queen Mary 2*: *Genesis of a Queen*).

In particular, Trimline craftsmen carried out work on the port and starboard tender lounges, where passengers will normally assemble to board launches for shore excursions or other trips. Since these rooms will have second roles as aerobic fitness spaces, they were also equipped with mirrors, rails, and storage space.

Other jobs undertaken by Trimline on this ship included manufacturing curtains for cabins and the officers' mess, enhancement of shower rooms in the Canyon Ranch SpaClub, carrying out various glazing works, fitting teak tabletops, and other finishing tasks.

New abrasive technique ensures dust-free surfaces

A MANUFACTURER of coated abrasives for demanding conditions, KWH Mirka Ltd, is a specialist in flexible abrasives and products that allow for dust-free surface finishing processes. Its newest product, Abranet, has recently been awarded the furniture industry's ASFI 2002 innovation award in the UK, an environmental award in The Netherlands, and a technical innovation prize in France, as well as recognition in Finland, and the USA.

Dust emissions are claimed to be reduced significantly when the Abranet abrasive is used in sanding operations. It can be used for a wide range of sanding applications, such as paints, fillers, composites, aluminium, soft woods, and MDF.

The Abranet abrasive system minimises dust-escape into the atmosphere and is designed to fit most common industrial systems.

New 'bug-eating' metal for AC systems

A NEW metal coating, which could be said to 'eat bugs', would be of major benefit to the cleanliness of ships' air-conditioning systems, according to an expert in shipboard air quality. A research team at Giles Consulting has identified the silver-based coating, branded as AgION, as having huge maritime potential; at present, the coating is only available in the USA where it has been approved by the Environmental Protection Agency. So far, interest has been limited to land-based applications.

AgION works by the slow release of atoms and molecules which inhibit bacteria, mould and fungi growth. As air becomes more humid and favourable for microbial growth, more silver is released for long-term protection. The purifying properties of silver have been known for thousands of years.

The coating can be applied to standard units and is seen as a system upgrade, no extra effort would be required from the shipbuilder.

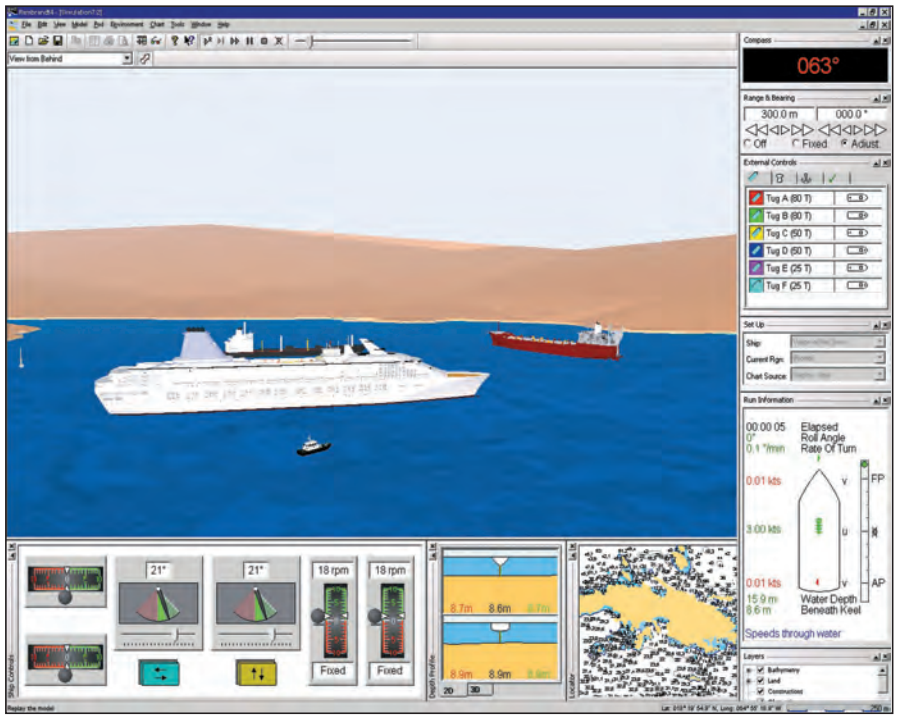
PC-based ship-handling software upgrade

AT the recent Seatrade Miami Cruise Show, BMT SeaTech Ltd, a subsidiary of British Maritime Technology Ltd (BMT), launched a substantially upgraded version of PC Rembrandt, a widely used application in the field of onboard training and ship-handling familiarisation. In a development that, it is claimed, will deliver considerable cost-savings to clients, PC Rembrandt Version 4 now enables the use of industry-standard electronic charts as the interactive 'backdrop' for simulations. The new software supports ARCS (British Admiralty), S-57 (S-52) ENC, and BMT's own-format charts.

Said to represent a technological step-change in this sector, the upgraded software also incorporates high-quality 3D visuals similar to those found on full-bridge simulators, which complement the existing 2D 'bird's eye' view. This 3D capability extends underwater, providing a clear visualisation of the sea-bed topography, local bathymetry, and channel dimensions, aiding understanding of the causes of the interaction effects often experienced in confined waters.

To enhance this situational awareness, PC Rembrandt Version 4 features a variety of environmental and visual conditions including day, night and twilight settings, alongside reduced visibility options. At the heart of the new version lies a massively upgraded mathematical model, which broadens the scope for PC Rembrandt's use as a training tool and allows more accurate assessments to be made of a vessel's manoeuvring in confined and busy waterways.

This latest version of PC Rembrandt is the most significant step forward in eight years of PC-based ship-handling simulation, believes BMT. The development has relied heavily upon feedback from a broad spectrum of users including cruise ship, ferry, LNG, and tanker operators.



This typical PC Rembrandt screen display shows a cruise liner manoeuvring off Port Everglades. The latest release, Version 4, offers a number of extra benefits.

The new version now accounts for: vessel-waterway interactions, including bank effects, quay-wall interactions and squat, ship-ship interactions, and wave drift forces.

Current PC Rembrandt users will be able to use their existing databases, and manually edited charts can still be supplied for use in assessing new berth, channel, dredging, and pilotage arrangements.

The new version includes full 3D visuals that are produced directly from the ENC electronic chart and are therefore at no additional cost. In night time view, this includes all navigational aid lights and sequencing.

PC Rembrandt Version 4 also sees the inclusion of an advanced track-pilot and auto-pilot function, allowing simulations to be generated automatically for rapid assessments of the feasibility of a required manoeuvre or approach.

Azipods chosen for Ultra Voyager cruise ships

A CONTRACT has recently been signed with ABB and Kvaerner Masa-Yards to supply the electrical power plant and Azipod propulsion system for Royal Caribbean Cruises' Ultra Voyager newbuilding, which is set to be delivered in May 2006. This vessel will be approximately 15% bigger than other Voyager-class vessels and is claimed to be the world's largest cruise ship by gross tonnage and passenger capacity.

As in the earlier Voyager ships, the electric propulsion plant will include three 14MW cyclo-converter-controlled Azipod propulsion units (the same size as on *Voyager of the Seas* and her sisters) - one being fixed on the centreline, with two wing steerable units. These Azipod units will be built in Vuosaari, Finland.

The primary power plant will consist of six main generator sets, each of 17.6MVA (12.3MW), an 11kV main switchboard, four bow thruster motors of 3.4MW each, and 18 transformers.

In other news, ABB is also to supply electrical power, distribution, Azipod propulsion, and automation systems for two cruise ships to be built at Meyer Werft. These 93,000gt liners will be built for Norwegian Cruise Line and are scheduled to be completed in autumn 2005 and spring 2006.

The delivery includes two cyclo-converter-controlled Azipod propulsion systems rated at 19.5MW each, generators for the main power plant, and a medium-voltage distribution system, as well as integrated alarm, monitoring, and control system (IAMCS).

LETTER TO THE EDITOR

Sir Charles Parsons: steam and gas turbines

Sir - I would like to add two historical points to your Editorial Comment in *The Naval Architect* March 2004. *Turbinia's* record of nine propellers (on three shafts) was soon broken. The Royal Navy destroyer *Cobra* had 12 - three on each of four shafts. The loss of this ship was the subject of a RINA transactions paper in 1985, 'The loss of HMS *Cobra*: a Re-assessment', by J A Faulkner, J D Clarke, C S Smith, and Prof D Faulkner.

In 1912, Sir Charles Parsons told the Royal Commission on Fuel and Engines that 'I do not think the internal combustion engine will ever come in. The internal combustion turbine is an absolute impossibility.' One is reminded of the First Law of Arthur C Clarke, the science fiction writer: 'If a middle-aged scientist or engineer says that something is possible, he is probably right. If he says something is impossible, he is probably wrong'. All too often, such impossibilities are resolved by material developments - such as steels which do not creep at gas turbine temperatures.

David K Brown, FRINA, RCNC
9 Park Lane
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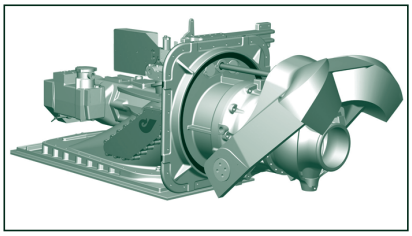
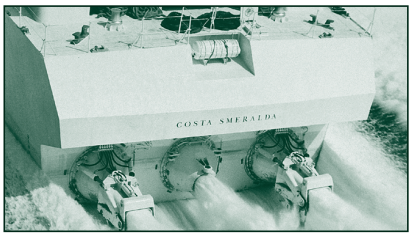
The Royal Institution of Naval Architects

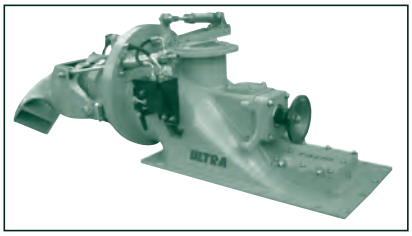
WATERJET PROPULSION IV

26 - 27 May 2004, RINA HQ, London, UK

Second Notice







supported by Rolls-Royce

This international conference continues the very successful series of RINA events looking at developments in waterjet propulsion.

Waterjets are now accepted as a proven technology, particularly for high speed craft and they are increasing their penetration into the small craft, leisure, workboat and military markets. Continuing developments now include very large units of 20-30MW capacity and the use of waterjets for high speed boost propulsion.

As the technology matures, designers need better tools to help predict the performance and efficiency of these systems across a wide range of operating conditions. Computational fluid dynamics is an increasingly powerful tool which has become almost universal, but traditional model testing and trials measurements are still required to confirm critical results.

Designers and manufactures also continue to seek to optimise the strength and weight of the various mechanical components and to improve reliability, reduce installation time and maintenance.

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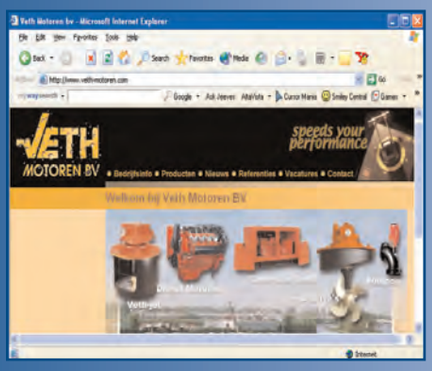

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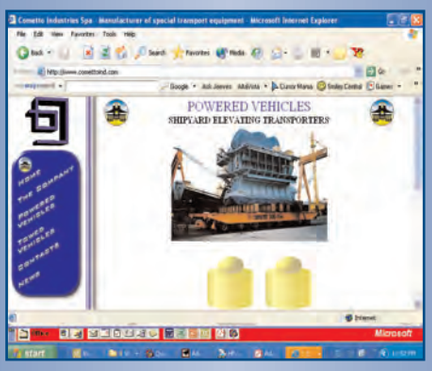

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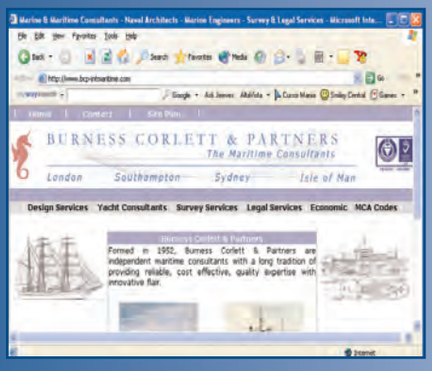

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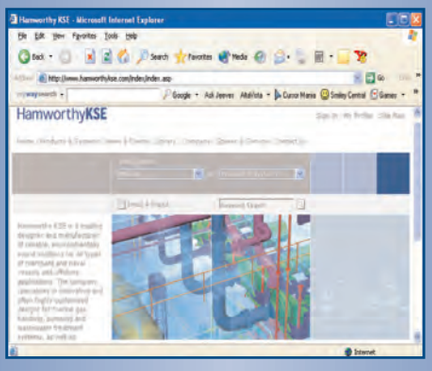

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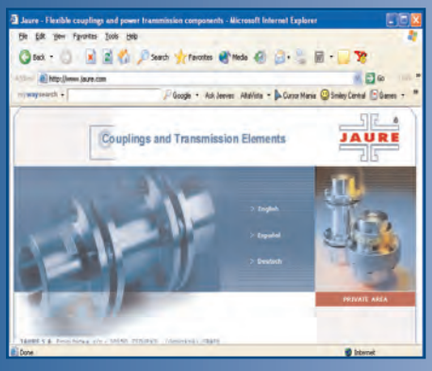

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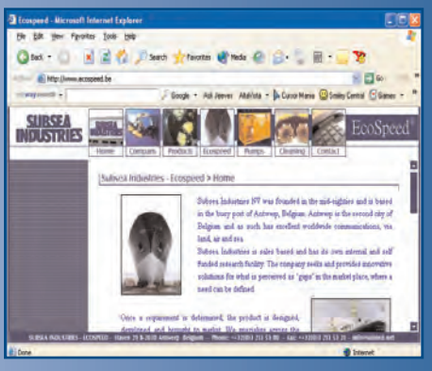

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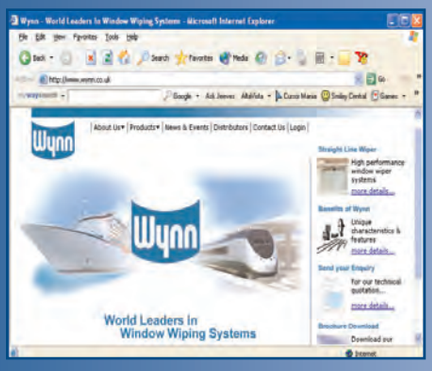

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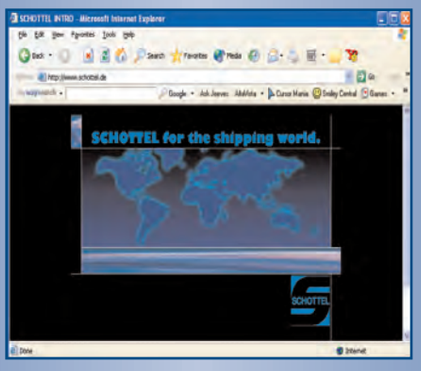

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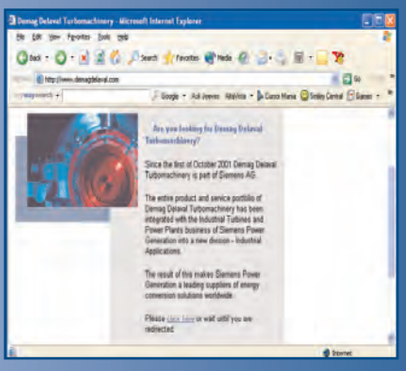

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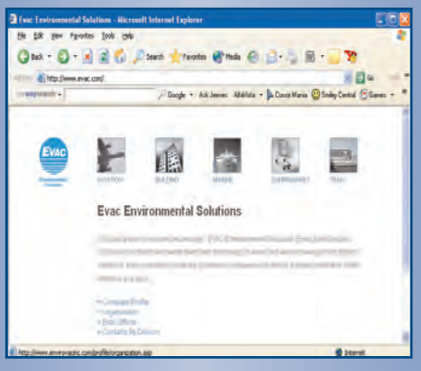

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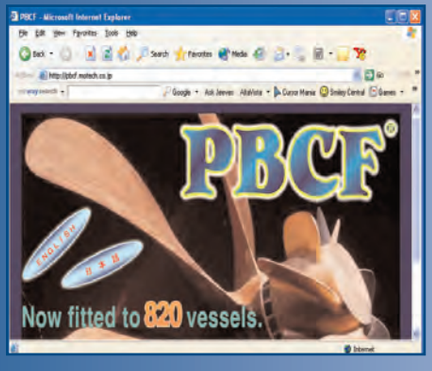

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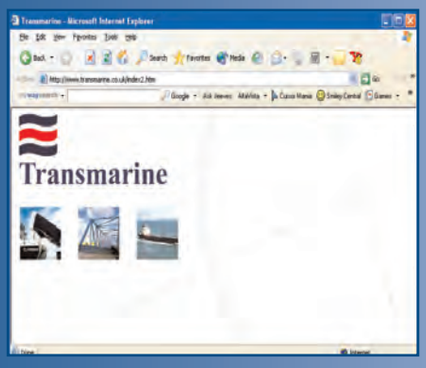

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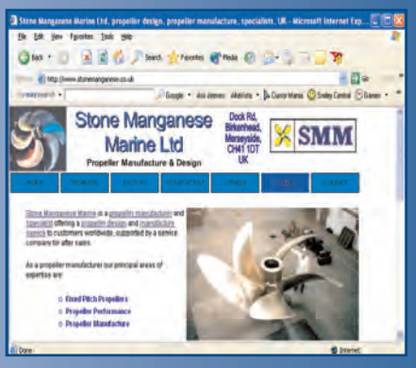

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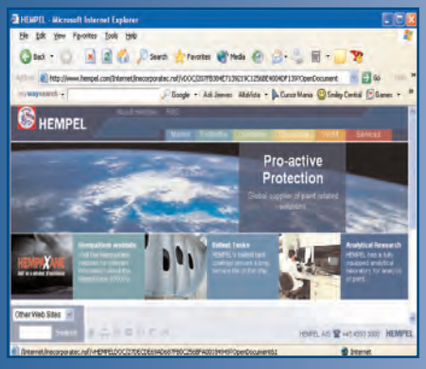

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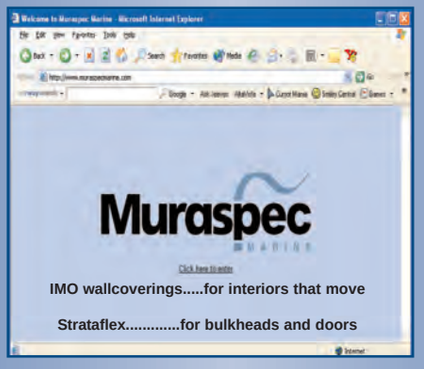

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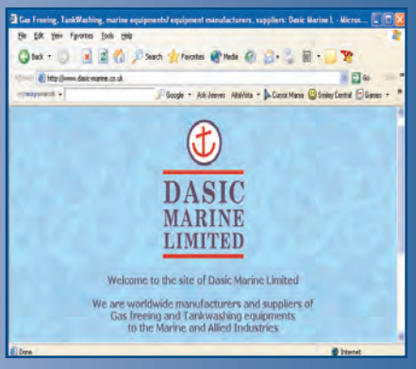

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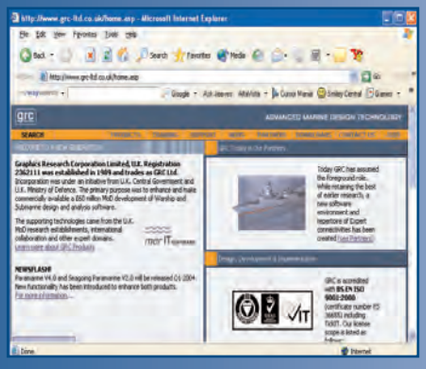

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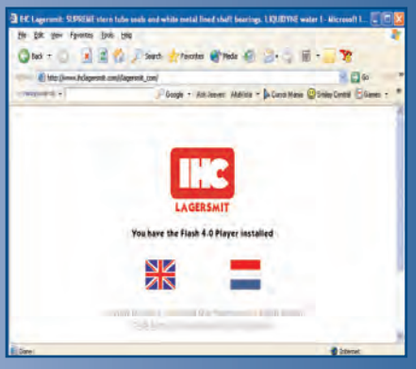

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The Royal Institution of Naval Architects

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- Comprehensive, technical descriptions of the latest newbuildings
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