THE NAVAL ARCHITECT

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THE NAVAL ARCHITECT
International Journal of The Royal Institution of Naval Architects

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Printed in Wales by:
Stephens & George Magazines
Merthyr Tydfil

A one-year subscription in 2006 to *The Naval Architect* costs £105 (UK), £110 (Europe), and £120 (Rest of the world).

Audited Circulation 10,482
JAN - DEC 2005
ISSN 0306 0209

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State-of-the-art controls: a comprehensive array of instruments, including a closed-circuit TV monitor, on the wheelhouse port wing console of Everard's new 4420dwt coastal product tanker *Speciality*. A special article on this advanced 'green' vessel appears on page 6.

PRINCIPAL ARTICLES

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Challenges and excitements for product tankers

THESE are both exciting and challenging days in the product and chemical tanker sector: not only are some most interesting new ships coming on stream but a new raft of legislation is due to enter into force on January 1 - the latter affects all tankers and perhaps other ships, too. Some of this will definitely concern naval architects planning new tonnage.

Most notably, MARPOL Annex I rules now state any ships contracted after August 1 2007 and delivered on or after February 2010, and with fuel tank capacities of 600m^3 or more - that is, quite small ships - will have to have such tanks located a minimum distance inboard of shell plating; alternatively, ships will have to meet an accidental oil outflow performance standard

Also due to come into force on January 1 are further Annex I and International Bulk Chemical Code (IBC) rules. Essentially, these mean that non-IBC tankers with a noxious liquid substance (NLS) certificate will be allowed to carry only a very few chemicals. Operators still wishing to carry a more extensive range of chemicals might wish to upgrade their ships accordingly - which will include compliance with the International Safety Management Code. A stripping test will also need to be carried out before January 1.

At the same time, so-called oil-like substances that oil tankers can currently load will be banned from those ships and will have to be transported in chemical tankers. One of these cargoes is vegetable oil, hence the ordering of ships such as Koole Tanktransport's new 4050m^3 design (reported in our July/August issue, page 4), and although Annex II currently includes a provision relaxing this requirement for certain vegetable oils, it may to be pertinent to a particular vessel.

Hull lines for the future: typical of the exciting advances taking place in the product and chemical tanker world is this computer impression of Aker Brevik Engineering's TP150 15,000dwt creation, the lines for which are said to be some of the best for this class ever tested at Marintek. The prototype, *Marida Boreas*, from the Aker Braila yard, was completed very recently.

If all this is not enough for operators and shipyards to absorb, further IMO legislation likely to be ratified this year will require all ships, including product tankers, of more than 150m length and contracted after January 1 2007 to conform with the new Ballast Tank Standard for coatings. Technical details of all these new moves appear in the September 2006 edition of Lloyd's Register's *Tanker Focus* publication.

Despite these possibly problematic challenges, more cheering news comes in the form of some highly stimulating new state-of-the-art tonnage entering service. Those readers interested in the finer points of hull lines will find our article on *Marida Boreas* enlightening. This 15,000dwt chemical tanker, built in Romania has, it is claimed, some of the best lines ever seen at the Marintek model basin. They were created and evolved by Aker Brevik Engineering.

At the same time, it is interesting to record yet another delivery from the Lindenau yard in Germany of this company's successful product tanker type. Several variants of its Safety Class 2000 design - which started life in 1990 as a 23,400dwt ship and which has been continuously adapted, modified, and honed - have now been delivered to, mostly, German owners. The newest vessel, *Sea Trout*, completed for German Tanker Shipping, has now reached 40,500dwt. Lindenau has always placed heavy emphasis on the safety aspects of its creations, including Germanischer Lloyd COLL3 standards for withstanding collisions, and last year's *Seychelles Pioneer* also had a GL Green Passport notation, for environment-friendly eventual recycling.

Yet another interesting new tanker is the 4400dwt *Bergen Star*, built in Turkey by the RMK Shipyard and planned to sail along the difficult and extensive coast of Norway. In that environment, efficient manoeuvring is a prerequisite, and this has specially influenced the propulsion plant. The latter, in combination with a custom-made hull form from the Rolls-Royce NVC-Design stable (formerly Nordvestconsult), features twin Rolls-Royce Azipull mechanical pulling azimuthing propellers; these eliminate the need for rudders.

The Azipull concept has already been applied successfully to small double-ended ferries but most notably, it has also been specified for a quartet of 14,500dwt oil/product tankers ordered by the Swedish owner Broström at the Jinling Shipyard, in Nanjing, China. Here, twin 2380kW MAN B&W Alpha 7L27/38 engines drive Azipulls for a loaded service speed of 13.00knots. Notable features are that these tankers are believed to be the first such ships to feature DNV's Clean Design notation, and they also have an RP notation for propulsion redundancy. The first ship, *Bro Deliverer*, is now believed to be in service.

Notwithstanding the impressive pedigree of all the above ships, a new benchmark must certainly be considered to have been reached with the arrival of the first of F T Everard's new quartet of Chinese-built and highly 'green' 4420dwt coastal product tankers. Last month, the lead vessel *Speciality*, made a special visit to the Pool of London for a formal naming ceremony, and although she had been substantially delayed by various shipyard and subcontractor problems, she certainly has a most impressive design and outfit, as *The Naval Architect* was able to witness firsthand.

A considerable amount of thought has gone into her design, drawing partly on experience with her predecessors, the 1997-built *Asperity* and *Audacity* - from Singmarine Dockyard & Engineering. Both types have been created with the assistance of the Bergen-based consultancy Skipskonsulent, working in close cooperation with Lloyd's Register and the UK Maritime & Coastguard Agency to achieve the owner's full objectives.

Diesel-electric power is in the ascendancy today but it was a bold decision by Everard to choose this technique - and to have the ships built in China. Not only that, the owner has opted for the highly unusual number of six small diesel-alternators driven by high-speed engines. Like some of the other ships mentioned here, *Speciality* likewise has twin propellers - such an arrangement appears to be increasingly common for smaller classes of tanker.

Not only will exhaust emissions be considerably lowered by the rare choice of six small gensets burning marine gas oil but all oily waste is being retained on board in a special tank, thus earning *Speciality* and her sisters a dispensation from fitting an oily water separator. All fuel tanks are inboard - between the two enginerooms - and tremendous efforts have been spent on reducing noise by specifying variable-frequency drives for much equipment and special insulation measures. More details appear in our article in this issue.

Clearly, these are interesting times for the product tanker trades. Hopefully, the arrival of these new breeds of ships will inspire others to follow suit.

Star Princess fire report published

A REPORT by the UK Marine Accident Investigation Branch (MAIB) into the serious balcony fire which broke out in March this year on the Princess Cruises (Carnival) liner *Star Princess* has just been published. One passenger died, and 79 cabins were condemned, with a further 218 damaged by fire, smoke, or water. Although the balconies complied with SOLAS II-2 as far as fire protection was concerned, the basic principles of the regulation were found not to apply to these or other external areas.

The MAIB found that the polycarbonate partitions, polyurethane deck tiles, and plastic furniture were all highly combustible and produced dense black smoke, also that glass in the doors between cabins and balconies was not fire-rated to A-class nor were the doors self-closing. Balconies also crossed main zone fire boundaries, both horizontally and vertically, without structural or thermal barriers at the zone or deck boundaries.

Finally, there were no fire detection or suppression systems fitted on the balconies. Additionally, it was noted that firefighters had difficulty in reaching the fire because of the construction and partitioning of the balcony areas.

A safety bulletin has been published by MAIB and a safety notice issued by the International Council of Cruise Lines. The MAIB has made recommendations to the UK Maritime Administration, aimed at developing amendments to the 1974 SOLAS convention to ensure that fire protection arrangements in external areas such as balconies were as robust as those currently applicable to internal areas.

Following a submission to IMO by the UK delegation at MSC 81 (May 2006), that safety committee approved a circular (MSC 1/Circ 1187) for immediate distribution, detailing operational measures recommended for immediate implementation on cruise liners with balconies; it also proposed amendments to SOLAS and the FSS code. The SOLAS proposals will be considered at MSC 82 next month (December). In view of the high-level response to this fire, no further MAIB recommendations have been made. Copies of the report can be found at www.maib.gov.uk

Seen here following her recent launch at the Spanish yard Astilleros de Huelva is *Clipper Point*, the first of five new Knud E Hansen-designed ro-ro freight ferries (including two with lengthened hulls); she is being built for Seatruck Ferries' service from Heysham (England) to Warrenpoint (Northern Ireland). A service speed of 22.00knots will reduce the current crossing time from nine to six-and-a-half hours, and up to 1830lane metres will be provided for freight on three levels, with a few cabins for drivers. Seatruck Ferries is a member of the Clipper Group. Further information on activities at the Huelva yard appears on page 38 of this issue.

SUPERIOR STEEL FOR CONTAINER SHIPS - Technology that should enable the use of a new grade of very high tensile steel for use in the longitudinal strength members of jumbo container ships has been developed by Mitsubishi Heavy Industries and Nippon Steel Corp. Yield stress of the new steel is 47kgf/mm^2, and it is believed that this is the first time that such a grade has been proposed for container-ship hulls; up to now, 40kgf/mm^2 has been the maximum used. The new grade has been created to overcome the reduced toughness of steel when the material is required to be thicker - as is needed in current generations of very large container liners.

This new steel is expected to offer improvements in weight reduction and overall hull reliability, as well as contributing towards fuel reduction. Classification society Class NK has participated in this interesting project, and to ensure high-quality welding for such material, Mitsubishi will be using a new system known as vibratory electro-gas-arc welding (VEGA). The first ship to feature the new ship will be built at Mitsubishi's Nagasaki yard.

AVEVA FOR KOREAN CONSULTANCY - The Korean naval architectural and marine engineering consultancy Korea Maritime Consultants Co (KOMAC) has purchased the Aveva Group's Marine Solution software package, to enable it to carry out initial design, detail design, and assembly planning. The aim is to improve project schedules, streamline workflow, and reduce project costs. KOMAC will now be able to support customers using both the Tribon and Vantage Marine systems. Vantage Marine is a combination of Tribon M3 Hull and PDMS for outfitting.

NEW RULES FOR MEGAYACHTS - French classification society Bureau Veritas (BV) is linking with leading yacht designers and shipyards to completely re-engineer its rules for classification and certification of yachts - particularly new breeds of so-called megayacht over 24m length but under 500gt, which today are often entering new technical territory. The new rules will cover structures, electrical systems, stability, and fire protection.

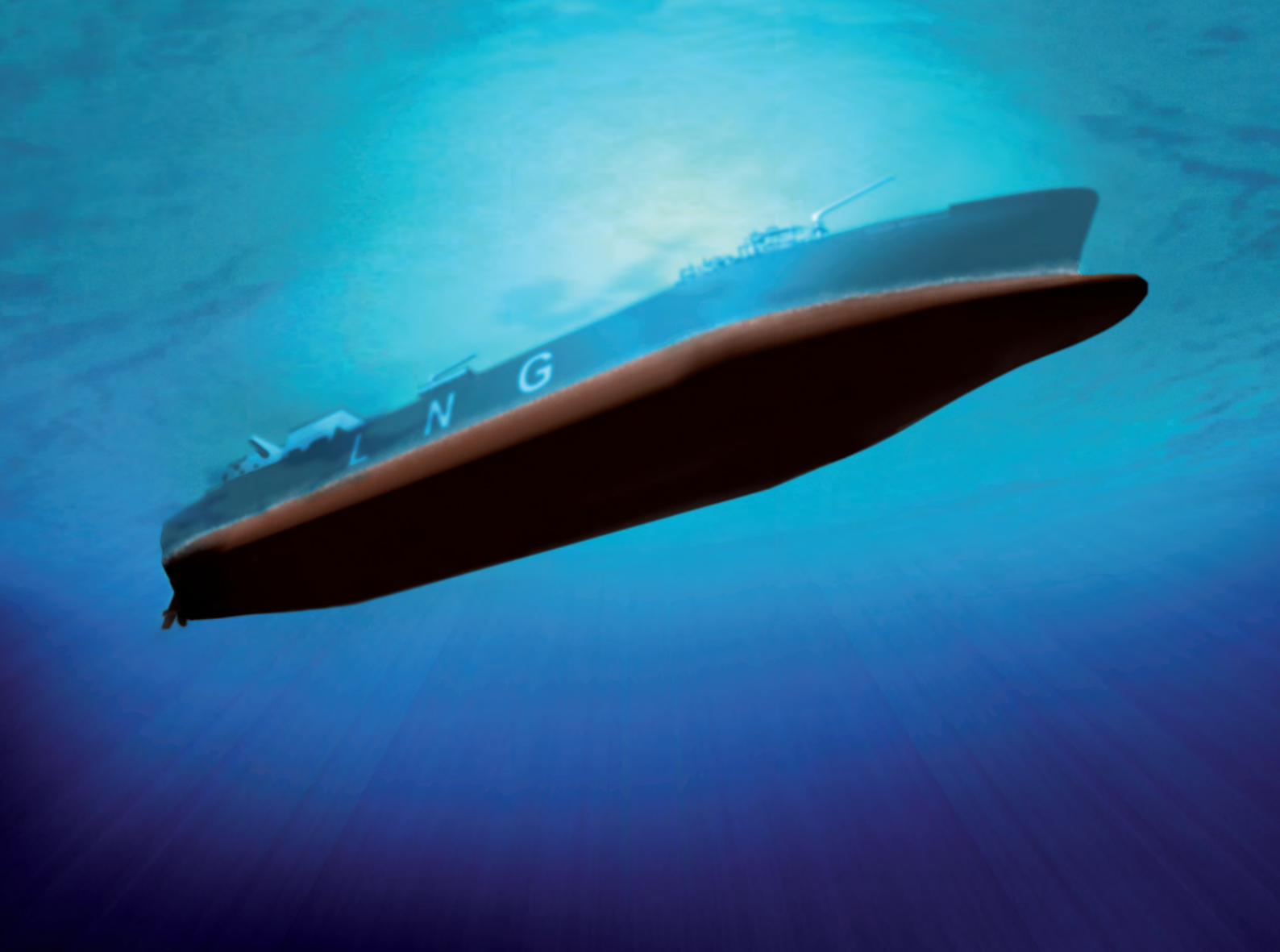
Another society, Registro Italiano Navale, has also updated its pleasure yacht and charter-class rules. These have been designed to meet the optimum requirements for each type of craft and material, including wood, steel, light alloy, and glassfibre, and are specially focussed on the importance of class for maintenance.

MARS AT VT - We are informed that the illustration showing a section of a Type 45 destroyer at VT Shipbuilding (page 160 of our September 2006 edition), as part of an article on Logimatic's MARS ERP system, was actually taken at the BAE Systems yard in Glasgow.

PEOPLE

We regret to record the death of **ERNST VOSSNACK**, arguably one of the finest practical mainstream naval architects of the second half of the 20th century. He was particularly associated with ships built for the Nedlloyd group and its predecessors but he was tirelessly campaigning for better ship designs, particularly container ships and those associated with the anomalies of gross tonnage measurement.

Professor Ken Rawson, former chairman of the Royal Institution of Naval Architects' Safety Committee, has told us of the death of **MAURICE DE ROHAN**. Although he was not a naval architect but a mechanical engineer, Mr de Rohan's name will be familiar to all those involved in the traumatic days and months that followed the *Herald of Free Enterprise* disaster in March 1987. As organiser of the Herald Families Association, he was instrumental in coordinating passenger response to the tragedy, including meetings with The Royal Institution of Naval Architects. He helped to concentrate the technical minds of those charged with finding solutions to the problems (still on-going) of free-surface effect in ferries, and his actions can be said to have helped mould the more positive and pro-active attitude towards safety standards that exists today at RINA.



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Speciality: state-of-the-art coastal product tanker

In mid-October, a fine new addition to the British tanker fleet arrived for inspection in the River Thames. F T Everard's *Speciality* - most of the company's ships have names ending in *ity* - is the lead vessel of a series of four 4420dwt ships ordered from the Qingshan Shipyard, in China.

SPECIALITY possibly represents the zenith of modern marine technology in being powered by a multi-engine diesel-electric plant, coupled with a state-of-the-art cargo handling package, and a heavy emphasis on environment-friendly operations. Although under 5000dwt, she has a double hull throughout. *The Naval Architect* was able to visit the ship while she was in London.

Everard is a well-established player in the European coasting trades, and the new quartet are much enhanced versions of the *Asperity* class built in 1997 by Singmarine Dockyard & Engineering (*Significant Ships of 1997*). Like the *Asperity* pair, *Speciality* is a product of the Norwegian consultancy Skipskonsulent and is actually designated as the SK4210 type; however, the overall design has been the result of extensive collaboration between Everard, Skipskonsulent, Lloyd's Register, and the UK Maritime & Coastguard Agency. Extensive model tests, and manoeuvring trials on a simulator, were performed at Force Technology, Lyngby, Denmark.

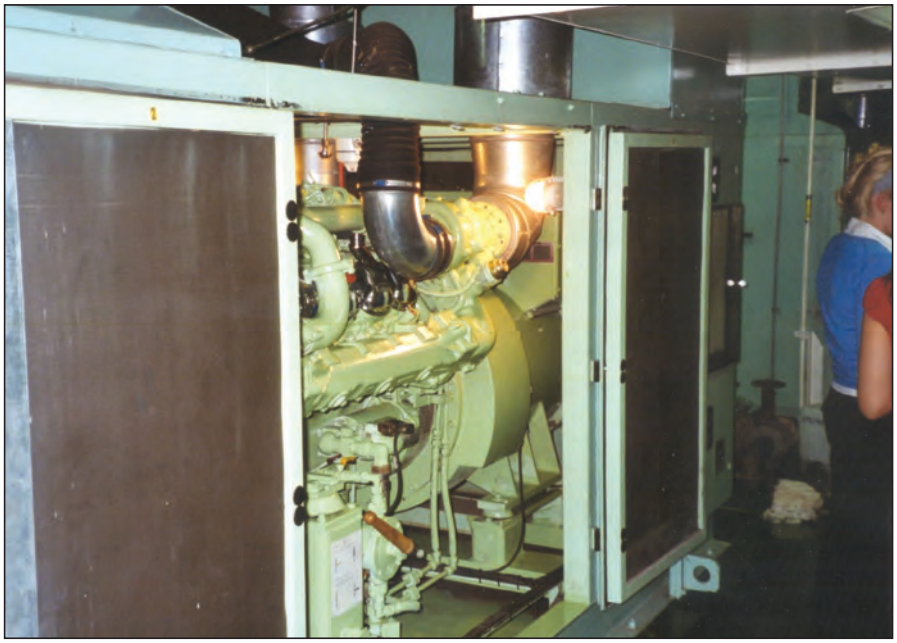
The most notable difference is the choice of a diesel-electric plant - a currently popular concept in several sectors and one perhaps particularly relevant to coastal trades where a ship is running in and out of harbour and at different speeds. In parallel, a basic theme of the new ships was that no single piece of equipment should give rise to a hazardous incident, hence the diesel gensets and switchboards are split over two independent spaces. Failure mode effect analysis (FMEA) techniques were employed throughout the design and construction phases to assess the consequences of potential failure and to identify any modifications necessary.

A description of the electrical plant, supplied and engineered by the Dutch company Imtech, was given in our September issue (page 76). Here, it can be noted that Everard made an interesting decision to base all primary power on the unusual choice of six Leroy Somer alternators driven by high-speed MAN engines - all positioned at one level on the main deck. Electric-based power is also of special relevance to quiet cargo operations - hydraulic pumps being notably noisy - since Everard ships often berth in small ports where residential properties are close by.

Because there are six engines and all at main deck level, dispensation was granted not to fit an emergency alternator and an emergency fire pump. Operation is on marine gas oil with a maximum sulphur content of <0.2%, and fresh-water cooling through Bloksma box coolers (one high/low-temperature unit for each engine, plus six low-temperature models for other systems) is employed. The small engines should give much reduced emission figures - around 50% less NOx, 90% less SOx, and 30% less CO_2.

The 900kW Alconza propulsion motors drive the FP propellers through Renk reduction gearboxes to give a nominal output speed of 140rev/min, and a brake is fitted on each shaft for use alongside, particularly in Immingham where

F T Everard's new 4420dwt coastal tanker *Speciality* berthed alongside HMS *Belfast* in the river Thames on a grey October day. She marks a new stage in modern product tanker design, featuring an advanced diesel-electric power plant, touch-screen cargo control, and a heavy emphasis on environment-friendly technology.



Six 486kW diesel-alternators, each mounted in a noise-insulated enclosure, provide primary power. The choice of small multi-sets burning gas oil was made based on flexibility and low exhaust emissions. All six sets are mounted at main deck level.

TECHNICAL PARTICULARS
SPECIALITY

Length, oa	95.10m
Length, bp	87.00m
Breadth	17.00m
Depth	7.70m
Draught, summer	5.90m
Deadweight, summer draught	4420dwt
Gross	3859gt
Cargo capacity, 98%	4510m³
Slops	43m³
Water ballast, 100%	2633m³
Diesel-electric plant	6 x MAN D2840 LE301 6 x Leroy Somer alternators
Output	6 x 486kWe
Fuel consumption	approx 6tonnes/day
Propulsion motors	2 x Alconza
Output	2 x 900kW
Speed, service	11.50knots
Speed, maximum	13.00knots
Bow thruster	1 x Jastram, 350kW
Crew	5 officers + 3 ratings
Flag	UK
Classification	Lloyd's Register +100A1, Double-hull Oil Tanker, ESP, LI, EP(V), +LMC, UMS, PSMR*, CCS, ICC, ShipRight (SERS, SCM), SBT

there is a 9knot tide. With only one engineroom in operation, *Speciality* can achieve a speed of 10knots, compared with a normal service speed of 11.50knots.

Centreline bulkhead again eliminated

Two notable features that have been continued from the previous ships are cargo tanks with no centreline bulkhead (primarily to speed up stripping time) and a deep full-scantling trunk on the upper deck. This gives total protection to most of the cargo and ballast piping, also the hydraulic valves, heat exchangers, and instrumentation. The trunk serves as a handy form of longitudinal stiffening in the absence of a centreline tank bulkhead, while the reduced number of tanks also cuts residues, and shrinks the numbers of valves - although *Speciality* still has 226 of the latter in her cargo and ballast lines.

With no centreline bulkhead, additional care must be taken over any free-surface conditions but a Damcos Easacon computer will handle both intact and damage stability. Both propulsion machinery and cargo handling are masterminded from dedicated consoles in the wheelhouse, although a small cargo office is also situated on the poop deck forward where an Omnicron gas sampling system is situated; a SAM Electronics package handles all navigational operations. No paper charts are carried, and *Speciality* is believed to be the first British ship since 1894 not to carry a magnetic compass; a combination of gyro compass and global positioning system perform the former's role. Everard's own company, Ships' Electronic Services, carried out most of the electronic installation work.

Piping is arranged for six cargo segregations, and heating can be arranged up to 66°C by circulating cargo through Bloksma stainless-steel shell-and-tube heat exchangers. Hot water for this purpose and for tank washing can be supplied by either of two Greens Spanner 1600kW boilers. Tank washing can be carried out at temperatures of up to 85°C by 12 Dasic Orbiter machines, with final stripping to a 43m³ slop tank by an eductor.

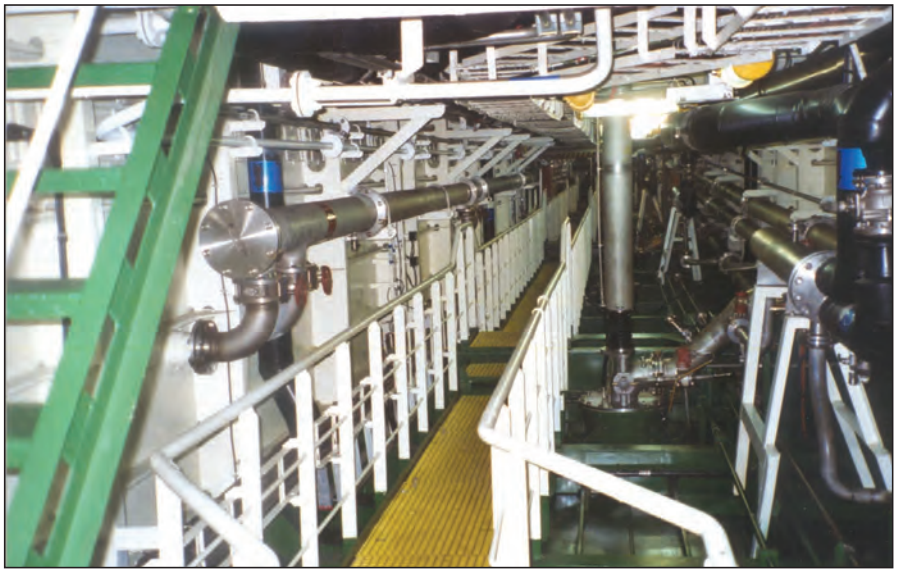
Tank venting is by Pres-Vac high-velocity valves, one in each tank and with silencers on the suction side - claimed as the first time ever, and a fixed gas-freeing fan of 5000m³/h capacity is installed to supply fresh air via the vapour return line either directly to the tank or via the manifold using a U-bend.

Cargo tank gauging is carried out by a Saab Rosemount TankRadar system, supplemented by level probes in each cargo tank well and independent high-level alarms. Loading and discharge of the six cargo tanks (which are coated with International Paint Interline 903 phenolic epoxy - claimed to be well above the normal specification for such tankers) are handled by six Marflex deepwell pumps, each of 375m³/h. These are driven by electric motors mounted on top of the trunk, and the typical volume that can be discharged is 3000tonnes in four hours.

Highly intelligent touch-screen cargo and ballast control

All cargo and ballast operations, also control of the 226 hydraulic valves on the ship, are masterminded from an impressive touch-screen with mimic diagrams in the wheelhouse, created by the Danish company Damcos, formerly known as Danfoss Marine Systems.

This apparently simple Damcos console in the wheelhouse is actually a highly advanced touch-screen system for masterminding all cargo operations. From here, a total of 226 hydraulic valves can be controlled.



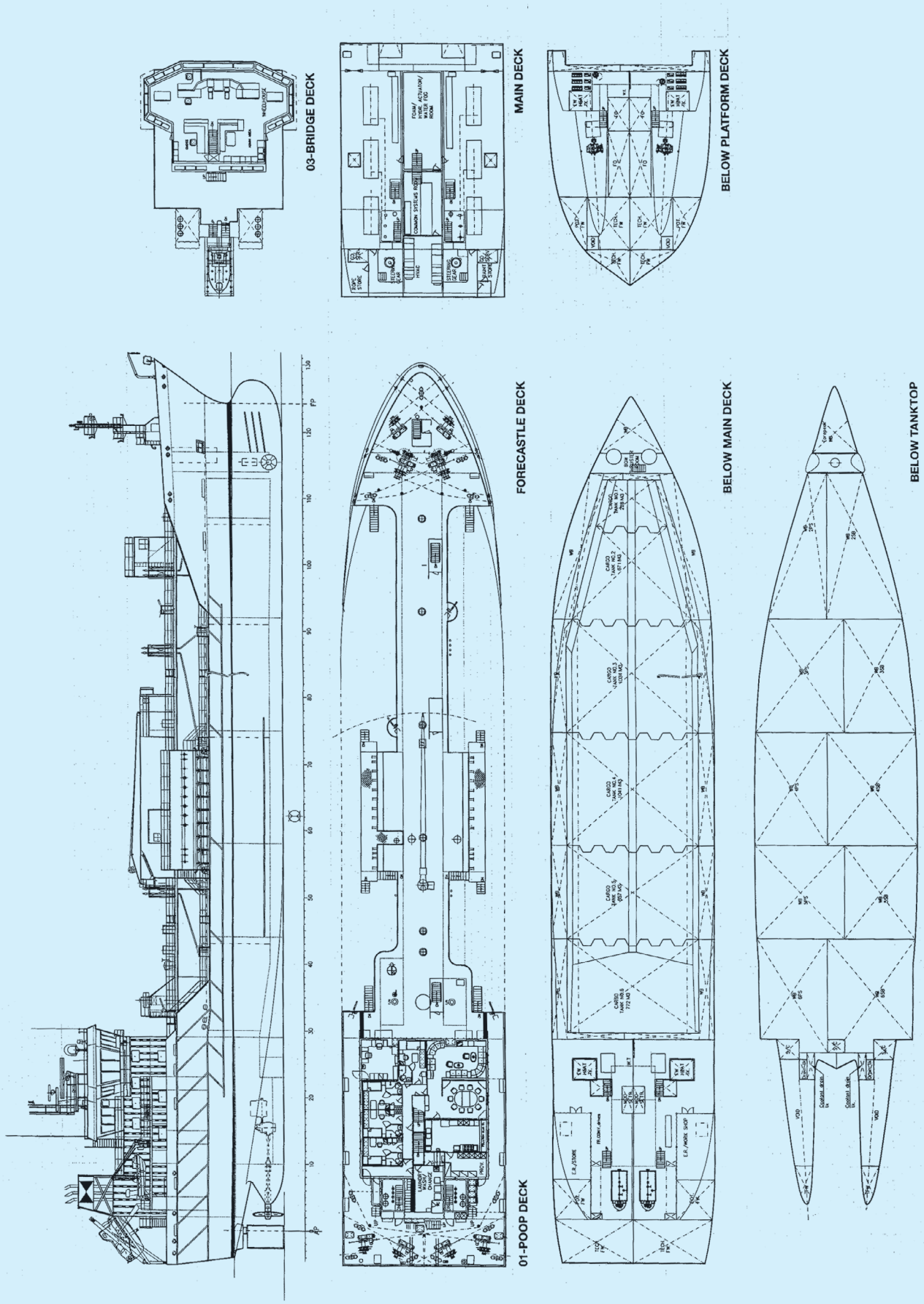
***Speciality* continues the feature installed on the earlier *Asperity* and *Audacity* of eliminating a centreline cargo tank bulkhead but installing a full-scantling trunk deck, where most cargo and ballast piping is installed. One of the six Marflex cargo pump drives can be seen in the centre - the electric motor is mounted outside above.**

The 'real-time' software includes a detailed and intelligent cargo planning mode, specially developed for Everard, which can check the viability and integrity of an entire cargo load or discharge plan before it can be executed. In particular, this will check: that there are two valve separations between different cargo grades, that manifold valves are only opened on the side connected to a shore pipeline, and that cargo is not loaded into a tank or through pipelines allocated elsewhere in the plan to a different grade. A dynamic colour system is employed to indicate any changes made.

During loading - often considered the most hazardous tanker operation, the officer in charge is able to set individually two high-level warning alarms for each tank. These provide early and final warnings of any problems - even without an independent fixed high-level alarm being activated. To ensure maximum safety levels, a total of 24 closed-circuit TV cameras are installed around the ship, and during normal operations two crew members would be in the wheelhouse, one of whom would be an engineer.

Further pollution-control measures include the positioning of the fuel tanks between the two

General arrangement plans of the 4420dwt coastal product tanker *Speciality*, built by Qingshan Shipyard for F T Everard.



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enginerooms and separated from the bottom shell by an 800mm cofferdam. All oily waste is led directly to a 2.9m³ waste oil drain tank in each engineroom, which is also separated from the bottom by a cofferdam.

MARPOL exemption for oily water separator

A further interesting feature on this new ship is an exemption, granted by the UK Maritime & Coastguard Agency, from fitting an oily water separator. The reasoning behind this was this was that the ship's trading area is almost exclusively within MARPOL designated areas. Therefore, to comply with the alternative necessary 100% retention-on-board policy, *Speciality* is installed with a 30m³ capacity waste oily water tank on the main deck, with transfer pipelines from each engineroom waste oil drain tank. The size of the waste tank handily conforms to the capacity of a typical road tanker.

Further 'green' credentials are added by the specification of IHC Lagersmit's air-space type outer sterntube seals on the propeller shafts. Any fluid that does enter the gap is automatically drained to the waste oily water tank.

For firefighting in the relatively small machinery spaces and in the deck trunk, Everard chose a Semco Maritime watermist system on the premise that it is not a 'one-shot' system, as is CO_2, and it can be actuated in specific areas, and is only limited by the on-board fresh water supply; in an emergency sea water can also be used. Also, it is not necessary for personnel to evacuate any spaces.

Limiting noise levels

Ødegaard & Danneskiold-Samsøe, the Danish specialist consultancy, was employed to offer guidance and solutions on noise control for this new design, with the aim of limiting noise to less than 45dB(A), measured 25m from the vessel. During design progress, it was realized that this figure could not be achieved; nevertheless, as a result of the following measures, levels recorded during sea trials, with all fans running and gensets and electric motors running at 60% MCR, ranged from 47.5dB(A) at the bow and 60dB(A) at the stern (mainly from propeller wash):

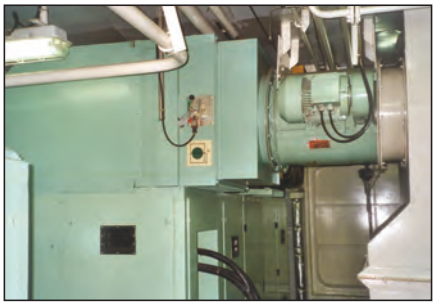
- individual sound-attenuating canopies for each diesel genset
- high-specification exhaust silencers
- variable-speed FP propellers, oversized blades (3.04m diameter, running at 140rev/min)
- hull side insulation in way of machinery spaces
- variable-speed, electric deck machinery
- variable-speed, electric bow thruster, oversize blades, active (air-injection) and passive (resilient mounted) noise reduction systems
- variable-speed, electric cargo and ballast pumps
- careful design of ventilation fans and air intakes
- modification, and type approval, of pressure vacuum valves, with added silencer at the vacuum side.

As can be seen, variable-speed electric systems, using Vacon frequency-converter control, have been extensively chosen, not only for minimum noise levels but also for optimised operation and power levels. Steering gear pump motors for the two Rolls-Royce rotary-vane gears only run when a helm order is given. Energy losses through the diesel-electric system are generally recovered by the power optimising process, and the plant operates at 690V, which does not require any specialist engineering expertise.

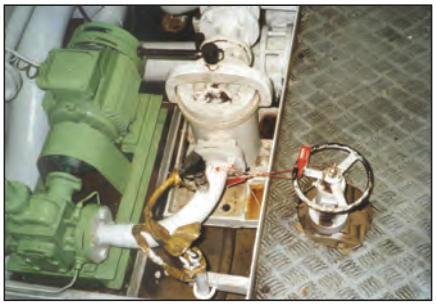
All these features are assisted by an extensively modelled hull form and use of CFD techniques to give a highly efficient hull form with a block coefficient exceeding 0.72; this results in a low propulsion requirement for a given speed. Waste heat from the diesel engine cooling system is also recovered for use in tank washing, domestic hot water, and accommodation heating; temperatures up to 45°C can be obtained without starting the oil-fired boilers.

From the above features, it can be seen that this new class represents a key milestone in the design of coastal tankers. Everard's philosophy and the high standard of equipment and features selected should prove a first-class example to others wishing to run efficient 'green' ships in this new century.

Variable-frequency electric drives are used for much propulsion, manoeuvring, and cargo equipment, as well as the Rolls-Royce mooring winches. These can be remotely operated from the wheelhouse.



Huge efforts have been taken to minimise noise, especially as the tanker will often be calling at small harbours with houses often close by. Seen here is one of the insulated engine air intakes.



***Speciality* and her sisters have twin independent enginerooms and switchboards. Some important equipment can be cross-connected in an emergency but to prevent accidental cross-over, wheels have ties on them, as shown here.**

A single mess room is provided for both officers and ratings, as is Everard's policy. As in the rest of the accommodation, outfitting (by a Shanghai company which also built the furniture) is to a high standard, since the company wishes to recruit and retain quality crews. Large windows, as seen here, are used throughout. Individual satellite TV sets are provided for all crew members, and the master, chief officer, and chief engineer each have their own laptop computers.

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Sea Trout: first Safety Tanker 2010 from Lindenau

This German yard has been most successful in retaining the successful basic concept for a 'green' product tanker, introduced some years ago but continually improving and modifying it, to the apparent satisfaction of several owners.

LINDENAU Shipyard, in Germany, has a longstanding reputation as a designer and builder of oil/product carriers and chemical tankers, in addition to a wide range of other vessels. Several of its Class 2000 tankers have been presented in various editions of our *Significant Ships* series, including *Seychelles Pioneer* in the 2005 edition.

Among the most recent designs delivered by the yard are *Sea Trout* and *Sea Cod*, two double-hull product carriers that are among the largest and, the yard believes, safest and most environment-friendly tankers built in Germany. They are enhanced versions of earlier completions, introducing new technical features.

Sea Trout **is the first example of Lindenau's Safety Tanker Class 2010 - the newest in a progressively developed series of 'green' and efficient tankers.**

Influences of a changing market and new legislation

In a recent paper addressing the market for tankers in the size range in which it is active, Lindenau noted that the age profile of the worldwide fleet less than 50,000dwt is ageing rapidly, and that of this fleet of approximately 6000 ships, more than 1300 (approximately 22%) are more than 30 years old, and another 1700 or so tankers in this size range are 20-30 years old.

TECHNICAL PARTICULARS
SEA TROUT

Length, oa	188.00m
Length, bp	179.50m
Breadth	32.20m
Depth, to main deck	17.05m
Draught, design	10.00m
Draught, scantling max	11.00m
Gross	26,600gt
Deadweight, design	35,000dwt
Deadweight, scantling (minimum)	40,500dwt
Cargo and slop tanks, 100%	47,450m³
Residue tank, 100%	160m³
Main engine	MAN 8L58/64
Output	11,200kW
Gear-driven alternator	1700kVA
Diesel-alternators	3 x 1200kVA
Speed, max, design draught, 100% MCR	16.50knots
Speed, trial, design draught, 8200kW	15.50knots
Complement	28
Classification	Germanischer Lloyd +100 A5 E3 Product Carrier, Oil Tanker, ESP, ERS, COLL 3, Suitable for the Carriage of Various Oil Products, MC E3, AUT, INERT

Against this backdrop of an ageing fleet, new measures and much new legislation have been, and continue to be, introduced to make tankers safer and more environment-friendly. Among the main effects of new IMO legislation has been the introduction of double hulls for tankers of more than 5000dwt, but as Lindenau notes, as of last year, of the worldwide fleet of tankers of < 50,000dwt, only some 27% have double skins.

Rule changes as a result of well-documented tanker accidents have been many, notes Lindenau, citing *Exxon Valdez*, which led to OPA 90 double-hull requirements and subsequently to amendments to MARPOL; *Erika*, leading to well-publicised single hull phase-out requirements by 2015; and *Prestige*. Following the last-mentioned incident, phase-out requirements for single hulls were tightened to 2010.

Against this background of the phase-out of single-hull tankers, the market for the transport of oil and oil products has grown significantly, creating demand for new classes of tankers with double hulls surrounding the cargo area and fuel tanks. Combined with this have been new technical solutions to problems such as corrosion in ballast tanks due to premature breakdown of coatings, and the introduction of fixed hydrocarbon gas detection systems capable of monitoring tank atmospheres.

Designs produced by Lindenau such as the 2005-built *Seychelles Pioneer* have been at the forefront of the response to the issues mentioned above. *Seychelles Pioneer* is believed to be the first double-hull vessel with a fixed gas detection system built to GL class, and one of the first with an 'Environmental Passport', certifying that the design takes advantage of environment-friendly features. These include ballast water management, reduction of NOx and SOx emissions, a vapour return system, sewage treatment, 'green' coolants and firefighting agents, waste treatment onboard, minimal bilge water oil residues, and a TBT-free antifouling system.

Since 1976, Lindenau has delivered well over 30 double-hull tankers, and in the latest evolution of its tanker designs, the Lindenau Safety Tanker Class 2010, on which the design of *Sea Trout* and *Sea Cod* is based, various environment-friendly features have been incorporated and taken even further. Designed to transport oil and oil products up to a specific gravity of 1.1tonne/m³, *Sea Trout* and her sister also have a high cargo volume (specific gravity homogenous loaded to the design draught, of approximately 0.74tonne/m³, or 0.84tonne/m³ on the scantling draught), combined with the highest level of safety and environmental protection, also operating economy.

continued

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With the cargo and fuel storage tanks protected by a double hull, these latest ships from Lindenau have dedicated rooms for the steering gear, diesel alternators, and separators, and fulfill Exxon Marine environmental and safety criteria for vessels in ExxonMobil affiliate service, Edition 2002, including strongly preferred items, and SOLAS 2002 (including an automatic identification system and voyage data recorder).

Delivered to owner German Tanker Shipping in June, the 40,600dwt/47,372m³ *Sea Trout* is also a very fuel efficient design, the ship's lines having been optimised by the yard's naval architects. They worked closely with the owner, to give the vessel an optimised load/volume ratio at a maximum draught of 11m and Panamax breadth of 32.20m.

CFD studies to perfect hull form

Extensive computational fluid dynamics (CFD) studies were undertaken prior to model tank tests for resistance, propulsion, seakeeping and performance in ice. These resulted in a design which the yard describes as having an extremely favourable speed/power ratio, resulting in low fuel consumption at relatively high speed.

Particular attention has been paid to the design of the forward end, in respect of the Safety Tanker 2010's seakeeping, both in relation to structural stresses and loss of speed in a seaway. Compared with many other, similar newbuildings, believes Lindenau, *Sea Trout* and *Sea Cod* will experience many fewer 'deck wetness events' in adverse weather conditions, and structural stresses on the foreship are claimed to have been reduced by almost 40% compared with previous deliveries.

A further benefit of the optimised fore-end design is the ability to operate at high speed in ice, with good icebreaking capability, a feature that is complemented by a high level of manoeuvrability, thanks to an efficient Becker flap rudder with 45deg turning angles, and an electric bow thruster of 1250kW output.

The newbuilding fulfills national and international rules for exchange of ballast water, MARPOL Annex VI requirements for NOx and SOx emissions, and in keeping with earlier generations of tankers designed by Lindenau, the vapour return system, sewage treatment, compliance with requirements for minimal bilge water oil residues, and use of non-ozone depleting coolants, all help to ensure that *Sea Trout* and *Sea Cod* are fully environment-friendly in all possible respects. The double-hull design, which provides the highest possible level of protection in the event of collision or grounding, qualifies for GL safety class COLL3, this being four times higher than the collision resistance of a typical single-hull tanker.

The cargo spaces on board consist of five pairs tanks as well as three slop tanks, which are separated from one another by longitudinal and transversal bulkheads. This has the beneficial effect of creating absolutely smooth tank interior surfaces, leading to short discharge times, minimal cargo residues, additional protection against cargo contamination, and reduced tank cleaning times. A high level of cargo flexibility is made possible by use of cargo tanks with different sizes, as well as the high tank volume/deadweight ratio.

Heating of the cargo tanks is carried out individually by means of deck-mounted heat exchangers for each tank, with temperature indication in the control room. Steam is supplied by a 15tonne/h oil-fired boiler and a 1tonne/h exhaust-gas unit. The electric deepwell pumps are sized to provide a discharge time of approximately 12 hours. The latter - combined with the tank washing system - should result in much-reduced times spent at terminals.

Lindenau also notes that a newly-developed fixed emergency discharge system enables the entire cargo to be discharged under closed conditions in the event of a cargo pump failure. There are three manifolds with cross-over, and six grade segregations. Of the 12 deepwell pumps installed, 10 have a capacity of 600m³/h and two operate at 250m³/h. The maximum discharge capacity is up to 3600m³/h.

Radar-type tank gauging equipment is fitted for the cargo and slop tanks, with pneumatic level measurement system for other tanks. The cargo, slop and residual tanks are all coated with epoxy and the cargo pumps, pipes, and fittings are of stainless steel. A 10tonne hose cranes is installed amidships.

Efficient product/chemical tankers from Romania

DURING October, the first example of a newly created 15,000dwt coated product/chemical tanker design was delivered by the Aker Braila yard in Romania. Although this shipbuilder often fabricates hulls for outfitting elsewhere, this particular series is being totally completed there. The design, known as the Aker TP150 type, was developed by the Norwegian consultancy Aker Brevik Engineering, and model-tested at Marintek, in Trondheim, from where it is reported that the hull has some of the most efficient lines ever seen there for a ship of this type.

Six examples of the Aker TP150 have been ordered by Marlow Navigation, based in Limassol, Cyprus, and the first is named *Marida Boreas*. All six ships are being heavily ice-strengthened to meet Det Norske Veritas 1A standards, for operation in Arctic waters including the Baltic Sea. The series is planned for IMO Type II cargoes up to 1.3tonnes/m^3 specific gravity. The vessel contains 14 cargo tanks and two slop spaces.

Eight different grades of cargo can be handled simultaneously, although each tank is equipped with its own Frank Mohn hydraulic submerged pump, each with a capacity of 350m^3/h; all cargo control is masterminded from a console mounted in the cargo control room. Hydraulic power is supplied by a common high-pressure pack, with an output suitable for four pumps working simultaneously, plus 10% spare capacity.

Hydraulic power is additionally supplied to two 500m^3/h ballast pumps and two slop tank pumps, each with capacity of 100m^3/h. Tank sounding is provided by equipment from Krohne Skarpenord.

An impression of the newly completed 15,000dwt coated product/chemical tanker *Marida Boreas*, the first example of Aker Brevik Engineering's TP150 design. She was built at the Aker Braila yard in Romania.

One of the preliminary tests carried out in the fjord by Aker Brevik Engineering prior to formal testing at Marintek.

Photographs taken in the model basin at Marintek, at a speed of 14knots on a draught of 8.50m.

TECHNICAL PARTICULARS
MARIDA BOREAS

Length, oa	149.60m
Length, bp	139.25m
Breadth, moulded	22.00m
Depth, amidship to main deck	12.95m
Draught, design	8.50m
Deadweight, design draught	15,000dwt
Cargo capacity	18.000m^3
Slop tank	360m^3
Heavy fuel	650tonnes
Marine diesel oil	50tonnes
Potable water	140tonnes
Technical fresh water	170tonnes
Lubricating oil	25tonnes
Ballast water	9300tonnes
Sewage	15tonnes
Complement	20 persons
Main engine	MAN 8L40/54
Output, MCR	5700kW
Speed, service, loaded, 85% MCR	approx 15.50knots
Flag	Cyprus
Classification	Det Norske Veritas +1A1, Tanker for Oil and Chemicals, E0. Class notations: Shiptype 2, a2, b3, c3, v3, f2, str0,1, TMON, BIS, Inert, Vcs-2

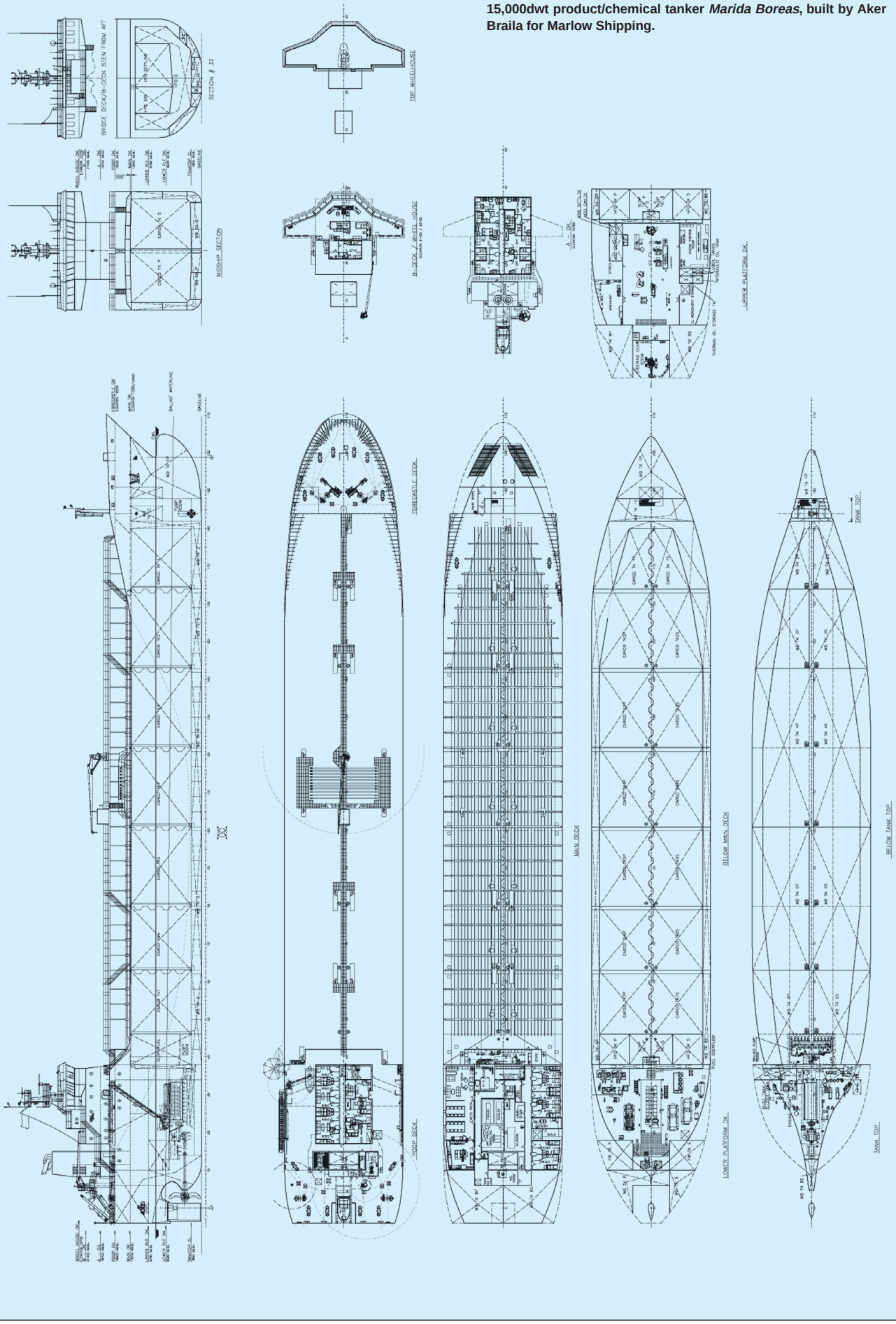
Tank venting, which includes high-velocity pressure/vacuum valves, is provided by Pres-Vac equipment.

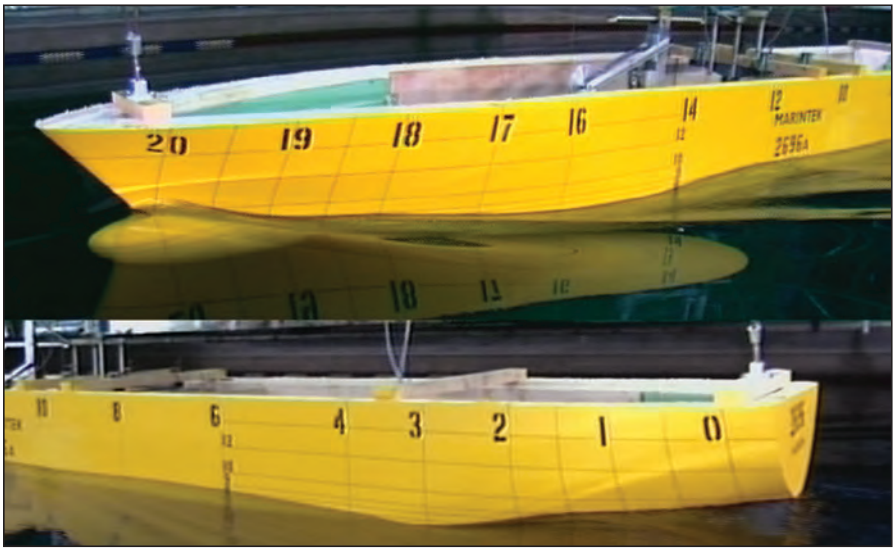
Cargoes can be heated to 60°C by deck-mounted heat exchangers supplied from a S-man thermal-oil boiler. All cargo and slop spaces are coated by 300microns (dry film thickness) of Jotun Special Tank Guard. All steel in these tanks is shotblasted to SA2.5 grade prior to application, followed by a zinc silicate shop primer.

The structure of the vessel is arranged with double sides and double bottom. All cargo tanks have clean and smooth internal surfaces with stiffening inside the double-bottom and double side-skin. Deck-beams and girders are all on the upper side of the deck. The centreline longitudinal bulkhead in the cargo area has vertical corrugations, while those bulkheads for transverse divisions are horizontal.

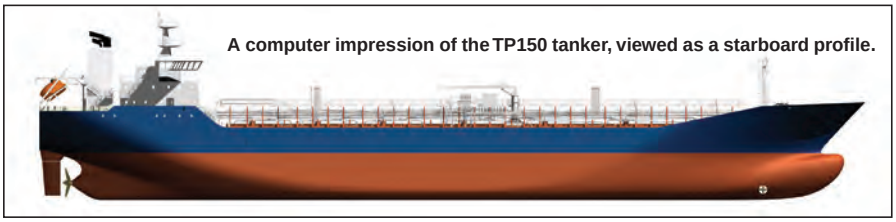
Frame spacing throughout the hull is 700mm. The double bottom is arranged with a slope towards the centreline, and the minimum height at the centreline is 1860mm. Longitudinal stiffening is used in the upper deck, bottom, and sides, as well as the inner bottom and inner shell. The underwater hull is planned for three-year drydocking intervals and is coated with a Jotun system comprising Jotacote Universal and

General arrangement plans of the Aker Brevik Engineering 15,000dwt product/chemical tanker *Marida Boreas*, built by Aker Braila for Marlow Shipping.





Photographs taken in the model basin at an increased speed of 15knots and a draught of 8.50m.



A computer impression of the TP150 tanker, viewed as a starboard profile.

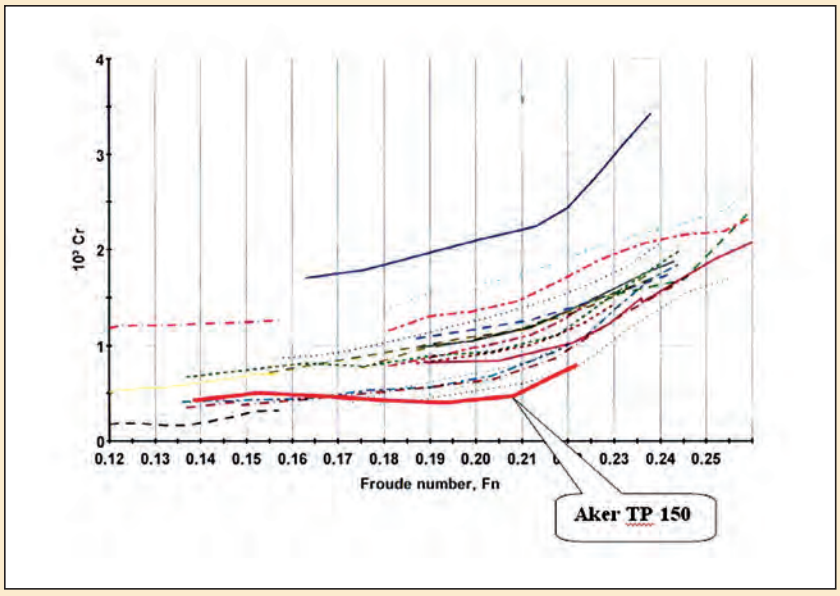
Model tests of the Aker TP150

HULL lines development for the Aker TP150 tanker was mainly based on the given deadweight and required speed when loaded. The beam of the vessel was restricted by the facilities of the yard in Romania, and a maximum loaded draught given by the owner.

The hull was designed using the Maxsurf program suite from the Australian software company Formation Design Systems. When a set of lines, based on experience and believed to be good, was ready, a simple model in scale 1:125 was made and towed at sea. The main objective was to study the wave pattern produced by the hull/bulbous bow.

After the tests, the fore body was slightly modified; a final lines plan was prepared and sent to Marintek, which carried out a set of tests for resistance, propulsion, streamlines, and 3D wake measurements. These revealed outstanding results for fully loaded draught and proved the preliminary test to be a good investment.

An extract from Marintek's report showing residual resistance for the Aker TP150 tanker and comparable ships.



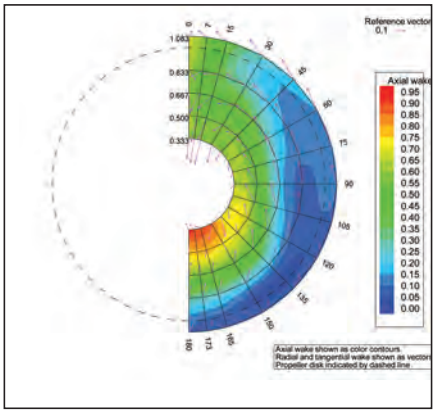
Safeguard Universal, followed by two 100-micron coats of Seaforce antifouling (light red and dark red). Total dry film thickness is 600microns.

Propulsion is provided by a MAN medium-speed engine of 5700kW (MAN is the new name for former MAN B&W medium-speed models), which is laid out to drive an Alpha high-skew CP propeller of approximately 5.80m diameter through a Reintjes flexible coupling and reduction gear fitted with a power take-off shaft for a 1450kW alternator. This alternator is reversible and can be used as a 'take-me-home' device in case of main engine failure. Using the main diesel engine, this plant gives a minimum service speed of approximate 15.50knots. Auxiliary electrical power comes from three 760kW Wärtsilä-driven gensets.

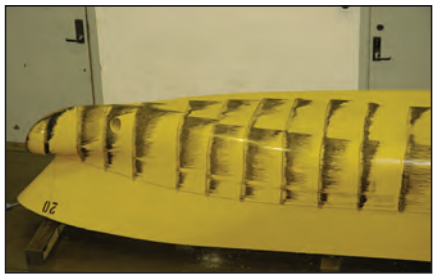
A CO_2 firefighting system is fitted for the machinery spaces, assisted by a local water-mist system, as required under the new regulations, while foam monitors are provided to cover the cargo tank area.

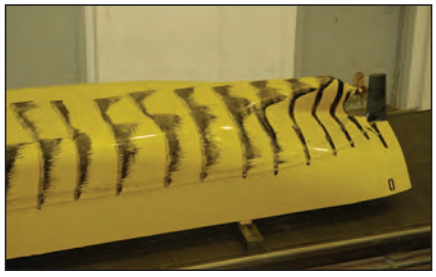
Aker Brevik Engineering also has other product/chemical tanker designs ready in its portfolio; these are the TP130 (13,000dwt), TP120 (12,000dwt), and the smaller TP57 (5700dwt).

Axial wake polar plot with transverse wake vectors, made by Marintek for the TP150 tanker.



The results of paint streamline tests, showing the bow and stern areas.





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Ever the Apprentice

By Kenneth Rawson, FRINA. Published by The Memoir Club, Stanhope Old Hall, Stanhope, Weardale, County Durham,UK. 2006. 222 pp. ISBN 1-84104-155-6. Soft back. £14.95.

Ken Rawson has many friends at RINA and his name will be familiar to most, if not all, members. Many will have been taught by him or have served with him in the various organisations within which he worked. All will find this book fascinating to read, and I would venture to say that even his close friends would learn something new about him from its pages.

In a foreword, Peter Usher, a former president of the institution, says that Ken was '…intellectually ahead of the field, but not aloof. A good leader, cheerful and considerate of the well-being of others.' I would certainly agree with that, and it is clear that Ken was, and remains, fair, honourable, and caring.

Apart from covering Ken's life and career, this book is a social history of the times through which he has lived. It is full of thought-provoking commentaries and reflections on life and the changes that have occurred over the best part of 80 years.

As the title suggests, we can go on learning all our lives, and this is something Ken has clearly enjoyed. He has been blessed with a very fulfilling family life, with a loving wife, three children and eight grandchildren. He has enjoyed interacting with people in general but in particular, with the young. That must be one reason he found the part of his career in academe so rewarding.

Three years ago, Marshall Meek, another former RINA president, produced a book, *There Go the Ships*, describing his life up to that time. It was a blend of personal reminiscences about family, friends, religious beliefs, and matters of national and international importance. Ken Rawson's book covers similar ground but in a different style, as one would expect.

It is interesting to compare the experiences, and thoughts, of Marshall from the private sector with those of Ken who worked in the UK Ministry of Defence and at university. The two men were friends and their paths crossed at RINA and also when dealing with the so-called 'short fat ship' controversy which began in the late 1970s. Both books show what a varied and rewarding career a naval architect can enjoy.

Ken had a harder, but probably a much more rewarding, childhood than children of today. With his brief but vivid descriptions the characters he mentions seem to come to life. In fact, I went to the same grammar school and can easily recognise the masters he describes but does not name. His boyhood love of ships brought him to Portsmouth Dockyard and a cadetship in the Royal Corps of Naval Constructors. A year at Devonport (where he met his wife-to-be), three at the Royal Naval College, Greenwich, and a year at sea completed his training.

There followed a career in design, a secondment to Lloyd's Register, research, ship upkeep, and teaching at University College London. He finished his career with the MoD as the chief naval architect. He left that post, and the Ministry, because of his experiences with the 'short fat ship' controversy.

Those experiences introduce the one sour note in the book, because of the way the media behaved. In spite of the facts supporting Ken's stance on this issue, they treated him shabbily, I believe. It is a sorry thing for a country when the media are willing to treat an honest, sincere man in this way. It is also sad that Ken received so little real support, with a few notable exceptions, from within the MoD, which he served so diligently.

When Ken left, he took up a post at Brunel University as head of the department of design technology. This was at a time of change in the way the subject was regarded and taught. It meant hard work but Ken's efforts led to a course and a degree that students and staff can be rightly proud.

Over the years, Ken served the institution, and our profession, well. He served on many committees and on the Council over many years, including a stint as chairman. I would suggest that he served us particularly well as chairman of the Safety Committee, directing its work during a very important phase, during which a number of critical, and sensitive, issues had to be addressed.

I have known Ken well over the years, our real collaboration starting with the writing of *Basic Ship Theory*, back in the 1960s (and still

regarded, 46 years later, as a classic text book for naval architectural students - *Ed*). It was hard work but we are both pleased we took on the challenge. We are still good friends and enjoy meeting up from time to time to discuss life then and now. I feel sure that all members - and non-members - will find much of interest in this book.

Eric Tupper

Maritime Security - A Practical Guide

By Steven Jones. Published by The Nautical Institute, 202 Lambeth Road, London, SE1 7LQ, UK. 2006. Softback. 258 pp. ISBN 1 870077 75 X. £27.50 (£19.25 to members of NI).

The author's special interest in maritime security was aroused when pirates attacked his ship, on which he was serving as a deck officer. He has also worked in marine fraud investigations and, as a security specialist, at a major protection and indemnity association. He has used this experience, together with his in-depth knowledge of the International Ship and Port Facility Security (ISPS) Code to produce this practical guide to maritime security. In a foreword, the secretary-general of IMO welcomes the book.

Terrorist attacks and piracy are not new but, unlike attacks on aircraft, the media does not always report them fully. In 2005 there were 276 acts of piracy reported and 25 vessels were hijacked, with 440 crew members being taken hostage. During the Iran/Iraq war there were 395 attacks on mercantile shipping. The hijacking of *Achille Lauro* in 1985 led to the security of passenger shops becoming an issue.

However, it was the 2001 terrorist attacks in the USA that brought things to a head by showing what attractive targets shipping and ports were to terrorists - either for attack or as the means of delivering an attack. IMO undertook to coordinate the response to the threat of maritime terrorism to ships and ports. The outcome was chapter XI-2 of the SOLAS Convention and the ISPS Code, introduced in July 2004. It is the aim of this book to give those in the maritime industry a good understanding of the code and its consequences.

The shipping industry is one of the most regulated in the world. On safety, the overarching code is the International Safety Management (ISM) Code. Security is distinct from safety and, in some cases, a compromise is needed between the two. For instance, making access by terrorists to the ship difficult may also hamper removing crew and passengers to safety in an emergency. The naval architect is well used to compromise.

On the design side, it is necessary to make unauthorised access difficult both in port and when underway; powerful upper deck lighting is needed on deck and over the surrounding water; means of restricting access to sensitive areas must be effective; and suitable surveillance and communication equipment must be provided. This must not be at the expense of effective ship operation and safety. This brings us back to a compromise. It is necessary to be able to assess the effect of explosions on ship structure and equipment.

In commissioning this book, The Nautical Institute wanted to demonstrate best practice in introducing and maintaining effective security in ships. It can be said that the society achieved its objectives. To assist those wishing to increase their understanding of special requirements, more than 300 sources are quoted including websites. The book will be very useful to all involved in maritime security.

Eric Tupper

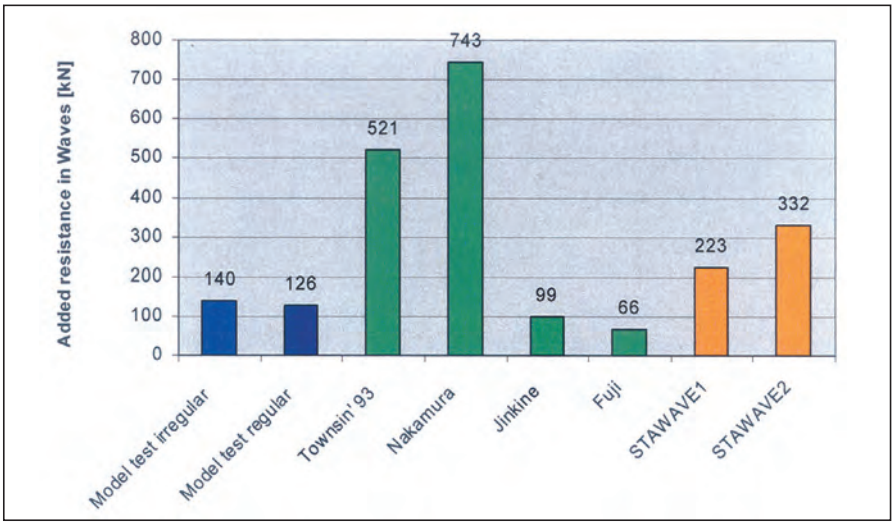
BIMCO Ice Handbook

Published by BIMCO Informatique A/S, Bagsvaerdvej 161, DK-2880 Copenhagen, Denmark. ISBN: 87 90342 37 2. 160 pages. Softback. €65.00 (BIMCO members) or €119.00 (non-BIMCO members). E-mail: sales@bimco.org

Ice demands serious respect from all those involved in the industry. Readers concerned with chartering ships will find this new book of great interest, since it discusses the careful preparations needed prior to sending a ship into ice-infested waters. The new publication provides a wealth of information in a handy format, and includes many charts and illustrations.

New industry standard for speed trials

This year's Shipbuilding, Machinery and Marine Technology (SMM) international exhibition, held from September 26-29 in Hamburg, Germany, broke all records. A total of 1669 exhibitors from 50 nations took part. The exhibition itself, already enormous in 2004, was considerably extended, with the opening of three new halls (more to follow for 2008). Trade visitors totalled more than 45,000 - another record, and 70% claimed to be decision-makers in their companies. *The Naval Architect* was also there, and in the following pages, we report on a small selection of the many innovations on show.



Comparison of the new STAWAVE added-wave-resistance prediction with earlier methods and with model test results, for a 174m-long loaded product tanker.

A NEW reference system for sea trials is being promoted by the Dutch model test basin and research organisation MARIN. The object is to try and avoid anomalies that arise when ships do not always run as well in service as during trials after completion. This is the result of a three-year study - the Sea Trials Analysis joint industry project - initiated in 2002 by MARIN in association with three leading owners: Shell, P&O Nedlloyd, and Maersk; the outcome is a best-practice code for conducting sea trials, also a recommended analysis procedure.

This new standard should help to contribute towards higher quality ships, since the speed/power performance upon delivery can be derived, it is claimed, with transparent and reliable methods. Within the project, traditional trial procedures were reviewed, using ISO 19019 and ISO 15016 as starting points, and 20 ships were investigated and re-analysed.

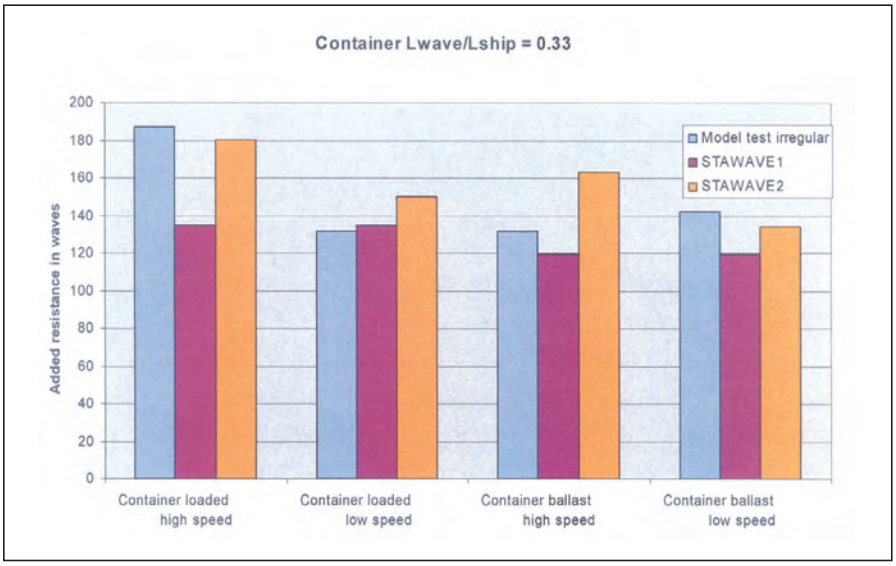
Subsequently, new methods for conducting a speed trial and new analysis techniques were developed, including correction methods for conditions deviating from the contract specification. In particular, correction techniques for wind and waves were developed, since it was found from 20 trial case studies that existing methods were not reliable for present-day ships and can actually lead to substantial trial speed deviations.

Already, the new standard and the specially developed software QSTAP, for onboard analysis and reporting of trials, have been verified and demonstrated in Korea on five recent new ships. According to MARIN, speed/power performance can now be assessed to within 0.1knots, whereas in the past, trial speed deviations of up to 1.0knots have been recorded. The software package is commercially available.

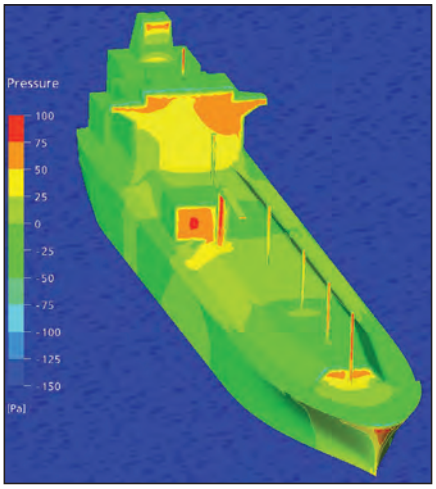
Since 2002, the group members have expanded to include other owners: CP Offen, ER Schiffahrt, Hapag-Lloyd, Kuwait Oil Tankers, NDR-H Schuldt, NSB, Teekay, UECC, Vela, and Vroon, also the following Korean and Japanese shipyards: DSME, Hanjin, Hyundai Heavy Industries, Samsung, STX, and Sumitomo. MARIN invites further companies to join in this useful project.

Although the project is formally finished, group members will continue to exchange experiences, and at the same time, a new two-year project, Service Performance Analysis, will start up this month (November), to examine performance increase and fuel cost reduction. The catalysts for this have been the extremely high prices for fuel today and the new restrictions on exhaust-gas levels.

Validation of new STAWAVE methods for a container vessel in short waves.



Various inputs were used by MARIN to develop its new trials standard, including these wind pressures on an LNG carrier, computed by CFD techniques.



NAVAL PLATFORM TECHNOLOGY SEMINAR 2007

New Environment, New Technology, New Capability

16-17 May 2007, Singapore

CALL FOR PAPERS

The Republic of Singapore Navy (RSN) is pleased to organise the **Naval Platform Technology Seminar (NPTS) 2007,** in conjunction with the **International Maritime Defence Exhibition Asia (IMDEX Asia) 2007**.

Today, Navies are faced with a widened spectrum of operations. As a result, new tactics, doctrines and strategies have to be developed to meet these new challenges. Correspondingly, new capabilities have to be developed, often by applying new technologies, to support the new tactics, doctrines and strategies. The theme for NPTS 2007 is therefore **'New Environment, New Technology, New Capability'**.

Technical papers are invited on the various aspects of naval technologies including **design of manned and unmanned surface and sub-surface platforms, advanced materials, hydrodynamics, survivability, propulsion, maritime and port security, sensors and weapon systems.**

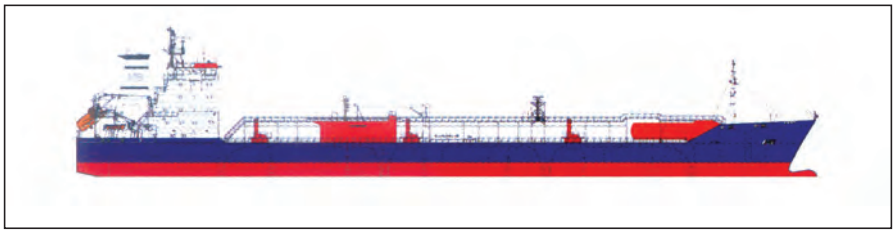
To submit a paper or for further information, visit the conference website at www.mindef.gov.sg/navy/npts

H B Hunte: concentrating on new-generation gas tankers

AS many readers will know, the marine gas carrier industry is enjoying a boom period at present. This optimism is primarily centred on LNG carriers, but in parallel with this is a most interesting rise in the LPG sector, which has also led to new generations of smaller vessels, including a niche market for tankers equipped to load both LPG and LNG.

One consultancy that is much involved in these matters is H B Hunte Engineering, a company formed during the 1990s out of the H Brand Shipyard, at Oldenburg, a yard with several gas tankers in its portfolio. That yard is now closed but the expertise remains, being transferred into Ingenieurbüro Hartwig Brand and in 1999 to a second company, H B Hunte Engineering. Both are flourishing, and, although also involved in designing bulk carriers, container ships, and livestock carriers, gas carriers are a prime target of Hunte. Nupas-Cadmatic and Napa software are employed.

One of the consultancy's newest designs is the recently completed *GasChem Shinano*, a 6500m^3 LPG/ethylene carrier, ordered by Hartmann Schiffahrt for operation within the GasChem Services pool. She is the first of four ships ordered from the Severnav yard in Romania to a new design (although based on the successful 2004-built 8495m^3 *GasChem Baltic*) and is engineered to carry cargo at -104°C and 4.5bar. The following three vessels will be named *GasChem Mosel*, *GasChem Leda*, and *GasChem Rhona*.



Profile of a 17,000m^3 LPG/ethylene tanker, one of a number of projects being worked on by the H B Hunte Engineering consultancy.

The fore and aft parts of the hull were optimised at the HSVA model basin, and for the first time for this type of ship, it is believed, a narrow bulbous bow has been fitted. Optimisation was especially aimed at achieving a good speed when carrying ethylene and when in ballast, thus, ship speed when carrying vinyl chloride monomer is 16.00knots but this rises to 16.50knots when loading ethylene, and more than 17.00knots when in ballast.

H B Hunte is currently working on a project for a 30,000m^3 tanker to carry LNG cargoes using bi-lobe tanks (similar revolutionary concepts are also being proposed by Tractebel Engineering and were discussed in our October supplement *Gas Carriers: Trends and Technology*); work is also being undertaken on another project for a 17,000m^3 ethylene tanker with four cargo tanks. In a different sector, the consultancy also carried out, in association with the Dutch company Vuyk Engineering, the basic design for the submersible heavy-lift ships ordered from Lloyd Werft by Combi Lift (*The Naval Architect* September 2006, page 24), and is working on a new-generation livestock carrier.

New common-rail engine launched

THE need for sustainable development has been identified by Caterpillar in its corporate 'Vision 2020' strategy. Considering customer expectations, and emissions regulations, the company believes that electronically-controlled engines will gradually become the norm. To this end, Caterpillar has developed in-house simulation and analysis tools for engine combustion, fuel systems manufacturing, and internal electronic controls design.

The company has also invested heavily in its ACERT technology. This utilises a number of modular building blocks, allowing the combustion process to be managed precisely, optimised to the given operating point. This leads to less emissions and noise, and gives better performance. The modular system allows tailor-made solutions.

On display at SMM was a MaK 6M32C medium-speed marine engine, equipped with Caterpillar common rail (CCR) and ACERT technology. Following extensive research on engine durability with heavy fuel operation and careful evaluation of field experience with competing solutions, CCR, it is claimed, will combine cutting-edge technology with best-of-class reliability. Starting with the MaK M32 engine series, CCR will be available eventually for the whole MaK medium-speed portfolio, comprising M20C, M25, M32C, and M43C engines.

A Caterpillar 3516 high-speed marine engine was also on display, mounted on a common base frame with gearbox, ready to be installed for megayacht propulsion. Also aimed at the pleasure craft market was the Caterpillar C32 model, the most powerful member of the new electronic C-family of high-speed marine engines. This C32 on display was equipped with ACERT technology, providing for improved performance and reduced emissions.

An example of the new MaK 6M32C engine, equipped with Caterpillar common-rail technology.

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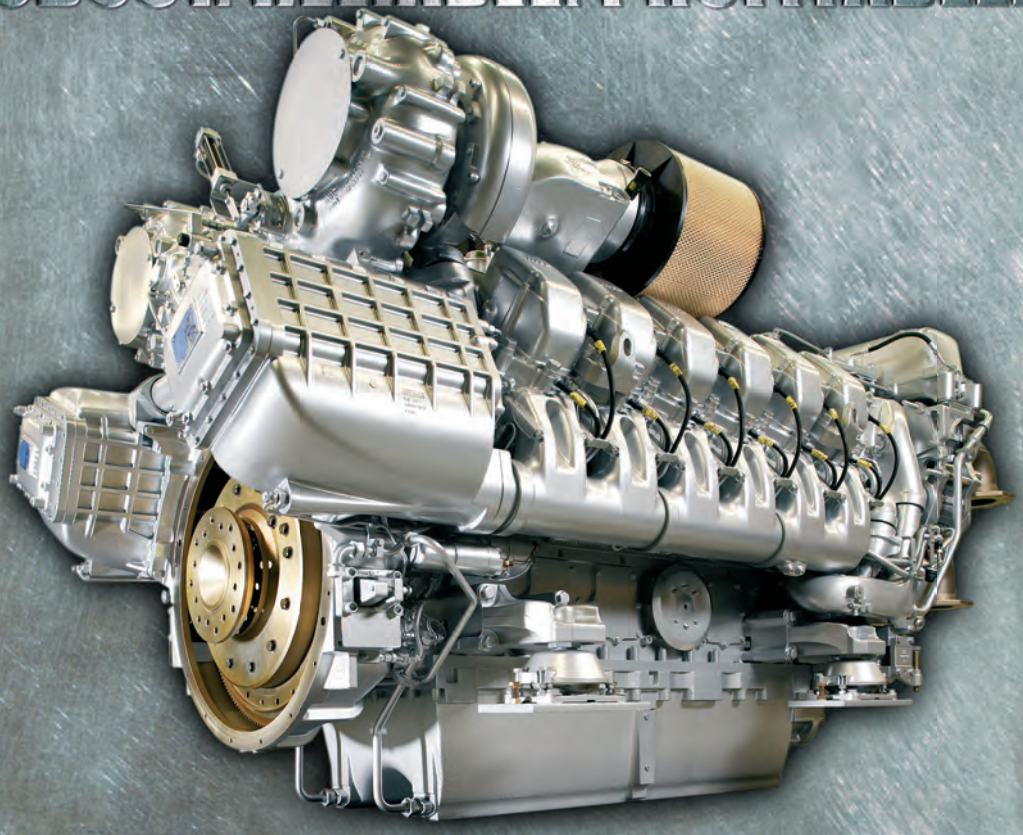

MTU SERIES 4000 FOR WORKBOATS

www.mtu-online.com

mtu

The Royal Institution of Naval Architects

Developments in Classification and International Regulations

24 - 25 Jan 2007, London, UK

Second Notice

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

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

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

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

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

- The effect on ship design
- The impact of the Common Structural Rules
- Consequences for industry
- Future directions for development
- The role of IMO, Flag States and Class Societies

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New contracts for innovative cargo-access equipment

PREVIOUSLY called Macor Neptune, Macor Marine specialises in hatch cover and ro-ro equipment, cargo and passenger access equipment for cruise vessels and megayachts, and turnkey systems including hydraulic power pack systems, shell doors, rudders, and platform systems. Recent developments include the Macor Compact Locking System (MCLS), which combines the locking bolt and hydraulic cylinder function of conventional door cleating systems in one unit.

The hydraulic cylinder of the MCLS is equipped with integrated closed-in limit switches, which check the position of the piston only, as well as a self-locking system, which can only be interlocked through external hydraulic pressure, guaranteeing the locking requests of a class society.

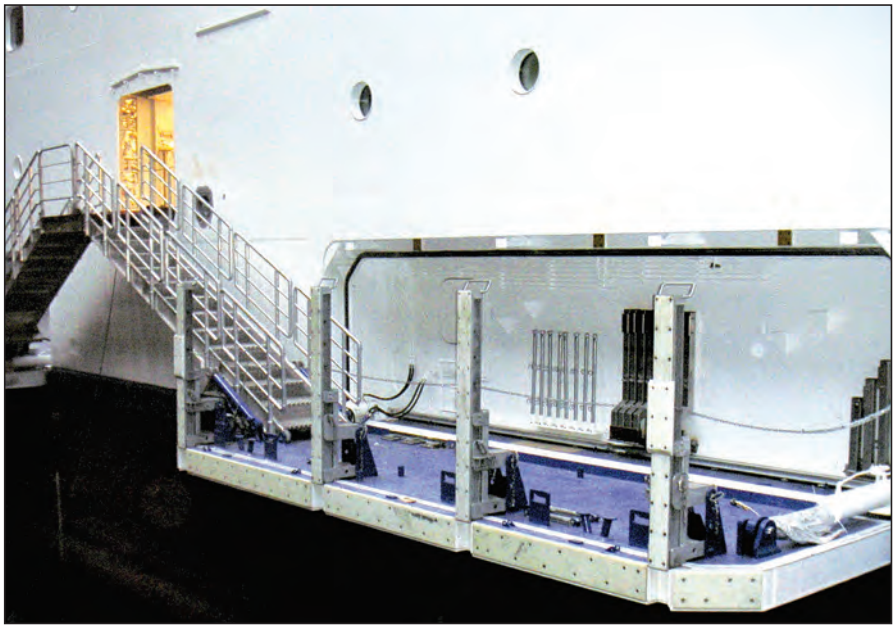
This system, which has been type-approved by Det Norske Veritas, is said to eliminate the need for the complicated mimic of a conventional sliding bolt system, used inside many shell door structures.

Another new addition to Macor's portfolio is sandwich pads, which can be used as flexible, elastic, and non-sliding hatch cover support pads. Due to the integrated design features, a horizontal container-vessel hatch movement balancing of +/-75mm can be guaranteed, it is claimed. Since the sandwich pads can do without the ordinarily necessary framing system of conventional bearing pads, the pads only slide over the hatch coaming when the hatch movement is larger than the offered 150mm range, but without creating any damage to the structure.

Compared with conventional hatch cover support types, the Macor sandwich pad needs no coaming-side support plates since it directly rests on the coaming bar. Welding of support frames or special coating is not necessary. The pads are said to be easy to install, with the differences in coaming height compensated by a shim plate between cover and fixing plate of the hatch cover support. They are also claimed to be easy to replace and require little maintenance.

In another sector, Macor is supplying twin spade-rudder systems, a large stern ramp, and tweendeck and pontoon hatch covers (equipped with the new sandwich pads) for the two 11,000dwt Combi Lift submersible heavy-lift ships (*The Naval Architect* September 2006, page 24). Other recent contracts include the supply of a foldable helicopter landing pad, shell, tender and stern doors (equipped with the MCLS cleating systems) on two megayachts building at TKMS Nobiskrug Rendsburg.

By early 2007 and early 2008 respectively, two SSW Super 1000 container ships will have been completed by Schichau Seebeck for the German owner Bernd Sibum, based in Haren/Ems. These vessels have a length overall of 151.72m, are 23.40m width, have an 8.00m maximum draught, and they will have a loading capacity of 1036TEU. Macor will be supplying hydraulically-operated, hinged weather deck hatch covers (equipped with Macor sandwich pads).



A typical product from Macor's portfolio: a folding tender embarkation platform fitted to a cruise liner.

SharpEye: revolutionary new radar technology

ONE of the most revolutionary new technologies to be introduced into the marine market since the introduction of commercial radar in the 1940s is claimed to be SharpEye, from UK-based Kelvin Hughes. For 60 years, radar has had to use short high-power pulses of microwave energy to detect contacts on the sea surface. With the patented SharpEye technology, Kelvin Hughes has eliminated the magnetron and high-voltage modulator from its latest series of radar transceivers.

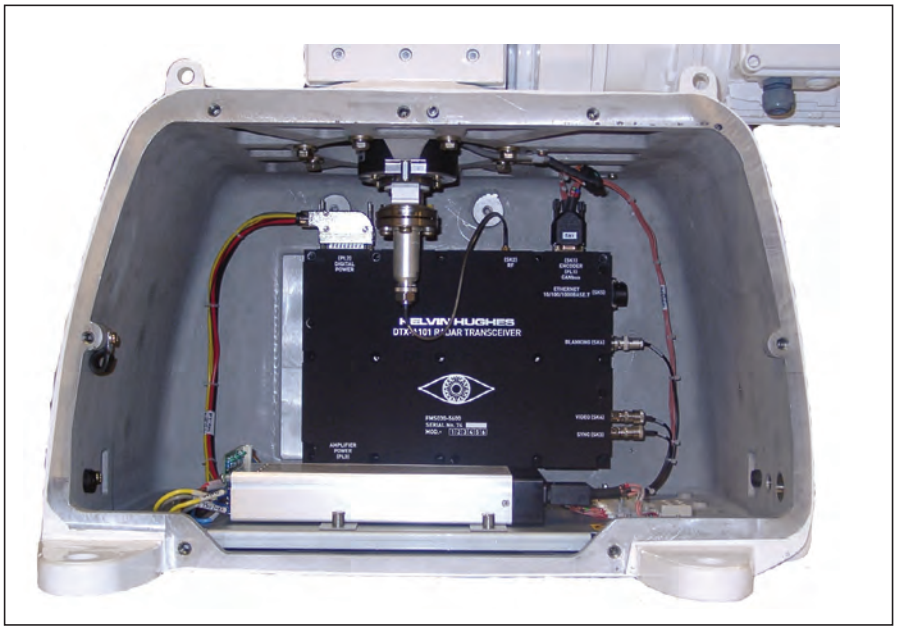
A radical approach within the transceiver enables more information to be extracted from the radar returns before processing by the display, allowing detection techniques, normally only found in highly expensive military systems, to be available in commercial equipment. SharpEye can also be fitted to existing Kelvin Hughes Nucleus 3 and Manta systems.

The new S-Band SharpEye system will detect targets in clutter long before conventional radar, it is claimed. It achieves this major performance advantage through the use of a monostatic pulse Doppler solid-state transceiver that uses the Doppler effect to determine a target's velocities. It features advanced pulse compression, which processes received echoes into velocity bands, enabling it to separate wanted targets from clutter. With no items requiring periodic replacement, SharpEye should ensure that only a minimum amount of maintenance is needed.

In the SharpEye radar, the solid-state power amplifier has a peak output power of just 170W; this contrasts with typical marine radar systems in which the magnetron has a 30kW peak output. At the same time, SharpEye produces more energy than the magnetron system, therefore exceeding conventional radar in detection performance.

The system continuously measures key performance parameters such as RF output power, VSWR, oscillator frequencies, and receiver sensitivity, and informs an operator that the radar is operating within its performance envelope. The system automatically alarms if there is any degradation in radar performance and removes the need for periodic performance checks.

Kelvin Hughes is so confident of the reliability of this new technology that it is offering a lifetime guarantee in support of the SharpEye technology.



An S-band turning mechanism with SharpEye.

World's first wide-screen bridge console

Meanwhile, Kelvin Hughes has developed what it claims is the world's first wide-screen bridge console, using the new MantaDigital common-core processors. This was shown for the first time at the SMM exhibition.

Anticipating new IMO standards coming into effect in 2008, the new common-core processors will meet the requirement for enhanced performance in radar processing and tracking. They have also been designed to be totally multi-functional with the capability of enabling the display of radar, chart, radar plus chart, and more. The MantaDigital chart radar is also capable of being configured for individual preferences.

Using the latest wide-screen flat panels, the new MantaDigital bridge comprises three completely multi-functional displays, each of which is capable of showing digital charts, radar, conning information, or the new and claimed to be unique dual plan-position-indicator (PPI) function.

The ability to display different scales, orientations, motion modes and trail modes from the same radar sensor on the dual PPI provides an added safety benefit for the mariner. On the main PPI, a navigator will be able to use the chart radar in many configurations for his anti-collision and general navigation. On the second PPI display, on the same screen, the operator is able to have the range scale looking further out to assess risk further down his planned track.

MantaDigital processors are already available for ECDIS, VDR, and SVDR. The new Kelvin Hughes chart radar will be available in 2007, to meet the new IMO standards.

Extensive digital processing and clutter-reduction algorithms are used to exceed the new radar performance standards, as well as improving reliability and reducing service interventions, thus saving time and reducing costs.

The new MantaDigital wide-screen bridge has been designed to:

- reduce an operator's workload by simplifying the use of radar
- incorporate the new MantaDigital chart radar
- provide dual PPI displays on the same screen
- utilise truly multi-functional screens
- integrate SharpEye technology to maximise detection and tracking capability
- provide correlation of radar and AIS for improved target tracking and collision avoidance

The new Kelvin Hughes wide-screen bridge utilises MantaDigital common-core processors.

- use the latest technology to increase and enhance safety at sea including the use of 'picture-in-picture' technology
- greatly enhance reliability and reduce through-life costs by using common core technology.

The radar processor is designed to provide facilities for remote diagnostics through a network or modem link to include: remote software upload - for both primary radar application and embedded software; remote diagnostic download - for configuration data, run-time parameters and recorded radar data for analysis; remote control of radar; remote download of total operational hours (ie, run-time) for all components with a limited life (eg, if magnetrons are used); and service call initiation (under operator control) - automatic fault finding and reporting.

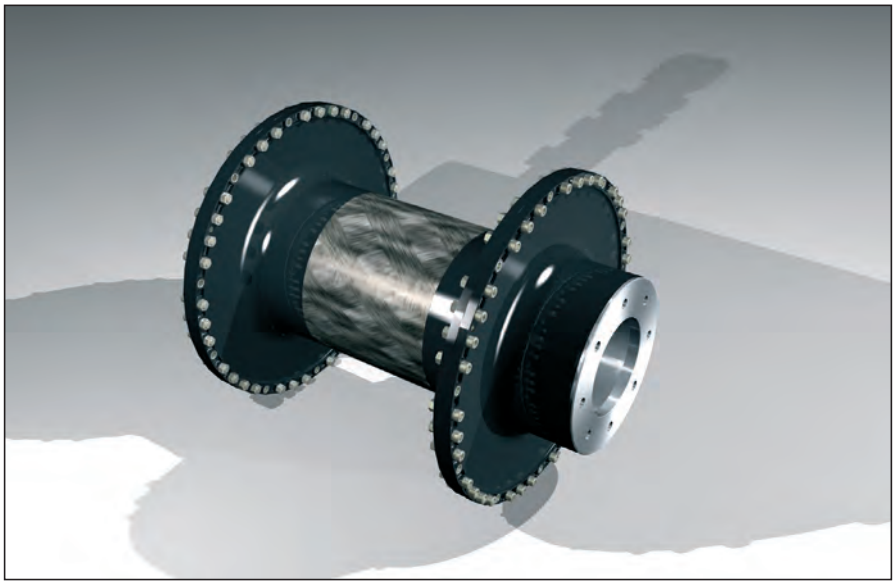
Membrane-type coupling from Centa

A NEW membrane-type propeller shaft coupling has been launched by the German manufacturer Centa. This is the Centadisc-C4 design, which allows a naval architect to span larger distances without intermediate bearings, especially with waterjet systems, as well as offering a considerably higher torque range. By using carbon-fibre composite shafts, lines up to 10m are possible.

Shaftlines with Centadisc couplings should be torsionally stiff, free of backlash and can compensate for axial, radial, and angular misalignment. Both membranes can adjust their outer diameter jointly, since they are not rigidly clamped.

The materials used are aimed at high-performance applications, and a novel adhesive bonding techniques applies a static safety factor of five, compared with a nominal torque. The Centadisc-C4 series covers a torque range from 2kNm to 20kNm.

Centa has also designed a new Centax-B series of high-flexibly coupling for all main and auxiliary drives - especially on gensets, where ship designers are seeking torque ranges between 5kNm and 240kNm. Centax-B models combine flexible elements with a simple, stiff pin and bush coupling, offering medium to high torsional flexibility, depending on the number of Centax elements. These elements can be exchanged without disturbance of the coupled units. Since the coupling can slide axially and can adjust on the bushes, the torsionally stiff pin and bush coupling allows substantial movement in the axial direction.

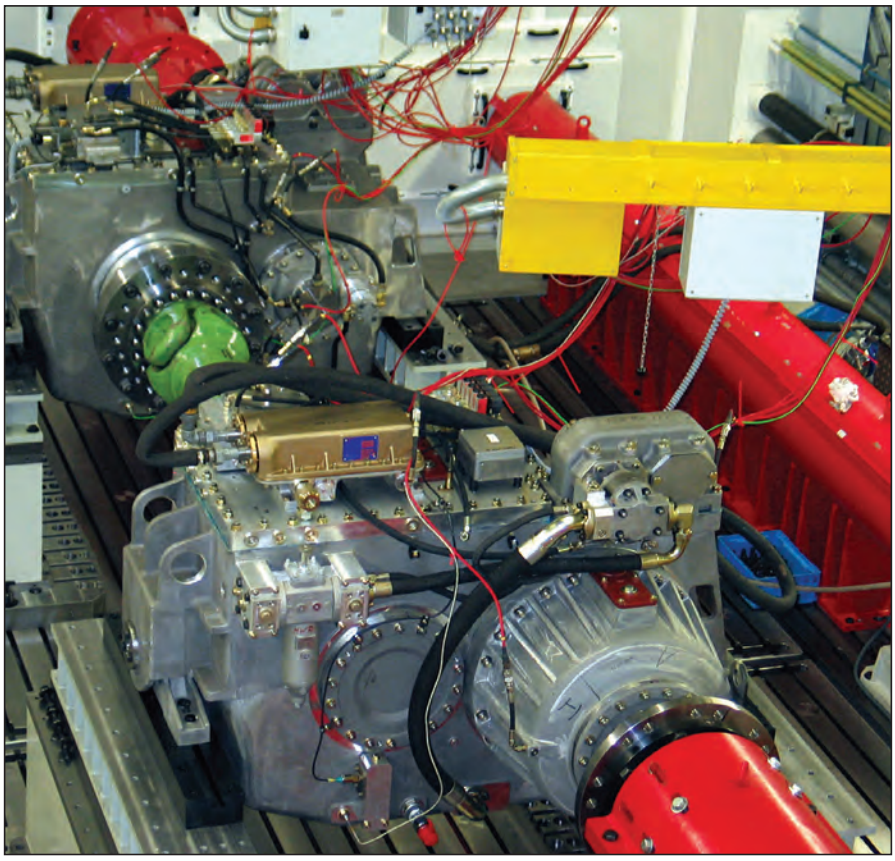


The new Centadisc-C4 membrane coupling allows designers to span large distances without intermediate bearings, particularly on waterjet systems.

ZF gears for new Austal ferry

SEEN here during back-to-back tests at the ZF Marine factory are two of the four 53800NR2H gearboxes for the new Austal-designed catamaran for Hawaiian Superferry, discussed in our September issue, page 116. This ferry is being built in the USA at Austal's yard in Mobile, Alabama.

These gears are of a horizontally offset design suitable for a maximum rated input of 10,890kW; on the Hawaii ferry these are coupled to MTU 20V 8000 M70 engines, each developing 8200kW. A hydraulic multi-disc clutch is included, and the casing is of lightweight cast aluminium alloy. One power take-off shaft, driven from the input, is also a feature but extra take-offs are an option.



Two of the four ZF Marine gearboxes for the new Austal catamaran being built in the USA for Hawaii Superferry are seen here during back-to-back tests.

2006 RINA
LLOYDS REGISTER SHIP SAFETY AWARDS

Nominations are invited for the 2006 RINA - Lloyds Register Ship Safety Awards.
Entries close 1st January 2007

The RINA - Lloyds Register Ship Safety Awards
recognise recent innovations or developments which have led to an improvement of safety at sea, or which have the potential to do so.

Entries may be submitted directly by individuals or teams from universities and industry from any country, and may cover design, construction, research, equipment or operations. Entries are judged on originality, quality of design, feasibility of production and contribution to ship safety.

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

There are separate categories for universities and industry. An Award of £1500 is made in each of the categories and will be presented at the 2007 RINA Annual Dinner.

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

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Lloyd's Register

New compliant oily water system

TESTING to receive US Coast Guard type approval for its new oily water separator (OWS) system has been completed by EnSolve Biosystems. The PetroLiminator PL630M was tested to meet the new IMO MEPC 107(49) clean water standards for overboard discharge. The first PL630M system will be installed on a Color Line ferry later this year.

The PL630M consistently achieved effluent levels of less than one part per million (ppm) in oil content. The highest recorded measurement in the tests was just 2.2ppm, far below the IMO specified limit of 15ppm. The system is rated to treat up to 20,000litres of bilge water daily.

EnSolve technology is claimed to be unique, and unlike any other OWS product on the market, in that it uses safe non-pathogenic hydrocarbon-degrading microbes to destroy particles of oil and other contaminants in the bilge water. This 'green' technology produces no harmful by-products and is free of hazardous materials.

The PetroLiminator system treats both pure and emulsified oil, as well as other organic chemicals, such as detergents, degreasers, glycols, and transmission fluid. The system's fail-safe oil content monitor, with automatic shut-off, should ensure that no contaminated effluent can be discharged accidentally.

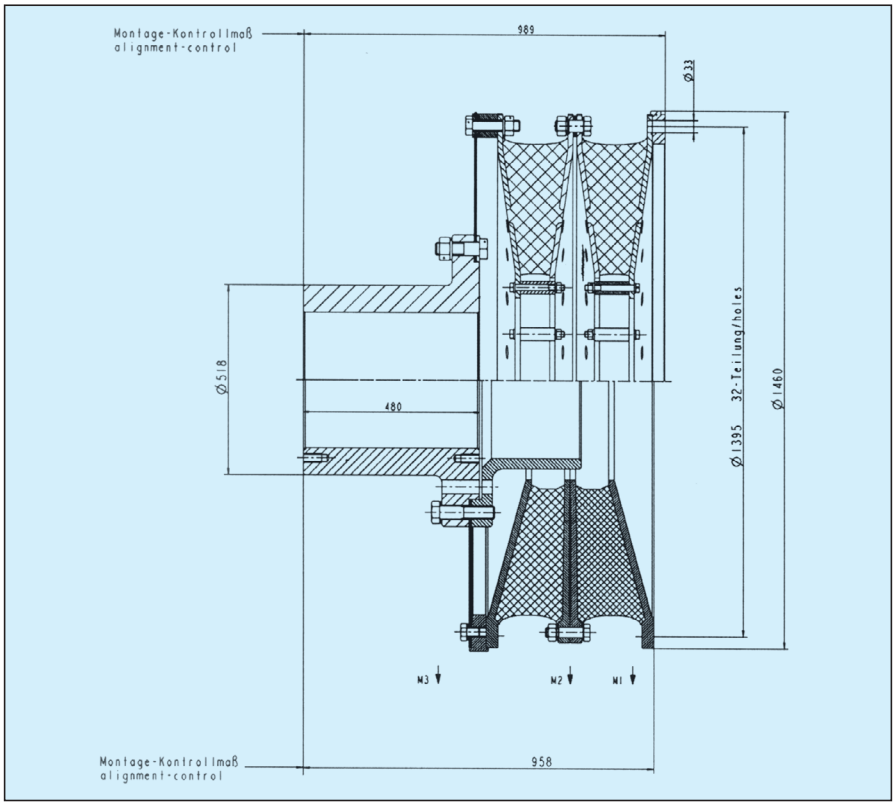
The PetroLiminator is virtually maintenance-free. There are no flocculants to add or beads to change, thus greatly reducing chemical and disposal costs. It operates fully automatically.

The PL630LM new-generation PetroLiminator, from Ensolve, of the USA, now has IMO and USGC approval.

The capital investment and operating costs are claimed to be far lower than those of other OWS technologies. Data gathered from operational shipboard PetroLiminator systems reveals average operational costs to be on the order of US$0.02/gallon of treated water.

Largest-ever Rato-R transmission coupling

THE latest Rato-R flexible coupling for marine transmission lines has been launched by the German manufacturer Vulkan. Until now, the largest Rato-R model was able to handle 8MW at 1000rev/min in both main and secondary drives but the brand-new R4720 coupling will be able to transmit 10MW at medium speeds (750rev/min). New R4710/20 sizes can absorb nominal torques up to 240kNm.



Section through one of the new Vulkan Rato-R4720-type flexible couplings, which can handle nominal torques up to 240kNm.

The Royal Institution of Naval Architects

RINA Historic Ships Conference

21-22 February 2007

Second Notice

www.cuttysark.org.uk

Courtesy: F Walker

Courtesy: F Walker

There are a huge number of historic ships that are in need of restoration/preservation. Several organisations exist, who aim to preserve these ships for the benefit of future generations.

This conference is aimed at exploring the technical and engineering issues involved in the construction, preservation and restoration of historic vessels from large passenger ships and warships to coastal and inland waterway craft, and of all nationalities and of local, national or international importance. Topics to be included are:

- Construction / building methods used for Historic Ships and their replicas.
- Materials and structural analysis, including appropriate material replacement, repair or replication.
- Propulsion systems, rigs and sails.
- Layouts and the need to meet current safety legislation.
- Techniques for conservation and restoration.
- Recording and deconstruction
- The balance between preservation afloat or dry.
- Maintenance of craft skills and training.
- The case for the replication of key historic vessels
- The sourcing of technical / historic information on "important" ships

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New-generation MTU engines showcased

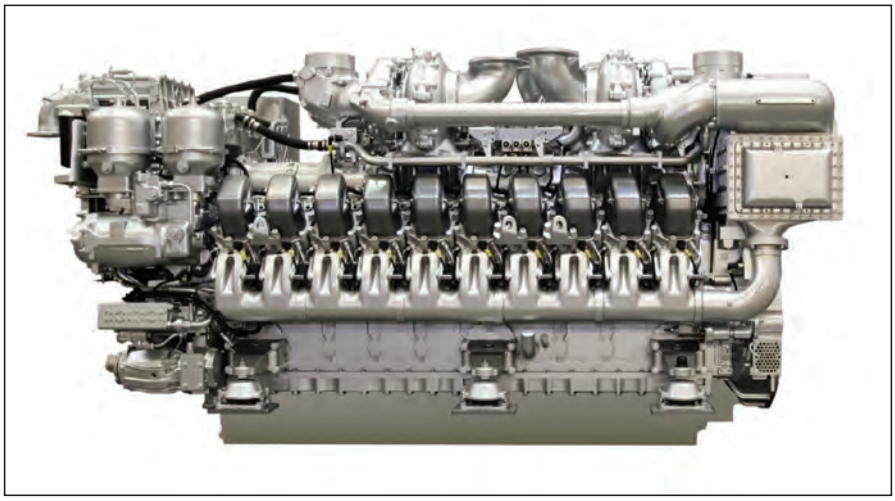
A NEW generation of the successful Series 4000 marine diesel engines from MTU Friedrichshafen was launched at SMM. These new propulsion units are said to be both cleaner and more powerful than their predecessors.

The new engines meet the more stringent demands of US EPA Tier 2 emission specifications which, in particular, prescribe a significant reduction in nitrogen oxides. The MTU marine units undercut the new NOx limit of 7.2g/kWh by employing purely internal engine technology without any exhaust after-treatment. The new combustion balance on the Series 4000 marine engines also achieves a significant decrease in particulate emissions.

The lower pollutant emissions from MTU's Series 4000 units are not achieved at the expense of reduced power - the opposite is actually true. Cylinder performance has risen by more than 26% from 170kW to 215kW at a rated speed of 2170rev/min. The total power of a 12-cylinder engine has thus increased from 2040kW to 2580kW, whilst the 16-cylinder unit has risen from 2720kW to 3440kW.

New in MTU's marine applications range is a 20-cylinder version of the Series 4000; this engine generates up to 4300kW. Despite the reduction in emissions, fuel consumption has also been slightly reduced.

As replacements for the older and larger MTU 595 Series, the new Series 4000 engines represent a significant fuel reduction. Replacing a 12-cylinder Series 595 unit generating 3240kW with a new Series 4000 16-cylinder marine unit delivering 3440kW produces fuel savings of around 10%. The same fuel reduction also results from replacing a Series 595, 16-cylinder marine diesel (4320kW) with a 20-cylinder Series 4000 version (4300kW).



The new Series 4000 marine diesel engines from MTU Friedrichshafen produce up to 4300kW.

Apart from fuel advantages, a decision to switch engines and engine series also means additional benefits in terms of space. Whilst the two engines are otherwise comparable in size, the new Series 4000 unit is around 0.5m lower and approximately 1.5 tonnes lighter. Because compliance with exhaust emission specifications has been achieved without exhaust after-treatment and the additional sub-assemblies that go with it, the new engine will fit the same footprint as its predecessor. Even the 595 interfaces remain similar, so that engine exchange is possible - whether the conversion is from Series 595 or an older Series 4000 unit to the new 4000 marine engine.

Reduced dimensions together with increased performance mean the new MTU engines are extremely compact in relation to power and their improved power-to-weight ratio produces the highest acceleration characteristics in their class.

Improvements with turbochargers

MTU has also achieved technological progress on the tubocharging front. The new Series 4000 marine engines are fitted with two (12- and 16-cylinder versions) or four (20-cylinder version) of the turbochargers developed and manufactured by MTU in-house. These can be switched in line with engine speed, and a single-stage sequential charging system ensures optimum performance across the whole engine performance map.

The latest generation of MTU's own electronic management system, ADEC (advanced diesel engine control), represents a further significant advance incorporated in the new engines. Among other features, the ADEC unit has triple injection electronics (pilot, main, and after-injection), which provide optimum control of the fuel injection process to ensure low-pollution, high-efficiency combustion.

Spray insulation for new LPG tanks: an important advance

AN important advance in insulating new LPG and ethylene cargo tanks has been developed by the Korean company Finetec. Repairs to LPG tanks using spray insulation have been made for many years, but never for newbuildings. The first new LPG tanker to feature spray-insulated tanks was delivered in March this year by Hyundai Heavy Industries, but this was not a Finetec system.

The concept of applying cargo tank insulation by spray on new ships is believed to be the first real development in LPG cargo technology for at least 20 years. Several Korean yards are expected to employ the new material soon.

Finetec is an established producer of polyurethane for cryogenic industries and has been producing spray foams since 1980. Since 2002, the company has additionally had a cooperation agreement with the Danish specialist Løgstør Marine (LR Industri), the leading exponent of pre-insulated pipes for ships, mainly for tankers.

Benefits of the Finetec system are claimed to be improved thermal efficiency, extended insulation lifetime, less maintenance, better weather resistance during assembly, and reduced application time. The advantages are most obvious where free-standing tanks are involved.

The system comprises two types of material: polyurethane foam for low-temperature insulation and a polymeric coating for surface protection. Between four and six layers of approximately 30mm each are required to build up a coating of 120mm thickness for LPG cargoes and more than 180mm for ethylene. Surface thickness tolerance is between +20mm and -5mm. The polyurethane coating is applied to a thickness of 3mm on the top of a tank, and 1mm on the sides and bottom. Both foam and coating will follow tank expansions and contractions, so there should hopefully be no problem with cracking. The system is understood not to be suitable for LNG cargoes because of the much lower temperature (-163°C) at which these are carried.

Spray application is said to eliminate the risk of creating voids, and the fact that there are no joints increases tightness. Complete bonding to all surfaces helps to eliminate accumulation of moisture. Finetec's system, which is applied by company staff, is designed to fulfil the requirements of Lloyd's Register, Bureau Veritas, Class NK, and Det Norske Veritas. DNV has issued an approval in principle.

Good prospects seen for SkySails system

VERY soon, sail assistance for diesel-powered ships using the German SkySails concept will take a further step towards becoming a commercial reality when a full-scale system should be operational on a commercial cargo vessel owned by the Beluga Group. SkySails GmbH & Co KG, based in Hamburg, has already fully tested its parachute-like concept, attached to a ship by a cable, initially at the HSVA model basin on an 8m model, representing a 200m x 30m container ship, which also ran trials in the Baltic Sea; results revealed that the concept is perfectly suited to cargo ships, with all previous calculations and assumptions proved to be correct.

During 2005, a SkySails package was tested on the experimental yacht-type vessel *Jan Luiken*, which was equipped for towing kite areas up to 40m^2. Launch and recovery systems were also successfully demonstrated. In January 2006, a 55m long buoy tender *Beaufort* was further equipped, and was used to check sails up to an area of 160m^2 suitable for cargo ships.

In 2007, the programme envisages the first full-scale cargo ship, one of Beluga's latest-generation 10,700dwt cargo/container vessels, *Beluga SkySails*, will be fitted with a SkySails system and will undergo extensive practical tests. This ship is believed to belong to the *Beluga Revolution* class, presented in *Significant Ships of 2005*. Later next year, SkySails are expected to be applied to a superyacht, and in 2008, the company plans to enter the marine market officially, offering parafoils up to 640m^2, although areas up to 5000m^2 are said to be possible. Retrofitting should not be a problem on most ship types.

SkySails believes that it can offer nominal powers of up to around 5000kW, and that fuel costs can be shrunk by between 10% and 35%, depending on actual wind conditions and achievable operational periods. Under optimal wind conditions, up to 50% fuel could be saved (the sail equipment is normally linked to a wind-optimised routing system).

Courses up to 50deg close to the wind can be navigated, but in practice, courses from 70deg can give a high degree of propulsion (most efficient between 120deg and 140deg). The mounting system is carefully chosen to ensure the ideal alignment on individual vessels and is normally positioned on the port bow. The towing cable, made of carbon fibre, is stowed on a dynamically operating winch. Steering is fully automatic.

Three illustrations show the launch and deployment of a SkySails system on the buoy tender *Beaufort*. Most attractive fuel savings are believed to be possible, given favourable wind conditions.

Transmitting high torques with small couplings

TWO new products were being promoted at SMM by Voith Turbo GmbH, one of which is the Hycon propeller shaft coupling. This is designed as a compact, lightweight unit, comprising essentially a tapered clamping sleeve and a conical hub. The hub is pushed onto the sleeve cone by hydraulic pressure, thus generating some radial pressure. Friction factors normally determine transmission torque: conventional couplings produce a mathematical friction factor of 0.14 while the Hycon design can achieve 0.3 - approximately 100% more than a conventional model. The end-result is that much higher torques can be transmitted by substantially small components, giving a weight reduction of at least 40%; at the same time, torsional vibration is reduced.

Apart from several orders for naval use, the new Hycon is being used (stainless steel models) in megayacht projects, and the Croatian yard Uljanik has also ordered the design for two new container ships.

Voith is also entering the waterjet market with its Voith Water Jet, which has been specially developed for ships sailing at speeds between 25knots and 40knots. The propulsor consists of a specially shaped jet, a rotor, and a stator. A key technical feature is claimed to be the unit's linear inflow and outflow; this is said to avoid flow direction changes and should result in significant efficiency improvements and lower noise levels. The prototype has a rotor diameter of 2m, a jet length of 3m, and can absorb an input power of 6.0MW.

Testing is currently under way at the SVA Potsdam model basin, and work is expected to be complete next year. Voith believes that, apart from military and para-military use, the new waterjet is also applicable to megayachts.

New Polish design consultancy

A NEW name on the naval architectural scene is the Baltic Design Centre, based in Gdynia, Poland. The company was set up in July this year by former leading employees of the Gdynia Shipyard, in association with the well-established Fast company (Zaklady Wielobranzowe Fast), which is known for its steel section fabrications, including complete deckhouses, and interior furnishing projects. Fast holds 50% of the shares in the Baltic Design Centre, with the remaining shares split among management and employees.

Baltic Design Centre employees are experienced in conceptual, contractual, and basic design work, and have already created some new ship designs, including a 45,000dwt chemical tanker and a 4500-unit car carrier. The centre is also fully prepared to carry out specific naval architectural projects such as finite-element and damage stability calculations, also to act as owners' representatives during newbuilding construction. It is expected that good relations will still be maintained with Gdynia Shipyard and that employees of the new consultancy will be able to assist with projects there.

New products from Renk

A NEW department has been established within the German gear, transmissions, and bearings manufacturer Renk, in its special drive technology sector. This central gear technology unit will focus on R&D activities.

At the same time, a number of new developments from the company have recently been launched. These include elastically-mounted gears with integrated thrust bearings. So far, these have been limited to a power of 8MW, and tests will begin at the start of 2007 aboard a yacht.

Another new design is the advanced thrust bearing (ATB). This allows a compact arrangement of an external thrust bearing and an elastically-supported gearbox. This patented construction of hydraulically-supported thrust pads provides for direct attachment of the bearing on the gearbox, and there is no need for the usual minimum distance of 10 times the shaft diameter. As a consequence, propeller thrust can be measured continuously without any extra appliance.

Before the development of the ATB, Renk incorporated the oil distribution box for a CP propeller into the shaft train of elastically-mounted gearboxes. A design variant of the ATB now allows users to directly mount the box onto the gear itself, analogous to the rigid support.

A new, patented propeller shaft separation clutch, type KAZ 45-450, is now being manufactured at the Renk plant in Hanover, and is particularly suitable for product tankers. Renk has so far supplied 12 of these clutches for six Stena twin-screw P-Max vessels which are currently under construction at Brodosplit shipyard, Croatia (*Stena Paris* was presented in *Significant Ships of 2005*).

Waterjet thrust bearings, especially conceived for high-power waterjet propulsion lines, were also displayed at the SMM exhibition. The thrust shaft - and with it the entire shaft train - can be aligned to +/- 6mm due to integrated hydraulic cylinders, ensuring that the waterjet impeller assumes the best possible position for optimum efficiency. In order to save weight, the casing is of light-metal design.

An example of the Renk PSC225 clutch, which will be fitted to each of the propeller shafts of the new 216,000m³ LNG carriers being built in Korea. It will allow a propeller to be disconnected from its low-speed diesel engine for economical running or for maintenance.

Gears and clutches for LNG carriers

Renk's plant at Rheine specialises in the manufacture of single- and twin-engine gearboxes and propeller shaft clutches, and currently is particularly concentrating on units for new-generation LNG carriers. Several new South Korean- and Japanese-built LNG tankers, with capacities of up to 165,000m³, are being equipped with electric propulsion and Renk twin gear units with centre distances up to 4000mm. Two electric motors are linked to the FP propeller by a twin-input/single-output gearbox to deliver a power output of 30,000kW.

Other new-generation ships will have twin electrically driven propellers, again featuring Renk gears. For another new series of large LNG tankers - ships with a capacity of 216,000m³ and powered by twin two-stroke diesel engines driving twin propellers, Renk's Rheine plant is supplying new propeller shaft clutches. These will allow the economical operation of only one engine in certain cruising conditions, as well as maintenance work during voyages.

Dutch thrusters for new Russian icebreakers

DISPLAYED on the stand of the Dutch propeller systems manufacturer HRP was the bow thruster for the second of the two new diesel-electric Baltic icebreakers being built at Baltiysky Zavod, in St Petersburg. These 114.00m-long ships were designed by the Central Design Bureau Baltsudoprojekt and the Krylov Shipbuilding Research Institute, primarily to support the growing trade in Russian oil exports from terminals such as that at Primorsk.

The 8001TT thruster, with its variable-speed electric drive, has an output of 1000kW at 1200rev/min, and the diameter is 2200mm. Blades are cast in stainless steel, and the unit is strengthened to meets the JIJI6 ice standards of the Russian Maritime Register of Shipping. Each icebreaker's two main propulsion azimuthing thrusters are being supplied by the Finnish manufacturer Steerprop and, at 8000kW each, are believed to be the largest-ever mechanically driven designs yet.

Seen here in the HRP factory at Krimpen aan den Lek is the 1000kW bow thruster for the second new icebreaker being built at Baltiysky Zavod.

Joint manufacture of low-speed engines in China

ENGINE manufacturer Wärtsilä, China Shipbuilding Industry Corp (CSIC), and Mitsubishi Heavy Industries (MHI) are establishing a joint venture to manufacture large, low-speed marine engines in China, including new two-stroke designs. CSIC will hold 50% of the joint venture, Wärtsilä 27%, and Mitsubishi 23%. The investment will total around €75 million, spread over several years. Production is scheduled to start at the end of 2008.

The joint venture will be called Qingdao Qiyao Wärtsilä MHI Linshan Marine Diesel Co Ltd (QMD). The start-up of the joint venture is subject to final approvals, which were expected to be received by the end of October 2006.

For CSIC, the QMD factory is much more than increased manufacturing capacity. It enables the yard to further develop the technological capabilities of its machinery industry, an objective aided by international cooperation.

The Chinese shipbuilding industry is growing rapidly and currently requires more engines than can be manufactured locally. As China has set itself the target of being the world's leading shipbuilding country by 2020, demand for low-speed engines is increasing correspondingly. QMD will primarily serve Chinese shipyards, however it will also be able to export engines to other markets such as Europe and India.

The QMD joint venture continues the cooperation started 2005 by Wärtsilä and CSIC to produce auxiliary engines. With MHI, Wärtsilä is cooperating in the form of a strategic alliance to develop two-stroke marine diesel engines.

The QMD factory will also develop, manufacture, and sell a new generation of energy-saving and environment-friendly low-speed two-stroke marine engines, built under licence from Wärtsilä and MHI. The factory will be in the Shanghai area, where CSIC is setting up a marine industry cluster.

Order for 50 propellers

Meanwhile, at the beginning of September the joint-venture company Wärtsilä CME Zhenjiang Propeller Co Ltd, in China, received an order for 50 FP propellers to be delivered to two shipyards, New Century Shipyard and New Times Shipbuilding Co Ltd, in the Jiangsu province, China. The order is worth €17 million.

With weights ranging from 28tonnes to 73tonnes, the propellers are designated for a large series of vessels, including 46 tankers and four container vessels, all being built at New Century and New Times for various customers. The vessels will be delivered between 2007 and 2009.

This order comes at a time when Wärtsilä CME is investing €8 million in a new propeller foundry at Zhenjiang. The investment will enable Wärtsilä CME to supply complete FP and shaftline packages, as well as blades and hubs for CP propeller installations. The foundry will be able to produce FP models with very large weights up to 140tonnes.

Automatic monitoring to avoid loss of stability

THE latest version of the established IMACS software package from the Israeli company Totem Plus contains some important new features; these have been especially created to assist ships' officers in determining transverse stability parameters (GM or VCG) automatically, either at the beginning of or during a voyage.

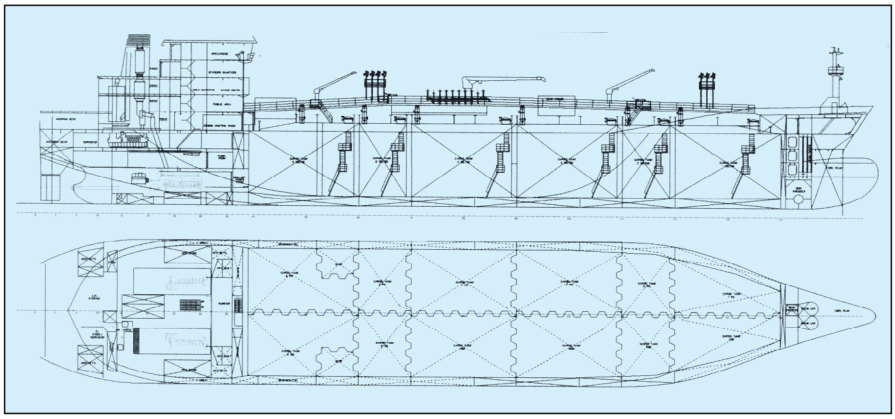
These calculations are especially important on car carriers and container ships, where the weight of cargo is based on a shore declaration and not on measured values. The consequences of loss of stability during a voyage were dramatically illustrated in the middle of this year by the heavy list taken on by the loaded car carrier *Cougar Ace* (she was subsequently saved).

IMACS software will automatically carry out an inclining experiment to determine the GM of a ship, and will display a figure for this and for the VCG. No user intervention or assumptions are required. Such information can also assist in avoiding parametric rolling in bad weather conditions, since rolling angle is monitored constantly, in real time. Advanced mathematical algorithms are applied to the data to deduce the rolling period and metacentric height.

IZAR Sevilla yard purchased by Huelva

AS many readers will be aware, today the giant Spanish state shipbuilding group IZAR has today virtually disappeared - partly as a result of a dispute with the European Union over subsidies, and buyers are being sought for the various yards. One of these key sites, in the city of Sevilla on the river Guadalquivir, is being purchased by the medium-sized private shipbuilder Astilleros de Huelva, based not far away in south-west Spain. At the time of writing, the purchase was still awaiting formal approval.

In recent years, Huelva has built a number of interesting ships, including ferries (such as *Manuel Azana*, presented in *Significant Ships of 1995*), a series of 123m-long ice-strengthened cargo ships, and more than 100 fishing vessels.



Profile and tank plan for the new 12,000dwt oil/chemical tankers being built by Astilleros Huelva for the Amoretti group.

TECHNICAL PARTICULARS
AMORETTI OIL/CHEMICAL TANKERS

Length, oa	119.00m
Length, bp	112.60m
Breadth, moulded	22.00m
Depth, to main deck	11.35m
Draught, design	7.30m
Cargo capacity	14,000m³
Slop tanks	400m³
Fuel	682m³
Gross	8600gt
Deadweight, at 6.00m draught	7100dwt
Deadweight, at 8.30m draught	12,000dwt
Main engines	Wärtsilä 2 x 8L32CR
Output	2 x 3680kW at 750rev/min
Speed, 85% MCR	15.00knots
Classification	Registro Italiano Navale C, +Oil Tanker-Chemical Carrier, ESP, Unrestricted Navigation, +Star Hull, +PMS, +AUT-UMS, +AUT-PORT, +AVM-APS, Clean Sea, Clean Air, Covent, In-Water Survey, Manovr, Monshaft, SYS-NEQ1, Cargo Control, VCS, SPM

IZAR's Sevilla yard has a long history, and has recently been noted for the construction of various ferries. Being located some way up a river has been a minor restricting factor in its operations, but its purchase by Astilleros Huelva should ensure continued work, especially as the latter currently has a relatively good order book. In particular, the new acquisition will allow larger hulls to be constructed; the Huelva site has a maximum length of around 140m, while Sevilla can handle ships up to 201m x 35m.

At present, Huelva's order book includes a series - today five ships - of freight ro-ro ferries for the UK operator Seatruck, a member of the Clipper group (reported in *The Naval Architect* April 2005, page 13). Their design was created by the Danish consultancy Knud E Hansen. Originally two ships were contracted for the Heysham to Warrenpoint service but subsequently more were added, including two with a lengthened hull - extended to 157.00m from 142.00m. The first, *Clipper Point*, was launched at the Huelva yard in September and will be delivered next February. Although mainly planned for unaccompanied freight, the ships have 12 single-berth en suite cabins for drivers.

A new order is for a pair of oil/chemical tankers for the Italian operator Marittima Etnea (Amoretti group). These 7100dwt/12,000dwt designs have 12 cargo tanks plus two for slops, with the total cargo capacity (12 tanks) being 14,000m³. A total of 12 segregations is possible, each tank being equipped with a Hamworthy Svanehøj DW150/150-3-K deepwell pump of 250m³/h. Pumps by the same manufacturer will also be installed in the slops tanks (2 x 100m³/h), and classification will be to the standards of Registro Italiano Navale.

A twin-screw propulsion plant is centred around two Wärtsilä 8L32CR main engines driving CP propellers through Wärtsilä gearboxes. Electrical supplies come from gear-driven alternator/motors and three diesel-driven units driven by Yanmar 6N21AL-GV engines of 1020kW.

Basque maritime association adapts to changing times

AN influential body in Spanish shipbuilding today is the Basque Maritime Industries Association (also known by the acronym ADIMDE). This association, with its headquarters in Bilbao, embraces 137 companies and helps to promote their activities - shipbuilding, ship equipment manufacture, and associated services; a few owners are also members. If required, packages can be assembled to meet owners' requirements.

Following the break-up of the state-owned IZAR shipbuilding group, association companies are having to adapt to a new era in Spain, but they are expected to meet this challenge. One of the most important moves affecting northern Spain is the current sale of the Sestao yard in Bilbao to Astilleros Murueta. Sestao's most recent claim to fame is the completion of the country's first new-generation LNG carriers (*Inigo Tapias*, presented in *Significant Ships of 2003*); one further such ship remains on order, for delivery in 2008 to Gas Natural.

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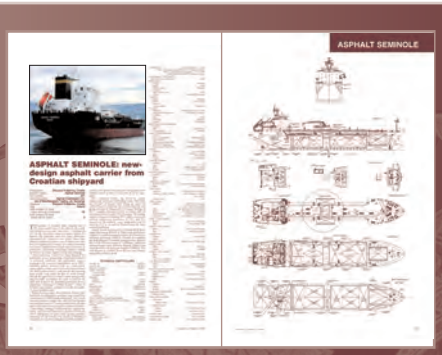

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Volcan de Tamadaba - enhanced ferry for Canary Islands

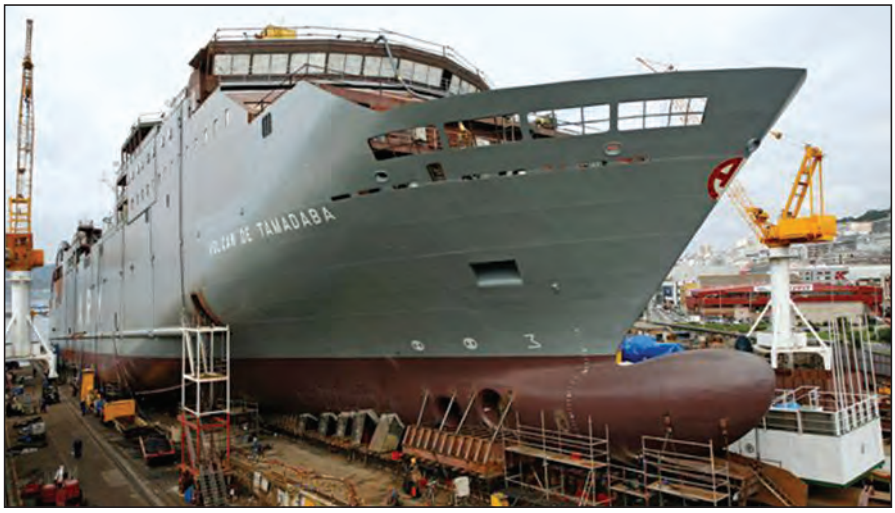
IN early October, Barreras Shipyard, in Vigo, launched *Volcan de Tamadaba*, the fifth ro-ro ferry from a series of eight near-sisters ordered by the Armas Group. She follows *Volcan de Tindaya*, *Volcan de Tamasite*, *Volcan de Timanfaya*, and *Volcan de Taburiente*, all of which feature slight variations to cope with the demands of various routes in the Canary Islands. Barreras is, of course, well versed in the construction of all types of ro-ro ferry, including freight versions and export car carriers.

It is noteworthy that the newest vessel (whose actual owner is Maritima de Barlovento, a company within the Armas group) is lengthened (between perpendiculars) by 12.00m to 137.00m, when compared with the first two ships, which had lengths of 125.00m. Through the specification of more powerful medium-speed engines (2 x 11,700kW), the service speed will be increased to 23knots (from 22knots in earlier examples, although *Volcan de Tamasite* was also able to reach 23knots); this will reduce the current time taken to travel on certain routes.

As on the previous vessels, stern-only ro-ro access is provided to the main deck, with the two upper decks reached by hoistable ramps. The total space available is equal to 1870lane metres or a typical mix of 57 x 16m trailers and 174 cars.

The number of passengers and crew is reduced to 1000 compared with earlier sisters, to give more extensive space for amenities. Eight two-berth passenger cabins are installed, together with 46 four-berth rooms, and two three-berth cabins adapted for disabled passengers. Lifesaving equipment comprises two 150-person enclosed lifeboats, four marine escape systems (each for 175 people), a fast rescue boat (starboard side) and a rescue boat (port side).

An emphasis has been placed on providing a high standard of luxury and comfort; features include a large number of glazed balconies overlooking the sea and a general feeling of spaciousness and light. Like the earlier sisters, the new ferry is classed with Bureau Veritas. Following the launch of *Volcan de Tamadaba*, the keel was laid down for a sixth vessel.



Seen here prior to her launch at Vigo is *Volcan de Tamadaba*, the sixth in a series of eight near-sister passenger/vehicle ferries ordered as part of a fleet renewal programme by the Armas group.

A completion earlier this year by Barreras was *Côte d'Albâtre*, the first of two new ro-ro designs planned specifically for the Dieppe-to-Newhaven service with Transmanche Ferries. She can carry 600 passengers and 62 trailers or a mix of cars and trailers. Further details of this ship appeared in our April 2006 issue, page 18.

Japanese office for Sener

LEADING Spanish consultancy Sener (Sener Ingenieria y Sistemas) has opened an office in Japan. This news follows the company's recent successful Foran licence contract concluded with Imabari Shipbuilding - reported in our July/August issue. The office is located in Okayama, a city in the Chugoku region of the western part of Honshu island and close to the many shipyards located around the Inland Sea (Seto Naikai). From this office, naval architects and engineers will provide consultancy, training, and technical support for CAD/CAM customers using the Foran integrated system. The opening of this new office also coincides with Sener's 50th anniversary, and good prospects are seen in Japan.

Direct-reduced iron fines and BLU Code addressed at IMO-DSC 11

BIMCO representatives attended the 11th session of IMO's Sub-Committee on Dangerous Goods, Solid Cargoes and Containers (DSC), held in London from September 11-15 2006. Some of the important points discussed are summarised here.

At the last DSC session (DSC 10), a circular was issued notifying administrations and others of the dangers of shipping and transporting direct-reduced iron (DRI) fines (DSC.1 /circ 36 - Accidents involving transport of DRI fines). IMO members were also urged to submit more relevant information concerning such carriage in order for a proposed schedule on DRI fines to be drawn up for consideration at DSC 11.

At this session, the sub-committee considered the relevant submissions made, which included two proposals in respect of a schedule for DRI fines and related casualty reports of the bulk carriers *Adamandas* and *Ythan*. As a starting point, some information about the carriage of DRI products would be useful here. These products have two major hazards: they can self-heat and/or evolve hydrogen when they come into contact with water. Also, the correct ventilation requirements pertaining to these cargoes seem to be unclear, ie, whether inerting or continuous ventilation should be the correct ventilation procedure used.

At the plenary, further problems were raised by various delegations; in particular, the type and form of DRI fines that is being transported, eg, DRI fines and DRI fines in pellet form are two different products and hence would react differently, thus suggesting that precautions required for safe carriage may not necessarily be the same.

In view of the above concerns and the issue as a whole being of a contentious nature, the sub-committee decided to refer the submissions on the carriage of DRI fines to the working group for detailed consideration and deliberation. At the working group, in which BIMCO was actively involved, an extensive debate ensued.

One delegate, who made various submissions, including an elaborate power point presentation, showed and explained the analyses of DRI (A) briquettes and hot-moulded fines (also known as HBI), conducted by independent organisations, the hazards and risks associated with their transport, as well as the safe practices recommended. Furthermore this cargo, as explained by the delegate, is a family of by-products, which are generated during the HBI production and handling process.

Although the submissions made by the said delegate showed that the carriage of DRI (A) briquettes and hot-moulded fines, if transported according to the safe practices advocated, is neither dangerous nor hazardous, it was felt at the working group that the conclusion arrived at was based on limited data, in particular, limited shipments, and hence was not conclusive.

The working group also considered the recommendations made in the casualty report on the bulk carrier *Adamandas*, which carried DRI pellets: that different types of DRI should be defined clearly since, apparently, their behavioural characteristics differ significantly, hence posing danger if proper precautions are not taken. Also, residues lying at the bottom of DRI piles tend to contain mostly fines and therefore should not be loaded on board.

This view was also reiterated in the casualty report for the bulk carrier *Ythan*, where the particular type of DRI carried should be clearly indicated, advocating that proper terminology be used and not a series of trade names; the latter tend to confuse matters regarding the safety precautions required. Also, according to the report, the sizes of the DRI fines dictate the type of ventilation required or inerting of the cargo holds, and for the latter, this may require the use of specialised ships such as OBOs (oil/bulk/ore carriers).

In BIMCO's opinion, notwithstanding the large amount of information obtained by the working group, precise and accurate information was still lacking; in particular, information pertaining to the type and form of DRI carried and the correctness of the terminology used. This lack of information, in BIMCO's view, could not enable the working group to determine a clear set of safety procedures required for the safe carriage of DRI fines.

At the end of the debate, it was agreed that more information was needed to allow the DRI products to be defined correctly, and information in the form of the following will be required for DRI (other than DRI (A) hot-moulded briquettes) from the industry:

- product types - (a) physical properties including grain sizes (bulk density and grain size distribution, and (b) chemical properties
- ship type
- mechanical ventilation: (a) arrangements of the ventilation system; (b) performance (number of air changes/hour); (c) duration of ventilation; and (d) type of fan drive (level of explosion proof)
- inerting methods and hazards with this cargo
- monitoring arrangements and results of measurements during voyage (hydrogen, oxygen, temperature)
- moisture content and temperature at the time of shipment
- emergency procedures during voyage
- any other information (such as loading/unloading precautions).

This above-mentioned list was brought forward to the sub-committee and approved.

Pending the receipt of this information or the development of a schedule in the BC Code for DRI fines, BIMCO would caution that members wishing to transport shipments of DRI fines during this interim period should consider very carefully how it should be undertaken, taking into account the aforementioned. BIMCO would strongly recommend that members seek the advice of their P&I Club so that an informed decision can be made and the highest level of precautions be taken if carriage of such a product is so decided.

Mandatory application of the BC Code

The working group took on the onerous task of identifying which sections of the BC Code should be mandatory and which recommendatory, as well as identifying the necessary amendments required. Work is still in progress and it is envisaged that a draft mandatory BC Code will be tabled at the next DSC session. It is hoped that the mandatory BC Code, if agreed upon at DSC 12 and adopted by MSC 84 (2008), will be placed on a voluntary basis as from July 1 2008 in the interest of safety to ships and crew. In connection with this, the amendments to SOLAS chapters II-2, VI and VII would also be finalised to be in line with the proposed mandatory status of the Code.

Application of the BLU Code to ships carrying grain

The report of the correspondence group on the extension of the Code of Practice for the Safe Loading and Unloading of Bulk Carriers (BLU Code) to include grain, established at DSC 10, of which BIMCO was a member, was presented to the sub-committee for consideration. The sub-committee agreed to the following:

- preparation of an MSC Circular for approval at MSC 82 adopting the amendments to the BLU Code so that the application of the Code will be extended to ships carrying grain
- preparation of an MSC circular for approval at MSC 82, adopting amendments to the Manual on Loading and Unloading of Solid Bulk Cargoes for Terminal Representatives, in view of the extension of the BLU Code to include grain
- to request the working group on the amendments to the BC Code and its mandatory application to consider the necessary amendments to SOLAS in view of the extension of the BLU Code to include grain.

Apart from the above, the correspondence group commented that the BLU Code and the Manual for Terminal Representatives should be included in the BC Code as one publication. The reason is that this would make referencing an easier task since only one source of information instead of three will be identified. This was warmly received at the plenary. A suggestion to include them as the BC Code Supplements, just like the IMDG Code Supplements, was made at the plenary, and it is envisaged that this course of action is likely.

IMDG Code amendments

The Sub-committee considered the following issues:

Carriage of radio-active materials

At this session, the sub-committee agreed with the proposal that the IMO Secretariat would act as a facilitator to monitor the industry's experiences, in particular difficulties encountered with the shipment of IMDG Code Class 7 Radio-active Materials (RAM). The secretariat would then, in accordance with reports received, consider the appropriate action to be taken, eg, this may involve contacting the relevant national authorities if there are delays or denials of carriage. An *ad hoc* mechanism to put in place this facilitation process is underway and hopefully it will pave the way towards resolving the difficulties encountered in the carriage of RAM materials.

It should also be noted that at the last session of the Facilitation Committee (FAL 33), it was agreed that it would not be appropriate to assign specific UN numbers and thus an associated proper shipping name to the carriage of such materials. In addition, technical concerns were raised at this sub-committee regarding an entry in the Transport Document and/or Dangerous Goods Manifest (FAL Form 7) to confirm that RAM shipments are to be used in medical or public health applications only.

Concerns such as, for example, the definition of medical, consumer, public health or agricultural applications are at present not clear in the broader context of radio-active materials and also the issue concerned here is multimodal in nature, and hence should be brought to the attention of the UN committee of experts on the transport of dangerous goods and on the globally harmonised system of classification and labelling of chemicals. In view of these concerns, the sub-committee advised that these concerns be relayed to the FAL 34 and MSC 83 accordingly.

Unpacked ice in cargo transport units

A submission on unpacked dry ice, which is normally used for cooling purposes, eg, for the transport of seafood, in standard freight containers was raised at this session. The primary danger associated with this unpacked dry ice was that during transport, large amounts of the dry ice could turn into gaseous carbon dioxide, which will significantly reduce the oxygen content in a cargo hold. Hence, such transport without any warning seems unacceptable. Furthermore, although dry ice is listed as dangerous under the IMDG Code, the requirements of the IMDG Code pertaining to the carriage of unpacked dry ice seem unclear.

The sub-committee considered the paper and approved in principle the following proposals indicated in the submission, with the instruction that the same be forwarded to the group tasked with the draft amendments (34-08) to the IMDG Code for consideration and incorporation:

- that transport of unpacked dry ice in freight containers should not be permitted
- with regard to IMO special provision 297 concerning carriage of dry ice under certain conditions, to align IMO SP 297 with that of the UN Recommendations SP 297
- that 5.4.2.1.8 of the IMDG Code should be amended to read 'When packages containing carbon dioxide solid (dry ice) are loaded into the container/vehicle, the exterior of the container/vehicle should be conspicuously marked on two sides WARNING CO_2 SOLID (DRY ICE)'.

Some delegations expressed the view that stowage of cargo transport units containing dry ice should not be allowed under deck and remarked on the need to have them appropriately marked. The sub-committee advised that this issue should be further examined in a wider context as in the form of multimodal transport, and hence invited the delegation that submitted the above to raise this issue at a future meeting of the UN Sub-committee of experts on the transport of dangerous goods.

Next DSC meeting

DSC 12 has been tentatively scheduled for September 10-14 2007.

This report is compiled in association with BIMCO (The Baltic and International Maritime Council).

The Royal Institution of Naval Architects

HUMAN FACTORS IN SHIP DESIGN, SAFETY AND OPERATION

21-22 March 2007, RINA Headquarters, London, UK

Second Notice

Naval architects and marine engineers have a direct influence over ship design and consequently how their designs are used by seafarers. In recent years, there have been increasing efforts to gain an awareness of human element issues and to improve understanding of how designs influence human behaviour. Design has an important role to play in improving habitability, occupational health and safety, and contributing to seafarer recruitment and retention. Good design of working and living conditions is likely to receive increased emphasis following the adoption of the ILO Maritime Labour Convention - a key theme for the conference.

The traditional view that human error is the major cause of all accidents is being challenged by some who consider human error to be a symptom of deeper problems within a system. Indeed, some argue that modern technology has reached a point where improved safety can only be achieved through a better treatment of human / system interaction. It is necessary to not only design ships and equipment for safe and effective operation, but to also align design and training. The wider context of management, culture, procedures and regulation also has a vital role to play in safe and effective operation.

This conference aims to bring together international specialists and professionals including designers, ship operators, seafarers, equipment manufacturers and regulators to highlight how the sensible application of ergonomics can reduce costs and improve safety.
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Cost savings with new Wärtsilä cylinder lubricating system

A NEW electronically-controlled cylinder lubricating system has been introduced by Wärtsilä Corp to meet the demand for lower cylinder oil feed rates. This pulse lubricating system (PLS), developed for application in Wärtsilä RTA and RT-flex low-speed two-stroke models, delivers, it is claimed, reduced cylinder oil consumption without compromising piston-running reliability.

The system makes it possible to reduce the cylinder oil feed rate compared with the existing accumulator system, through an improved distribution of oil to the cylinder liner in association with fully flexible, precise timing of oil delivery.

The guide feed rate for Wärtsilä RTA and RT-flex engines equipped with the PLS as original equipment is 0.7g/kWh of cylinder lubricating oil. Thus the cost savings achievable with PLS are significant.

In the case of a 12-cylinder Wärtsilä RT-flex96C engine of 68,640kW MCR, running at 85% load for 7000 hours annually with cylinder oil costing US$1700/tonne, a reduction from the guide feed rate of 1.1g/kWh with the existing accumulator system to the new rate of 0.7g/kWh can generate cost savings of more than US$270,000 a year. This corresponds to a cost saving of around 36% for cylinder lubricating oil.

The key feature of this concept is that it delivers accurately metered, load-dependent quantities of lubricating oil to the cylinder liner running surface at the precise timing required. Electronic control ensures accurate dosage and timing, with full flexibility in settings.

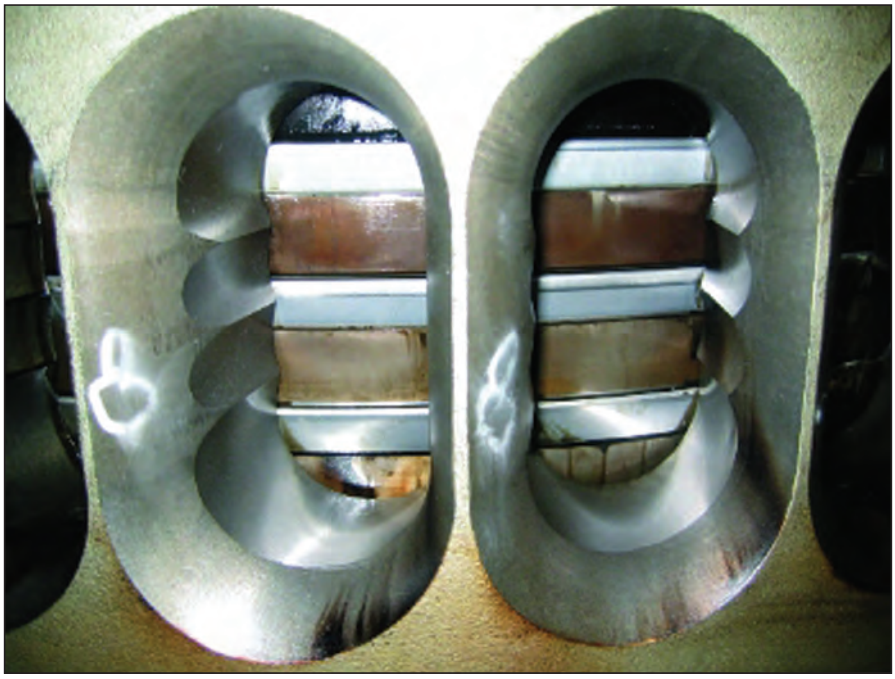
The cylinder lubricating oil is sprayed as a pulse of multiple jets on to the liner surface from a single row of lubricators arranged around the liner, each lubricator having a number of nozzle holes. The oil jet sprays ensure better distribution of the oil over the liner running surface than with the existing accumulator system. There is no atomisation and no loss of lubricating oil to the scavenge air.

PLS is available from January 2007 for newly-built Wärtsilä RT-flex96C, RTA96C, RT-flex84T-D, and RTA84T-D engines. Additional engine types will be added later in the year. The new RT-flex82C, RTA82C, RT-flex82T, and RTA82T engine types will be equipped with this system from the beginning.

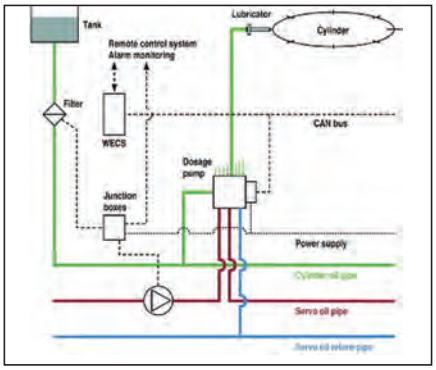
Service experience

To date, experience with PLS has been very successful, with claimed excellent liner and piston ring conditions. Trials have been carried out both on the Wärtsilä research engine in Winterthur, Switzerland, and on shipboard engines. The first production engine fully fitted with PLS successfully passed its shop test in May 2006, with other engines following.

The first PLS test started on the research engine in June 2003. Shipboard testing began with a Wärtsilä RTA58T engine in July 2004, followed by an RT-flex96C engine in June 2005. Shipboard testing has accumulated more than 18,000 running hours. Throughout, the outstanding performance of the PLS was confirmed, with all testing being at or below the guide feed rate of 0.7g/kWh.



The good service experience with Wärtsilä's pulse lubricating system (PLS) can be seen from this view of a piston ring pack in an RT-flex96C engine after some 6500 running hours with a cylinder oil feed rate of around 0.7 g/kWh during the most recent 3500 running hours.



Schematic of the pulse lubricating system.

Retrofit version

The PLS system is also available for retrofitting to RTA and RT-flex low-speed engines. The major cost savings delivered by a retrofit PLS should make for a quick return on the capital investment. As the PLS in new engines involves a different type of cylinder liner than for the Wärtsilä accumulator system, the retrofit PLS has been adapted to suit existing cylinder liners in RTA and RT-flex engines. Much of the hardware is the same for both newbuilding and retrofit versions of PLS.

The retrofit PLS can be fitted during commercial operation of a vessel. It is an independent system with only few connections or interfaces to other systems. Thus preparation and installation are said to be easy and quick. All equipment including prefabricated piping is supplied, with installation and commissioning being undertaken by Wärtsilä service engineers.

To a substantial extent, equipment can be installed during a voyage, considerably reducing port time required for final installation and commissioning. Installation of controls, pumps, wiring, and interface connections to remote and alarm monitoring systems can be executed during a voyage as well. Ample attention is paid to commissioning, fine adjustment, and running-in of the PLS in port and during a confirmation voyage.

PLS is available now for retrofitting to RT-flex96C and RTA96C engines, and for RT-flex84T-D, and RTA84T-D engines from January 2007, with additional engine types to be added during next year.

Wärtsilä Corp has already received considerable interest for retrofitting of the new, electronically-controlled PLS to RTA and RT-flex low-speed engines. Orders have already been received for 25 complete engine installations, amounting to 284 cylinders, and the first retrofit was completed in September 2006.

FUGRO GEOS LTD (www.geos.com) is part of the Fugro Group (www.fugro.com) and is one of the world's leading companies specialising in oceanographic, meteorological and structural engineering measurement, assessment and consultancy. The company is based in new purpose-built offices in Wallingford (Oxfordshire). Fugro GEOS has regional offices in the UK, Singapore, Houston, Norway, the UAE and Malaysia.

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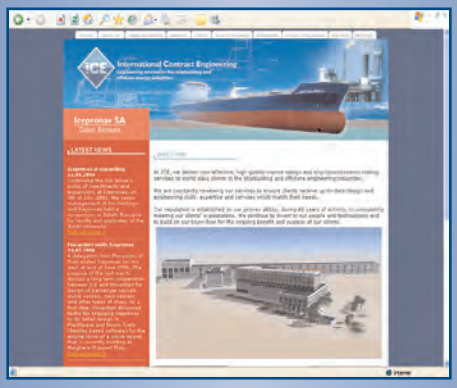

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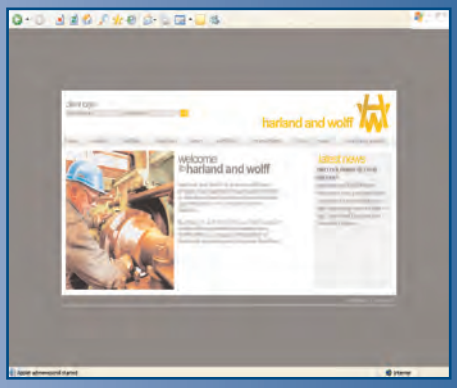

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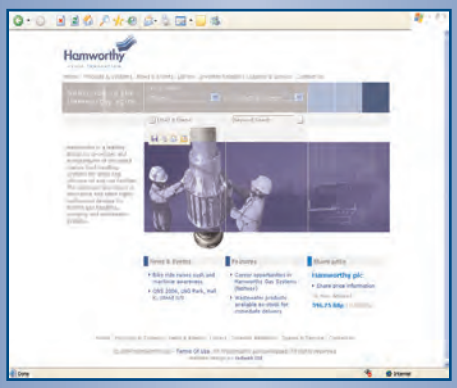

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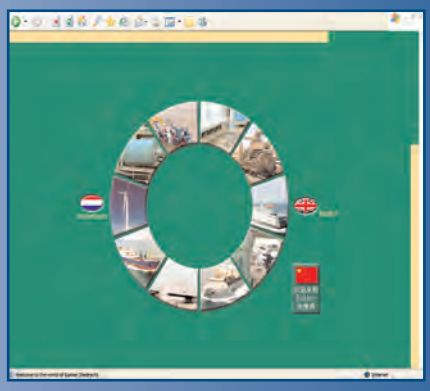

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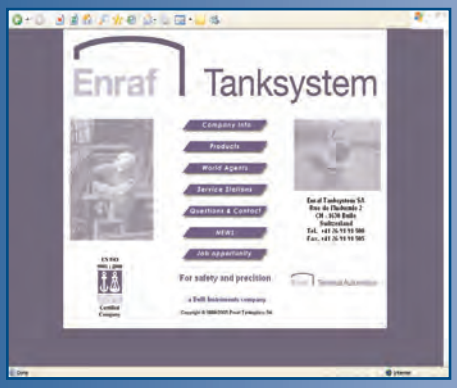

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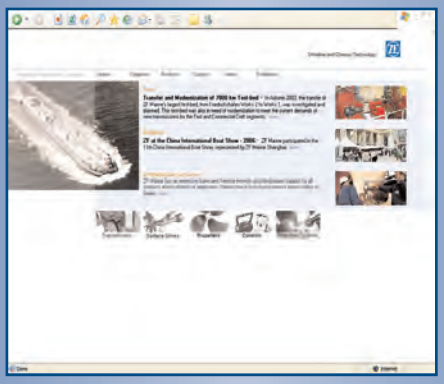

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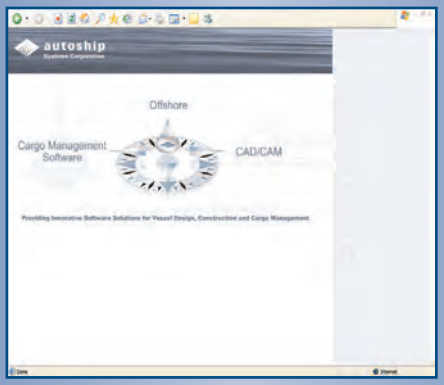

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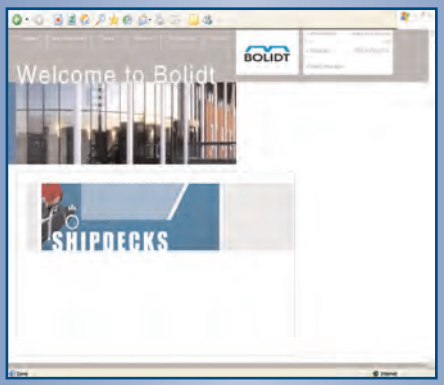

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