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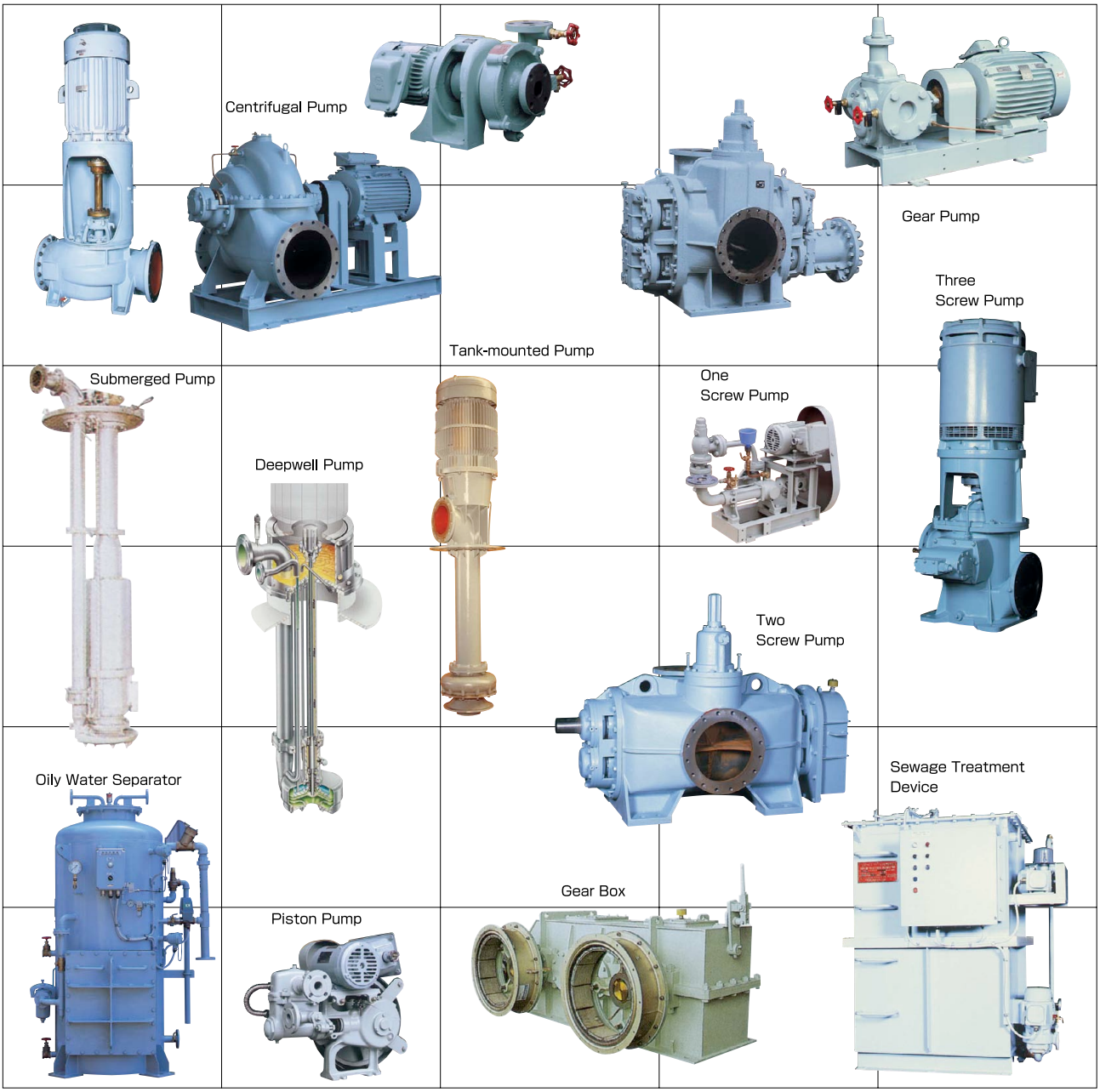

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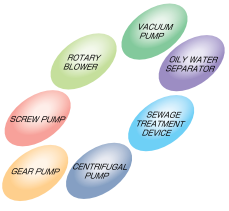

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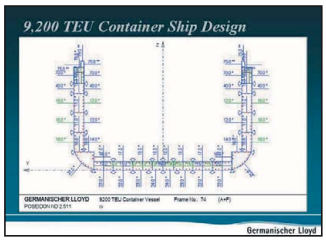

The design of very large container liners that can be powered by a single propeller is beginning to near the limit. Last year, orders were placed for the first 8000TEU designs and now contracts are in hand for 9200TEU vessels. A hold cross-section for such a giant, drawn up by Germanischer Lloyd and seen here, could require hatch-side girders of up to 78mm thickness. Some of the interesting technical questions raised by such giants are discussed in our Editorial Comment on page 3.

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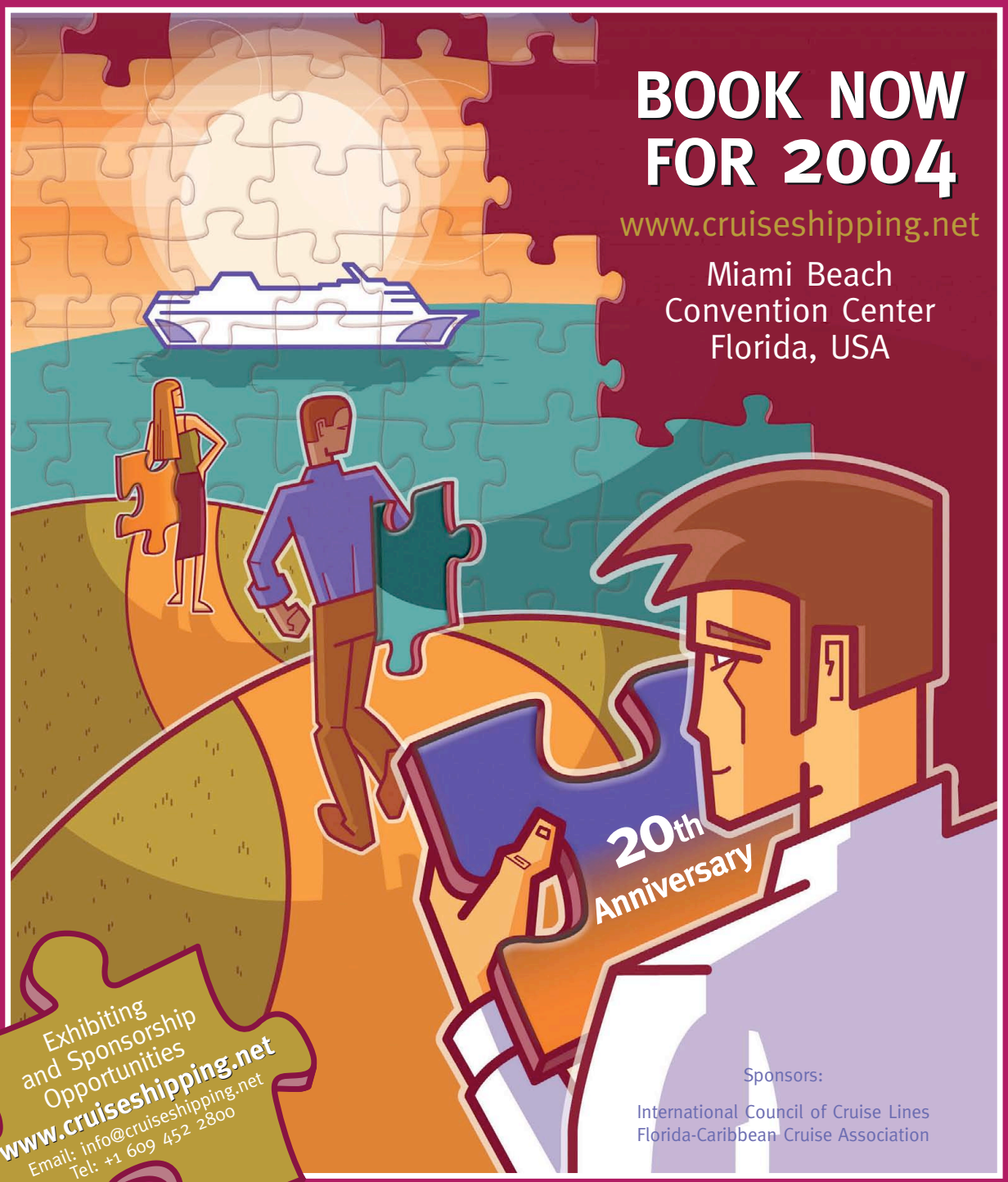

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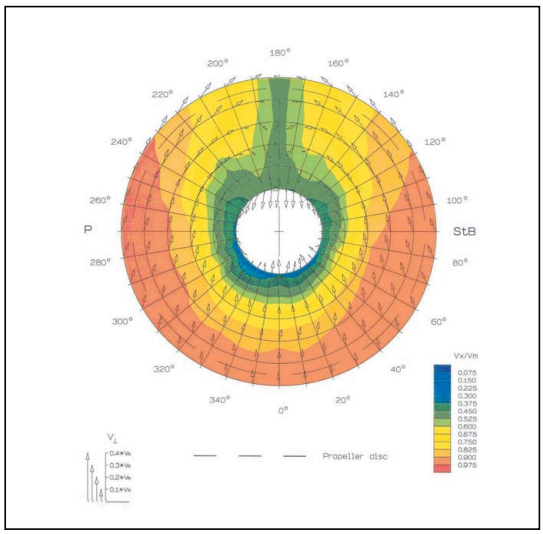
Stretching the limits for giant container liners

CERTAINLY, one of the most surprising advances of recent months has been the sudden boom in orders for very large container liners in the 8000TEU class; today, at least 80 ships of this size are on order, plus a few even larger ones of a nominal 9200TEU (but possibly able to load 9600TEU). Nearly all of these monsters have been contracted in Korean yards. We have written in this column on several occasions (notably May 1999) about the technical challenges of container-carrying leviathans but the need for careful decisions still remain, particularly in naval architectural, steelwork, and propulsion offices.

The Hamburg-based classification society, Germanischer Lloyd, from its leading technical position in the container ship sector, continues to remind us of the need for accurate designs. An 8000TEU design was already created in Germany during the early/mid-1990s within a joint industry project, and more recently the society has drawn up a 9200TEU giant, some details for which were revealed recently by executive board member Dr Hans Payer to a press presentation in London, attended by *The Naval Architect*.

These will be of special interest and assistance to naval architects since they particularly refer to hull deformations. For example, expanding the double side-skin from 2.0m to 2.8m gives a 15% reduction in critical maximum relative deformation of the deck structure, while introduction of a 20ft slot transverse deeptank reduces deformation by a significant



Aft-body lines for large container liners should be very carefully plotted, say experts at the HSVA, due to very high propeller loads. Likewise, attention should be paid to an optimum rudder form. This illustration (taken from the paper 'Very large container ships - difficulties and potential from the hydrodynamic standpoint', by F Mewis and H Klug) reveals a satisfactory measured wake field for an 8100TEU liner.

17%. Increasing the breadth to 46m might be another helpful feature; by comparison, current 8000TEU-class vessels have a breadth of approximately 42.80m.

As has been reported in the past, the propeller has a major influence - and is probably the ultimate limiting factor for the new breed of super-giants - on overall container liner design. Since draughts up to 14.50m are probably the maximum for port entry today, it can be deduced that 9500TEU is probably the maximum capacity that can be accommodated with a single propeller in terms of efficiency and cavitation.

A decision to expand into twin engines and twin propellers for larger hulls will demand vigilant examination of economics - but a brave owner opting for such a plant could launch a new worldwide ordering spree! More cautious owners might prefer to opt for the ABB/Samsung proposal of a contra-rotating Azipod unit behind a single mechanical main propeller (*The Naval Architect* November 2001, page 6). Maybe service experience with the two Shin-Nihonkai 31.50knot long-haul ferries currently being built at Mitsubishi's Nagasaki yard (discussed in our June 2003 issue, page 6), and to feature this arrangement, will swing the industry behind this attractive concept. The same concept is additionally being proposed for the new Finnish Enviropax ferry, to be featured in the February issue of this journal.

Meanwhile, Germanischer Lloyd's Dr Payer notes that alternative container-ship proposals using much larger two-stroke engines than employed today, ie, those with more than 12 cylinders, could generate additional difficulties for both naval architects and marine engineers, because of possible engine-bedplate rigidity anxieties and engine interaction with the hull. Another concern might be such an engine's ability to run at a low enough speed to comply with allowed speeds when in pilotage waters; however, the newest electronically controlled models without mechanical camshafts should be able to avoid this difficulty. Certainly, the production camshaftless 'intelligent' engine that *The Naval Architect* witnessed on demonstration early last year at MAN B&W's Frederikshavn factory was running at an exceptionally low speed. Alternatively, an electric-assist system (shaft-driven alternator built to double as an electric motor) could be coupled to the propeller.

Today, a huge percentages of boxes is being carried on deck - up to 60% of a total cargo, depending on individual ship designs. For the new breed of very large 21st century liners, hatch cover and coaming analysis will therefore be of paramount importance, and Gemanischer Lloyd has built up considerable experience in these critical aspects. It is interesting to record that 9200TEU liners will probably have hatch side girders of up to a massive 78mm thickness - a size that will call for most careful monitoring of shipyard welding procedures. Double coamings may also be adopted.

Some interesting and complementary work carried out by the Hamburg Ship Model Basin (HSVA) was presented last September, in Shanghai at the International Symposium on Naval Architecture & Ocean Engineering, by Friedrich Mewis and Hilmar Klug (their paper 'Very large container ships - difficulties and potential from the hydrodynamic standpoint'). One aspect that these authors examined was the need for an efficient rudder - a piece of equipment often taken for granted.

They noted that due to fast propeller slipstream speeds on large container liners, the very large rudders required (up to 12m deep and more than 7m long) can be highly loaded and are in danger of being effected by erosion and cavitation. Therefore, the authors believe, a rudder (ideally a spade type) 'must be designed like a propeller' - with the aid of CFD - and not by geometric rules; asymmetric leading edges and special designs for all gaps in the propeller slipstream are required.

Whether anyone will be brave enough take the next giant step - to order a circa-10,000TEU-12,000TEU liner (or larger) with its almost-certain twin propellers is a matter of conjecture. On the other hand, the HSVA authors consider (although operators would probably not agree) that the financial (less fuel) attractions of a single screw and reduced speed - to 23knots - from the current 25knots may be a staisfactory alternative to more advanced technology, especially if the Gorgon's head of a fuel price hike rises again. Meanwhile, under the ANCON project, HSVA is currently perfecting, with the help of three German yards, a simple new method for predicting propulsion power for a single-screw container ship up to 10,000TEU.

SafeHull Express - speeding up ship design

A NEW version of SafeHull, the structural design evaluation tool from the American Bureau of Shipping first introduced in 1993, has been launched onto the market. SafeHull Express claims to enable tasks that previously took several weeks to be completed in less than 14 days; the prototype version is for tankers but a module for double-skin bulkers should be available early this year.

SafeHull Express has been evolved in cooperation with shipyard naval architects, several of whom participated in the development team, also with the Finnish consultancy Napa Oy and MSC Software. The new package should provide seamless integration of classification software into the design process, generating approved designs more quickly and easily.

To meet shipyard requirements for 3D CAD systems for production design and manufacturing, SafeHull Express brings the benefits of 3D into the earliest stages of the design cycle, as well as providing easy-to-use templates to generate geometry and scantlings of the main hull. A model can be automatically converted into a finite-element version without manual data entry.

Lorries being discharged at Immingham from DFDS Tor Line's brand-new 10,407dwt ro-ro ferry *Tor Magnolia*, completed in October by Flensburger Schiffbau-Gesellschaft. She is the latest in a line of highly advanced ro-ro designs from this German yard, derived from a successful series of ships built for the Turkish operator UND. Although not evident here, the ferry is, unusually, powered by a single low-speed MAN B&W main engine, driving a CP propeller, behind which is an asymmetric rudder fitted with a Costa bulb. More information can be found in *Significant Ships of 2003*, due out in February.

FOUR LPG TANKERS FOR BP - A quartet of 83,000m³ LPG tankers has been contracted at Mitsubishi's Nagasaki yard by BP Shipping for operating east of the Suez Canal. The first ship should be completed in mid-2006. BP has enjoyed a long relationship with Mitsubishi since 1970.

CAR CARRIERS FOR FINCANTIERI - The Italian shipbuilding group Fincantieri is to build a pair of 2000-car ro-ro ships for the Greek operator Neptune Lines - an order secured against Far Eastern competition. Leading-edge design will enable maximum cargo volume to be exploited out of a length oa of 165m. As an alternative to cars-only, each ship will have 1750lane metres for trucks plus space for 1000 export cars. Two Wärtsilä 6L46C engines will provide a service speed of more than 20knots. The first ship will be built at Palermo for delivery in late 2005.

MORE PROPELLERS FOR CHINA - Another European company has decided to source propellers from China. Wärtsilä designs are now to be built at Zhenjiang CME Co Ltd; a new joint venture company, Wärtsilä-CME Zhenjiang Propeller Co, has been set up to build Lips and Kaida-brand units. Zhenjiang is already casting Kappel tipped propellers for Stone Manganese Marine (*The Naval Architect* October 2003, page 6).

PROPULSION TRAIN FOR AUSTAL FERRY - Fred Olsen's large new trimaran fast ferry, building at Austal in Australia, is to powered by MTU diesel engines (four 8200kW 20V8000 models); agreement has been made that the output can be boosted to 9100kW in 2006. Renk gearboxes will be installed, and the waterjets will comprise one Kamewa 125SII model and two Kamewa 180BII booster jets.

TWO-STROKES FOR LNG TANKERS? - More power to the cause of those promoting diesel propulsion machinery for LNG tankers has been given by MAN B&W, which is currently publicising the merits of its electronic two-stroke models, operating in conjunction with a cargo re-liquefaction plant, for very large designs up to 220,000m³ capacity. Two engines, driving FP propellers through clutches, would operate on heavy oil only. A special technical paper has been prepared for discussion.

WAVESPEC CNG SYSTEM - The UK engineering consultancy Wavespec Ltd, which specialises in LNG tankers, has achieved approval in principle from Lloyd's Register for a compressed natural gas (CNG) marine transportation system. This concept (so-called gas transport modules) uses composite reinforced pressure-vessel technology licensed to TransCanada Corp, and the vessels would be built under licence by NCF Industries Inc. Wavespec has worked in association with TransCanada, The Floating Pipeline Co, and Lloyd's Register to perfect the design.

NEW-TYPE AFRAMAX TANKER - The first example of a new 110,000dwt Aframax tanker design has been delivered by Mitsui Engineering & Shipbuilding's Tamano yard. *Mare Salernum*, ordered by the Italian owner Fratelli d'Amico, features a newly developed hull with a 42m beam and a cargo capacity of 128,000m³; an advanced bulbous bow and efficient stern lines are used for much improved propulsive performance. The tanker is built to the standards of both Registro Italiano Navale and Lloyd's Register, and meets the COVENT notation of the former society, which ensures ballast tank ventilation in the event of accidental oil leakage.

PEOPLE

FREDERIC PERDRIX has joined the board of directors of Houlder as technical director.

Bureau Veritas has appointed **DIDIER CHALÉAT** to the new post of vice-president and director of operations for its marine division. He was previously with P&O Princess Cruises.

DAVID RICHMOND has been appointed general manager of the marine engineering and nautical departments of BCP (Burness Corlett & Partners) - Marine Expert & Investigation Services.

The new technical director of Armstrong Technology is **JOHN TATE**, who joins the Newcastle upon Tyne-based company from the Babcock International Group.

Versatile tankers from Turkish design house

INCORPORATING a very high technical specification shaped by the Turkish owner's bid to better ensure trading flexibility, service dependability, atttractiveness to oil industry charterers, and long-term asset value, a newly-contracted, 15,000dwt oil products and chemical tanker will be distinguished by the use of azimuth thruster propulsion.

The 148m-long, IMO Type II newbuilding entrusted by K S Tankers to Cicek Shipyard will be constructed to ice class 1A standards to permit year-round access to the Baltic region. The design has been developed by the prolific, Istanbul-based consultancy Delta Marine Engineering Co in conjunction with the Kaptanoglu group-associated shipowning firm.

The unusual choice of thrusters for main propulsion in such a vessel reflects a requirement for manoeuvrability of a high order, benefits of which should be faster turnrounds and a lessened need for tug assistance in confined harbours and narrow fairways. The selected drive and power translation system, with independently-controlled twin thrusters, was also favoured for its properties in conferring full redundancy and emergency propulsion.

Ulstein Aquamaster omni-directional thusters form just one element of a comprehensive package of Rolls-Royce equipment to be supplied to the Cicek premises at Tuzla Bay. One of the other, especially significant constituents of the deal is the nomination of Bergen B-series, long-stroke engines as the prime movers.

Overall, the project provides an important new marker in the tanker sector for Rolls-Royce's capabilities in furnishing complete and integrated shipsets of equipment and machinery. It is indicative of the success of the UK-owned group in achieving a wider market reach for a business philosophy long espoused and applied by the Scandinavian forebears of the various producers involved in this latest package for Turkey.

The Bureau Veritas-classed oil product and chemical carrier will embody 18,265m³ of revenue-earning capacity within 18 coated, flush-sided cargo tanks encased by a double bottom and double skin. Each tank will be fitted with a hydraulically-driven, Framo cargo pump rated at 300m³/h outturn, and the 18 compartments will offer a corresponding number of segregations. Two slop tanks will be located on deck.

The MarineLine tank lining system developed by US firm Advanced Polymer Coatings (APC) has been chosen for the vessel, on account of its properties in terms of cargo resistance and range, and operational benefits as regards tank preparation and freedom from contamination between cargoes. The Siloxirane-based coating is far less expensive than stainless steel cargo containment.

K S Tankers' prospective new fleet entrant, due for delivery in October 2004, will be installed with two eight-cylinder models of the B32:40 engine, establishing an important reference for the modern, Bergen-produced, medium-speed diesel design in the tanker sector. Whereas marine contracts for the long-stroke series have to date largely entailed offshore service vessel applications using distillate fuel, the pair of 3600kW engines in the Turkish vessel will operate on heavy fuel.

Two Ulstein Aquamaster US305-type azimuth thrusters equipped with CP propellers will be direct-coupled to the main engines. Anticipated service speed in fully-laden condition is 15knots, at 85% maximum continuous rating, burning about 24.5tonnes of fuel per day. Added economic benefits will accrue from the use of two 1200kW shaft generators, with a small diesel genset in reserve.

Manoeuvring will be enhanced by a Kamewa Ulstein TT1650FP bow tunnel thrust unit of 600kW, giving a thrust of 93kN. The Rolls-Royce outfit will also include a set of Rauma Brattvaag, high-pressure hydraulic deck machinery, and a UMAS integrated automation system. UMAS will encompass monitoring of all shipboard machinery, cargo handling operations, tank sounding for cargo, and ballast and service tanks, using computer workstations on the bridge and in the cargo control and engine control rooms. The Scandinavian content will also feature two Aalborg thermal oil boilers of 2500kW apiece plus a 500kW Aalborg economiser on each main engine exhaust line.

The owner's emphasis on a design which will meet the rising expectations of cargo generators and the regulatory authorities is reflected in the intended adoption of Clean Sea class stipulations among an array of BV notations to which the ship will be built and equipped. It is understood that K S Tankers holds an option on a second such vessel from Cicek, for handover during the second quarter of 2005.

Retained design consultancy Delta Marine has grown rapidly since its formation in 1996, providing a broad range of services covering the gamut of naval architectural and marine engineering design, calculations, and project planning, and including feasibility studies, tender and contract preparation, supervision and inspection. Among the in-house initiatives has been the development of DeltaLoad, a loading instrument software package.

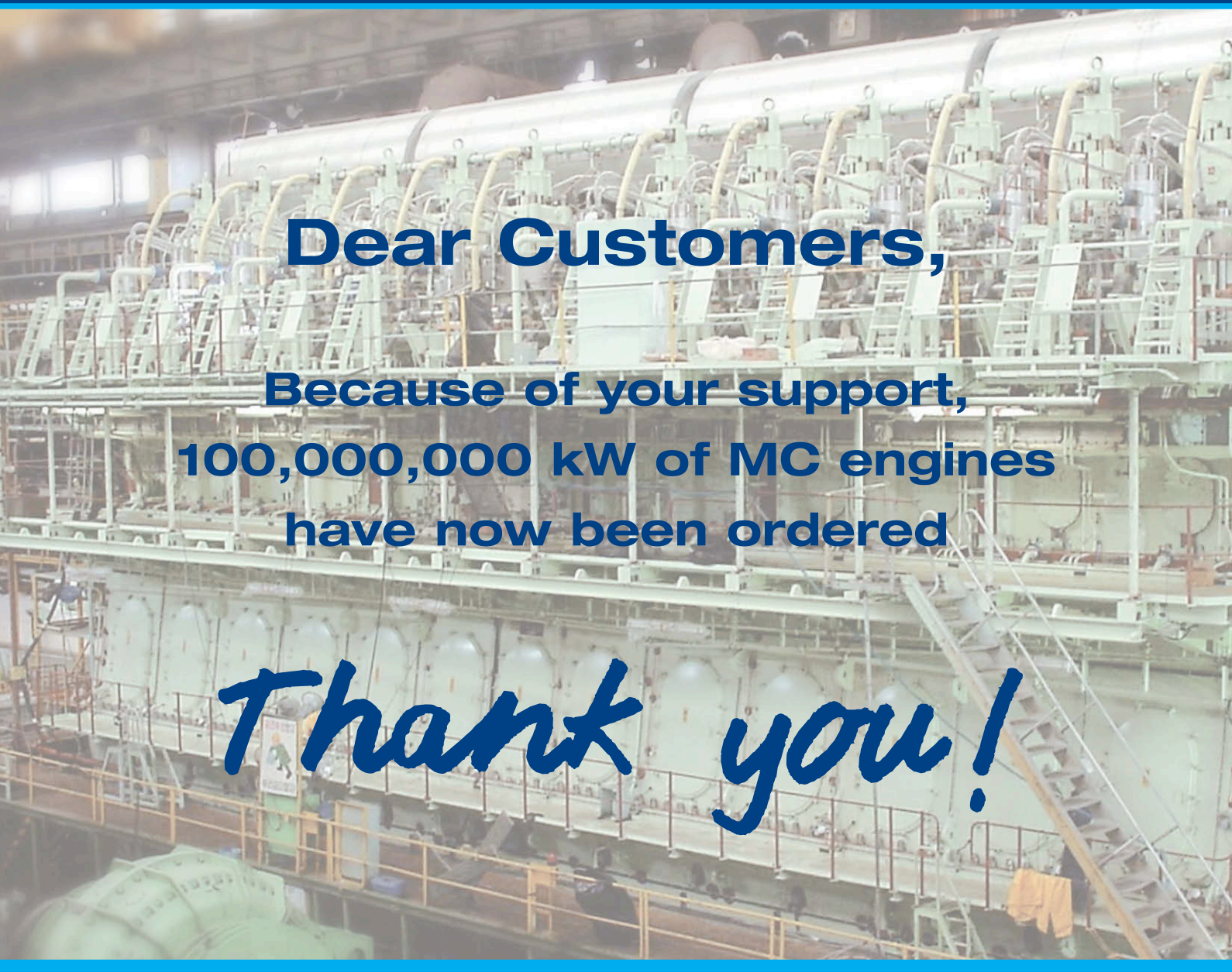
An array of oil products and chemical tanker designs figures among current projects at the Istanbul bureau, including newbuildings of 7100dwt, 7000dwt, 5850dwt, and 4850dwt booked by various Turkish owners from domestic yards. The common themes are operating features to promote charterer appeal and environmental compatibility, at the requisite cost-effectiveness. In a more specialised segment of the market, Delta Marine prepared the design for a pair of bitumen tankers built this year by Selah Shipyard to the account of Spanish operator Marpetrol. The 6000dwt sisters carry the material at cargo temperatures up to 180ºC.

The extent of the consultancy's present occupation with tanker projects is a pointer to the high profile of the shipbuilding industry clustered in Tuzla Bay in the construction of small tankers. While various yards in the area have now extended their capabilities to tankers in the 20,000dwt-30,000dwt range, the start of this year saw chemical and product carriers in the 4000dwt-10,000dwt band accounting for around half of all newbuildings in hand at Turkish shipyards.

TECHNICAL PARTICULARS
K S TANKERS
PRODUCTS/CHEMICAL TANKER

Length, oa	148.00m
Length, bp	139.50m
Breadth, moulded	21.60m
Depth	11.30m
Draught	8.50m
Deadweight	15,000dwt
Gross	9300gt
Net	5000nt
Cargo capacity	18,265m³
Cargo tanks	18
Cargo pumps	18 x 300m³/h
Slop tanks	2
Propulsion	2 x azimuth thrusters
Main engines	2 x Bergen B32:40L8P
Main engine power	2 x 3600kW at 720rev/min
Service speed	15knots
Class	Bureau Veritas

Historical Milestone
100 million kW



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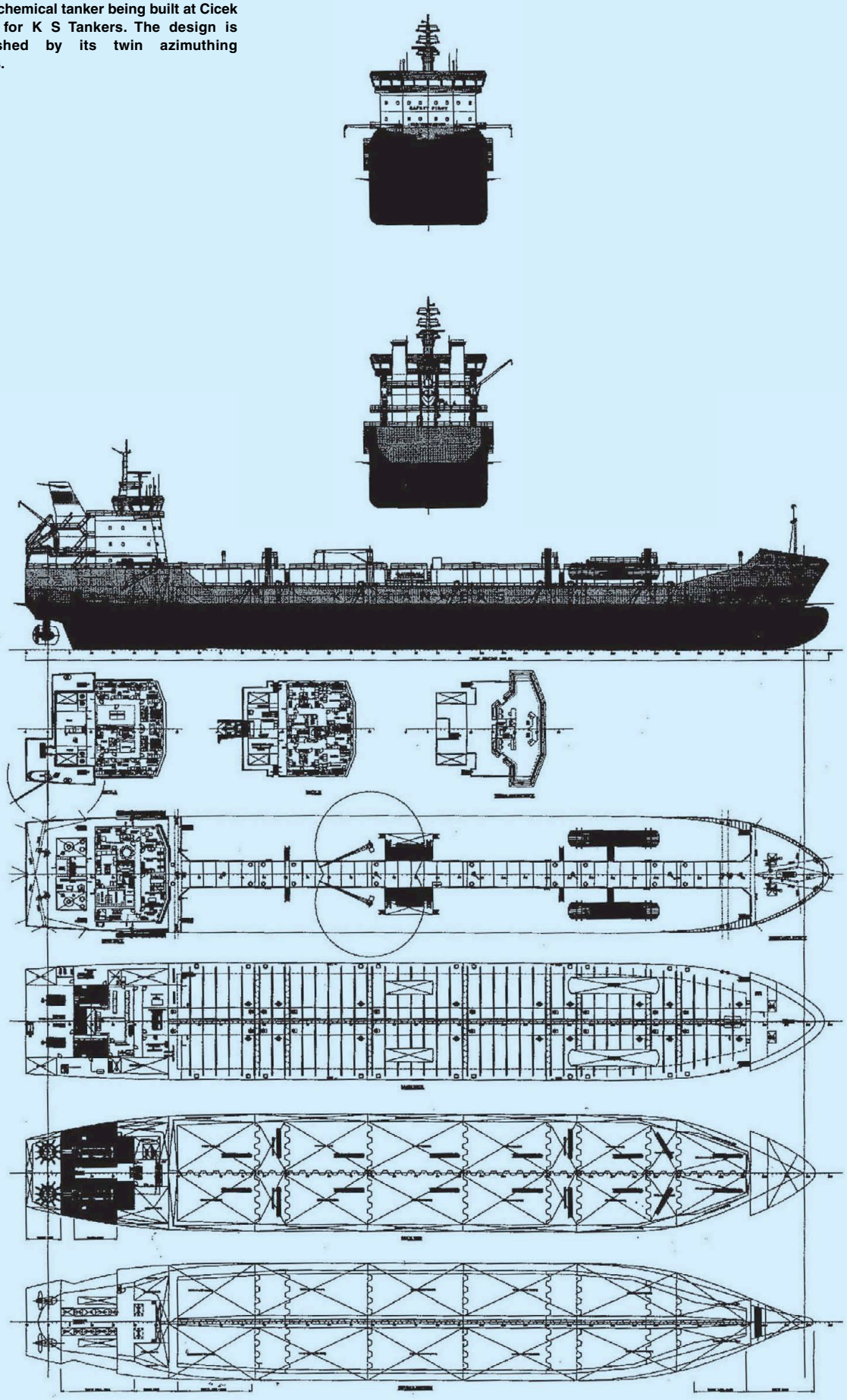
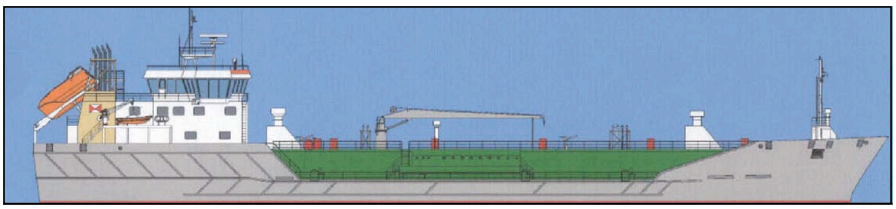
General arrangement of the 148.00m long products/chemical tanker being built at Cicek Shipyard for K S Tankers. The design is distinguished by its twin azimuthing propellers.



Chinese emphasis at Skipskonsulent

In the first of his reports on Norway's marine industries, David Tinsley discusses the continuity of involvement in small and medium-sized tanker design that has been the common thread in Skipskonsulent's activities since 1969. This is underscored by the Norwegian consultancy's retention for a host of current newbuilding projects in China and elsewhere.



Skipskonsulent has been responsible for the design of F T Everard's interesting new 3750dwt product tankers, which feature diesel-electric propulsion. These are under construction at Qingshan Shipyard. The first should be delivered early this year.

THE Swedish-based Brostrom Group's decision to entrust the construction of four 14,500dwt IMO Type II chemical and product tankers to Jinling Shipyard gives further expression to Chinese shipbuilders' penetration of the more technically demanding provinces of the international market. The SK4228 design drawn up by Skipskonsulent (a member of the Vik-Sandvik group) reflects the operator's requirement for an especially high degree of manoeuvrability, as well as service reliability.

Also indicative of the enduring nature of the relationships fostered by Skipskonsulent is that the current tanker fleet of the Bergen operator Rederiet Stenersen is composed entirely of IMO Type II vessels based on designs developed by the Norwegian consultancy. The link has recently been extended through the confirmation of an order at Jiangnan Shipyard, Shanghai, for a fourth example of the 16,600dwt chemical and products carrier type embodying the SK5054CT blueprints. This class was led by *Sten Idun*, completed at the end of 2002, followed by sisters *Sten Heim* and *Sten Berg* during 2003.

A notable feature of the SK5054CT, as with an increasing number of the types prepared by the design house from its Lakseväg premises in Bergen, is the adoption of a weathertight trunk along the main deck for cargo line and equipment protection. The design provides a capacity of 19,100m^3, at the 98% load measurement, in a cargo section subdivided by a centreline bulkhead as well as transverse bulkheads and configured for eight cargo segregations. Besides the Chinese-built foursome, the five other tankers in Stenersen's existing fleet are all based on SK designs.

A slightly enlarged version of the SK5054 series, designated the SK4056 type, was launched at the Jiangnan yard during October 2003 to the account of the Canadian company Algoma Tankers. The 18,750dwt *Algoscotia* offers similar flexibility in chemical and oil products transportation, embodying 21,800m^3 of coated tank capacity within a design specially adapted to trade on the Canadian east coast and into the St Lawrence Seaway and Great Lakes system.

Strengthened to ice class 1A requirements, *Algoscotia* has a length overall of 148.80m, compared with the 144.05m of Stenersen's SK5054CT tankers, and the hull breadth has been taken out to 23.76m from the 23.00m of the Norwegian ships.

In common with the latest Stenersen ships (and with many other tankers carrying chemicals), the Canadian tanker will incorporate an emergency propulsion device, offering a fair-weather speed of around 10knots, two-thirds that of the speed offered by the 6300kW main engine. Based on a PTI (power take-in) arrangement whereby the shaft alternator will be supplied by the auxiliary gensets to deliver up to 1500kW to the propeller shaft, the system has particular relevance to the needs of operators faced with the rising expectations of oil company charterers.

Recourse to Skipskonsulent design know-how by Nordic owners building in China is also demonstrated in consecutive Swedish contracts at the Shanghai Edward yard. Tarntank has ordered a fourth example of the 14,800dwt product/chemical carrier series, led by the 2001-delivered *Tarnvik*. The Tarntank ships employ the SK4092 design, offering a capacity of 15,800m^3 at 98% load.

A slightly shorter tanker, formulated as the SK4092S type, is also in hand at Shanghai Edward's premises for delivery to Tarbit Shipping, based at Skarhamn, in April this year.

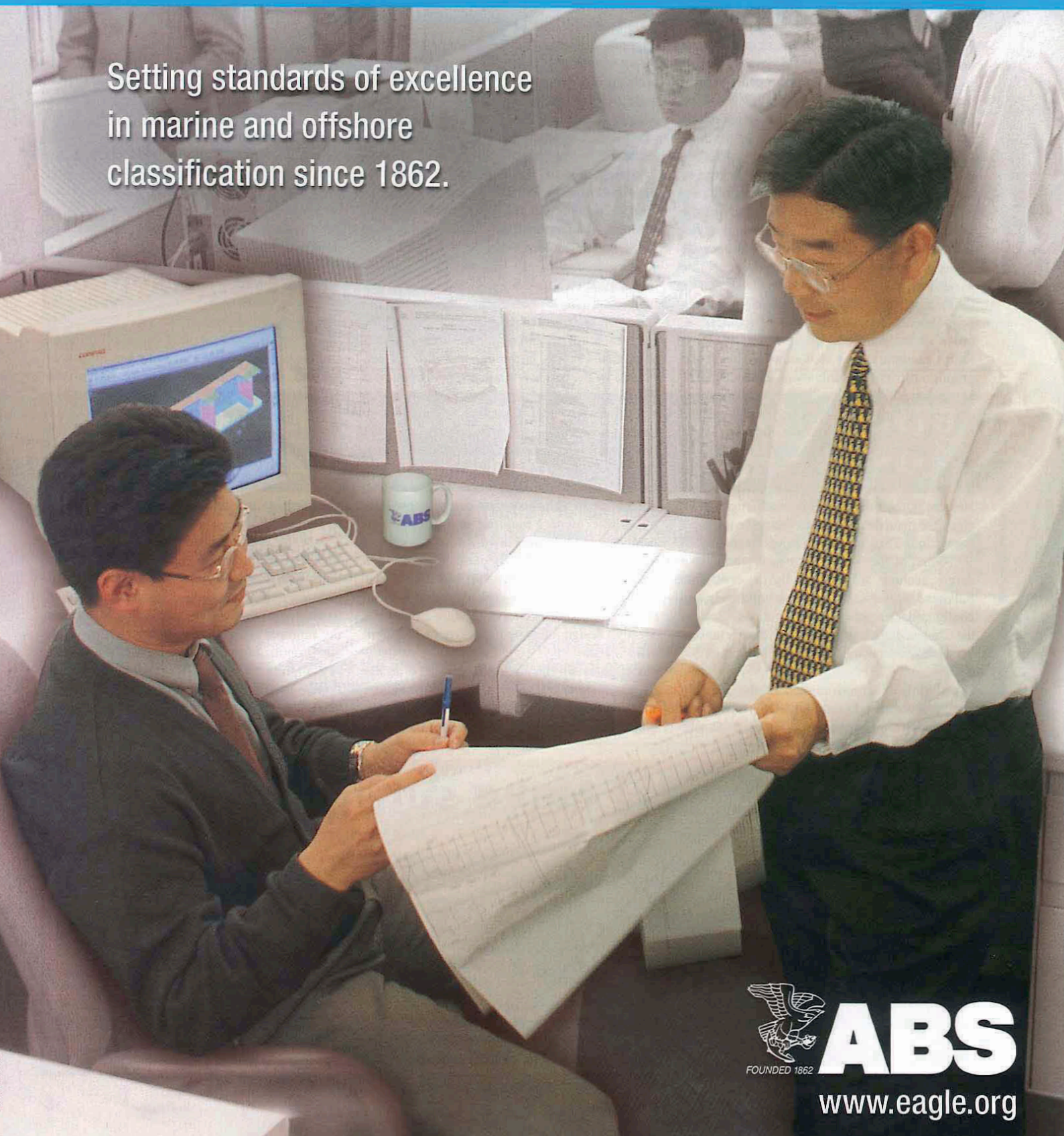
New designs for Everard

Prominent UK-based shortsea specialist F T Everard & Sons has made fresh recourse to Skipskonsulent's design know-how in connection with its latest fleet development project, entailing four oil products tankers, the first of which is nearing completion at Qingshan Shipyard, in Wuhan. Just as the Norwegian consultancy's SK4070 type was used by Everard for an earlier tanker building programme in the Orient, resulting in the delivery in 1997 of the 3780dwt *Asperity*-class duo from Keppel Singmarine (*Significant Ships of 1997*), the SK4210 design has been drawn up for the new quartet.

This new class of distributive tanker, conceived for unrestricted service but intended primarily for coastwise and shortsea duties, is similar in deadweight and some 6m longer, at 94.80m overall, relative to *Asperity*. As with the Singapore-built class, the Qingshan newbuildings incorporate an extra-wide double hull because of the absence of a centreline bulkhead. Instead of the five, full-width cargo tanks of 4250m^3 total intake in the *Asperity* type, each of the latest series is configured with six cargo tanks, amounting to a volume of 4550m^3, and giving six segregations.

Asperity and her sister were notable at the time as particularly sophisticated vessels for their size, and Everard's next generation will provide a new showcase for coastal tanker technology. Among the outstanding features is the nomination of a diesel-electric powering and propulsion system, driving twin propellers. A complete package will be provided by the Dutch company Imtech Marine & Offshore, using six 625kVA diesel-alternators and two 900kW propulsion motors.

New Demands Faster Phase-out Same Partner



New gas engine from Bergen

THROUGH the endeavours of the Rolls-Royce group member Bergen Engines, a powerful new design of gas engine has been added to the market. In addition to extending the scope of the Bergen Engines range in the market for stationary plant (a core business for the Norwegian manufacturer's lean-burn, spark-ignition gas engines), the new 350mm-bore prime mover is also considered to have potential in the marine field.

Officially designated the B-gas engine, but also referred to by technicians as the B35:40V type, the new machine gives fresh impetus to the company's drive to sell reciprocating gas engines into the marine propulsion sector. Building on the popular B32:40 diesel hardware, and incorporating the best of the KV-G4 gas engine combustion and governing technology, the B-gas design will deliver 440kW/cylinder in 12-, 16- and 20-cylinder vee-form configurations. The crankshaft speed is 720rev/min-750rev/min - on a par with that of the B32:40 diesel model.

With a maximum delivery of 8800kW, the B35:40V is the most potent medium-speed reciprocating gas engine from Rolls-Royce and the Bergen stable, and is claimed to be the world's most powerful spark-ignited gas engine. Interest in gas fuel for ship propulsion is growing in line with increasing concerns over emissions performance, prompted by the spread of environmental legislation and controls. Gas has clear advantages in an emissions context when used in suitable engines, burning cleanly to give low levels of NOx, negligible levels of SOx (oxides of sulphur), a claimed, complete absence of soot and smoke at any load, and the lowest CO_2 emissions of any fossil fuel. With a thermal efficiency of 46%, the B-gas engine is regarded as considerate to the environment.

A key advantage of the pure gas engine from a marine propulsion standpoint is that it lends itself to direct mechanical drive, as well as to diesel-electric systems. Having the diesel mechanical option is important to those owners who might baulk at the diesel-electric mode for whatever reason.

Rolls-Royce Bergen Engines considers that the B-gas concept lends itself to a number of sectors of the marine market, and is currently focusing on ferry applications. Norway's concerted development of the supply infrastructure to help foster use of indigenous LNG by both landside and marine transportation is salient to these efforts. The producer is ready to deliver a B-gas engine for marine use pending a relevant project. In the meantime, the design has made its landside operational debut in Denmark, where a 12-cylinder model started service at the Torring co-generation plant in October 2003.

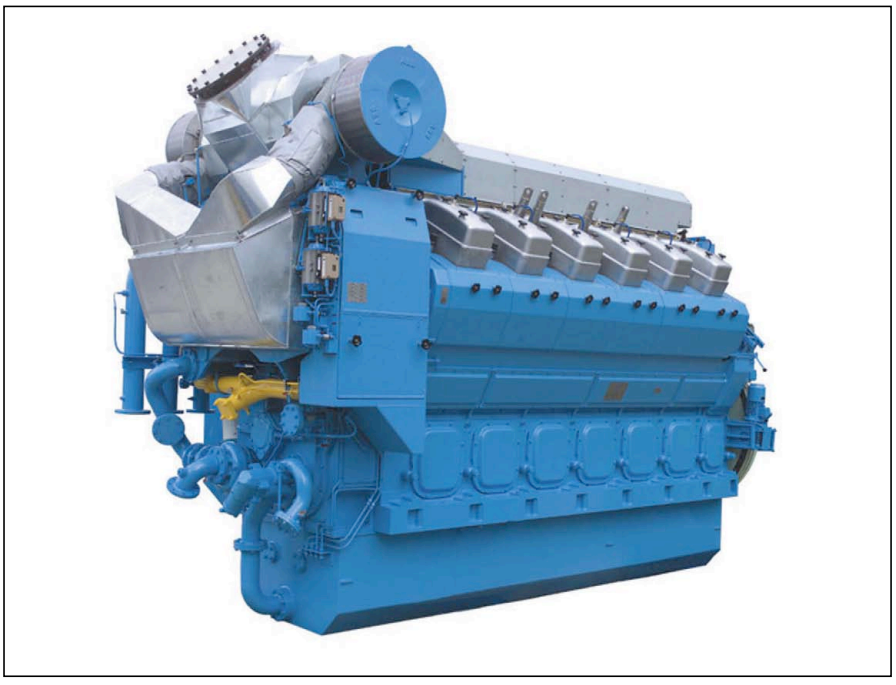
Last year, the group carried out special test programmes to explore the limits of lean-burn gas engine technology for marine propulsion. According to Rolls-Royce, the tests demonstrated first-rate performance under both steady and transient conditions for Bergen engines with their proven, lean burn combustion, advanced governing using individual gas and air control for each cylinder, and variable geometry turbocharging.

Good results were also obtained under rigorous manoeuvring and crash stop scenarios, demonstrating flexibility under quickly changing load conditions, suggesting that such plant would be well suited to dynamic positioning duties in offshore service vessels and to applications requiring frequent manoeuvring, such as ferries. 'Efficiency and power under propeller law operation is excellent, allowing simple mechanical transmission solutions to be chosen for optimum cost efficiency and weight reasons,' observes Rolls-Royce. Alternatively, electric transmission can be used if this best suits a vessel's operating profile.

Should a liquid fuel 'get-you-home' capability be required in an otherwise gas-fuelled vessel, Bergen argues for a simple mechanical transmission for the gas engine which can also drive a combined alternator/motor from a PTO (power take-off) on the gearbox. In an emergency situation, the electric unit could operate as a motor driving into the gearbox and powered by an emergency diesel genset.

Although there are as yet no international regulations governing gas-fuelled ships, Det Norske Veritas has established rules for engine installations in gas-fuelled vessels, and the Norwegian Maritime Directorate has drawn up requirements for gas-fuelled ferries and cargo ships.

While the B32:40 diesel engine went to sea for the first time in 2002, as the basis for the four-engine plant in the UT728L-type anchor-handler *Far Saltire*, the new B-gas engine may in turn provide the basis for a future heavy-fuel-burning vee-type series at 320 mm bore. This could be ready by early 2005. ⚓



Rolls-Royce has unveiled its most powerful medium-speed gas engine. This Bergen B-series, unofficially known as the B35:40V, offers useful potential for marine operation.

TECHNICAL PARTICULARS
BERGEN B-TYPE GAS ENGINE

Cylinder bore	350mm
Stroke	400mm
Output/cylinder	440kW
Cylinder configuration	12V, 16V, 20V
Max power range	5280kW-8800kW
Running speed	720rev/min-750rev/min

Strengthening automation and control at Rolls-Royce

PIVOTAL to the Rolls-Royce group's expanding role as a prime contractor for integrated ship systems, and central to the business need to meet higher expectations of reliability and performance with equipment of increasing sophistication, is the strengthening of its Norwegian-based activities in marine automation and control. Recent initiatives in integrated dynamic positioning technology and advances in joystick systems are underpinned by electronics know-how crafted and nurtured in Norway to achieve ever-more practical effect.

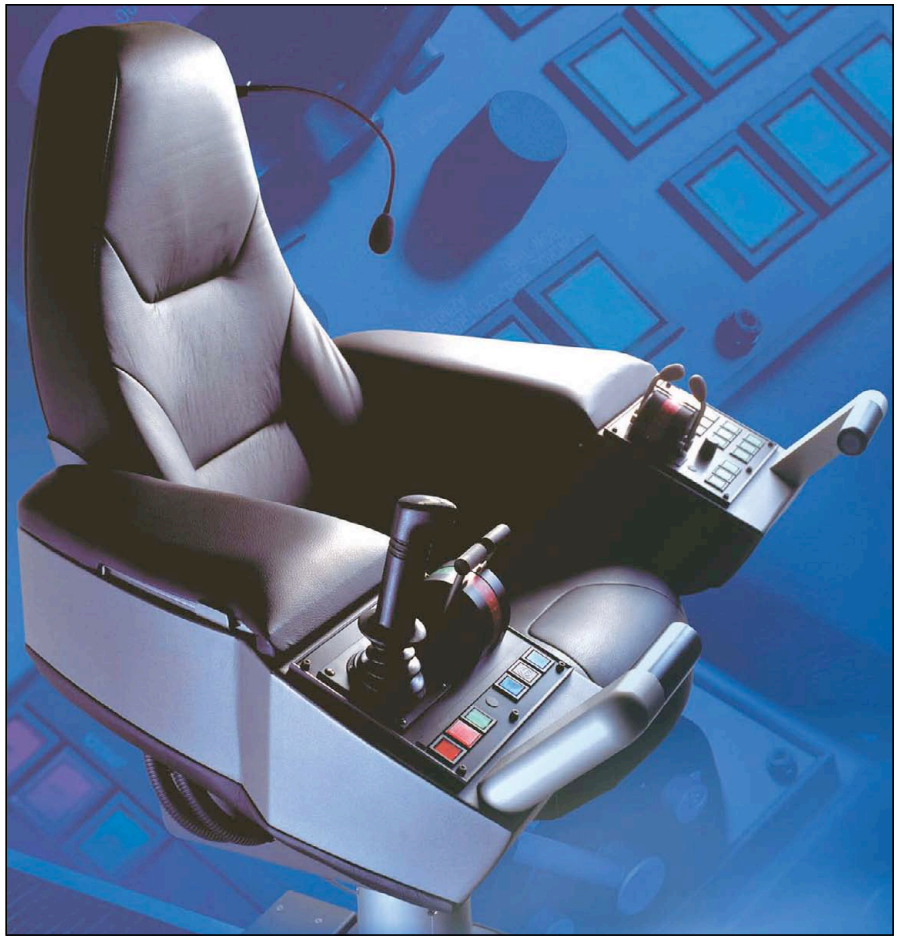
The running development programme overseen from the group's automation centre at Longva, on the west coast, is multi-faceted, spanning an increasingly wide range of Rolls-Royce marine equipment and machinery. Applying new and common system architecture, it encompasses the Bergen engine monitoring system also the turbine control system for the new, UK-developed Rolls-Royce MT30 marine gas turbine. Development work on UMAS monitoring and alarm automation is now focused on a third-generation system.

Other elements of the Longva programme include new propulsor and winch control systems, steering gear controls, health monitoring, and integrated bridge systems. The latest initiatives in joystick control and integrated dynamic positioning systems fit in with the company's marine automation strategy, based on the common control platform concept.

In March 2003, a new department was established in nearby Ålesund to focus specifically on controls, with the initial emphasis on DP and joystick system developments. The Ålesund team cooperates closely with the group's ship design, propulsion and automation divisions, and also with key customers through the development stages and prototype installation. Functional integration is a core theme of the DP programme, and market release for DP products is planned for 2005, first targeting the offshore sector.

Rolls-Royce DP technology will be embodied in an operator workstation, operator panel, and graphical display linked to the main control cabinet and controller by the control network. This will interface to other, or third-party equipment including integrated bridge systems, sensors, and position reference systems. It will then send instructions to the power and propulsion plant, propulsors, and manoeuvring equipment. A further set of interfaces can exchange data with support, monitoring and advisory systems.

Under the development project, a simulator platform is to be delivered to collaboration partner Ålesund University College (Hogskolen) during the first quarter of this year, for evaluation of the joystick/DP technology in application to offshore support ships. A compact DP prototype is scheduled to be ready in the second quarter of the year, and a full prototype system is envisaged later in the year.



The UMAS captain's chair from Rolls-Royce: a new ergonomic design for use during offshore work or manoeuvring.

In the meantime, the new Rolls-Royce joystick system had its first reference in 2003 on the innovative, Azipull-fitted FerryCat fjord ferry built by the Fjellstrand yard for service across Stavangerfjord. Subsequent installations at the end of 2003 entailed systems for two UT745E-type diesel-electric offshore support ships constructed by the Langsten yard, followed by applications to a further two FerryCat double-enders ordered from Fjellstrand by a Turkish operator.

With the Norwegian heritage companies' long experience in the offshore support vessel sector, an early recognition of the practical needs of ships' masters in simultaneously operating winch and propulsion controls led to the development of the skipper's chair, with integral controls in the armrests. The concept has now been taken an important stage further, as expressed in the recent unveiling of the UMAS captain's chair, akin to an aerospace solution, and marrying new thinking in ergonomic design with interfacing flexibility.

Incorporating the remote controls for propellers and winches in the armrests obviates the need for the master to stretch or bend to reach the various devices during offshore operations and manoeuvring. Microphones can be included with a foot switch. Rolls-Royce is ready to work closely with any manufacturer of remote controls to be used in the captain's chair, and will prepare installation drawings for the yard. The company is adamant, though, that equipment mounted in the armrests must complement, rather than replace, controls in the bridge consoles.

One of the latest additions to the Bergen medium-speed diesel range, the C-type, benefits from a monitoring system fitted on the engine itself, and interfaced to the remote devices via a bus system. Connections to the engine sensors are protectively routed through an aluminium profile integrated with the engine frame, and control and monitoring uses a panel PC with 264mm touch-screen resiliently mounted on the engine.

Similar systems are being applied to other Bergen engines, not least the B32:40 design, which made its seagoing debut in 2002. The B32:40 incorporates a CAN (controller area network) bus signalling system for monitoring purposes. A touch-screen menu-type engine display unit is linked to the bridge and other monitoring systems.

Rolls-Royce ploughed around NKr30 million into controls and automation R&D at its Norwegian premises during 2003, and a similar level of expenditure is expected through 2004. One of the next developments will be a new console layout. ⚓

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R&D - a key aspect of DNV's future

RESEARCH is fundamental to the regeneration of any maritime technological base, to product and service competitiveness, and to the ultimate benefit of safe and efficient sea transportation. However, under today's exacting, intensely competitive market conditions and the relatively narrow margins obtainable in so many fields of maritime industrial endeavour, there is a pressing need for companies and organisations to give greater market focus to their research efforts. Understandably, there is a much increased expectation of an identifiable business return on such expenditure.

Classification societies have recognised the economic requirement for more pragmatic R&D, while acknowledging that their standing as centres of maritime technology and know-how is inextricably linked with a capability for thinking well ahead down the technological timeline. Indeed, expenditure on certain areas of R&D work, notably evaluation of infant technologies, must transcend the cyclical influences on the maritime business.

Det Norske Veritas ploughs around 5% of its turnover back into R&D, and has adopted what it terms a 'third-generation R&D philosophy'. Under this initiative, its endeavours are closely integrated with the society's overall business plans. Its strategic research division, looking some five or even 10 years ahead, identifies and tests new technologies and builds knowledge within areas that are considered to offer future opportunities. Much of the work is then passed on to the business units, which undertake further or applied research, with the ultimate aim of bringing technological advance to bear on specific services and products.

Adhesive being applied at Det Norske Veritas during bonding trials under the BONDSHIP project.

DNV's strategic research during 2003 was focused on five major programmes, comprising lightweight and multifunctional materials (LMM), energy and resources, transport systems, organisations of the future, and bio-risk management, all of which are pertinent to the society's technical maritime activities as well as work in other industries.

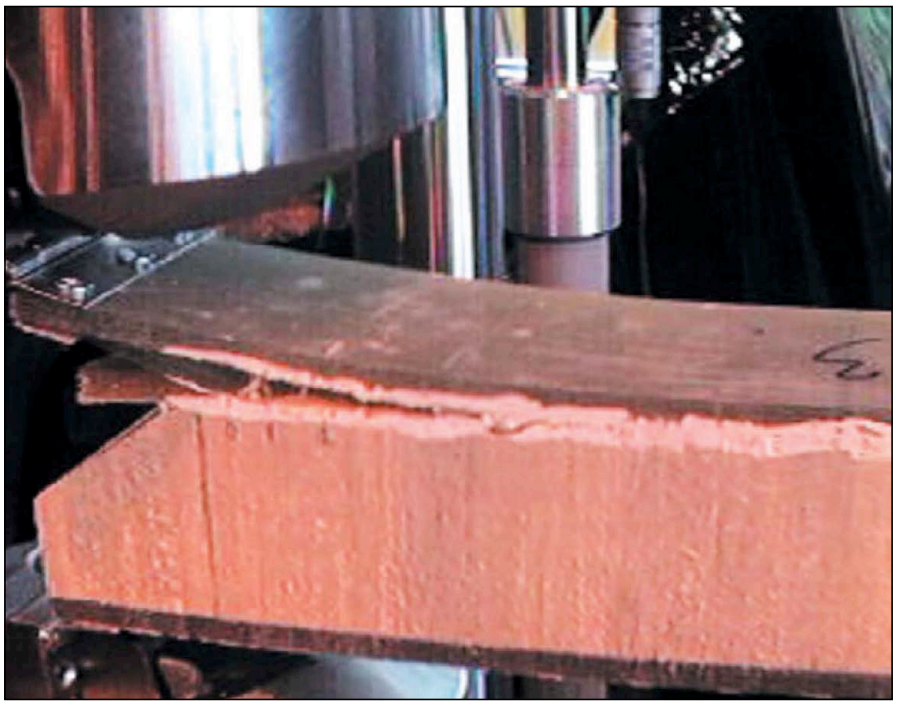
Current investigations into the ballast water issue illustrate DNV's high-technology research capacity, and the business case and environmental arguments for pragmatic research work. As is now widely recognised, ecosystems worldwide are threatened by the introduction of new species from other ecosystems, which can be transported via deepsea vessels' ballast tanks. For the USA alone, it is estimated that invasive species cost the country over US$100 million every year.

Among other current studies being undertaken by the strategic research division, and which could in time form the basis for further research by the society's maritime business unit, is an investigation into the possibilities offered by nanotechnologies as regards lightweight and multifunctional materials.

The present focus is on research related to lightweight structures, such as steel sandwich and composite superstructures, new joining methods, encompassing adhesive bonding and hammer-peening, and the inspection and repair of sandwich structures. DNV will seek to exploit nanotechnologies to strengthen the society's own technological and skills base, and renew its current service portfolio. Promising areas are felt to include the development of ultra-lightweight materials with superior coating and super-light, fire-resistant walls. Researchers dealing with composite lightweight structures and joining methods were transferred to DNV's

continued

Pull-off test of a sandwich specimen at the DNV laboratories.



technology services business area in September 2003 in order to 'commercialise' their expertise in the field.

A current example of research feeding directly into a product with undoubted safety and operational merits is DNV's active operator guidance (AOG) concept. In close cooperation with major container ship fleet owners, AOG is under development as a shipboard decision support tool, to help the master and bridge personnel avoid or minimise hull damage and loss or damage to cargo in heavy weather.

AOG combines analytical tools previously only used in seakeeping simulations for ship design, with novel hardware technology to capture real-time sea state information. It provides guidance on operating the vessel within safe limits at optimal speed in the pertaining sea state. It employs a wave radar to monitor sea state, a motion sensor, a database of pre-calculated seakeeping simulations and operational limits, and software to integrate the system with a display and operational guidance screen on the bridge.

The five key aims are to prevent the onset of parametric rolling (a potentially severe problem for large container liners), to prevent broaching, to keep rolling, pitching and accelerations during normal operation within safe limits, to keep slamming forces on the bow and aftship within the hull design limits, and to prevent green seas on deck. The first commercial version of the system is expected to be released in the summer of this year.

In addition to in-house work, DNV is extensively involved in collaborative research projects at national and international level, entailing a high degree of public funding. An ambitious, proposed new initiative entitled Safedor (design, operation, and regulation for safety), champions the concept of safety as a fundamental design objective, rather than as a design constraint.

DNV is one of eight European companies and organisations which have taken the lead in shaping Safedor, with a view to research studies being implemented in April this year under the auspices of the EU's Sixth Framework Programme.

A risk-based approach to ship design and approval is the central theme of Safedor, which would encompass a number of research projects over four years, undertaken by different groups of study partners. Among the topics on the preliminary list are structural integrity, stability, flooding prediction, cargo securing, lifesaving systems, probabilities of collision, grounding, fire and explosion events, and an integrated design environment. Other subjects include a risk-based regulatory framework, innovative decision support, high-level formal safety assessment, and a risk-cost-earning performance model. Research would concentrate on knowledge-intensive and safety-critical vessels with high economic value for European industry.

New-generation car carriers for Wilh Wilhelmsen

DURING September 2003, Wilh Wilhelmsen awarded a contract to Mitsubishi Heavy Industries for the construction of a third PCTC of 6500-unit capacity, and simultaneously took out options on three additional vessels of the same type. Costing just under US$50 million apiece, the first ship is intended as a replacement for the wrecked *Tricolor*, and is due to be phased into the jointly-owned Wallenius Wilhelmsen Lines' operation in October this year.

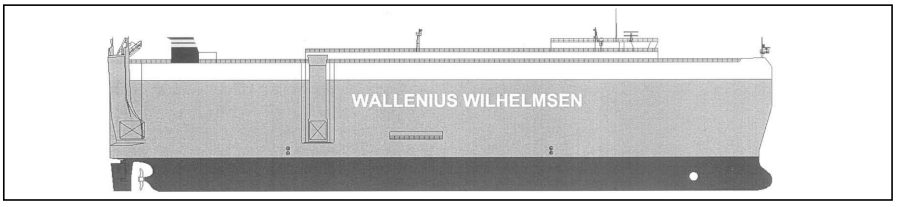
The second vessel, scheduled to be handed over by the Nagasaki yard in January 2005, is to be deployed by the South Korean joint venture EUKOR Car Carriers. Allocation of the third newbuilding, expected to be ready in July 2005, had not been decided at the time of writing.

Project management and design input for the newbuilding programme is the responsibility of Barber Marine Consultants, the Wilhelmsen group's technical arm.

Both the scale and potential mix of the cargo intake in the series will put the ships at the leading edge of the PCTC category in terms of capacity and capability. The 6500-unit rating is calculated using the RT43 dimensional standard, which allows for an overall stowage area of 8.5m^2/car, based on a vehicle of 4.125m x 1.550m plus the requisite stowage margin, all around. The tightness of the stows employed for today's trade vehicle shipments may be gauged from the fact that the 'air' gap between the cars is just 300mm, pointing also to the effectiveness of lashing arrangements and to measures to reduce vessel motions.

Wilhelmsen's PCTC newbuildings are approximately 200m length oa, compared with 190m for the preceding generation of ships. Japanese loading ports primarily determine the 200m length parameter, while retention of Panamax beam remains a key operational criterion.

In addition to the gain of 10m in hull length, increased carrying capacity has been realised through various optimisation measures, while maintaining the same level of horizontal subdivision in the form of 12 decks. One such modification has been the release of the full width of the uppermost car deck by transforming certain equipment and trunking to the weatherdeck, allowing the car stow to be taken out fully to each side. In addition, obstructions have been minimised through a reduction in the number of pillars, with companion steps to ensure rigidity and strength.



Profile of Wilh Wilhelmsen's new 6500-unit car/truck carriers ordered from Mitsubishi for operation in Wallenius Wilhelmsen services. They will be powered by Mitsubishi UEC60LSII slow-speed machinery.

As with the earlier ships, four of the 12 vehicle decks are dimensioned for 'high and heavy' cargo, and incorporate liftable car decks. In addition, so as to confer added operating flexibility, the platform decks will permit locking at three heights, offering increased stowage scope and permutations for different categories of car and other vehicles. Special scissor trucks for moving the liftable deck sections will be carried aboard the ships.

In addition, the height of the fixed car decks will vary between 1.85m and 2.30m, to improve versatility in catering to the changing shapes and heights of modern cars, notably the new breed of so-called sport utility vehicles (SUVs).

Emphasising the 'high and heavy' freight-carrying attributes of the design, the main deck will have a maximum clearance of 5.20m and will be strengthened for unit weights up to around 200tonnes, carried on special roll-trailers, and for a 60tonne front-lift truck axle load. Inter-deck transfer arrangements from the main deck upwards are based on hoistable ramps which can be lifted while bearing vehicles, as a further optimisation measure. The entire outfit of cargo access equipment, including the huge quarter ramp, plus shell side ramp and internal ramps and covers, has been supplied by TTS Ships Equipment.

Deterministic progressive flooding calculations have been applied by Barber Marine Consultants in the latest project, to ensure that the vessels will be able to survive penetration of the shell in way of the main deck.

Mitsubishi UEC engines selected

The Norwegian company has once again opted for indigenous, Japanese low-speed diesel propulsion machinery rather than the market-dominant European two-stroke brands. Through recourse to Mitsubishi's own UE series, in the shape of a seven-cylinder UEC60LSII engine delivering 13,240kW to a FP propeller, Wilhelmsen suggests that the installed horsepower will be less than that of comparable ships in the vehicle carrier sector. Anticipated speed of the new class is 20knots at 9.5m design draught.

UE performance in terms of specific fuel consumption is well regarded among users of such machinery, and Wilhelmsen can look to its own experience with the modern generation of UE engines since the delivery of the *Taronga* from Mitsubishi in December 1996 (*Significant Ships of 1997*). *Taronga* had been fitted with a 7UEC85LSC two-stroke model, following detailed studies including analysis of engine load profile and performance against criteria for maintainable service speeds, reliability, and running costs.

Nordvestconsult tanker proposal for Statoil

AN innovative design of coastal products tanker is being planned by Ålesund-based Nordvestconsult (NVC-Design) for an unidentified Norwegian owner on the strength of a charter to national energy group Statoil. The project is an endorsement of the commercial viability of the consultancy's proposals for a tanker concept based on pulling azimuth thruster propulsion - featured in our July/August 2003 issue, page 14, enshrining issues of system reliability, redundancy, manoeuvrability and cost-effectiveness. It also expresses Rolls-Royce Marine's (Nordvestconsult is today a member of that group) strategic decision to expand its market reach by delivering designs for product and chemical tankers in the 3000dwt-20,000dwt range, focusing on tonnage required for operation in coastal and narrow waters.

For Nordvestconsult, which celebrated its 30th anniversary in December 2003, the commission constitutes a breakthrough in the tanker domain, complementing its highly regarded work in ferry, fishing vessel, vehicle carrier and cargo ship design. The move into the tanker field is a response to the perceived market opportunity offered by regulatory influences on tonnage demand, and by the new expectations of owners and charterers (including major oil companies) in propulsion redundancy and higher safety factors in coastwise trading. The age profile of the existing fleet in the targeted tonnage band, coupled with the accelerated phase-out of single-hull tankers, suggests a demand for some 500-1000 such new vessels over the medium-term.

The 4250dwt tanker planned for duties with Statoil will offer a cargo capacity of 5200m^3 in 10 cargo tanks. She will be distinguished by the use of a twin Ulstein Aquamaster azimuthing pulling propeller (the Azipull system, discussed in *The Naval Architect* January 2001, page 47), driven by two medium-speed diesel engines, of as yet unspecified make, producing approximately 1400kW apiece.

Model AZP085 propulsors, incorporating CP propellers, will be employed. A clutch fitted at the top end of the Azipull will enable each engine to be disconnected from the thruster unit. Shaft generators coupled to the free ends of the main engines will cover the vessel's at-sea electrical power load, including the feed to a 500kW, electrically-driven bow thruster when manoeuvring.

The system offers full redundancy in both propulsive and electrical power supply, and also permits maintenance of one engine to be conducted while berthed at a terminal. This is especially pertinent to the distributive trades, since oil terminals tend to require main propulsion machinery to be readily available, in case of any need for the ship to rapidly leave the berth.

Rolls-Royce Nordvestconsult designers claim that the compact nature of the Azipull-based installation has yielded a 5%-7% increase in cargo tank volume in relation to other propulsion solutions within the given hull envelope.

The new breed of coastal trader will be the first manifestation of the NVC-Design tanker concept, the outcome of extensive research and development. The work has been conducted using CFD (computational fluid dynamics) techniques, and has entailed comprehensive model basin studies, undertaken at Marintek, in Trondheim, and encompassing hull resistance, propulsion and manoeuvring tests, thruster-hull interaction, and performance evaluation in inclement weather.

Fast fish-transport to be re-studied

A FOUR-YEAR, pan-industry research project launched in Norway during 2003 has the goal of devising a maritime logistics system for transporting seafood from the country's west coast to the European market. Core elements would be a fast, high-capacity shipping service, dedicated handling arrangements, and new thinking in cargo care. There have been previous endeavours to use high-speed catamarans to take Norwegian farmed fish to UK and continental European markets, but none of these proved very successful. One of the main problems seems to have been the issue of cargo care in rough weather conditions.

Following evaluation of three possible ship types in the 130m-170m range, studies are progressing on the basis of a conceptual design of 150m slim monohull vessel, with a service speed around 27knots, developed by Rolls-Royce group member Nordvestconsult in conjunction with Marintek, Norway's test-tank and research organisation. The proposed fish and unitised cargo carrier is something of a hybrid, displaying high-speed vessel lines in the foreship, and a more conventional ro-pax type, with skegs, at the stern.

Main criteria for the vessel in such a role include good seakeeping performance, to ensure scheduling reliability and cargo safety during rough weather, plus tailoring to the special freight-carrying units and handling methods foreseen. Key to the venture's success as a whole is seen as integration, in terms of the meshing of experience and competences from the various disciplines.

Entitled 'High-capacity sea-route logistics system for seafood', the project is co-ordinated by Sintef BioMarine Industry, a business unit created by Trondheim-based Sintef, the largest independent research organisation in Scandinavia. Funding support towards the NKr24 million-plus study has been committed by the Research Council of Norway and the Norwegian Shipowners' Association. Participants include cargo handling specialist TTS (which could perhaps include elements of its FastShip work for the Atlantic), classification society Det Norske Veritas, plus the Rolls-Royce group, with its Norwegian marine equipment, engineering and ship design interests. The project consortium also encompasses four seafood producers, including the country's leading aquaculture 'farmers', and three shipowning firms.

The brief calls for a system initially offering two sailings each week, connecting producers on the Norwegian west coast with a Continental distribution hub, and providing faster through-transport times and lower freight costs than those entailed with existing trailer-based movements. Innovative facets of the system to be developed include special freight containers, new cargo cooling and freezing methods, featuring the superchilling technique, and advanced ship-to-shore handling arrangements.

Capturing lessons learned during FPSO projects

J R Still, formerly of Amerada Hess, London, considers a lesser known aspect of offshore structure design. **Organisations such as oil and gas producers or contractors involved in leasing floating production, storage, and offloading (FPSO) vessels, are recommended to encourage their project teams to select appropriate and relevant benefits from previous project lesson-learned analyses or from other operators of FPSOs willing to share their experiences.**

IT is recommended that an operator records all positive or negative lessons learned during the life of a project to enable these to be included in the work scope of future projects. This article outlines a method adopted by an offshore operator to capture lessons learned during the engineering, construction and commissioning phases of the Triton FPSO project. It is advisable to develop a cause-and-effect diagram based on the work scope and lessons learned, as illustrated in Fig 1 (page 20), which identifies the key activities that influence the success of the project.

To establish a lesson learned, various tools can be used to identify improvements for future projects. The best source for lessons are members of the project team. In the case of Triton, the project team was invited to describe any lesson learned and to recommend how to improve or accept a finding as being appropriate for future projects.

Methodology

Individuals from the project team were requested to submit details of any item or items, which they considered added no value, or where substantial gains were achieved or could be achieved for the future.

PROJECT ELEMENTS		ACTIVITY	
A	PROJECT MANGEMENT	1	MANAGEMENT
		2	CONTRACTS / COMMERICAL
		3	PLANNING
		4	DCR / CLASS
		5	HSEQ
		6	DEVELOPMENTS
B	VESSEL	1	DESIGN / ENGINEERING
		2	CONSTRUCTION / INSPECTION
		3	COMMISSIONING / SEA TRIALS
C	TOPSIDES FACILITIES	1	DESIGN / ENGINEERING
		2	PROCUREMENT / FACTORY ACCEPTANCE TESTS
		3	CONSTRUCTION / INSPECTION
		4	COMMISSIONING (ONSHORE)
D	MOORING SYSTEM	1	DESIGN / ENGINERING
		2	CONSTRUCTION / INSPECTION
E	OPERATIONS INVOLVEMENT	1	DESIGN / ENGINEERING / CONSTRUCTION

Table 1. Categories identified as essential for the success of the Triton project.

It was also stressed that the names of individuals were not to be added to the submission sheets so as to ensure that realistic findings could be documented. Principal elements of the project were subdivided into activities considered essential for the success of the project and are listed in Table 1. The importance of these elements can be compared to segments of an arch supporting a bridge. All segments are equal and play an important part in achieving the project objectives. Elements considered essential in the project were:

- project management
- the vessel
- the topsides facilities
- the mooring system
- the involvement of operations personnel.

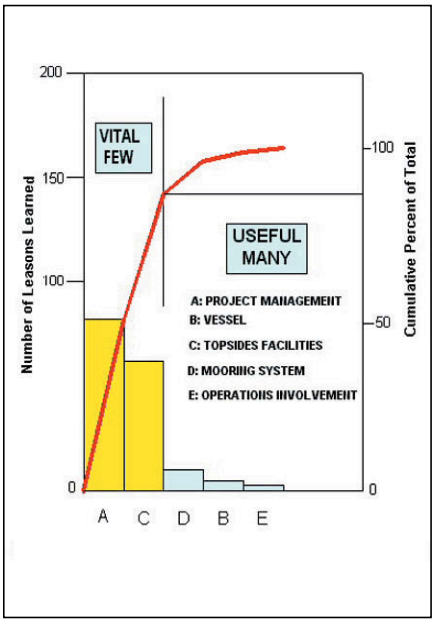
Lesson-learned analysis

The lessons learned were segregated into their respective elements and activities as outlined on Table 2. In order to identify the essential elements and activities that contribute to the success of the project, a Pareto Analysis [Ref 1] was used (a Pareto Analysis is considered to be a simple bar chart used after data collection to rank causes so that priorities can be assigned; its

Table 2. Results of a lesson-learned survey.

PROJECT ELEMENTS		ACTIVITY	%
A	PROJECT MANGEMENT	MANAGEMENT	37.8
		CONTRACTS / COMMERICAL	35.4
		PLANNING	3.4
		DCR / CLASS	2.4
		HSEQ	19.5
		DEVELOPMENTS	1.2
B	VESSEL	DESIGN / ENGINEERING	25
		CONSTRUCTION / INSPECTION	50
		COMMISSIONING / SEA TRIALS	25
C	TOPSIDES FACILITIES	DESIGN / ENGINEERING	41.9
		PROCUREMENT / FACTORY ACCEPTANCE TESTS	14.5
		CONSTRUCTION / INSPECTION	35.5
		COMMISSIONING (ONSHORE)	8
D	MOORING SYSTEM	DESIGN / ENGINERING	84.6
		CONSTRUCTION / INSPECTION	15.4
E	OPERATIONS INVOLVEMENT	DESIGN / ENGINEERING / CONSTRUCTION	100

Fig 2. Pareto Analysis of FPSO project elements.



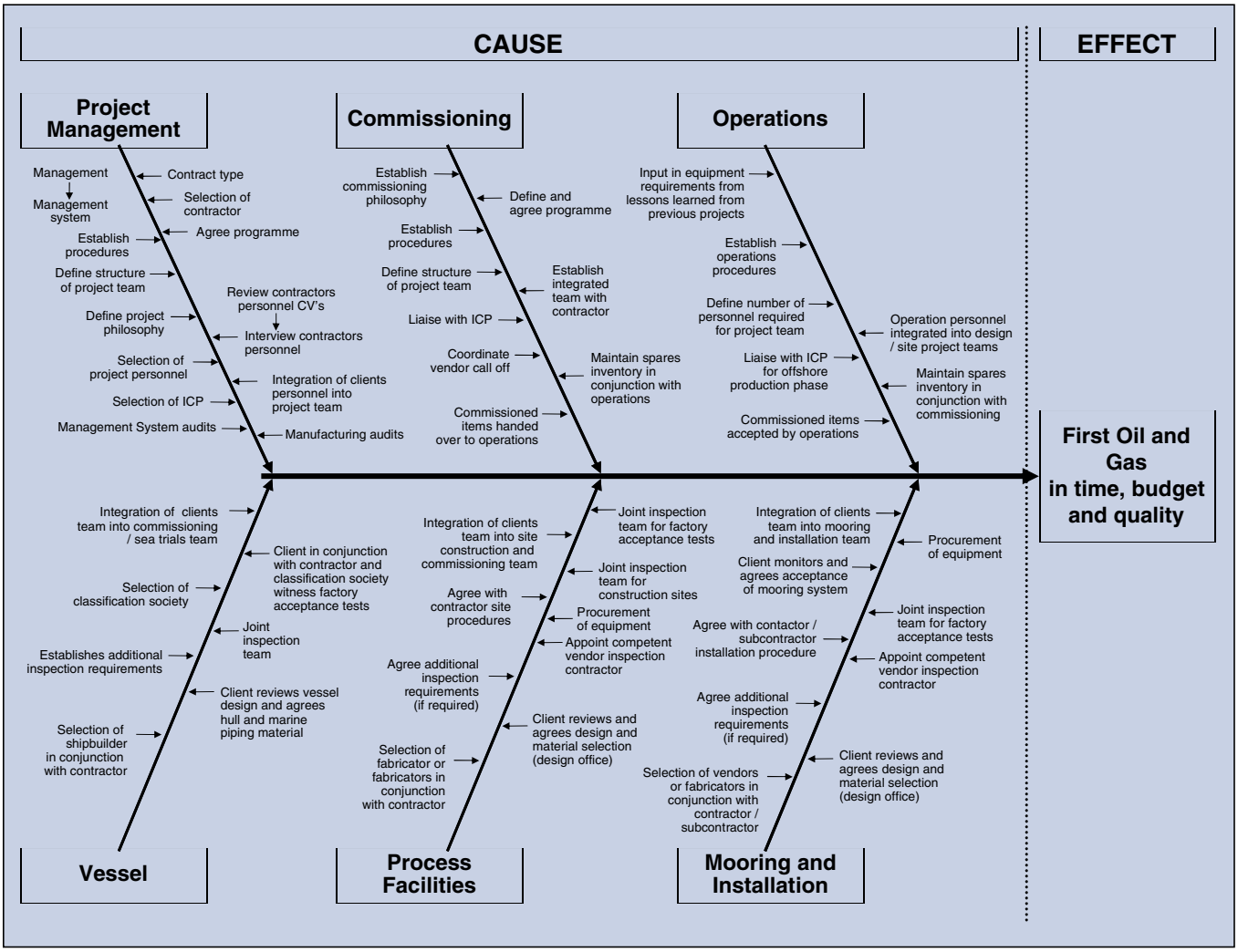


Fig 1. A typical cause-and-effect diagram, which identifies activities that influence the success of a project.

use gives rise to the 80-20 rule: that 80% of problems stem from 20% of causes). This analysis takes into account all elements and activities listed in Table 1 which contribute to achieving the project objectives; some of these influence the final success of a project and are termed the 'vital few'.

The Pareto Analysis was used initially to identify elements considered essential for the success of the project as illustrated in Fig 2 (page 19). It is clear that elements A and C (Project Management and Topsides Facilities respectively) have a significant influence on the success of the project. By means of a Pareto Analysis for activities A and C (Fig 3a and 3b respectively), the following activities were identified as the vital few:

- project management
- contracting and commercial activities
- design and engineering
- construction and inspection.

Although a limited number of lessons learned were submitted for B and D, it was considered valuable to develop a 'realistic' Pareto Analysis in order to demonstrate which element was within the category of the vital few:

- design, engineering, construction and inspection of vessel hull
- design, engineering and manufacture of the mooring system.

The number of submissions pertaining to the mooring system were few in comparison to other activities, the quality of both engineering and manufacture of the swivel surpassed any other element within the mooring system. Examples achieved by the manufacturer are illustrated in Figs 4a and 4b.

Information produced by the project team was used to produce a realistic Pareto Analysis encompassing all activities associated with the elements listed on Table 2. The analysis is illustrated on Fig 5 and identifies the vital few activities which had a significant effect on the success of the project.

Fig 3a. Pareto Analysis of project management activities.

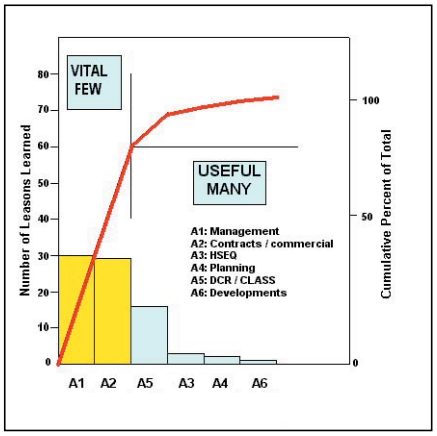
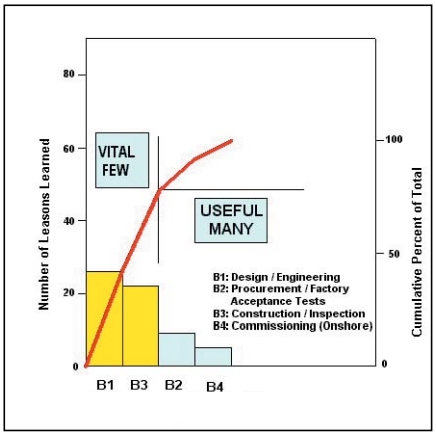


Fig 3b. Pareto Analysis of topsides facilities activities.



The Royal Institution of Naval Architects

FUNDAMENTALS OF CONTRACT AND CHANGE MANAGEMENT FOR SHIP CONSTRUCTION, REPAIR & DESIGN

14th – 16th April 2004

By Dr Kenneth W Fisher, FRINA

The RINA is pleased to announce another opportunity to attend Kenneth Fisher's highly successful three day training programme. The course is primarily designed for project managers who handle day-to-day relations with other parties, people who form contracts and senior managers who monitor contract-related cash flow for marine related projects. Those attending the course will be better able to identify the pitfalls and traps experienced within the industry, and be more prepared to identify all the costs, schedule changes and to properly assign responsibility for those changes and effects. This will save companies considerable sums in each major contract.

" Excellent course which will pay for itself over and over again"
BA Menzies - Babcock Rosyth Defence Ltd

" This was a very thought provoking course providing valuable lessons learned through experience" G Primrose - BAeSEMA

Topics to be covered:

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- Engineering/drawings
- Change orders
- Critical path
- Owner-furnished materials
- Contract performance documentation
- Hourly rates and overtime
- Post-delivery negotiations
- Claim avoidance
- Delay, disruption and accerleration

" After this training course you feel obliged to review all your procedures"
F Fernall - Account Services Maritimes SA

" Excellent course for all who are involved in ship construction or repair and design"
A Cresswell - The China Navigation Co. Ltd

To register, simply complete all sections of this form and return it with your payment to:
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Bank Transfer details enclosed for: £ _____
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Card Number: _____

Expiry date: _____

Signature: _____

Payment must be made in pounds sterling by Eurocheques, cheque drawn on a bank with a UK branch address, credit card (VISA/Access/Mastercard) or bank transfer. Please note RINA requires payment ***before*** the conference date.
Account Name: The Royal Institution of Naval Architects
Account Number: 10042127 **Account code:** 160016
Bank address: Royal Bank of Scotland PLC, Belgravia Branch, 24 Grosvenor Place, London SW1X 7HP, UK.
The following charges will be made in the event of a cancellation: *£250* if received before *16 March 2004*. Cancellations made anytime after that date will not be refunded. Delegates may be substituted in writing subject to the consent of the Conference Organiser.

Registration Fee: RINA Members: £900+VAT (Total: £1057.50) Non Members: £98a0+VAT (£1151.50) Group Fee (3 delegates or more): £880+VAT (£1034.00)

Conclusions

In order to understand the implications of an exercise such as this, it must be appreciated that any lesson learned contains a mixture of both positive and negative views, which are interpreted as:

- positive: identifies where improvements can be introduced into both project management and engineering (such as harmonious relations with the contractors or operator), also areas considered to be satisfactory during the life of a project
- negative: poor relationships with contractors, project management anomalies, and other areas considered wanting.

Although each lesson learned was analysed separately, the frustration experienced by some individuals involved during the onshore phase must be taken into account. Their aspirations to achieve a perfect project may have been dented when the project agreed to a concession on a particular item, with which they disagreed and which may lead to a negative lesson learned.

Operators or contractors embarking on the construction of an FPSO should consider implementing a generic project management system, based on the principle of the model management system [Ref 2]. This system may be applied to all types of FPSO projects involving newbuildings and conversions, including individual items of vessel and process equipment.

In the case of *Triton*, the findings of the project lesson-learned exercise identified that project management as well as the contracting and commercial activities were the key elements to success. ⚓

Ref 1. Pareto Analysis, Juran Institute, Wilton, Connecticut, USA.
Ref 2. BS EN ISO 9000/1:2000 Quality Management and Quality Assurance Standards: Guidelines for Selection and Use.

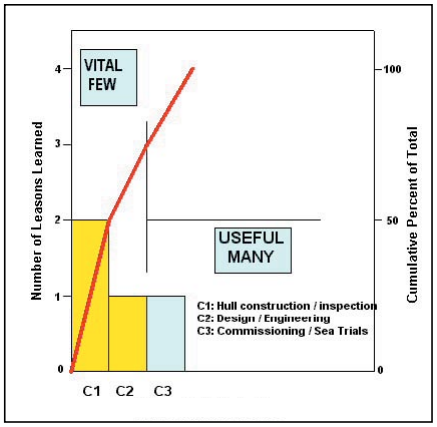


Fig 3c. Pareto Analysis for vessel hull activities.

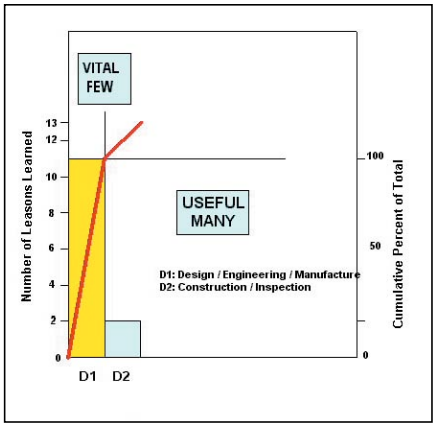


Fig 3d. Pareto Analysis for mooring system activities.

Fig 4a. A swivel section, illustrating the standard of workmanship.

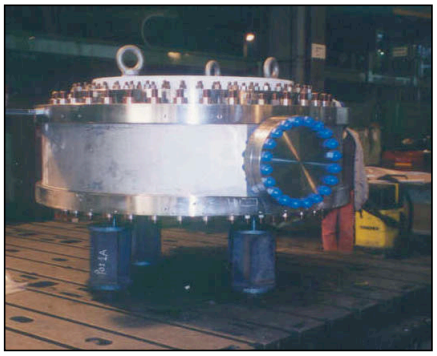


Fig 4b. A completed swivel section.

Fig 6. Model management systems.

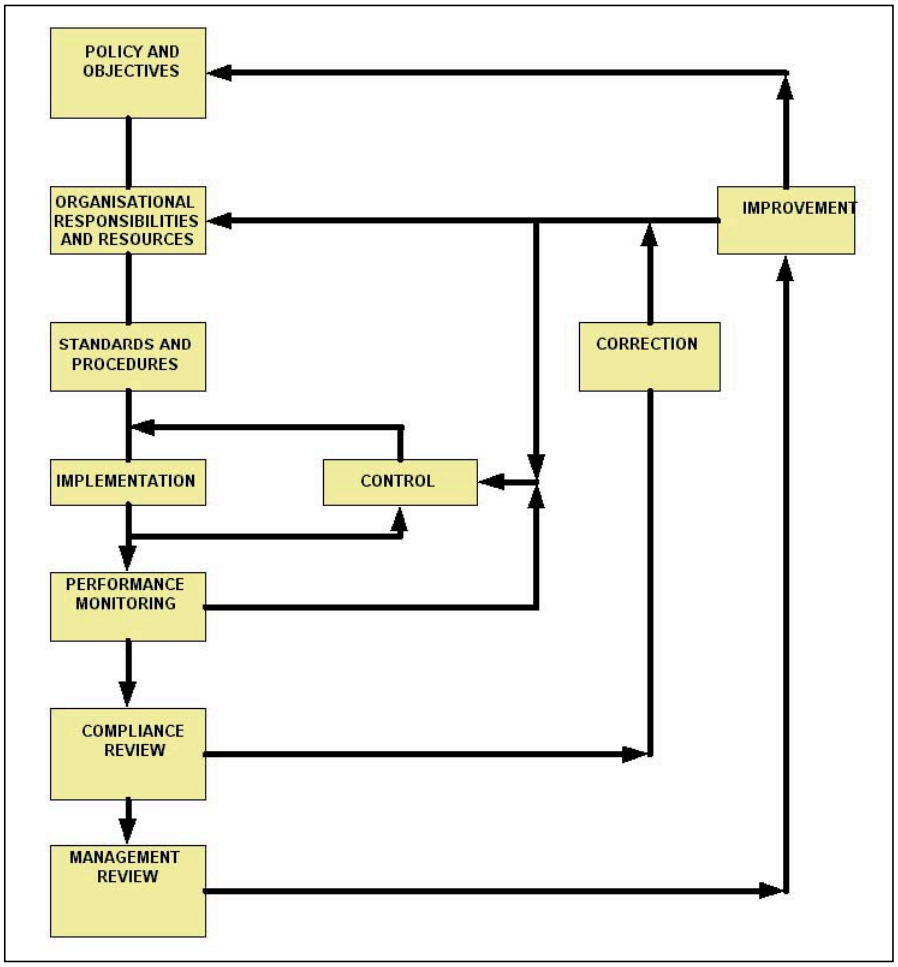
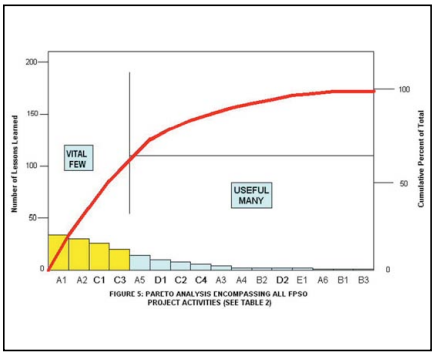


Fig 5. Pareto Analysis encompassing all FPSO project activities (Table 2).



Guidance from ABS on building and classing of TLPs and spars

THE US classification society American Bureau of Shipping (ABS) has announced its industry-first guidance on building and classing the specialised deepwater floating units known as tension-leg platforms (TLPs) and spars. Currently, some 20 TLPs and 10 spars are operating worldwide, with an estimated 20 new TLPs and another 30 spars expected over the next decade. Of the units installed, ABS claims to have classed 13 of the TLPs and all of the SPARs.

This guidance comes in the form of a supplement to the ABS *Guide for Building and Classing Floating Production Installations* and is available to the offshore industry free of charge. While the existing guide addresses column-stabilised units and other types of floating platforms, the supplement addresses the structural performance and demands specifically associated with TLPs and spars. Key areas of emphasis include global performance requirements, load and environmental issues, stability parameters, and structural strength criteria.

The supplement requires that owners perform global performance analyses to fully address the comprehensive effects of environmental loads on an overall platform and its components, including the deck, hull, tendons, mooring system, and risers. Loading and response predictions for each of these components can be completed separately or in an integrated form. Elements of such analyses include frequency-domain analysis, addressing the six degrees of freedom, ie, surge, sway, heave, pitch, roll, and yaw, as well as time-domain analysis, deck clearance, and model testing to calibrate design parameters and analytical tools.

The guide is said to be particularly useful in addressing risk issues associated with potential loss of vessel and environmental protection. Concerning vessel stability, the guide discusses requirements for tendon tension to ensure TLP platform integrity and specifies ballasting requirements in the event of collision damage or accidental flooding. For example, in the event of a vessel collision and considering only one compartment damaged, a TLP must be able to maintain adequate tendon tension, with the vessel capable of sustaining a full range of possible centre of gravity variations.

With regard to spars however, the supplement provides, for the first time, operators and owners with specific design parameters for maintaining stability. The guide requires that all emergency and safety systems, including lifesaving and 'abandonment' equipment, are to be operational at parameters specified for storm survival and specific wind conditions. The supplement also delineates the modes of operation for both pre-service and in-service conditions. Other relevant issues include gravity loads, together with the effects of wind, waves, current and other phenomena, such as earthquake, temperature, fouling, and ice, depending on location.

Load issues addressed include those for the following: environment, hydrostatic pressures and buoyancy, gravity and inclination, inertia, operation, mooring and risers, vortex-induced vibration, green water, and slamming, during both transportation and operation. Vortex-induced vibration loads are new to the guide and are particularly important to the safe operation of spars. The supplement provides that these particular loads and fatigue strength are to be fully assessed and that the mooring system fully analysed, considering vortex-induced vibration effects.

The *Guide for Building and Classing Floating Production Installations* is available for free download at: http://www.eagle.org/rules/downloads.html. See publication Number 82, Supplement 2, August 2003.

University of Michigan entry wins international design competition

With its ultra-deepwater dual-activity entry *Drillship Nereus,* a six-person team from the University of Michigan, in the USA, has won the second International Student Offshore Design Competition sponsored jointly by the US Society of Naval Architects and Marine Engineers (SNAME), the Ocean, the Offshore Arctic Engineering Division of the American Society of Mechanical Engineers, and the Coastal, Oceans, Ports, and Rivers Institute of the American Society of Civil Engineers. This entry was one of six projects submitted by students from universities around the world. Winners received a cash prize of US$1500 and the opportunity to present the *Drillship Nereus* concept to industry representatives last October at the World Maritime Technology Conference and Exposition.

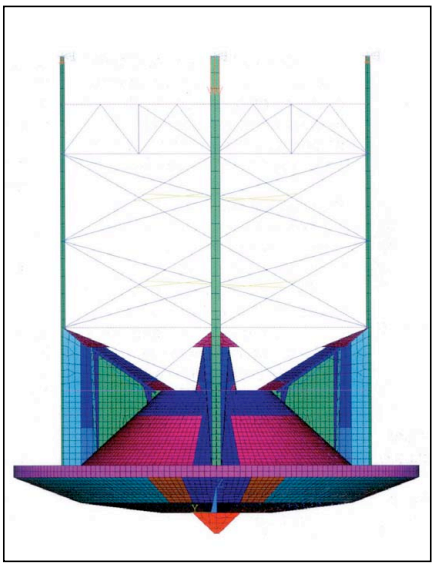
For its entry, the Michigan team prepared a complete contract design, requiring completion of all of the naval architectural requirements such as the general arrangement plan, weight estimate, lines development, hydrostatic calculations, trim and stability calculations, resistance and propulsion estimates, manoeuvring and seakeeping assessment, and the preparation of machinery and systems arrangements. In addition to the structural design of the Panamax-dimensioned vessel and a vibration analysis, its likely cost was calculated.

Longest subsea pipeline tie-back using large-diameter pipe

The UK office in Surrey of Houston-based INTEC Engineering is providing professional services for the Simian, Sienna, and Sapphire deepwater projects as part of continued development of the Egyptian offshore concession north in the Mediterranean Sea's Nile Delta. The concession is operated by Burullus Gas Co on behalf of the West Delta Deep Marine concession partners BG (British Gas) and Petronas. Burullus Gas is a joint venture company, comprising Egyptian General Petroleum Corp (Egypt's national oil company), BG Egypt, and Petronas.

New problems for jack-up operators

Old footprints are causing new problems for offshore drillers and operators of jack-up platforms. These are the craters left behind by the spud cans or shoes of jack-up legs which have previously been drilling at the same location. Installation of jack-ups on such uneven seabed can cause structural damage to the legs as a result of sliding into the old holes. It is very expensive to complete a leg repair or indeed the rig could be completely immobilised as a result of damage. Now Offshore Technology Development, an arm of Keppel Offshore & Marine (Keppel O&M), is proposing a solution to this problem. Keppel client ENSCO International has been implementing a cost-effective solution on some of its jack-up rigs.



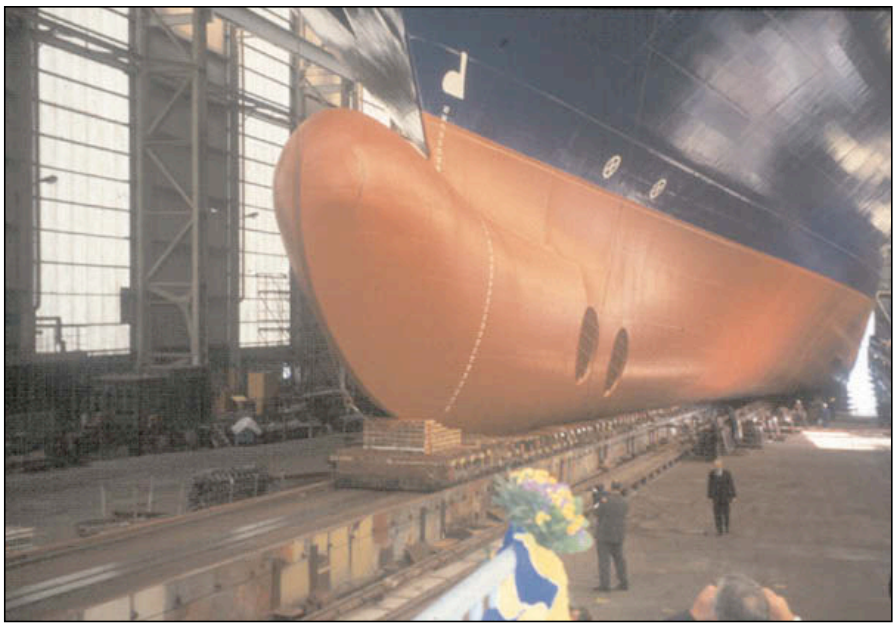
By using the concept of rack-phase difference, Offshore Technology Development and Bennett & Associates plan to be able to alert operators to potential damage from jack-up spud cans placed in old craters.

The obvious solution would be to develop very stiff legs to prevent buckling of the leg braces. However, this would significantly increase the cost of construction but would not completely eliminate the problem. Instead, Offshore Technology Development utilised the established concept of rack-phase difference (RPD), which is the relationship between leg brace loads and the relative elevation of chords of any one leg to provide real-time information; this can then alert drillers and operators to non-design loadings during the jacking of a platform.

With proper measurement of the RPD, costly damage to rig legs can be avoided. Offshore Technology Development and its technical partner Bennett & Associates are promoting the use of RPD monitoring as one of the means to minimise such damage. They are also hoping that the measurement process will be standardised at some stage. Two papers relating to this topic were presented at the recent 9th International Conference on the Jack-Up Platform which was held in the United Kingdom.

Horizontal or sloping?

Geoffrey Fuller reports on newbuilding aspects of The Royal Institution of Naval Architects' recent conference devoted to drydocks, launching, and shiplifts.*



Despite a naval emphasis at the conference, Mr Fred Walker, in his paper 'An overview of ship launching', noted that the Flensburger shipyard in Germany is using computers for accurate monitoring of traditional launches of new-generation single-screw 10,000dwt ro-ro ships (*Tor Petunia* is seen here in September last year). The sliding surfaces are made of steel and Teflon respectively.

A CONFERENCE on launching and docking is most welcome. As far as is known, this subject has not been addressed previously in such a comprehensive manner by RINA, notwithstanding that the changes of environment from land to water and vice-versa are the most potentially hazardous events in the life of a ship.

A total of 19 papers were presented, of which three were for written discussion. Apart from the opening address and two overview papers, they fell into two groups, four on the first IN - the launch, which will be discussed in this report, and 11 on the OUTS and INS during life, which will be the subject of a separate article in *Shiprepair and Conversion Technology*. Not covered was the growing interest in disposal, now relevant to new design, which will eventually become elderly ships of uncertain condition of stability and material content. Today, such ships range from out-of-service cargo ships, US Military Sealift Command reserve ships - some of which were on their way to the UK at the time of the conference - to nuclear-powered vessels of the USA, UK, and Russia.

The conference provided an excellent overview of the many launching methods. Papers covered the past and present, a look to the future, and examples of near accidents. However, little was said about marine railways, a popular method where water and bank conditions are right.

The keynote address was given by John Coles, chief executive of the UK Warship Support Agency (supporter of the conference, which was actually sponsored by Syncrolift), who concentrated on the needs of warships - which set the tenor of the conference. The assets were very costly, critical to the defence of a nation, and in the case of nuclear-propelled vessels, required very stringent safety regulations to be followed. He emphasised the inherent hazards, which could be contained by good management practice, well-trained operators, and proper application of formal safety case (FSA) procedures. He reminded the conference that the UK Ministry of Defence was sponsoring textbooks on launching and docking methods.

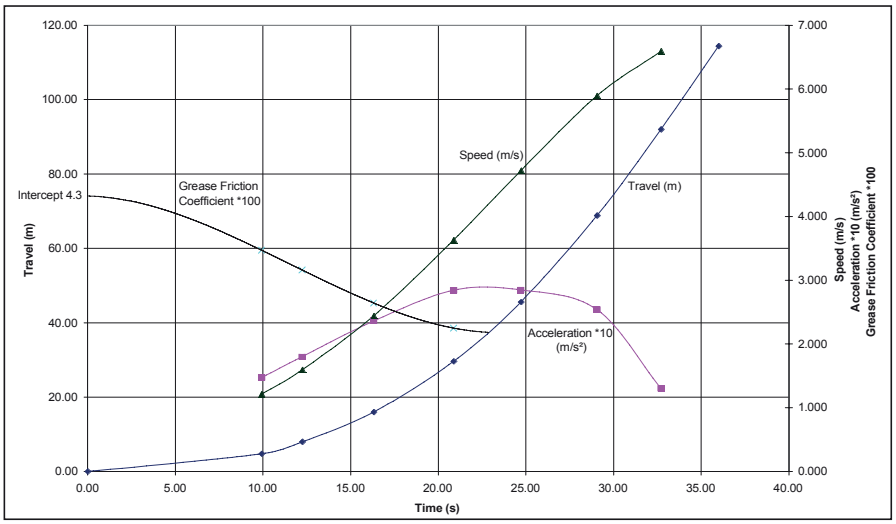
The new fleet tanker *Wave Knight* being prepared for a traditional launch at Barrow-in-Furness in September 2000. Since this yard had been relying on a Syncrolift launch system (with a beam restriction) for previous vessels, naval architects had to re-activate launch skills, last used in 1980. From the paper by J Salisbury and J M Dodd, of BAe Systems.

Launch methods could be divided into two systems. Firstly, dynamic, using gravity to propel a ship down sloping ways into the water, and, secondly, quasi-static systems, in which the ship is lowered into the water or is floated up in a graving dock. There was considerable, even emotional, discussion between the 'dynamists' who have history on their side in the use of the first system - notwithstanding inherent hazards - but which were known and containable, and the 'staticists' who prefer to reduce the hazards to be as low as reasonably practical.

The Barrow-in-Furness shipyard of Vickers (today owned by BAe Systems) was a good example of both methods, well described in two papers. These covered the 15-year experience of the shiplift there (a Syncrolift), designed to cope with the weight of *Vanguard*-class submarines but limited to a beam of 20m - essentially a large destroyer. Orders in the 1990s for AO-class fleet tankers and LPD(R)s, with beams which exceeded 20m, therefore called for re-activation of slipway launches after a 12-year gap in which facilities and skills had been lost.

A very thorough review of launches at Barrow over many years was undertaken, noting that the Walney Channel is both narrow and has a huge tidal range. Drag chains were essential, their stopping criteria being to halt the ship before it hit the opposite shore but also to ensure the ship was clear of the slip and not pulled back onto it.

Other papers described launches at Govan and Scotstoun, and at Woolston, from where the trimaran *Triton* was launched, despite the triple hull form and very little beam clearance. VT described the use of a graving dock at Portsmouth, as part of a barge-launch transfer



A BAe Systems post-launch calculation for travel, time, and speed down the ways of the new fleet tanker *Wave Knight* (around 12,000tonnes launch weight). From the paper by J Salisbury and J M Dodd, of BAe Systems.

system from the new building hall (*The Naval Architect* July/August 2003, page 45). There was also the suggestion that the very large docks at Rosyth in Scotland may be used to assemble large units of the new Royal Navy aircraft carrier, which have been barged from various subcontractors. However, new-construction graving docks are immensely popular in the Far East, where they are almost always used for any 'greenfield' site.

The main messages of this interesting conference were:

• the dynamic launch, stern first, down inclined ways, was still very popular with many shipbuilders, notwithstanding obvious hazards to a hull. It is contended that modern safety assessment techniques will identify the hazards, and then permit them to be ranked and the most likely/serious to be dealt with. However, the main questions of launch weight accuracy, centre of gravity, stability of the ship post-launch, and coefficients of friction of the lubricant and the drag chains remain. One growing problem was the shortage of large timber for the construction of the traditional ways and the high cost of other materials. The less hazardous transverse launch orientation, as used by Northrop-Grumman's Avondale yards and others, was not discussed

• a slow but continuous move to 'static' methods was underway, critically enabling the ship to be built on the level and launched under full human control. Methods discussed at length were the shiplift - a highly flexible system, especially when linked to a transfer system for multi-hull construction, and the use of a slave-pontoon or barge. Not discussed were the use of floating docks fed by a shore transfer system, such as at the Northrop-Grumman Pascagoula yard and the level-land system at General Dynamics' Groton facility

• the assembly and launch of large commercial ships and offshore structures was not addressed at the conference, which, being held in association with the MoD Sea Technology Group, concentrated on warships. It is to be hoped that the important commercial sector will be the subject of a future conference. Finally, it is hoped that the last OUT - disposal - will also be a future topic. ⚓

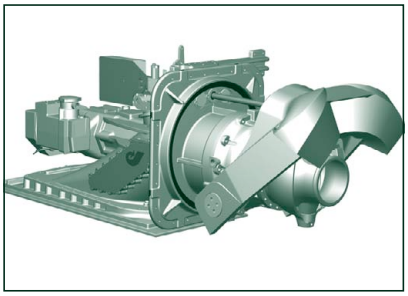
*Drydocks, Launching, and Shiplift Conference, organised by The Royal Institution of Naval Architects, and held in London on November 5 and 6, 2003.

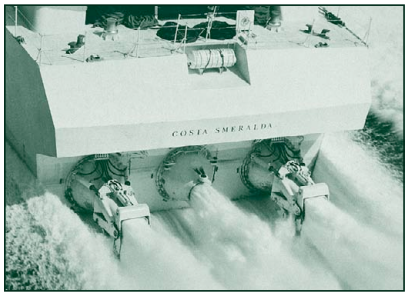
The Royal Institution of Naval Architects

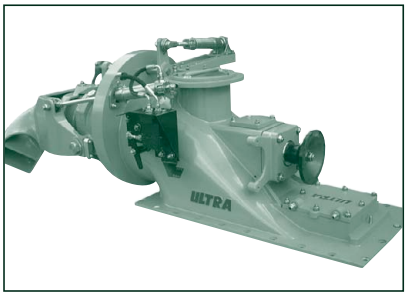
WATERJET PROPULSION IV

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

First Notice and Call for Papers







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

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

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

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

RINA invites papers on all aspects of waterjet design, production and operation, from designers, researchers and operators by the 30th of January 2004.

☐ I would like to offer a paper and send a synopsis of no more than 250 words by 30th January 2004

☐ I wish to receive details on exhibition space and sponsorship opportunities

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Please return to: Conference Department, RINA, 10 Upper Belgrave Street, London SW1X 8BQ, UK
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Annex III, bulk cargoes, and alternate hold loading discussed at IMO

At the end of September, BIMCO representatives attended the eighth session of IMO's Sub-Committee on Dangerous Goods, Solid Cargoes and Containers (DSC 8). The agenda item dealt mainly with the following issues:

- harmonising the International Maritime Dangerous Goods Code (IMDG Code) with United Nations recommendations on the transport of dangerous goods
- amendments to the IMDG Code and supplements
- review of Annex III of MARPOL 73/78.

Review of Annex III of MARPOL 73/78

Having reviewed the report of the working group established at this session to undertake the review of Annex III of MARPOL 73/78, the sub-committee approved the report in general and agreed with the following:

1. That the criteria adopted by the UN should also be adopted under Annex III to MARPOL 73/78 and reflected in the IMDG Code to define substances as hazardous to the aquatic (marine) environment.

2. That there was no necessity to identify severe marine pollutants and informing the Marine Environment Protection Committee (MEPC) and the Legal Committee (LEG) of the consequences that the deletion of severe marine pollutants would have on the International Convention relating to Intervention on the High Seas in Cases of Oil Pollution Casualties (1969) and the related Protocol.

3. That until issues associated with making appropriate amendments to the IMDG Code are resolved, it would be inappropriate to make recommendations for the associated amendments to Annex III.

The overall review of the IMDG Code and Supplements ended with the sub-committee approving the amendments to the IMDG Code and instructing the E&T Group to prepare a final consolidated text of the draft amendments to the IMDG Code. This should take into account, among other things, the proposals agreed in principle and comments made at the plenary, for submission to MSC 78 in May 2004, with a view to adoption and an expected entry into force date of January 1 2006.

Revision of the Bulk Carrier Code

The ongoing process of a review of the Code of Safe Practice for Solid Bulk Cargoes (BC Code), with a target completion date of 2004, was considered at this meeting, focusing on the following issues:

- evaluation of the properties of solid bulk cargoes
- the possibility of making the code mandatory.

Having reviewed the report of the working group established at DSC 7 to undertake a review of the BC Code, the sub-committee approved the report in general at this session, including the issue of a DSC circular on the transport of ilmenite clay and the endorsement of the working group to prepare a new schedule for ilmenite clay. The purpose of the circular is to highlight ilmenite clay's high moisture content and its potential liquefaction, following an investigation report of an incident where a vessel developed a list of 20deg at sea due to liquefaction of such a cargo.

The circular also highlights the importance of having information, such as moisture content and the transportable moisture limit when a new product is being transported in bulk, to be provided by the manufacturer/shipper as required by the SOLAS convention. Furthermore, the present entry, Ilmenite ('dry and moist') in Appendix A of the BC code does not seem to describe all ilmenite products satisfactorily. The new schedule to be prepared for ilmenite clay would not only describe the inherent danger of the product itself but will also help to avoid confusion with the existing schedule on ilmenite sand appearing in Appendix C of the BC Code.

The working group was re-established at this session to continue with preparation of the revised draft BC Code, as well as being instructed by the sub-committee to consider, among other things, the feasibility of making the code mandatory after the sub-committee had agreed in principle to make it mandatory. This resulted in the following recommendations made by the working group which were endorsed by the sub-committee:

- that for the purposes of improvement of safety, it is effective to make the BC Code or parts of it mandatory
- the current revision of the BC Code should be allowed to be completed, recognising that the industry awaits a user-friendly format of this draft revised BC Code
- the industry should also be given the opportunity to become familiar with the new format after its adoption
- in the event of making the BC Code mandatory, a comprehensive review of the BC Code and other IMO instruments would be necessary.

The sub-committee also approved/endorsed the following matters arising from the report of the working group:

- the issue of a DSC circular drawing the attention of users to compliance with provisions of the BC Code when transporting solid bulk cargoes in bulk, following the outcome of an incident investigation report on the transport of ammonium nitrate-based fertiliser
- no action to be taken regarding the consideration of new procedures for evaluating liquefaction potential of solid bulk materials
- to revise MSC/Circ 671 (lists of solid bulk cargoes for which a fixed gas extinguishing system may be exempted or for which a fixed gas extinguishing system is ineffective), after completion of the draft revised BC Code at the next DSC session (DSC 9).

Loading/unloading manual

A working group in which BIMCO participated was established at this session to consider the development of a manual on loading and unloading of solid bulk cargoes for terminal representatives, in particular the risk control option: improvement of ship/shore communications, training of stevedores and terminal operators and better control of loading capabilities.

Having received and considered the report of the working group, the sub-committee approved the report in general and concurred with the group that the work should be continued through an inter-sessional correspondence group with a view of using the content structure of the IBTA Draft Guidelines for Terminal Representatives at the Ship/shore Interface submitted by IBTA (International Bulk Terminals Association) as the basic format, and its report, including a draft manual, is to be submitted to DSC 9.

A draft MSC circular relating to Ship/Terminal Interface Improvement for Bulk Carriers prepared by the working group was also endorsed by the sub-committee. This circular addresses the concern raised by the report of the Working Group on Bulk Carrier Safety regarding the risk control options on ship/terminal interface improvement for bulk carriers by the application of the guidance on risk control options contained in the Code of Practice for the Safe Loading and Unloading of Bulk Carriers (BLU Code). Through this circular, it is hoped that member governments will invite all shipowners, shipmasters, shippers, terminals as well as terminal representatives to apply the risk control options in the BLU Code.

Application of the BLU Code

BIMCO, together with the International Federation of Shipmasters' Association (IFSMA), submitted a proposal for the extension of the BLU Code to include ships loading and unloading grain, on the grounds that the International Grain Code does not provide for loading and unloading periods, apart from ensuring that a ship carrying grain has adequate stability at every stage of the sea voyage undertaken. Furthermore, all matters addressed in the BLU Code are as relevant to ships carrying grain as they are to ships carrying other solid bulk cargoes.

continued

Operating 24/7

24 hours a day, 7 days a week, all through a ship's life. An economically viable vessel has to stay in service day and night. That's what our motto "Operating 24/7" is all about.

Germanischer Lloyd Aktiengesellschaft
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Phone +49 40 36149-0 · Fax +49 40 36149-200
headoffice@gl-group.com · www.gl-group.com

Germanischer Lloyd
OPERATING 24/7

The sub-committee noted the decision of MSC 76 that this issue merits consideration and decided that it was appropriate to have it on its work programme, on the understanding that BIMCO and IFSMA, together with at least one interested member government, would consider submitting a proposal to the committee to include a new relevant item in the sub-committee's work programme. One member government expressed interest, and BIMCO informed the meeting that a proposal by the parties concerned will be submitted to the committee accordingly.

Alternate hold loading ban for bulk carriers

MSC 77 had stated that it concurred with DE 46 on the outcome, that of all the options considered to ban alternate hold loading of heavy cargoes in a full-load condition, Option 3 was the most appropriate (see below). Prior to the committee taking any relevant regulatory action, the sub-committee has been requested to consider the possible options and provide advice thereon.

Option 3 - Banning bulk carriers from sailing with any hold empty

'Banning bulk carriers from sailing with any hold empty: Bulk carriers in the full-load condition (90% of the ship's deadweight at the relevant freeboard) of single-side skin construction and 150m length and over, constructed before July 1 1999, after reaching 10 years of age, or constructed after July 1 1999 if not in compliance with SOLAS Chapter XII and IACS UR S12 Rev 2.1, shall be banned from sailing with any hold empty. The ban shall not apply to ships constructed before July 1 1999 if they comply with SOLAS Chapter XII and IACS UR S12 Rev 2.1.'

Having noted that DE 46 had expressed a preference for Option 3, the sub-committee concurred, with reservations being expressed by one delegation. The committee will be requested to remove this agenda item from the sub-committee's work programme accordingly.

Next meeting

The ninth session of the DSC is tentatively scheduled to take place from September 27 to October 1 2004.

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

CP propeller agreement between MAN B&W and Kappel

AT a recent special event, attended by *The Naval Architect*, celebrating 100 years of CP propeller manufacture at MAN B&W Alpha, Frederikshavn, Denmark, a cooperation agreement was signed with J J Kappel in which MAN B&W, which believes the Kappel tipped propeller is an interesting development for the shipbuilding industry, will promote, market, and collaborate in the design of and manufacture of CP versions of this propeller.

In the terms of this agreement, MAN B&W Alpha will be able to offer CP propellers applying the Kappel hydrodynamic design, which results in a 3%-5% increase in propeller efficiency, and corresponds to a similar reduction in fuel consumption. For some time, J J Kappel has been working with the hydrodynamic design of unconventional propellers, mainly with blades curved in the direction of the suction/ahead side towards the tip, resulting in the Kappel special design.

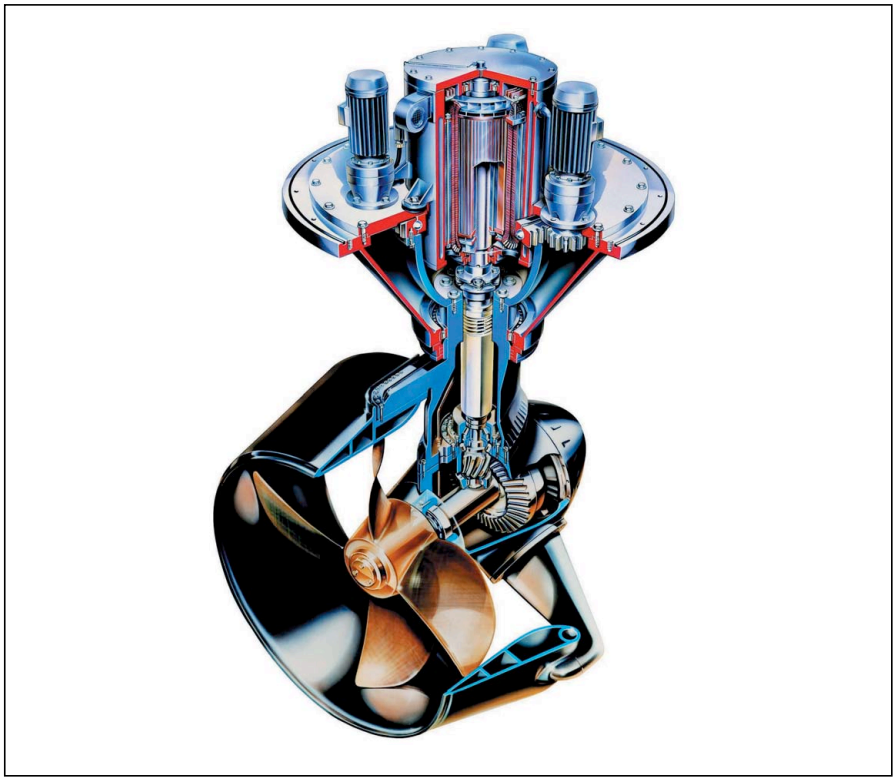
From Kappel, MAN B&W Alpha obtains a non-exclusive worldwide right to manufacture and sell CP propellers of Kappel's hydrodynamic design. Further, MAN B&W Alpha has been granted the right to market Alpha propellers using the 'Kappel' and the 'Kappel propeller' names in its marketing and promotion. FP Kappel designs are already being produced in China by Zhenjiang Propeller Plant for Stone Manganese Marine.

Combi Drive - a new Schottel propulsion system

ENGINEERS from Schottel are now developing a new concept that combines the main technical and economic criteria of both mechanical rudder propellers and pod drives: this is the Combi Drive (SCD). In contrast to pod drives with an electric motor inside the pod, the motor in the new propulsion system will be integrated vertically into the support tube of the Rudderpropeller.

This arrangement means that the new concept is similar to that of a rudder propeller with a vertical power input (an L-system). Moreover, neither an above-water gearbox nor a cardan shaft will be required, making the system extremely compact and easy for shipyards to install. This very small space requirement will be particularly advantageous, for example, in the case of offshore supply vessels, whose hull design means that space in the stern is limited in any event. Further potential applications are ro-pax and double-ended ferries, tankers, and container ships.

The Combi Drive will be based on the Schottel Rudderpropeller types SRP 1515, SRP 2020, and SRP 3030, with their proven mechanical components, and will cover a power range from 1900kW to 3800kW, with propeller diameters from 2500mm to 3500mm. Azimuth steering can be implemented using either hydraulic or electric motors. The new drive will be available as single propeller version with nozzle or twin propeller version.



Schottel's new Combi Drive, with its vertical electric motor, is planned to cover a power range from 1900kW to 3800kW and can be used in a variety of vessels, including ro-pax ferries, tankers, and container ships.

The Royal Institution of Naval Architects

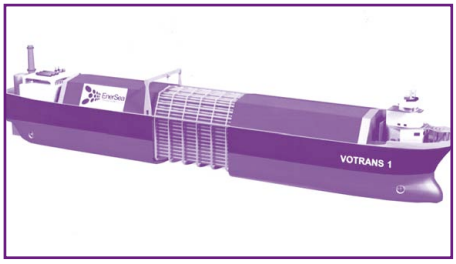
DESIGN & OPERATION OF GAS CARRIERS

22 - 23 September 2004, London, UK

First Notice and Call for Papers

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

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



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

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

RINA invites papers on all aspects of the design and operation of gas carriers, including the following topics:

- Design of larger capacity vessels
- Design of Shortsea & Coastal Vessels
- Greater flexibility in design to cater for spot market trading
- Innovation & new technology: Floating plants/vessels, CNG/PNG, etc.
- Optimisation of power plant

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by fax on +44 (0) 20 7259 5912 or by email:conference@rina.org.uk

EROCAV workshop for cavitation and erosion investigations

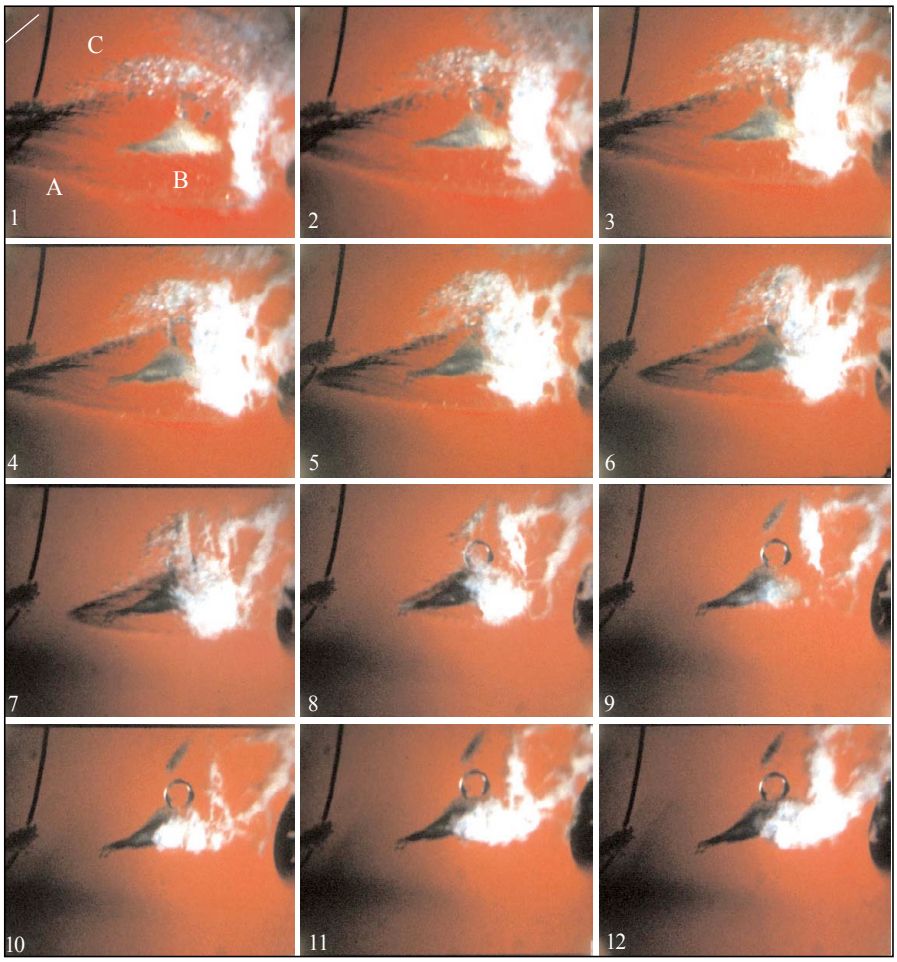
In October 2003, a workshop on cavitation-induced erosion was held at Germanischer Lloyd's headquarters in Hamburg, Germany. The workshop was organised within the framework of the European research program EROCAV, and discussed background knowledge of erosion processes, and on the possibilities of foreseeing and preventing damage in an early design stage using, for example, model tests. The workshop was mainly for technical staff members of shipowners, and operators, also for design engineers from shipyards. J Friesch, EROCAV project coordinator, HSVA, reports on this event.

THE main objective of the EROCAV EU project is to improve prediction methods for cavitation-induced erosion, both experimental and numerical, at the German model basin HSVA. New test methods and software tools will strongly enhance the capacity of model basins and consequently of propeller designers, shipyards, and owners, giving a definite economic advantage. The EROCAV Consortium has 11 partners from six different countries.

The spectrum of consortium members includes shipowners, propeller manufacturers, classification societies, and model basins with a large variety of different test facilities, and a university. The consortium consists of experts in various disciplines with state-of-the-art facilities. All of the members are involved in developing and improving ship propulsors. The EROCAV partnership crosses both functional and national boundaries and will foster links between the various organisations. The main tasks of the research, divided into four technical work packages and a guideline, are:

- development of knowledge about the mechanism of cavitation-induced erosion
- extension of the existing methods to predict erosion in full scale by modelling the involved mechanisms
- development of improved experimental test procedures for the reliable prediction of cavitation-induced erosion damage
- reproducibility of the eroded zones on propeller blades and rudders observed in full scale by different model tests techniques
- improvement of design procedures for rudders and propellers.

The project is fundamentally based on extensive full-scale and model investigations. Ships with propellers and rudders showing severe damage have been included in the test cases. One of the basic requirements to succeed within the project was to obtain full scale data on erosion damages. The positive response from shipowners concerning measurements onboard their ships assured that these requirements were met.



Pictured here is highly focussing propellerroot cavitation.

Full-scale work has been carried out very successfully. The results show a variety of mechanisms causing erosion on propellers and rudders. Apart from the regular mechanism of cloud cavitation behind a sheet, observations have shown that slight cloudy streaks near the tip can also cause propeller erosion. Rudder erosion was expected to be caused by tip vortices, but the mechanism seems to be more complicated in that erosion is especially caused when there is breaking up of the cavitating tip vortex upstream of the rudder.

The concept of focusing of the collapse energy has been applied in practical observations as a procedure for analysis of erosive cavities. It has been indicated that erosion can also be generated by cavities that stay glassy until a very late stage of the collapse, a circumstance implying that focusing of energy should also be analysed for this type of cavity. From some experiments, it was found that glassy cavities can, as focusing cavities, be closely related to the generation of severe erosion. Furthermore, erosion tests results showed that any type of fluctuation in the focusing of the collapse energy lead to a decrease of collapse pressure and thus a decrease of erosion.

Although there are many measures proposed to fix rudder and propeller erosion problems, a lot of unsolved questions remain and the problem will last for a long time in the future because the phenomena include both hydrodynamic and mechanical aspects. Model experiments are, and will, continue to be the only reasonable way to make predictions, concerning the influence of cavitation on the occurrence of erosion. Beside the detailed observation of the cavitation phenomena, high-speed video observations and paint tests are the most reliable tools at present. ⚓

Pods prove their worth powering Baltic ferries

A SUCCESSFUL two years' operation is reported for the first ferries with podded propulsor drives. The ro-pax twins *Nils Holgersson* and *Peter Pan* respectively entered TT-Line service in July and October 2001 on the German owner's trans-Baltic Travemünde-Trelleborg (Sweden) route (*The Naval Architect*, September 2001, page 56, gives full details).

Twin Siemens-Schottel SSP pods were specified for the 36,500gt/744-passenger vessels, each with an input power rating of 11,000kW and together yielding a speed of 22knots. Each pod is fitted with a 4.5m-diameter three-bladed FP propeller fore and aft of the motor housing, the propellers turning at 176rev/min.

Electrical power for the pods and ship's services is supplied by a Caterpillar Motoren/Siemens medium-speed-diesel power station embracing two MaK 8M43-driven gensets, two 7M43 gensets, and a 6M32C genset, with a combined output of just under 30,000kW.

Valuable space was released within the hull for extra vehicle stowage (2613lane-metres capacity is arranged on three decks) and an improved afterbody design fostered by the pods, which eliminate propulsion motors from the engineroom. Passenger and crew comfort is also enhanced by a significant reduction in noise and vibration, thanks to the submerged motors and the location of the generating machinery well aft.

'The advantages of the diesel-electric pod drive in terms of economy, reliability and environmental friendliness, compared with conventional diesel-mechanical drives, are convincing', asserts TT-Line managing director Dr Arndt-Heinrich von Oertzen.

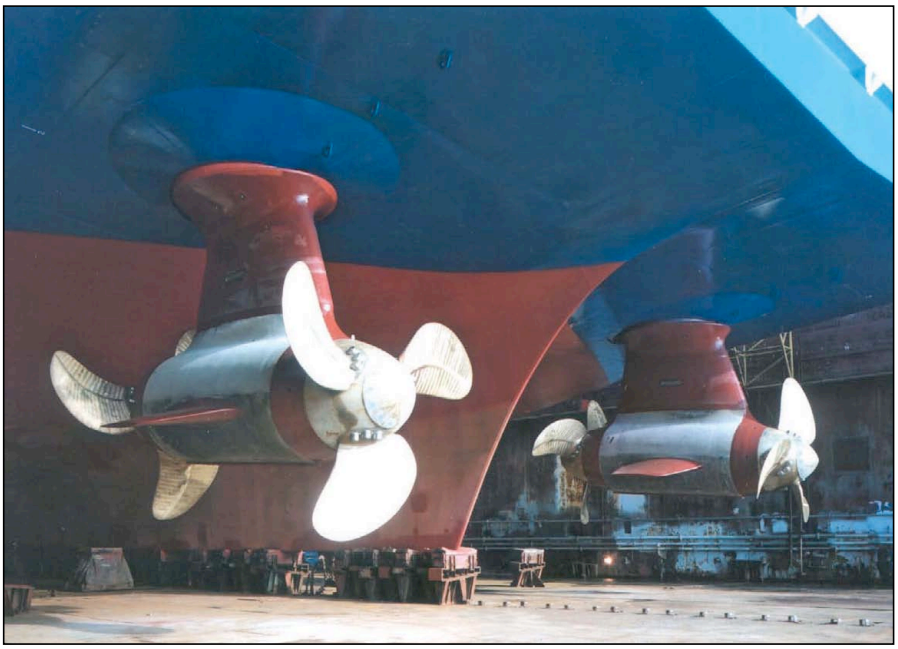
Fuel consumption is reportedly lower than with traditional ferry propulsion plant since the main genset engines always run in the optimum operating range, while maintenance costs for the diesel-electric installation are also reduced. As for the pods, Siemens says that only routine checking and servicing has been called for, and a lifetime matching the ships is anticipated.

The azimuthing capability and powerful thrust of the pods are valued when the ferries enter and leave the confined waters of the German and Swedish ferry terminals, especially in adverse wind conditions. In combination with a pair of 2400kW Schottel bow thrusters, the pods allow the ferries to be turned in the basin and berthed sideways, an impressive manoeuvre witnessed in Travemünde during a recent visit by *The Naval Architect*.

Crash stops can also be effected swiftly - from 22knots to rest in around 600m. Four hydraulic power sets are installed to rotate the azimuthing pods, one set per pod being operated at sea and two per pod during manoeuvring.

The two TT-Line twins *Nils Holgersson* and *Peter Pan*, built in 2001 by the SSW yard at Bremerhaven, are the first ferries to benefit from the attractions of Siemens-Schottel SSP podded drives.

Siemens-Schottel SSP pods are distinguished by their twin FP propellers with bolted blades, also by fins on the hub. They are seen here in drydock on the lead ship, *Nils Holgersson*, and each unit develops 11,000kW.



Distinguishing features of the SSP

Siemens-Schottel's SSP propulsor is distinguished by twin propellers (running in the same direction) and a permanently-excited synchronous motor derived from submarine practice. At the core of the SSP pod is a Siemens Permasyn permanent-magnet motor whose compactness achieves a slim, hydrodynamically-efficient housing of a size not exceeding 30%-40% of the propeller diameter. No complex cooling system is required for the motor, direct cooling being effected by the seawater through the pod surface.

A twin-screw configuration, adapted from Schottel's Twin Propeller (STP) mechanical thrusters, allows a significantly smaller overall diameter to be specified for the pod's propellers compared with single-screw solutions, contributing to lower noise levels.

Load is distributed 50:50 between the fore and aft propellers, and the swirl energy generated by the forward unit is recovered rather than lost. A high propulsive efficiency is further promoted by the lack of excitation losses of the permanently-excited motor and the arrangement of guide fins on the pod between the propellers which - along with the vertical stem of the underwater housing - also recover swirl energy. ⚓

Breakthrough in LNG carrier gas detection

What is claimed to be the world's first LNG tanker gas detection system to provide continuous monitoring for methane in gas-sensitive spaces has just been delivered by Martek Marine Ltd to the first of four 148,000m^3 Moss-type tankers being built by Hyundai Heavy Industries for the Shell Nigeria LNG project. This new system is said to eliminate a number of technical shortfalls of conventional sequential gas sampling systems, which have to date been the industry standard.

The heart of Martek's system is the unique LNGD intrinsically safe infra-red gas detector - believed to be the first and only infra-red detector to be certified and approved for direct measurement in gas-dangerous spaces on LNG carriers. The LNGD is to be installed on the Hyundai ships to provide protection in hold spaces, the cargo compressor room, cargo pipe passageways, and the vent mast.

In accordance with the IGC code, all electrical equipment to be installed within such dangerous spaces on gas carriers must be certified as intrinsically safe. Before the release of the LNGD on the market, no certified intrinsically safe detector is claimed by Martek to have existed to serve this duty. In order to provide protection in gas-dangerous zones, sequential gas sampling systems were the only option.

Sequential gas sampling systems use a pump to extract gas samples through stainless steel tubing from a space, to be analysed for methane in a gas-safe space, often up to 250m away. These systems, says Martek, could suffer from technical weaknesses such as:

- if a sporadic gas leak occurs, the system may not detect such a leak because each detection point is only monitored sequentially - typically once every 30 minutes. Sequential sampling systems rely on a leak coinciding with the sampling sequence of the complete system. Major gas leaks that are exhausted to atmosphere by natural and/or forced ventilation could go potentially undetected
- long response time - because each point in the system is only generally monitored once every 30 minutes, the reponse time to provide an alarm in the event of a leak is equally long
- an extractive gas sampling system is only as good as the integrity of the sample tubing. If any tubes become blocked and/or broken, leaks in the space being monitored would go undetected
- if the sample pump or sample selection valve fails, the system will not operate
- if the system analyser fails, the whole system is inoperative
- potentially explosive gas is drawn into gas-safe spaces
- regular replacement is required of moving parts - sampling pump and solenoid valves.

The LNGD is said to be a highly stable, which when deployed directly, should overcome all of the problems mentioned above. Requiring calibration checking only once a year with full in-built sensor diagnostics, the detector provides fail-safe operation. Configured with a standard 4mA-20mA output of the measured gas concentration, an LNGD can be connected directly to integrated automation systems, simplifying the whole control system and saving space and cost. In the event of a gas leak, the system is said to guarantee a response to alarm within a matter of seconds.

Martek Marine, Century Business Park, Manvers Way, Rotherham, South Yorkshire S63 5DA, UK.
Tel: + 44 1709 300166.
Fax: +44 1709 300165.
E-mail: enquiries@martek-marine.com

Tank-cleaning acquisition

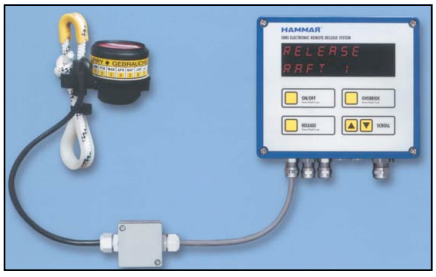
Alfa Laval has recently acquired Gunclean Toftejorg, and this has resulted in an extensive marketing, distribution, and service network for advanced tank-cleaning equipment. With 120,000 units currently in operation, Gunclean Toftejorg is believed to be the largest supplier of this type of equipment in the market. Models include the 270FT Optima single-nozzle unit, especially optimised for use on product tankers, crude oil tankers, and bulk carriers.

Alfa Laval Ltd, UK.
Tel: + 44 1276 413632.
Fax: + 44 1276 413524.
www.alfalaval.com

New lifesaving remote-release system

A new range of electronic remote release systems for liferafts, evacuation systems, or other lifesaving appliances has been launched by Swedish company C M Hammar AB. This EERS has been specifically designed for quick and efficient evacuation of passengers.

The unit is operated via an electronic remote control panel that activates one or several electric Hammar H20 remote-release units. Operation can be from several remote release positions by adding one or several control panels to the master control panel.



The new H20 remote release system for lifesaving equipment can be operated from several positions.

A Hammar H20 system has no limitations in installation length so is easy and flexible to install, as well as saving space. It is backed-up by a ship's emergency power supply, but each panel is also equipped with a back-up battery. The system also performs a complete system test every hour.

C M Hammar AB, August Barks Gatan 15, S-42132 Västra Frölunda, Sweden.
Tel: +46 31 7096550.
Fax: +46 31 497023.
E-mail: info@cmhammar.com

NACOS for Everard's new tankers

An order for four NACOS 65-4 integrated navigation command systems from Ships Electronic Services, of Rochester, UK, has been received by STN Atlas Marine UK. These are to be installed on a series of new product tankers building for F T Everard & Sons at Qingshan Shipyard, Wuhan, China. These four 3750dwt vessels are due for completion this year and in 2005, with Everard retaining an option for another two vessels.

Featuring fully integrated radar and ECDIS operation as well as radar-controlled autopilot, the NACOS systems are being supplied together with Debeg 3400 UAIS and automated bridge and watch alarm facilities covering all radar, conning, and chart workstations functions.

STN Atlas Marine Electronics, Behringstrasse 120, D22763 Hamburg, Germany.
Tel: +49 40 88250.
Fax: +49 40 8825 4000.
E-mail: info@sam-electronics.de

Electric power for new reefers

Medium-voltage electric power systems for six 4000TEU reefer container ships will be supplied by ABB following an order from Daewoo Shipbuilding & Marine Engineering Co. These vessels, contracted by Hamburg Süd, will be delivered through 2004 and the second quarter of 2005; they will be built to Germanischer Lloyd's new class for reefer containers, RCO (Refrigerated Container Stowage Positions), which specifies accurate requirements for such ships.

A large amount of electrical power is required for dedicated reefer containers, typically more than 15MW. With this level of demand, medium-voltage electrical systems are said to provide important advantages over conventional low-voltage equipment.

ABB Marine will supply the main 'ring-net' type switchboards for distribution of electrical power to the reefer containers. Delivery to each vessel will include the 6.6kV main and cargo switchboards, bow thruster starters, battery systems, as well as engineering and network studies.

ABB Oy, Helsinki, Finland.
Tel: + 358 1022 23310.
E-mail: pekka.koskinen@fi.abb.com

Ibergrip non-slip coating for ferries

The latest 40-vehicle ferry from Western Ferries to go into service in Scotland has a specially developed Ibergrip surface coating, which was applied at Ferguson Shipbuilders, Port Glasgow. *Sound of Shuna* has approximately 600m^2 of Ibergrip XD Marine applied in four vehicle lanes. This anti-skid surface has been developed for marine applications specifically for use in all-weather environments, including on ferries, as well as offshore loading buoys, linkspans, pontoons, passenger walkways, and bridge decks.

Ibergrip XD is said to be an ideal surface for ferries where there is a combination of very high traffic usage and the need for non-slip security in all weathers. As the product is a polyurethane resin coating - as opposed to an epoxy-based coating -

there is a rapid cure time, typically just two hours in temperatures as low as 5ºC, and it will also cure at sub-zero temperatures. As soon as the surface is cured, a ferry can be opened to vehicles. As well as being hard wearing, Ibergrip XD is fire-proof to Class 1 and resistant to impact and to a variety of spillages including oil, petrol, diesel fuel, and lubricants. Its non-slip properties can be adjusted by the addition of a wide range of abrasives of various sizes, depending on the type and level of traffic using it.

Prismo UK,
Tel: +44 (0)1904 713706.
E-mail: Claire.doherty@jarvis-uk.com

Stand-alone window wash system

Wynn Marine has designed a new stand-alone window wash sytem which has a number of benefits, including: total window spray coverage through high-pressure nozzles, rapid dispersal of salt deposits through heated water, efficient removal of grease and oil, operation in Arctic conditions, and flexible network controls and remote operation.

As a compact off-the-shelf module, the series 5010 allows for the washing of bridge windows in groups, in an adjustable sequence mode by the touch of a button. Water can be heated at source and have detergent/antifreeze added to cope with every operational situation. Consumption of fresh water is kept to a minimum by limiting washing to selectable groups of windows.

Based on a pump and liquid storage module, the new window wash system is able to supply up to 10 nozzles simultaneously. Where more nozzles are required, the module output is able to be split and allocated to valve groups able to handle up to 30 nozzles. This can be expanded further by adding a second module to increase supply capacity.

Wynn Marine Ltd, Wynn House, Lansdown Estate, Cheltenham, GL51 8PL, UK.
Tel: +44 1242 232266.
Fax: +44 1242 231131.
E-mail: tony.parker@wynn.co.uk

Renk gears for fast trimaran

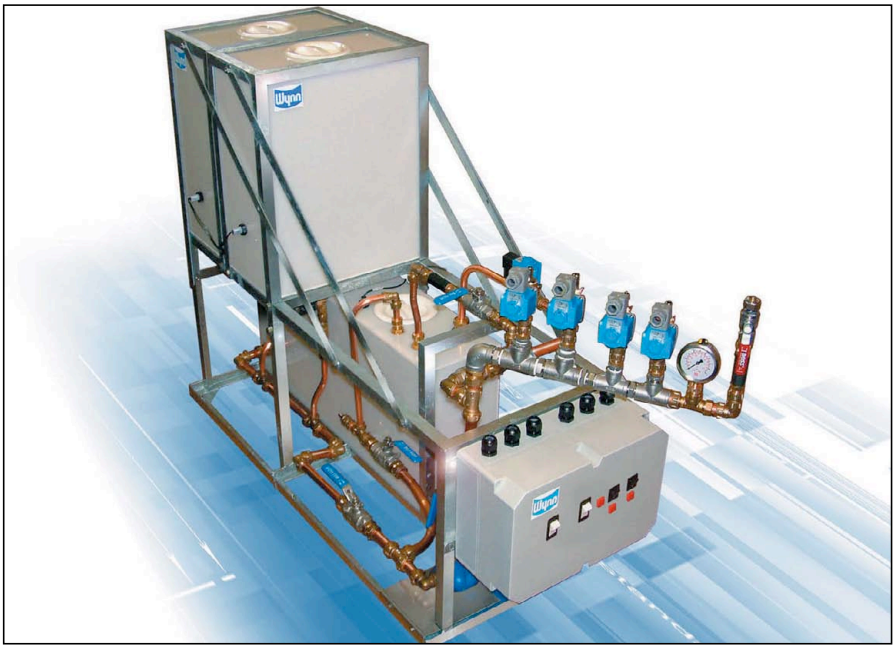
A contract to supply the main reduction gearboxes for Austal Ships' new-generation fast ferry design, has been awarded to Renk. This 127m long vessel will be operated by Fred Olsen in the Canary Islands, at the end of 2004 (*The Naval Architect* July/August 2003, page 4). It will carry 1350 passengers and 340 cars, with a top speed of 40knots.

The trimaran design has the entire propulsion system, with three waterjets, in the centre hull. Steerable wing jets are driven by one diesel engine each, providing 2 x 9100kW at 1150rev/min, via Renk ASL 65 single-stage reduction gears. This is a lightweight gear, with high performance and low noise radiation.

The centre combining gear is a Renk ASL 2 x 80, which transmits power supplied by two further diesel engines (2 x 9100kW/1150rev/min), to one large booster jet. For optimum operational flexibility, this section of the plant can be operated jointly, or at partial load with one diesel engine only clutched-in. For optimisation, a second gear stage is introduced in the form of a planetary gear in the output shaft arrangement; this can be coupled in at the output shaft of each engine and avoids separate gear stages.

This overall compact design, including selectable operation, provides a lower weight when compared to conventional solutions. In addition, Renk has applied component technology to the double-helical teeth at the centre of the main gear train, for smooth running in all modes.

Renk AG, Werk Augsburg, Gögginger Strasse 73, D-86159 Augsburg, Germany. Tel: +49 821 5700. Fax: +49 821 5700.



Wynn Marine's new series 5010 stand-alone window wash system can supply up to 10 nozzles simultaneously.

Integrated bridge systems for 12 new container ships

Sperry Marine has recently recieved orders from the China Shipbuilding Corp shipyard in Kaohsiung, Taiwan, to supply integrated bridge systems (IBS) for 12 new container ships. These new ships, which are being built for Chilean ship owner Compañia Sudamericana de Vapores (CSAV) and German owner, Reederei Peter Döhle, will be fitted with a complete IBS featuring Sperry Marine's proprietary voyage management system software. The IBS installation includes inter-switched navigation radars, information systems, an echo sounder, speed log, gyrocompass, differential global positioning system, automatic identification system, voyage data recorder, and communication station with Fleet 77 Inmarsat terminal.

A key element in the Sperry Marine IBS is the Navipilot 4000 fully adaptive, self-tuning autopilot system, which makes real time adjustments for loading dynamics and weather conditions. The auto self-tuning capability provides fewer and smaller rudder movements for reduced fuel consumption and less wear and tear on the steering machinery. All of the bridge consoles employ state-of-the-art, high-resolution flat-screen technology. Sperry Marine will also provide support for installation, interfacing, commissioning, and crew training.

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Fax: +1 434-974-2259.
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New generator protection module

A new microprocessor-based generator protection module for the defence of shipborne generators and mains supply networks, GPM 500, has been released by SAM Electronics. It has been designed for stand-alone operation, or in combination with other modules via a databus, the expandable modular unit features a range of protective and control functions, while also facilitating connection to external power management systems and Internet access.

Main protection functions include short circuit, overcurrent, reverse power, phase and breaker failures, as well as other critical parameters, while there are also additional options for earth faults and differential protection measures. Supplementary control functions are included for automatic synchronisation and frequency control. Both protection and control functions can be extended to meet additional requirements using an integral programmable logic controller and extra input/output modules.

GMP 500 is installed via snap-on rails, and includes a touch-screen display for mounting on the front door of generator panels for operation, control, and monitoring of all main generator data, in addition to status and indication of circuit breakers and alarms as well as online visualisation of PLC processing functions. Other facilities include simple on-site password protected parameter setting and an alarm list which is automatically activated in the event of any failures.

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Fatigue Analysis of Ship Structures

By Sergei Petinov. Published by Backbone Publishing Co, USA. Hardcover, 190mm x 254mm. 262pp. ISBN 0 9644311 8. Available through the RINA Bookshop, price £84.00 (RINA members, £79.00), post and packing to USA/Canada £6.00, rest of world £16.00.

The author of this book is a professor at St Petersburg Marine Technical University and a laboratory head at the Institute of Strength Problems, Russian Academy of Sciences. He has been involved in theoretical and experimental studies in this field for more than 30 years and has produced many papers and several books on the subject. This book is written for naval architects, engineers, research workers, and university lecturers. It is intended to be a useful tool in many practical applications and contains 134 figures as well as an extensive bibliography with more than 370 references.

Fatigue is very important in ships. It is the main cause of many, and contributes to the majority of, structural failures, some of which are catastrophic. Apart from the need to consider it seriously during design, fatigue must be taken into account during the later phases of a ship's life. This is because the building process inevitably introduces inbuilt stresses and because an owner's operational and maintenance philosophy can have a big influence on its fatigue life. Thorough surveys, particularly in areas where fatigue cracking is likely, are essential since they provide critical checks on the continuing safety of a ship's structure.

For these reasons, an up-to-date book which covers the field so thoroughly is to be welcomed. The many references will enable anyone to follow up individual concerns in more detail. It is a full exposition of a difficult subject and one on which our knowledge is still far from complete. The author explains the limitations of existing knowledge and design methods.

As he points out, one critical problem is determining the extent to which the principles of similitude and the identity of fatigue damage are implemented in the relationship between the damage in a laboratory specimen and in a structural detail.

Besides presenting his own work, the author discusses recent advances by other workers in the field. Emphasis is given to the micro- and macro-mechanics of fatigue phenomena, to a level that can be helpful to those engaged in the development and application of fatigue assessment methods and criteria as well as those engaged in experimental studies. The fatigue damage of a ship's hull structure is viewed as a two-stage process comprising the crack nucleation and the sub-critical crack propagation phases.

The first three chapters are devoted to the behaviour of structural materials under alternating loads, fatigue crack initiation, and fatigue crack propagation. The fourth chapter deals with the application of fatigue analysis to the design and maintenance of ships. Appendices cover other fatigue assessment models, data on stress concentration factors, and the physical modelling of structural damage.

The S-N curve and local strain are used to model the damage process in the initiation period and the crack growth is specified mainly in terms of fracture mechanics. Unified approaches are suggested based on the application of cyclic plasticity. Emphasis is put on the effects of stress concentration, residual welding stresses, random loading, and on statistical aspects of the damage accumulation and crack growth. Attention is also given to the methodologies of the fatigue design of structural details, including the procedures approved by classification societies.

A book of this nature does not make for light reading. However, those who are concerned with fatigue, particularly those working to extend the frontiers of our knowledge, will find it very informative and helpful.

E C Tupper

Hold cooling systems for refrigerated boxes

Sir - It was a pleasure reading the article 'Hold carriage of air-cooled refrigerated containers', by R Sillars, in the September issue of *The Naval Architect*, page 90. Although I am a layman in this field of expertise, I still take the liberty of putting a question mark over the underlying assumption, because it appears to me that the presented heat balance is container-centric, where one could also have chosen for the entire hold as the primary system.

Indeed, the different heat loads transfer heat from outside the container to its inside, and this heat ultimately has to be removed from the container through the condenser, but the effect will also be that the environment, the hold, is cooled down. Actually, only the electrical heat load and the respiration heat load introduce 'new' heat, which must be removed from the hold. The transmitted heat, infiltration heat, and the air-refreshing heat circulate between inside and outside the container, but these components introduce no new heat in the hold, so there is also no need for the ventilation system to remove it.

On the other hand, other heat sources and heat sinks, such as sunlight and cooling through the submerged shell, affect the heat balance of the hold. Perhaps the author could comment on this view.

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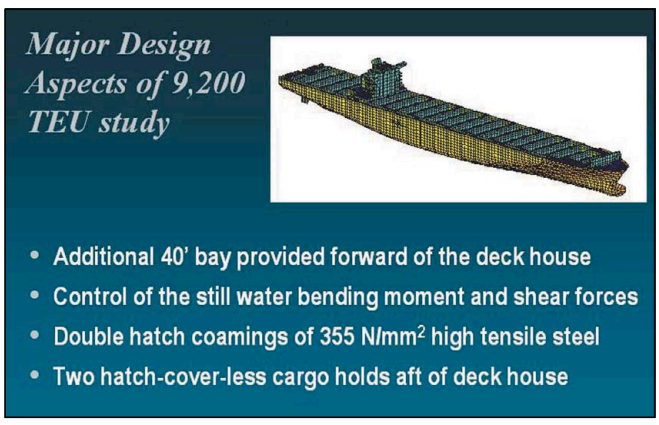
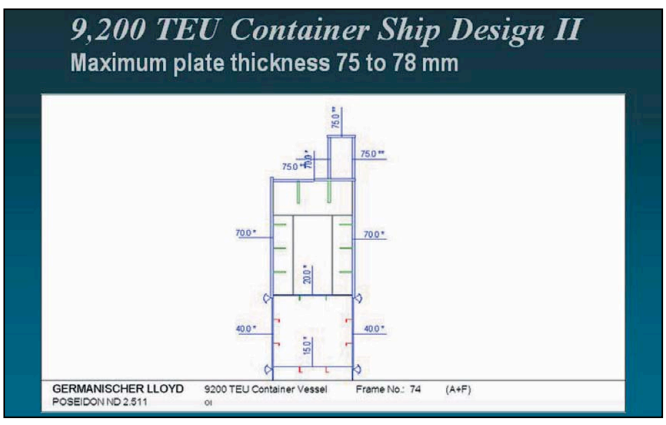
We hope to publish Mr Sillars' comments in a future issue - Ed.

As noted in this month's Editorial Comment (page 3), Hamburg-based classification society Germanischer Lloyd is taking a leading role in development of very large container liners; in particular, the organisation has studied the detailed technical requirements of the newest 9200TEU giants. Some of the interesting aspects being examined are seen here, including the use of double hatch coamings of 355N/mm² high-tensile steel (left), and plates in longitudinal girders up to massive thicknesses of 78mm (right).

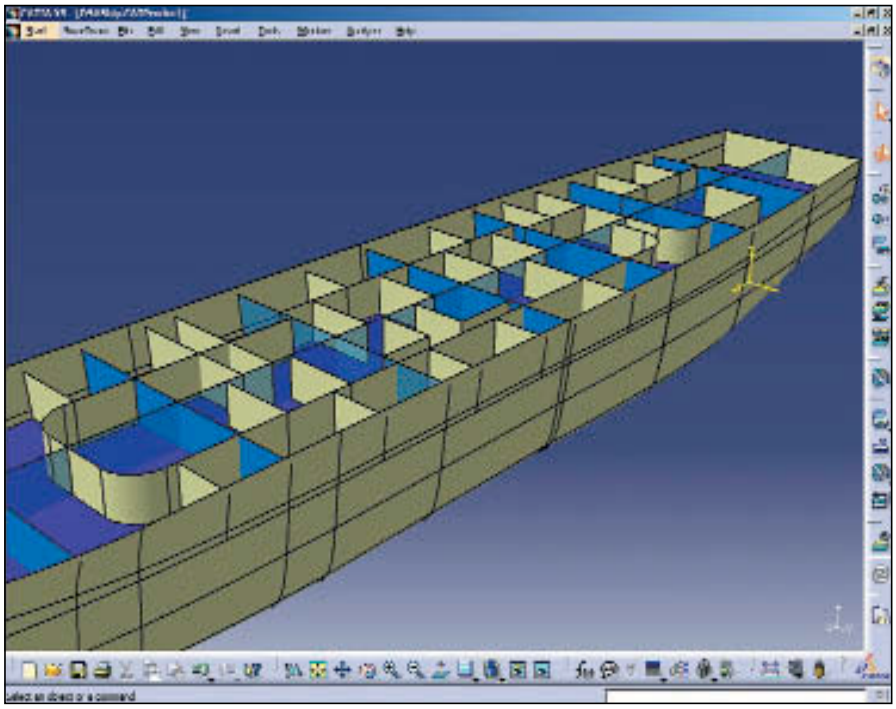




New PLM release includes specialist design components

IBM and Dassault Systèmes have introduced release 12 of their Product Lifecycle Management (PLM) solutions suite for the shipbuilding industry, featuring new applications for structures and compartment design. Included in release 12 is the latest version of CATIA Version 5, which continues to expand outfitting/ machinery design and now fully integrates piping, tubing, HVAC, raceway/conduit, waveguide, electrical/ instrumentation, and hanger design.

THE latest advanced software offering from this leading US/French pair provides powerful new tools for detailing steel piece parts, as well as the layout and detailing of entire structural systems such as decks, reinforced panels, and bulkheads, for example. With Release 12, IBM and Dassault Systèmes claim to have delivered 21 new applications for shipbuilding - said to be the largest single R&D investment of any IT company in the marine industry.



Shown here are Compartment and Access (CNA) accommodation definitions for a cruise ship. CNA defines the volumetric limits of compartments also the accesses and pathways to and from them. Access may be through hatches, stairs, walkways, or other means. CNA functions can produce many specialised reports and drawing styles, which can also include areas, volumes or other spatial inventories.

Concept layout to structural detailing

Every ship design passes through a series of phases, starting with early performance requirements and progressing through to conceptual and functional design. Hull forms, also deck and zone definitions subdivide space into volumes for various uses. Structural functional layouts are followed by compartments and access-ways. Structural systems and details follow in accordance with safety, performance, and production strategies.

CATIA Version 5 Release 12 includes key applications that support end-to-end structure design, analysis, and detailing. Users can produce well laid-out systems that ensure structural integrity, space needs, and can be modularised in production facilitating cutting, welding, and bending processes. A good structural system should positively impact on profit margins by maximising re-use, assuring standards compliance, minimising waste, and optimising production equipment utilisation. IBM's PLM Release 12 new Compartment and Access, Structural Design and Ship Structural Design and Detailing modules claim to address these needs.

CATIA compartments and access

CATIA - Compartment and Access (CNA) is dedicated to the definition of compartment and access objects within a ship design. It is dedicated to defining the limits of compartment and access forms (such as doors, hatches, windows, and portholes). CNA provides the user with the ability to define a compartment's boundary surfaces, to place access objects such as doors, windows and stairs into compartments, and to generate unique drawings and reports. The compartment created in CNA can be used to organise downstream system design processes, set the specifications for machinery and support systems (piping, HVAC, and cable trays, for example) passing through the compartment and generate unique bills of material (BOMs). This system can:

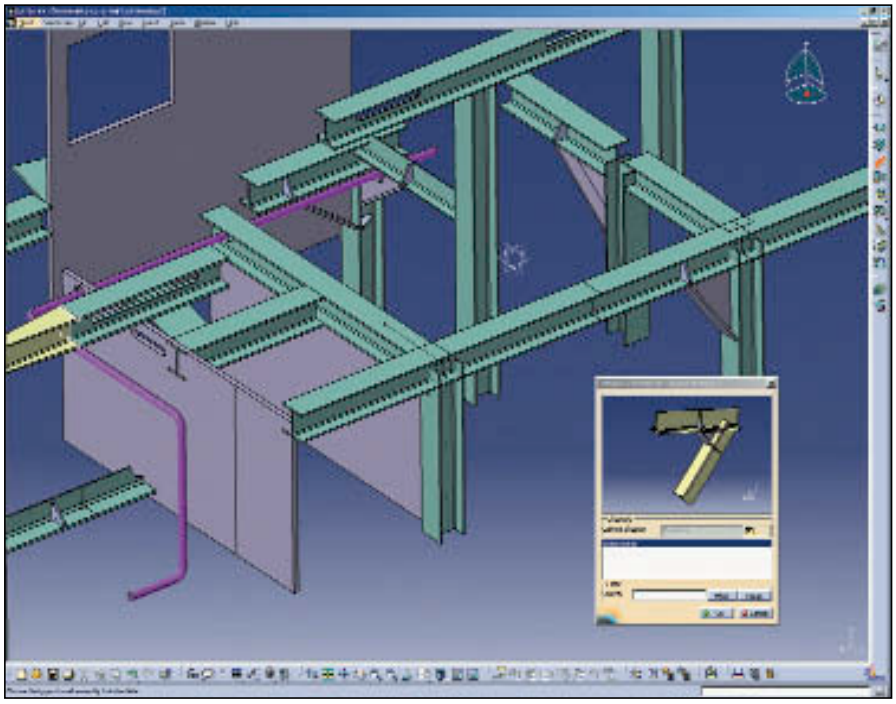
- define wall systems within a deck
- define compartments and boundary surfaces within a ship
- place access objects such as doors, windows, and stairs
- define a compartment used to organise downstream system design processes
- provide drawing and report generation capabilities
- integrate with CATIA - Structure Functional Design and the entire portfolio of outfitting applications (such as piping, tubing, HVAC, cable trays, hangers, and waveguides) and Generative Drafting.

The new additions to this release include definition of wall systems within a deck. Starting with a simple sketch over the deck, wall systems are bounded by decks or moulded forms. Associated with the hull surface and structural bulkheads, CNA gives the user the ability to generate multiple wall surfaces very quickly and easily.

It can also define compartments and their boundary surfaces within a ship. Wall systems are generated in one step, and the user is provided with a compartment preview before generation. When the compartments are generated, a geometric definition of the compartment is created. The definition, in turn, can be used to generate other compartments. Intelligent boundary objects are also automatically created for each wall surface of a compartment definition. Compartment boundaries can be exploited in downstream production when production sub-assemblies are defined.

It can place access objects such as doors, windows, and stairs within the design. This includes closure objects such as doors, windows, and hatches as well as ladder-related objects such as stairs, vertical ladders, and hand grabs. These closure parts are placed on structure objects, wall systems, or compartment surfaces. Helped by a catalogue-driven placement for all access objects, users have an easy placement positioning. Access objects can be placed on any planar structure objects, wall system, or compartment.

CNA also defines compartments used to organise downstream system design processes. Ship designers can use compartment and access definitions to integrate their equipment systems, and project planning. CATIA Knowledgeware allows users to define specifications for systems and equipment based on which compartment they fit.



Structure Design (SR1) details plates and small shapes including twisted, planar, and composite shapes. Workbench functions also define holes, slots and cut-outs created from catalogues, sketches or derived from equipment or systems routed through them, such as pipes, cable trays or HVAC ducts. An onboard machinery frame is shown here.

It provides drawing and report generation capabilities where the user can define tailored view styles for compartments based on classification society, company, or supplier standards. Users can also define and generate reports for compartment and access-related objects. Report definition includes explicit query mechanism and reporting of all geometric and technological attributes with options to output reports in text, html, xml or Excel formats.

Structural design - plates and shapes

CATIA - Structure Design 1 (SR1) product is an application enabling simple and quick creation of linear, curved structures, and plates, using standard or user-defined sections. Taking advantage of an optimised user interface, the user can easily create and modify structures, thanks to fully associative design in context capability. Moreover, the product includes a parametric catalogue through design tables and it generates user-customisable bills of material. It is 'natively' integrated with other CATIA applications for completing the structural design. The user will be able, for instance, to perform extensive stress analysis on structure elements and beams.

CATIA - Structure Design 1 (SR1) can additionally create straight, curved, and twisted structure, planar and surface plates, using standard or user-defined sections. All members are fully associated with a user interface optimised for the placement of structures and managing piece parts. Entire assemblies made of sub-parts can be quickly created through user-defined templates. The result is said to be a breakthrough in productivity. CATIA's infrastructure supports parametric catalogues through intelligent design tables. A wide variety of customizable bills of material are available. SR1 is fully integrated with CATIA Analysis products for downsteam structural analysis. Benefits include:

- fully associated design in context functions for creation and modification of structures
- optimised user interface for the placement of structures
- speedy assembly through user-defined templates, resulting in higher productivity
- parametric catalogue through design tables
- full modification capabilities for design changes
- generation of user-customisable bills of material
- integrated with CATIA - generative drafting, welding, sheet metal, and structural analysis.

Users benefit from having a single application capable of creating multiple types of linear, curved and twisted structures and assemblies from standard or user-defined sections. A single user interface provides simple-to-use workbench tools that can quickly build up structural layouts by referencing existing structures. Power users will find user-defined structural templates particularly useful when initiating common structural configurations such as braces, collars, stiffeners, or reinforced panels or in managing penetrations.

Focus on productivity, best practices, and re-usability

Shipbuilders who have been focusing on streamlining design and production are expected to find assembly templates a useful way to capture best practices on one project and re-use them on another. This method allows a user to be highly productive while being sure that his work is compliant with company standards and best practices. Those templates can be used, for instance, to automatically create stiffeners along a beam or to manage standard penetration of plates (standard opening or cut-out).

Using the standard section catalogues (delivered with the product), users can define parametric sections as well as create section catalogues easily and intuitively. Users can also create several structures between two reference structures or two edges of plate, by specifying the number of 'in-fill', the spacing, or let the software calculate this number. Information such as material, section, length to cut, and quantity requirements are easy to extract and use for bills of materials.

Visual basic macros can be written to create customer structure profiles and to automatically generate structure frames. Using CATIA - analysis products, advanced analysis of structural beams can be accomplished. This greatly facilitates the design-to-analysis process, allowing users to directly use what they have just designed to simulate the manufacturing of structural beams.

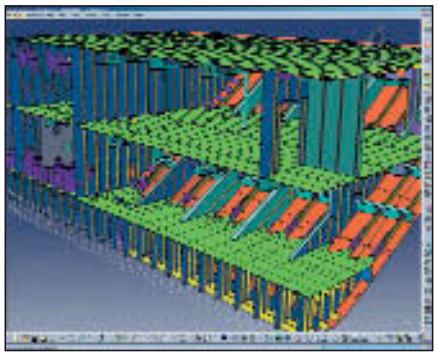
CATIA ship structure detail design

CATIA Ship Structure Detail Design (SDD), new in Release 12, extends structural design capabilities that begin with a ship conceptual design. SDD focuses on entire structural systems that are often made of composites or fabricated, assembled, and erected from smaller piece parts.

SDD offers highly automatic detailing functions for defining connections, penetrations, cut-outs and spanning parts. Small assemblies can be defined using 'knowledge-ware' templates and then be quickly distributed throughout the ship. Designers are able to assign project resources to various systems which aid later scheduling, managing work flow, defining work packages, and tracking materials.

SDD is fully integrated with Structure Functional Design (SFD) and able to retrieve design block information to perform the detailed design of the structure. SDD provides productive tools and an environment that manages structural systems and connections and creates physical plates and shapes.

Other new aspects of the suite allows a structural designer to generate structural parts from design block and existing functional specifications defined earlier with CATIA Structural Functional Design (SFD). Thus there is full re-use of the functional design specifications (material, grade, thickness, profile sections, and functional parts), which have been already defined in earlier design stages. Tight integration within CATIA V5 allows the user to re-use standard productive tools such as sketcher, catalogue, and knowledge.



An example of Structure Detail Design (SDD) with decks, frames, panels and panel stiffeners, showing end cuts, cutouts, doublers and other features.

to trigger rules to check details for compliance with project specifications or to make up work packages.

The new program provides a collection of industry-specific features to detail structural connections. CATIA - Ship Structure Detail Design (SDD) is a ready-to-use application. As a turn-key system, SDD includes a customisable library of industry-standard ship parts and features to speed tasks, as well as providing productive tools to incorporate shipyard rules and standards. It has tight integration with CATIA V5 'knowledge-ware' products and allows user to remain compliant with standards along the whole conception process.

Structural Functional Design allows definition of project resources at project level through the integration of an object dictionary in PRM (Project Resources Management). User can access directly catalogues shared between all structural applications and various project resources. This avoids knowing where the data are located and redundancy of information.

Finally, the release allows integration with CATIA V5 Drafting application. CATIA - Ship Structure Detail Design 2 (SDD) is fully integrated with CATIA - Interactive Drafting 1 (ID1) and CATIA - Generative Drafting 2 (GDR). This integration allows users to perform extensive drawing generation from structure detailed design elements and comprehensive 3D models. Drafting is used for downstream purpose such as fabrication, installation, reporting and maintenance.

It provides design block envelop definition and management, which are easy to define as 3D volumes from surfaces which delimit the hull form. The user can easily create block boundaries. Non-cubic blocks are also possible, giving the user considerable flexibility and control over how blocks and their resulting work packages are created.

The software gives user-dedicated features to manage structural systems and connections. Users can use, define, and manage such shipbuilding-specific parts and elements as: plating (deck, bulkhead), plates with a free edge (web frame), stiffening, stiffening on free edges (coaming), and beaming (pillars, stanchions). Structural objects are intelligent and maintain their properties, such as material description, weight and other technological specifications important to production and analysis. These properties can be used to create special reports, drawing annotations, or

New software aids workflow needs

A NEW version of Kronodoc Oy's software, Kronodoc Marine, has recently been released. This allows users to manage content, execute programs, and project manage. Kronodoc generates process analysis and reports in a distributed collaborative environment. Kronodoc Marine has been specifically designed to satisfy the different workflow needs of shipbuilding.

The new software version adds a wide range of new functionality including: project e-mail, tracking, a powerful information search, process management, system application integration (such as CAD Viewer and CADRef), and improved working with technical drawings. The main benefit of Kronodoc Marine is providing an improved competitive edge over competitors, and ensuring industry best practices. These are included in the product predefined work processes and operations in subcontractor network.

Kronodoc Marine was developed in the MERIKE technology program in cooperation with Aker Finnyards and Deltamarin. For more information about this union, see our July/August issue, page 49.

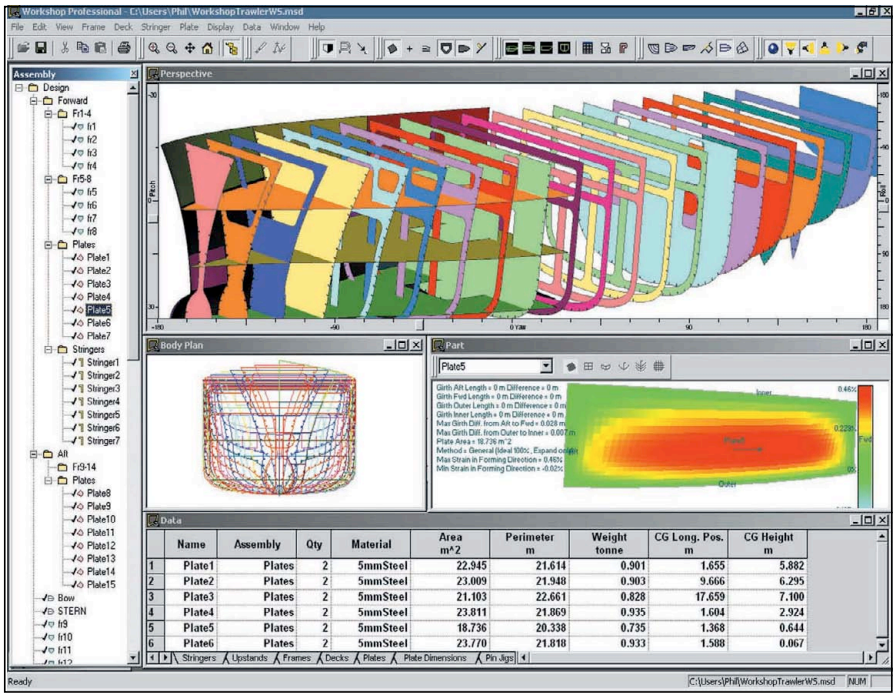
Union provides end-to-end solution for shipyards

FORMATION Design Systems and Albacore Research Ltd (ARL) have announced that Formation's Maxsurf suite of naval architecture and ship construction software now links with Albacore's ShipConstructor suite to provide shipyards with a complete end-to-end solution for ship design, detailing, and production.

The link has been developed by Formation Design Systems as part of its ongoing program of adding additional capabilities to the Workshop module within the Maxsurf suite of software. The new functions allow naval architects and structural designers to take preliminary structural definitions from Workshop and export them in a format compatible with ShipConstructor. This format allows transverse frames, longitudinal stringers, hull plates, and decks to be transferred.

This link has been developed as a result of demands from shipbuilding customers for a smooth link from initial design and structural definition through to detailed design and production. This solution satisfies the practical needs of builders during the detailing and construction phases. Intelligent data transfer of this type reduces errors, maintains part accuracy, and saves valuable time in the detailing process.

The new Maxsurf/ShipConstructor interface allows a range of parts to be exported. These include: export of hull plates complete with both 2D and 3D plate information and marking lines; export of stringer information including the full 3D stringer shape; export of transverse frames including cutouts for stringers and openings in the frame; and export of decks including any deck openings.



New transfer capabilities allow designers and shipbuilders to move data from Maxsurf to Ship Constructor for further detailing.

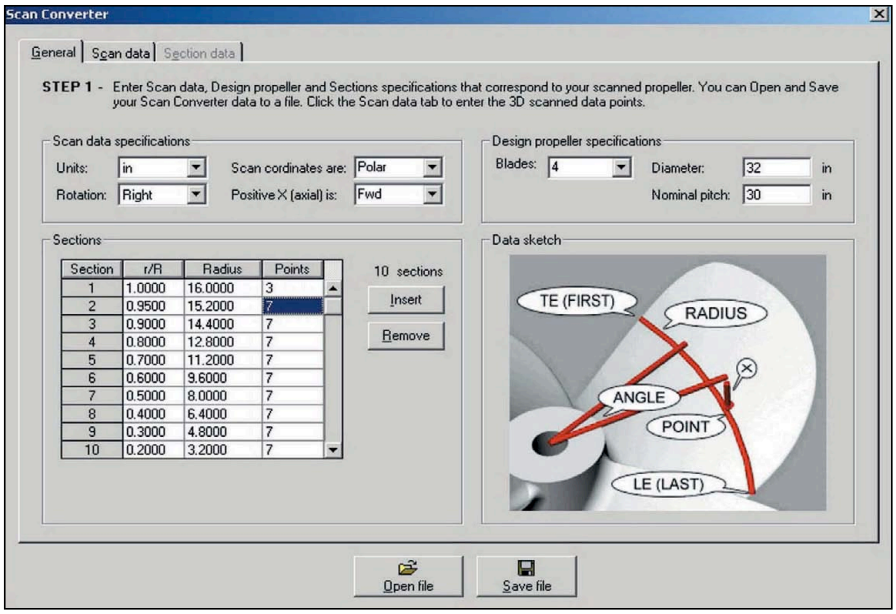
All parts can be rendered in 3D before export and verified in a similar way after import into ShipConstructor. The Maxsurf to ShipConstructor functions are available immediately in version 9.6 release of the Maxsurf suite of software. ShipConstructor's database can be integrated with other shipyard functions, such as production planning, scheduling, purchasing, and accounting. By employing this, ShipConstructor users have reported a reduction in man-hours of up to 50% per vessel.

Additional module for propeller CAD software

A NEW add-on module for HydroComp's PropCad propeller CAD software, Scan Converter, has recently been launched. PropCad is a software tool for the automatic preparation of 2D design drawings, 3D views, construction data, and CAM file exports for marine propellers.

The role of Scan Converter is to take scanned blade surface data (in XYZ or radial format) and convert it into a PropCad design file. With carefully scanned data for both surfaces of a blade, Scan Converter can develop the full geometric representation of the blades. This would allow a user to quickly and accurately make improvements to an existing product or to create new variants.

HydroComp developed Scan Converter in response to user requests for a tool to document and compare a propeller to an original PropCad design, as well as to create PropCad design files for existing wooden patterns. Scan Converter also allows a user to extract important design characteristics about legacy product models, or to precisely determine hydrodynamically-significant changes to a propeller after damage or repair.



Scan Converter is a new add-on module from HydroComp that compares and documents propellers to their original designs.

Plug-in software for surface expansion

ALBACORE Research Ltd, Canada, has released Expander, the Surface Expansion Plug-In for Rhino. This can expand surfaces such as ship hulls. Expander's technology has been developed from ShipCAM's plate expansion routine, which has proven its power and reliability in successfully expanding thousands of ship plates over the past 12 years worldwide. Expander is capable of expanding even the most complex compound-curvature as well as developable surfaces, both trimmed and untrimmed.

Expansion is the conversion of a 3D surface into a 2D shape as required for the production of many industrial items made from flat material such as sheet metal. There are two distinct types of surfaces - developable, which can be expanded without stretching the material, and compound curvature surfaces, which require stretching within limits allowable to material and the forming process that is used. Expander's intuitive user interface makes surface expansion simple, even for an inexperienced user.

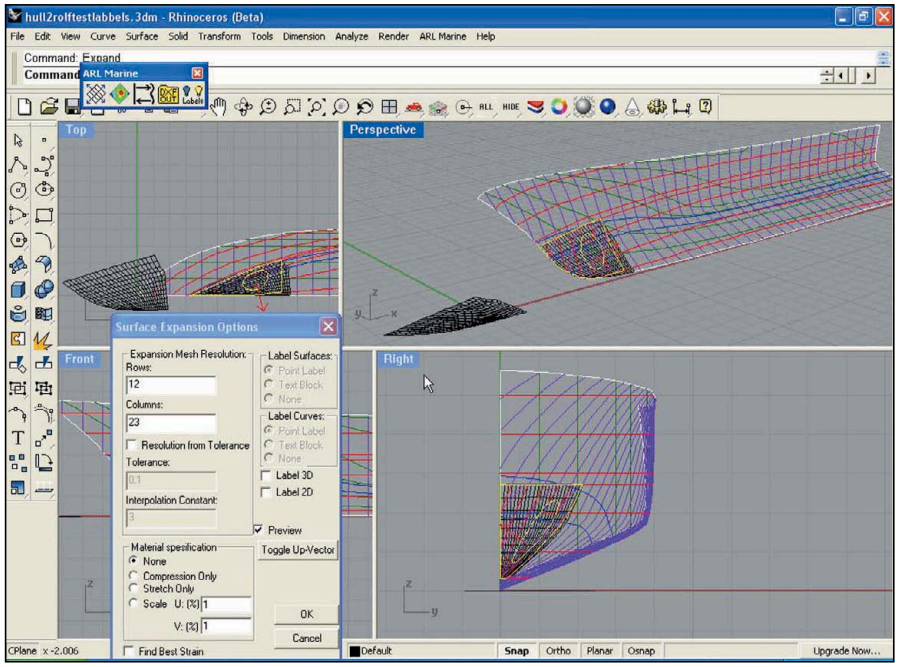


Fig 1. Expanding a small patch of a larger surface - previewing the untrimmed result.

Direct or split?

Small surfaces that can be produced in one piece can be directly expanded. However, larger surface or surfaces that should be split for design reasons are first divided into individual patches. It is only necessary to define seams on the 3D surface as required by the complexity of the surface, design requirements, the type of material, and the forming process to be used. Then select the surface patch for expansion, set the desired expansion parameters in the dialogue, and click 'expand'. The expanded shape is automatically displayed near the 3D surface.

Map curves

To aid production, Expander has functionality to map curves (marking lines) from the original 3D surface to the expanded 2D surface. For example, supports inside of a sheet metal surface will first be marked on the 3D surface and are then automatically transferred to the 2D expanded shape. Additionally, markings can be transferred back from the 2D shape to the 3D surface. This function is, for example, important should the expanded shape exceed the size of the available material or to visualise anything in 3D that may be printed or otherwise affixed on the 2D shape.

Text labelling

Furthermore, Expander also makes matching reference curves easy, with its text labelling of marking lines on the 3D surface and its 2D expanded counterpart. NC cutting equipment can mark these text labels automatically on the cut material for ease of identification.

Strain analysis

Compound curvature surfaces always require stretching or compressing the material to obtain the shape, which causes strain in the material. Strains are displayed in colours on the 2D and 3D surface, allowing identification of areas, which exceed the maximum allowable strain. This is an invaluable tool to optimise seam placement before problems occur in the production process.

Exporting expanded shapes

Finally, Expander provides a function to export expanded shapes with all markings to the DXF file format, which is the basis for most nesting and NC cutting programs. For ease of processing shape outlines, markings and text labels can be placed on user configurable layers.

Fig 2. The circle and rectangle are mapped from the 2D expanded back shape to the 3D surface.

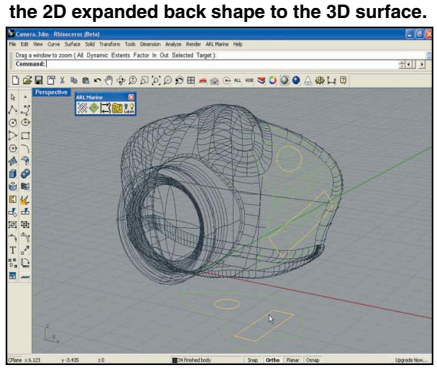


Fig 3. Strain analysis for a ship surface.

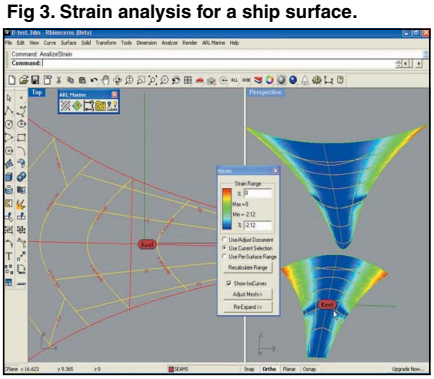


Fig 4. Layer creation options for export to DXF.

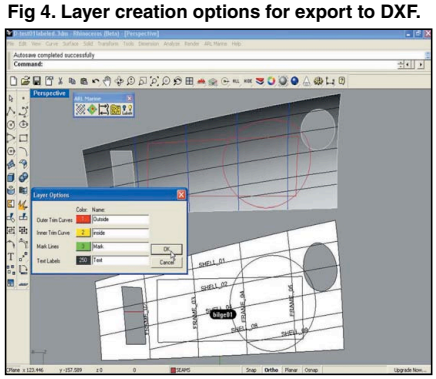
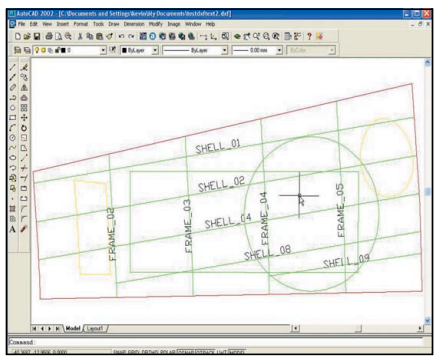


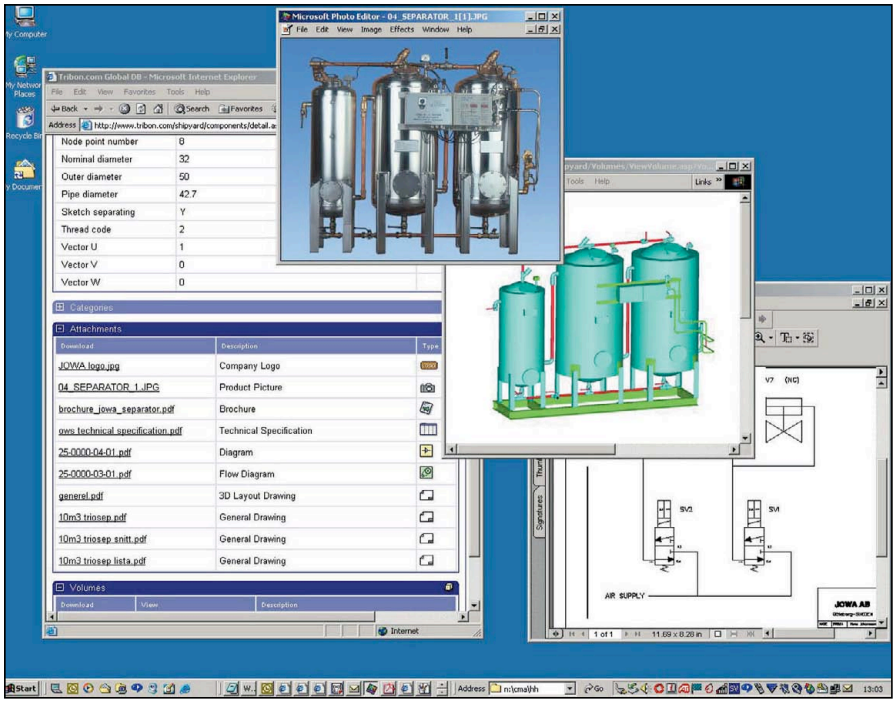
Fig 5. Same surface in AutoCAD transferred via DFX.



Korean shipyards upgrade to M2 CAD system

A STEEL cutting ceremony was held last year at Daewoo Shipbuilding & Marine Engineering's (DSME) Okpo Shipyard for a 110,000dwt class crude oil tanker, the first ship being designed with Tribon M2 as a result of the DSME CAD Unification Project. The basic design of the ship started in September 2002, and the Tribon M2, released in 2002, was the first significant part of the CAD project which has led to a full implementation of the entire Tribon system in the design and production areas.

STX Shipbuilding Co Ltd (formerly Daedong Shipbuilding) has also now extended the use of the Tribon Shipbuilding System by upgrading its installation with more seats for the entire Tribon M2 system, including the complete hull and outfitting applications. STX Shipbuilding originally implemented the Tribon system in 1994 (as Daedong Shipbuilding) but will now upgrade from Tribon 5 to Tribon M2/M3. STX Shipbuilding specialises in constructing vessels from 30,000dwt up to 80,000dwt.



An oily water separator from Jowa AB presented on the Tribon.com product database with some attached documents such as product picture, brochure, diagrams, layout, and general drawings.

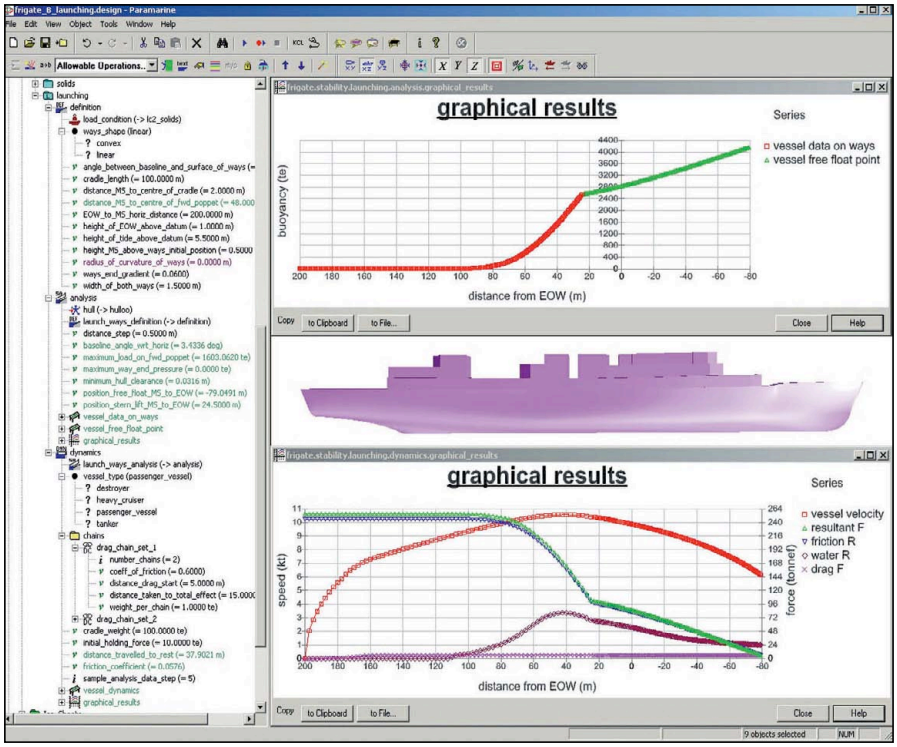
New Tribon.com version released

A main feature in the new product search function of Tribon.com 7.0 includes a category that can now be combined with a free text search, making it easier to search for and find suppliers' product information. Tribon.com revolves around a global database of shipbuilding components and equipment so shipbuilders can access, download, and integrate accurate product information directly into their design. In release 7.0 a product attachment is presented with a description and an illustrative icon indicating the type of the document. Ship designers can now define lists of their preferred suppliers in accordance with shipowners' makers lists. Multiple lists can be created and connected to specific projects or used as general preferred lists for all projects.

New launch and onboard software released

THIS month sees a new release of Graphics Research Corp's Paramarine ship design and launch software, also Seagoing Paramarine - an onboard version. Theses programs have many updated features, all of which are accessed through the same user-friendly, intuitive graphical interfaces. New features include:

- IntelliHull: a parametric design tool for generating commercial hullforms, which also includes a bulbous bow capability. The tool is very flexible and allows for easy manipulation and initial sizing of hullforms
- Launching: the stability capability is enhanced by launching analysis. The new objects will allow a user to define the launch ways, analyse the hydrostatics and dynamics of the launch at any point from initial launch position to rest in the water
- Seagoing Paramarine: the onboard version of Paramarine brings updates to the profile view in the deck plan, with hover and select functionality. Docking analysis is a powerful new tool, alongside calculation of bending moments and shear forces for various intact or damaged scenarios
- Structures: a cleaner and more efficient user-friendly methodology has been implemented, further enhancing structural capabilities.



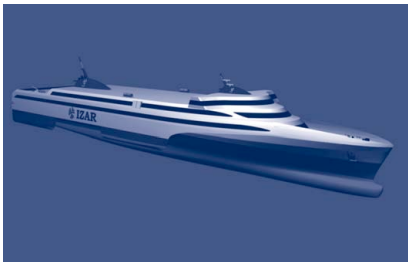
This screenshot represents Graphic Research Corp's new launching analysis, a function that allows users to define and analyse launch ways.

The Royal Institution of Naval Architects

Design and Operation of Trimaran Ships

29 - 30 April 2004, London, UK

Second Notice



The idea of trimaran ships has inspired a tremendous amount of attention, both civil and military. The concept; a stabilised monohull, with small sidehulls adding stability to a slender central hull, has a number of potential advantages. The most obvious are the increased control over stability and greater flexibility in layout, but other advantages include better seakeeping, reduced speed loss in a seaway and possible high speed powering and vulnerability benefits.

The subject has now been thoroughly investigated around the world with a combination of design studies, numerical simulation, model testing and the construction of the large ocean-going technology demonstrator, RV Triton. The trials have proven highly successful and have produced a large amount of data; validating prediction methods and design tools and providing experience of operating a seagoing vessel in all weather conditions.

There is now an increasing move to exploit this new technology, culminating in the recent order of a large trimaran fast ferry to operate in the Canary Islands.

This conference will definitively review the present situation with a selection of papers from civil and defence sources, as well as providing a forum to discuss plans for the future. This conference is planned with the UK MoD to include very significant discussion of the results of the Triton trials programme.

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For an application form please telephone Harriet Marquiss on 023 8032 9221, fax 023 8032 9465, e-mail harriet_marquiss@mcga.gov.uk or write to The Maritime and Coastguard Agency, Recruitment Team, Bay 3/19, Spring Place, 105 Commercial Road, Southampton SO15 1EG.
The closing date for completed applications is 27 February 2004.

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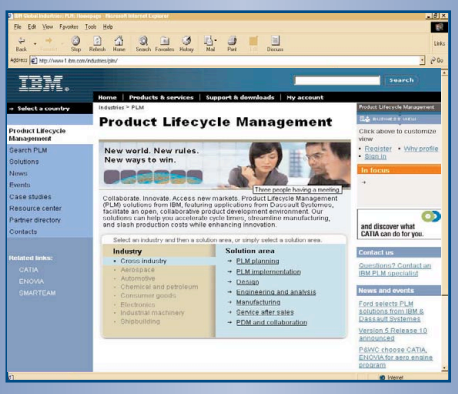

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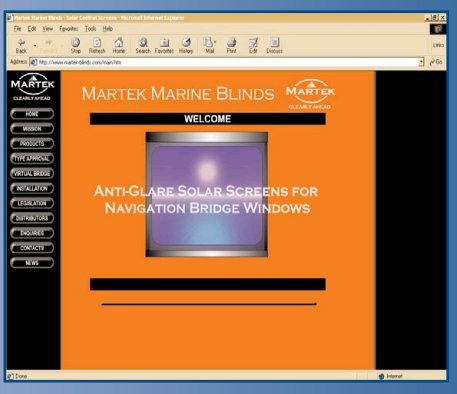

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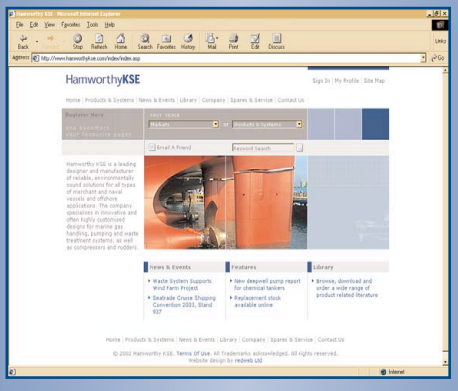

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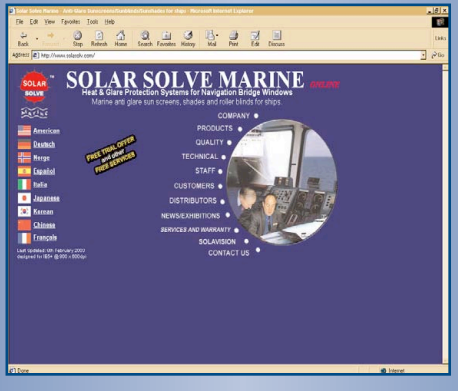

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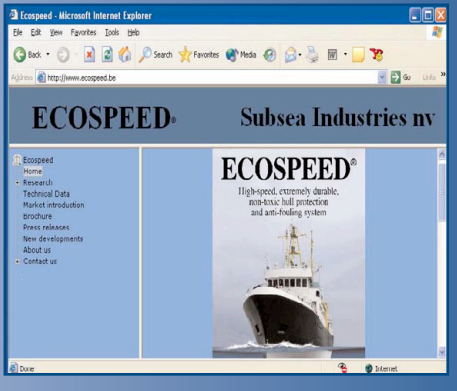

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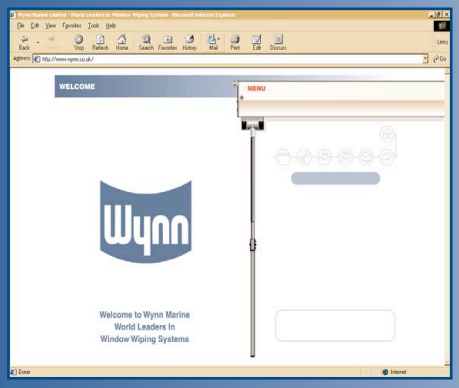

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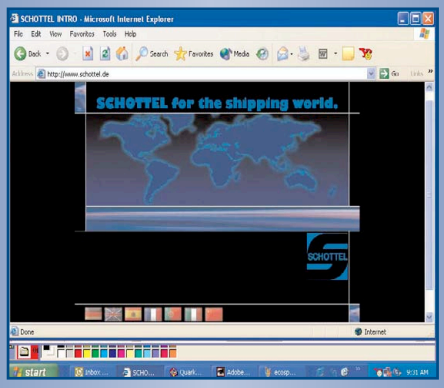

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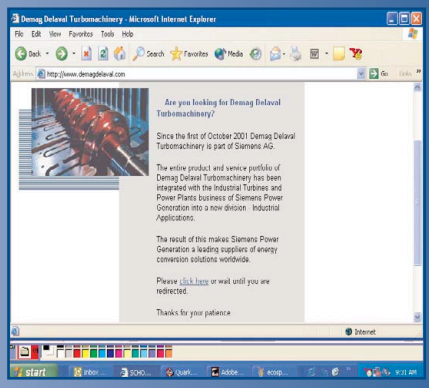

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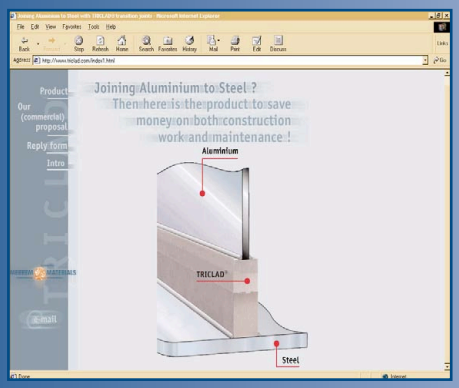

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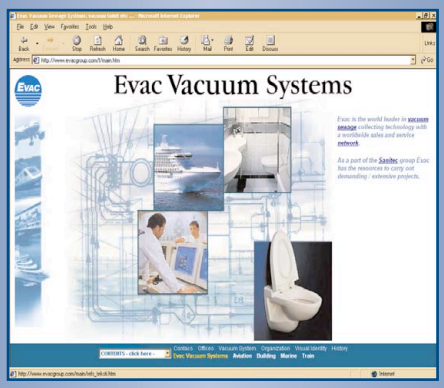

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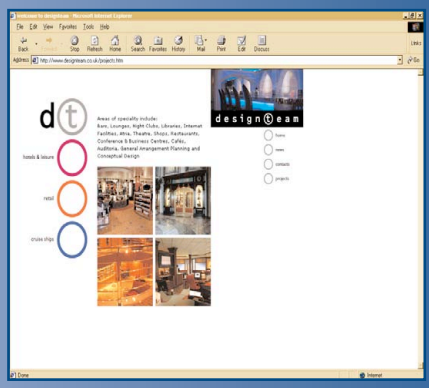

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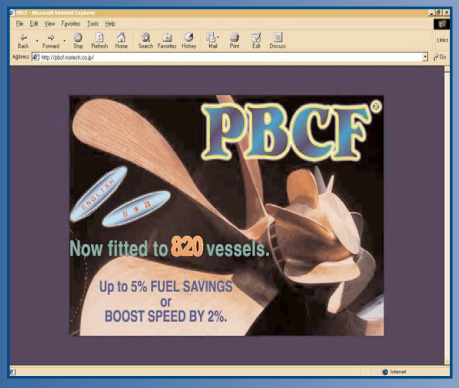

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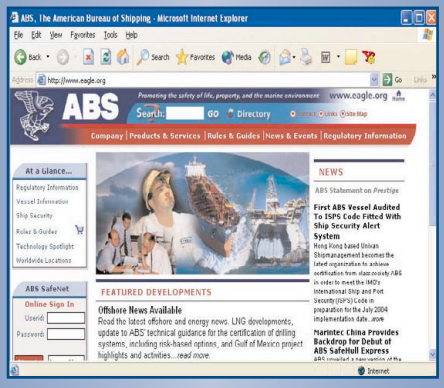

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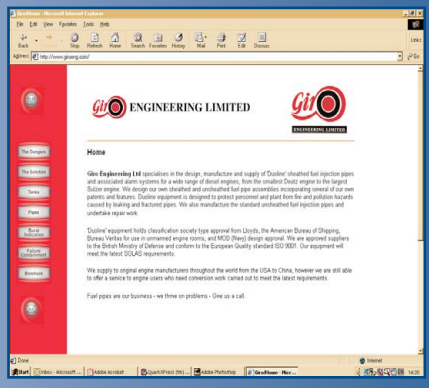

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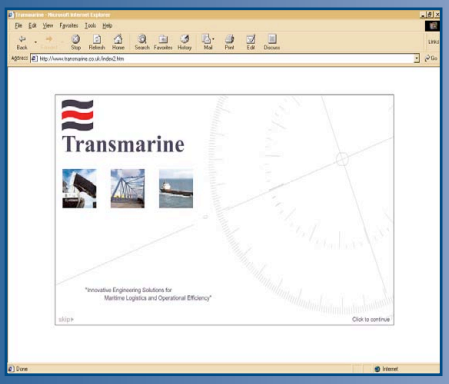

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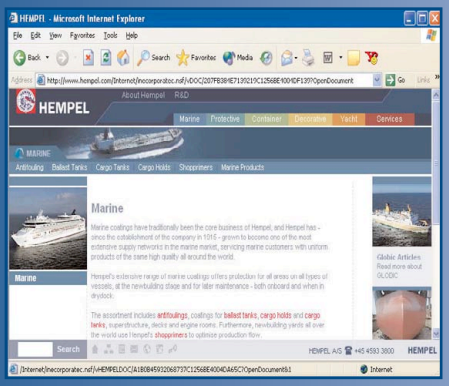

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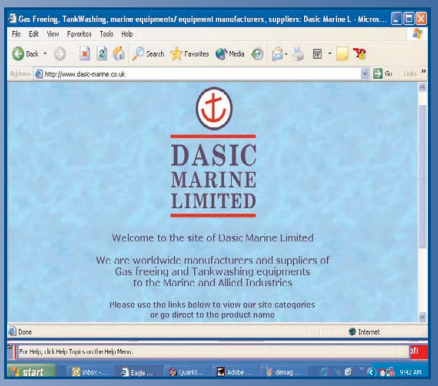

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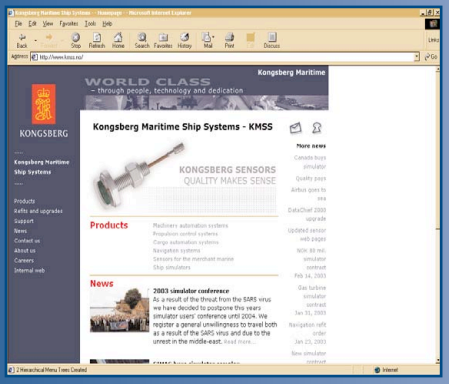

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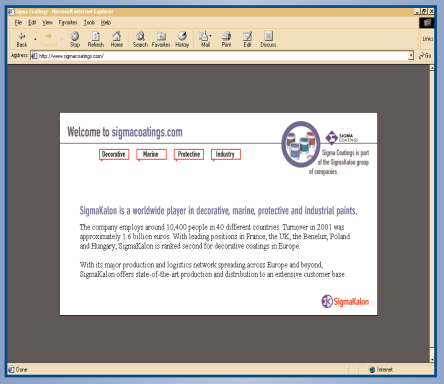

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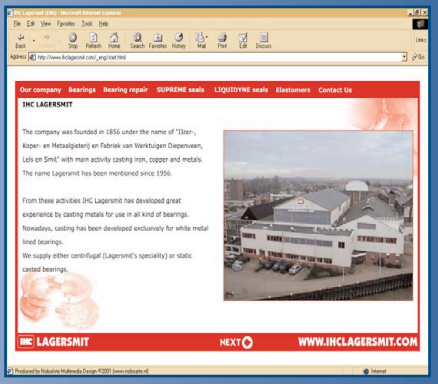

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