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THE NAVAL ARCHITECT

It is not easy being the lead architect at the world's busiest cruiseship building group. *The Naval Architect* spoke exclusively to Fincantieri's Maurizio Cergol(right), a man who wears his responsibilities lightly. *See pp29-30.*

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The work is there: where are the workers?

EUROPEAN shipyards are experiencing unprecedented levels of demand, but their success is exposing stark labour shortages in both the building and designing of ships.

In complete contrast to the dark days of 2003, when the plug was pulled on a large number of yards, amid the cry of 'foul' over competition from South Korea, many European yards are fully booked until 2010 and beyond, according to latest comments from the Community of European Union Shipyards Associations. Orders for 2006 were up by at least 10% on 2005.

However, while the work is there to be done, those wishing to expand their research, design, and construction capabilities in line with the continuing boom are finding it increasingly difficult to fill new posts.

The shipping industry has long acknowledged labour shortage, afflicting the merchant marine in Europe, where the prospects of a life at sea are no longer enticing for a generation of young Europeans.

As the building boom works through the orderbook, the same pattern is clearly afflicting the shipbuilding and marine equipment sectors.

This month, *The Naval Architect* travelled to The Netherlands and Italy as part of its regular coverage of these forward-looking shipbuilding sectors. Time and again, talk turned unprompted to the way labour shortages are tying the hands of those wanting to gear up production.

European shipyards and marine engineering firms could happily increase capacity, but the continuing labour shortage is applying the brakes.

One supplier of gauging equipment in The Netherlands summed up the current malaise as 'No people and too much work'.

One of the smaller Dutch yards said it planned to double the number of manual workers in its facilities by the end of the year, but acknowledged that it was having to be resourceful to achieve these ends. With three years work in hand, it was using recruitment consultants to look for workers in Romania, Poland, and eastern Germany. In April, it would welcome its first two Slovakian welders.

According to a leading thruster supplier, also in The Netherlands, the company could double its output and not find any difficulty in selling its wares in the current market climate. However, finding and training new people to achieve such an end was not possible. 'At the moment, we have 10 vacancies that we cannot fill,' said the company's representative. 'We need mechanical engineers who work with their hands, and people able to weld and grind.'

One solution has been to 'import' new staff from eastern Germany, but there are limits to such a strategy. 'We cannot employ people from Poland anymore,' said the same company representative, 'because they tend to stay only in the short term. It takes at least a year to train someone when it comes to the highly skilled electrical end of things, and that is an investment we will only make with people prepared to stay.'

Another Dutch company, involved in ship design, identified recruitment as the most serious issue facing management in 2007, and went so far as to ask for leads for new staff!

Even Marin acknowledged that, for the first time in its 75 year history, it was finding it difficult to source new people. The research and development organisation said it had 15 vancancies across the naval achitecture and marine engineering disciplines, but was finding it challenging to compete against other companies chasing after the same people.

One Dutch systems integrator, whose workload is currently at best ever levels, identified the problem as one of schooling, suggesting that responsibility lay with government to make the 'maritime cluster' more attractive to the younger generation. With an ageing workforce, the company said that shipbuilding and even sub-assembly of electronic parts was perceived as 'dirty work', and that only a concerted campaign could change such a perception.

For a generation raised on virtual reality, such a hearts and minds campaigning would likely fall flat.

In Italy, with a few notable exceptions, many shipbuilders have withdrawn from constructing cargoships altogether, leaving still active naval architects in that country to be just as resourceful in bringing on yards overseas to deal with their traditional shipowner clients.

However, here, on top of the shortage of new local talent, even these innovators are being squeezed on cost. In search of the type of rates to attract German and Nordic customers, one of these companies said it was increasingly farming out a portion of detailed design work to independent companies in Croatia – particularly around Rijeka and Pula.

But, for other social reasons, the problems of labour shortage are by no means limited to Western European yards. There is, in fact, a flip side to this coin.

Like other builders in Romania, Damen Galatz has had to face up to a skilled labour force haemorrhaging numbers to higher paying markets overseas. Over the last year, the yard reckons to have lost 600 of its 3000 frontline workers, and efforts to cover the situation through subcontractors have proved only partially successful, with sub-suppliers facing the same dilemma. Project managers, engineers, welders, and painters have all been leaving in droves, lured by easier money elsewhere in the EU, or by shipbuilders in more expansive mode, in Dubai and even China.

And, according to Damen, even if new workers can be attracted to Romania from other shipbuilding nations with lower expectations, one knock-on problem has been that those new workers take time to bed in, with implications for efficiency.

Where work is plentiful, the market dictates that workers should follow. But Europe's social forces indicate that the market is more complex than such simplistic thinking suggests.

GL optimises Panamax design

GERMANISCHER Lloyd is ready to discuss details of a containership design, fitting new post-Panamax lock limits set by The Panama Canal Authority (ACP) for lock chamber sizes, but able to carry more containers than the reference design envisaged by the ACP.

The extension of the Panama Canal entails a new generation of Panamax size vessels, with new locks set to double the existing capacity.

The ACP used a post-Panamax reference containership of 366m length, 49m width, and maximum 15m draft to establish the ideal lock chamber sizes. This vessel has been identified as the largest ship type which would regularly deploy in transiting the Canal with the greatest frequency, volume, and intensity. It will have a nominal cargo capacity of up to 12,000TEU. At present it is planned to use tugboats instead of traditional locomotives to position the vessels, which implies different operational safety margins.

However, Germanischer Lloyd has designed a new box ship, fitting the width of the locks. It will be 427m long, 55m wide, and 18.3m deep. The new vessel will be capable of carrying up to 12,500 standard containers - at least five hundred TEU more than originally calculated by ACP.

The optimised ship, which would fit the locks 'like a hand in a glove' could 'maximise the potential of the new locks without endangering the latter's safe operation', according to GL. An acceptance of the main dimensions above the present limitations could only be achieved in co-operation with the ACP.

The depth of the vessel depended on the number of containers in the cargo hold, the height of the hatch cover, and the space between the top of the container and the lower side of the coping. The number, as well as the position of the containers must be carefully investigated, as the strength of the container is the limiting factor for the principal dimensions of containerships.

The new design would see the deckhouse moved forward, with soot problems avoided by moving funnels away from the transom.

NAKILAT AND KEPPEL VENTURE

QATAR Gas Transport Company (NAKILAT) has signed a co-operation agreement with Keppel Offshore & Marine Limited (Keppel O&M) through its wholly owned subsidiary, KS Investments, that looks to develop a world-class shipyard facility in the Port of Ras Laffan, Qatar.

The proposed shipyard, Nakilat-Keppel Offshore & Marine, will be part of the massive expansion of the Port of Ras Laffan, in the Arabian Gulf, and is expected to begin operation in 2010.

Muhammad A Ghannam, managing director, NAKILAT, said: 'Our vision is for the new shipyard to become a centre of excellence for the repair and maintenance of LNG carriers, thereby securing a strategically important link in the supply chain of natural gas from wellhead to consumer.'

Tong Chong Heong, managing director of Keppel O&M, said: 'This business venture is in line with our "near market, near customer" strategy to be close to our customers, so that we can better serve them. We will replicate our proven management system in the new shipyard, and leverage the resources of our global network of 17 yards and commercial agents to ensure success of this joint venture with NAKILAT.'

NAKILAT and KS Investments have agreed to form an 80/20 joint venture company to manage the design, construction, and operation of the 43-hectare shipyard, which will be built on reclaimed land. KS Investments will contribute US$23m for its 20% interest in the joint venture.

The new facility will be suitable for the repair and maintenance of very large LNG carriers and a wide range of other vessels, and the conversion of tankers to floating production storage and offloading systems (FPSOs), and floating storage and offloading (FSO) systems. The estimated cost of the shipyard is approximately US$450m.

Qatar Petroleum (QP) will fund the reclamation of the land and construction of the yard's infrastructure, such as the two dry docks, the quays, buildings, and utilities distribution networks. QP will lease the infrastructure to the joint venture. In turn, the joint venture will fund the shipyard's mobile equipment, such as the floating dock, cranes, and workshop machinery, and provide cash for operations.

The shipyard can be expanded for the construction of specialised small ships (such as offshore supply vessels), and the fabrication of structures for the offshore oil and gas industry (such as jack-up drilling rigs, process modules and decks, jackets, wellhead decks, and flare booms).

FINCANTIERI LOOKS EAST

REPRESENTATIVES of Fincantieri have been visiting yards in Ukraine in search of a formal collaboration to cover niche opportunities for ship construction, which are no longer attractive as a building proposition in Italy.

A company spokesman said the Italian shipbuilder was keenly interested in remote building for the energy sector, in particular liquefied natural gas carriers and pipelayers. The objective was not to relocate any of Fincantieri's existing capacity, the spokesman emphasised, but more to take a slice of new market opportunities.

The development plans for new tonnage being developed by Italian offshore energy group SAIPEM, for example, provided just such an opportunity.

STX BREAKS GROUND IN CHINA

STX Shipbuilding is set to be the first South Korean company to build a shipyard in China capable of turning out complete vessels.

The company is investing US$1bn in Dalian's Changxing Island development, Liaoning, to build a centre that will include production facilities and its own engine assembly plants by the first half of 2008.

STX held a ground-breaking ceremony for the shipyard in Dalian in late March. The company has projected its sales from China will reach US$3bn by 2012.

STX is expected to begin working on vessels from the second half of 2008, starting with bulk carriers, petroleum product carriers, and car carriers. It is reported as having already taken orders for 25 ships worth $1.1bn, including 21 bulk carriers with capacity to carry 58,000tonnes of cargo and four 6700 vehicle capacity car carriers.

The completed ships will be delivered from Dalian from the second half of 2009.

DUAL PURPOSE FALL PIPE VESSEL

YANTAI Raffles Shipyard Limited has been awarded an interesting contract, worth US$78m, to construct a flexible fall pipe bulk carrier for Dutch dredging, offshore, and marine construction company Van Oord.

The vessel will be 175m long, with a 26m beam, an operational draught of 10.67m, and will be built to the standards of ABS and Bureau Veritas.

It has been designed as a bulk carrier, which can alternatively be operated as a DP flexible fall pipe vessel to carry out sub sea rock installation works. Such installations include the stabilisation, protection and covering of cables, pipes and flow lines, free span correction, upheaval buckling prevention, and filling up holes around platforms, structures, and rigs.

Other operations include seabed preparation before pipe laying, thermal insulation of offshore oil pipelines, protection against anchors and fishing operations, and ballasting of platforms, structures and loading buoys.

Data mining scoops award

During the 6th COMPIT conference, held in April in Cortona, the GL Compit award for an excellent paper was given to Jean-David Caprace of the University of Liege/Belgium.

The €500 award is sponsored by Germanischer Lloyd in recognition of outstanding work of a young researcher. The award was given for the first time in 2007, but henceforward will be given annually.

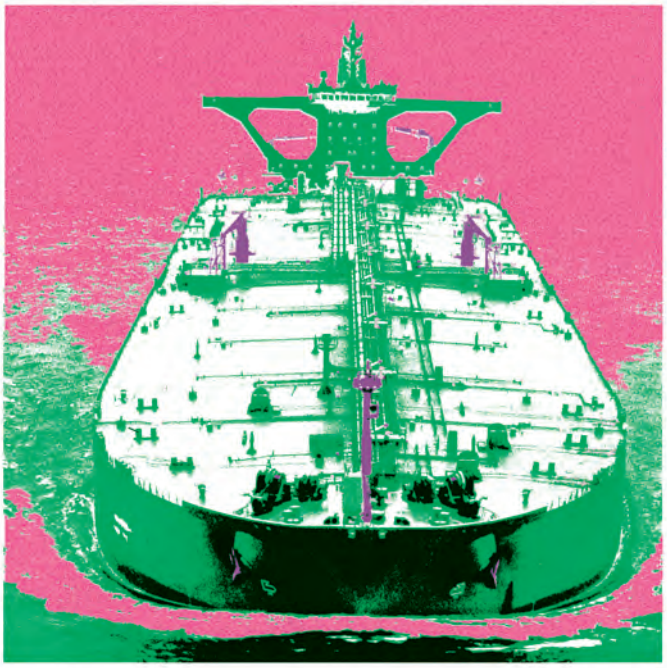
Mr Caprace was selected from many good candidates, in view of the scope and quality of his previous work as well as the quality of his paper, entitled 'A Data Mining Analysis Applied to a Straightening Process Database', which combined several IT techniques to predict the costs of straightening stiffened panels in ship production.

Mr Caprace is expected to obtain his PhD degree later this year.

Jean-David Caprace of the University of Liege/Belgium received the Compit Award for a paper on data mining analysis.

See you at NorShipping 2007
June 12-15, Stand No. D03-21



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As one of the largest of her kind in the world, the vessel will register a deadweight of approximately 30,000tonnes and offer a loading capacity of approximately 28,000tonnes. The fall pipe will measure 1.1m in diameter and can be operated with a maximum working depth of about 2000m. The vessel will have accommodation facilities for up to 52 persons.

The rock placing will be carried out through a central moon pool via a Van Oord patented flexible fall pipe system. At the lower end of the fall pipe system, a powerful cylindrical shaped remotely operated vehicle will be attached.

Upon completion in the fourth quarter of 2008, the vessel will start its operations in European waters, but will be suitable for worldwide operations.

WÄRTSILÄ ADDS RT-FLEX SOURCE

HITACHI Zosen has joined the family of licensees of Wärtsilä Corporation to manufacture Wärtsilä RT-flex electronically-controlled common-rail marine engines. The Japanese engine builder has been awarded an initial contract to build four six-cylinder Wärtsilä RT-flex50-B engines for ships to be constructed in China. The first of the ships will be delivered in the second quarter of 2009. The engines each have a maximum continuous power of 9960kW (13,560bhp) at 124rev/min.

With engine works in Ariake, Kumamoto Prefecture, Japan, Hitachi Zosen becomes the eleventh engine builder to manufacture Wärtsilä RT-flex electronically-controlled common-rail marine engines. The engine type has been very successful in the market with some 85 engines already sold.

ABS EXTENDS EDUCATION ROLE

CLASSIFICATION society ABS has extended its commitment to marine and offshore education and research by signing a memorandum of understanding with the Centre for Offshore Research and Engineering (CORE) at the National University of Singapore (NUS).

The agreement between ABS and CORE was one of the collaborations announced during ceremonies in which NUS received Sing$10m from Singapore's Agency for Science, Technology and Research (A*STAR) and the Maritime & Port Authority of Singapore to further its scientific research and development programmes.

The three year MOU outlines the working relationship between CORE and ABS to address offshore technology issues as well as the transfer of knowledge to the region where a tremendous amount of offshore development is taking place. In particular, the efforts will focus on research and development, teaching, and a research scholarship at NUS.

The R&D collaboration will include studies related to offshore tubular steel structures, offshore concrete gravity structures, marine geotechnical engineering, and intelligent offshore structure monitoring. ABS plans to provide instructors and offer short courses on such topics as first-principle analyses, marine hydrodynamics, computational fluid dynamics, structural reliability, and fracture and fatigue. A research scholarship for an advanced academic degreed (PhD) individual is being established by ABS.

DNV RAISES ACCIDENT CONCERNS

WHILE accident frequency in shipping has decreased over the past few decades, and the figures today are half of what they were in the late 1980s, Det Norske Veritas has predicted the trend is about to turn.

DNV monitors the annual frequency of serious accidents in several ship segments. Over the last five years, figures from this monitoring show an increasing incidence of serious accidents in several shipping segments, according to DNV. Even the tanker segment, with its high focus on safety, has more reported accidents today than it did five years ago.

Espen Cramer, the head of DNV Maritime Solutions, said: 'It is well known that ships and shipping companies are today inspected and audited with increasing intensity. Both the technical standard and transparency are better today than they were several years ago. In spite of this, we are seeing that the numbers are going in the wrong direction.'

DNV's worry is that there is more stress and fatigue relating to the people and organisations both onboard and onshore. While shipping booms, demand for crew is enormous, but the shipping industry is having to fight against loss of manpower to other industries and a short supply of quality crew from international training providers.

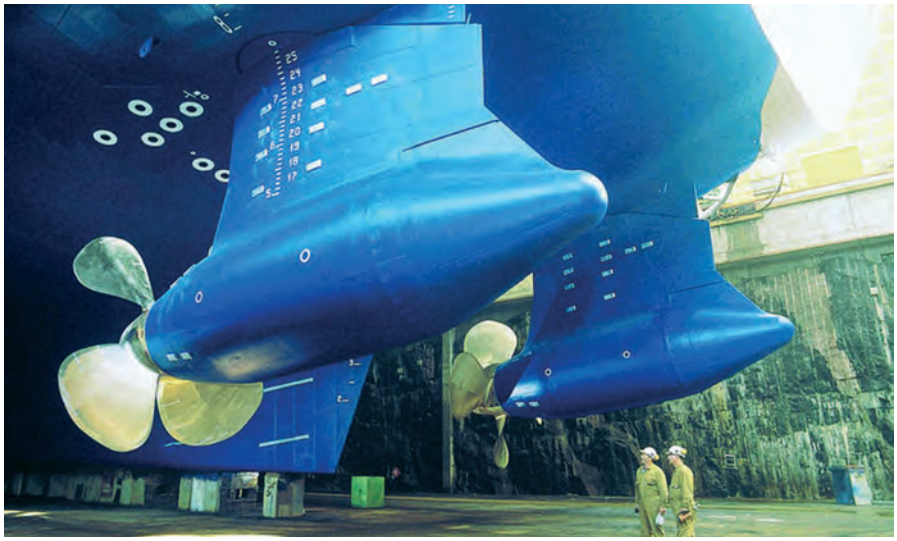
Dr Cramer added: 'In sum, the general level of experience onboard vessels has been reduced. There are more new recruits, less retention and faster promotion. In addition to these trends, the workload onboard with respect to paperwork and inspections has increased, while the crew

size is stable. The loss of experience is also a stress factor for those onboard who continuously have to train new crew members.'

The DNV statistics show that an area of high concern is navigational accidents such as collisions, stranding, and contact damage.

To reverse this trend and reduce accidents, Dr Cramer wants more focus on the crew onboard and the management onshore:

'The crew has to be more involved in safety programmes and the management has to demonstrate more commitment to safety. In that respect, shipping still has more to learn from other industries such as offshore and aviation, where there has been an intense focus on human and organisational factors for more than 25 years.'



ABB's Azipod propulsion, part of a package of deals adding up to $110m worth of business.

ABB WINS $110 MILLION IN MARINE ORDERS

ABB has signed contracts worth more than US$110m to supply Azipod propulsion, power-generation and power-distribution systems for 19 new vessels being built in Europe and Asia.

The new projects include; electrical propulsion systems for nine platform supply vessels, to be built in shipyards in Norway and China; complete electrical propulsion systems for a 153,000m^3 liquefied natural gas carrier from Hanjin Heavy Industries; total electrical power system package for one semi-submersible drilling rig for Petroserv, from South Korea's Daewoo Shipbuilding & Marine Engineering; drilling drive packages for one jackup rig and three drill ships to be built in Singapore and Korea; one Solstice-class vessel for Celebrity Cruises, with two 20.5MW Azipod units for main propulsion, medium-voltage generators, main switchboards, frequency converters, transformers, and bow thruster motors.

Deliveries for the new vessels range from late 2007 through 2009.

SEABUS INTERNATIONAL ADDS TO AUTOSHIP

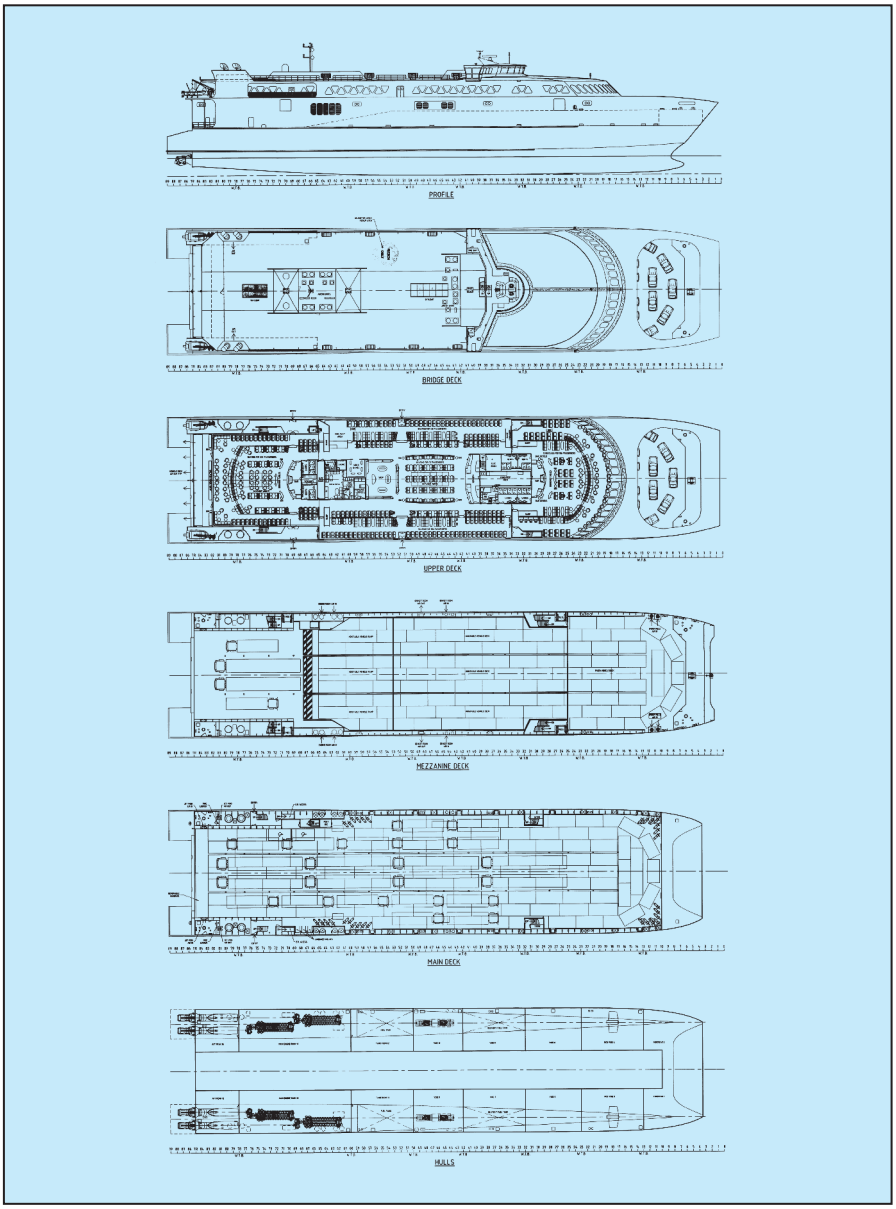
SEABUS International, of Guangzhou China, has upgraded its Autoship and Autohydro programs to the 2007 releases and to the more advanced Pro versions. It has also added Autostructure (internal structural design) to its CAD/CAM suite.

Seabus and its parent company AMD Marine Consulting of Australia (an Autohydro user based in Sydney) specialise in the design of high-speed fast ferries. The China office provides engineering support for fast ferries being designed for use in the China Seas, using Autoship to create the hull form, Autohydro for producing the stability reports and now Autostructure for providing the shipyard with the internal structure drawings.

Superferry milestone for Austal USA

Delivery is imminent of the largest aluminium vessel ever to be built in the US.

The Hawaii Superferry, tied up alongside after its delicate launching and ready for sea trials.



GA of the Hawaii Superferry – the largest aluminium vessel to be built in the US to date.

ENTRY into service of the hig-speed vehicle-passenger catamaran Hawaii Superferry in July represents an important milestone, both for inter-island transportation and for the builder of the ship.

At 107m long, this is the largest ever all-aluminium ship to be built in the US and, as the first of a pair of two vessels, the project is an important staging post for Austal USA's building programme, as it gears up for two larger, 127m-long littoral combat ships, already under construction for the US Navy. Construction is advanced on the second Hawaii Superferry, which is scheduled for completion in the first half of 2009, following the launch of the first LCS.

The launch of the 107m 'Hull 615' for subsequent sea trials, in January, was notable as a feat in itself. The day began with a floating drydock being secured to the Austal sea wall on the Mobile River in front of the assembly bay. After ensuring that the drydock was properly aligned and secured, the process of rolling the ferry out onto the drydock began with specialist operators maintaining an even distribution of weight at all times. This drydock was then towed back down river to deeper waters enabling the sinking and float-off of the ferry, allowing her to be returned and tied up alongside Austal USA.

Since the yard's front wall was recently removed in preparation for the launch, the true scale of the fast ferry was clearly evident given the very tight fit within the assembly bay.

Development of the 107m fast ferry follows on from the prior completion of several smaller ferries up to 58m by the mobile yard, which has developed its workforce size over seven years, since first acquiring the vacant land in 2000 and developing a purpose-built aluminium shipyard, to numbers now approaching 850. Austal USA can also leverage Austal's 19 year experience in Australia where, since 2000, it has led in the advanced design and delivery of +70 metre (230') high speed vessels by a factor of 2:1 over its nearest global competitor.

Timothy Dick, Hawaii Superferry chairman, said, 'Austal USA was chosen on the basis of its world-class shipbuilding facilities, unique expertise in aluminium design and construction, and unrivalled worldwide experience in high speed roll-on /roll-off ferries.'

Construction began on the first Hawaii Superferry in June 2004, building an idea first hatched in July of 2001 when one of the founders of the venture saw the latest generation of large, high-speed roll-on/roll-off vehicle-passenger ferries operating in the Atlantic Ocean and the Mediterranean Sea. Full contract funding for this two-vessel project was confirmed in October 2005, enabling work to be completed at an accelerated pace.

Hawaii Superferry will use Austal fast ferry technology to establish Hawaii's first high-speed vehicle-passenger service. Each catamaran can carry 866 passengers and up to 282 cars (or a combination of 28 x 12m trucks and 65 cars) and provide services connecting Honolulu to Maui and Kauai in three hours as well as from Honolulu to the Big Island in approximately four hours.

TECHNICAL PARTICULARS
HAWAII SUPERFERRY

Length overall:	106.5m
Length waterline:	92.4m
Beam moulded:	23.8m
Hull depth moulded:	9.4m
Hull draft (maximum):	3.65m
Deadweight (maximum):	800tonnes
Passengers:	866
Crew:	as per USCG requirements
Vehicles:	282 cars or 28 forty-foot trucks (342 lane meters) with 65 cars
Axle loads	
Centre lanes:	16.5tonnes (single axle) 13.2tonnes (dual axle)
Outer lanes:	9.9tonnes (single axle) 13.2tonnes (dual axle)
Vehicle deck clear height	
Mezzanines raised	4.6m-4.7m 15'1" - 15'5"
Mezzanines lowered	2.6m below 2.2m above
Fuel (approx):	215,000litres
Main engines:	4 x MTU 20V 8000 M70/4 @ 8200kW/10,996hp
Propulsion:	4 x Kamewa 125 S11
Service speed:	35.0knots, 90% MCR, 400tonnes
Classification:	Germanischer Lloyd

Launching the Hawaii Superferry proved a delicate operation for Austal USA.

Vessel loading is via stern ramps and, for the comfort of passengers when boarding, dry exhaust funnels have been designed to direct main engine exhaust fumes away from the ramps and other passenger areas.

Bread and butter trades are expected to include raw milk taken in tank trucks from herds on the Island of Hawaii to Honolulu dairies for processing. Cartons of fresh milk could then be in refrigerator trucks on their way to supermarket shelves in Kauai just a few hours later.

With a draft of 3.6m and beam of 24m, the ferry will commute between the Hawaiian Islands at speeds up to 35knots. The vessel is four decks high, including two decks for the car and truck loading, one deck for passengers, and the bridge deck reserved for the pilot and his crew. The second deck, or mezzanine, is two thirds hoistable in order to facilitate parking for lighter cars and leave maximum parking space for the larger trucks. The upper deck or passenger deck includes amenities for passengers of all ages besides comfortable seating. This deck includes a bar and lounge on each end, food counter, gift shop, video game room, children's play area, restrooms, crew mess, purser's office, and first aid room.

The ferry is powered by four MTU 20V 8000 M70 main engines connected to four ZF53000 gearboxes. Manoeuverability is supplied through four individually driven Kamewa 125 S11 waterjets.

Commenting on the stringent environmental focus placed on Hawaii Superferry's proposed service John Garibaldi, Hawaii Superferry CEO stated, 'Our ferries, because of the short inter-island distances, use just one tenth of the fuel per passenger or pound compared to flying, and our vessels have zero wastewater discharge to protect our oceans.'

Appraising the vibration standard

THERE is no tangible reason to distrust the new ISO 6954 guidelines on shipboard vibration, argues Wolfgang Menzel, head of measurement department, Germanischer Lloyd.

THE 'new' ISO 6954, with the somewhat clumsy title 'Guidelines for the measurement, reporting, and evaluation of vibration with regard to habitability on passenger and merchant ships' [1] has been in force for seven years. Unfortunately, the Guidelines have been subject to a number of misunderstandings or reservations that cannot readily be supported.

For those concerned with the practical use/application of the old ISO 6954 (1984) [2] its main weaknesses were as follows:

- The unfortunate conversion factor: regard for which or its disregarding led to frequent conflicts between owner and shipyard. Its application and interpretation were disputed right to the end. A reasonable application of the conversion factor would have been a very time-consuming and complex business and would never have had a chance of gaining acceptance.
- The choice of the FTT parameters allowed for a lot manipulation of the amplitudes. There was never just one correct result. Depending on the data in question, it was easy to produce deviations of 5%-30%.
- When several amplitudes of similar magnitude were present, sole consideration of the maximum value did not correspond to the subjective vibration impression. The standard failed completely when broadband excitation caused by the propeller(s) occurred.

By the late 1990s, the maximum value alone was no longer believed realistically to reflect subjective impressions. A significant number of experts never trusted in it [3], as it seemed increasingly illogical, and acoustics were looked at with some envy. The energy approach used in many other technical fields seemed convincing and there was a general understanding that vibration should be catching up.

One of the main reservations about the new ISO guidelines seems to be that sensitivity, weighting, and filter curves, human perception and other terms are incorrectly categorised. For this reason, an attempt will be made here to throw some light on this supposed area of darkness.

One has to say that, in principle, all these concepts refer to the same kind of curve. A mathematician will tend to talk about a filter curve whereas a physiologist would be interested in the perception threshold and call it the sensitivity curve.

Human vibration is evaluated on the basis of an extensive series of tests carried out on human 'guinea pigs' in the first half of the last century. The results were recorded in ISO 2631 [4] as curves of the same vibratory strength for various cases. Whereas the hand-arm curve is relevant for a power saw or a pneumatic drill, it is the 'sitting' position that is valid for passengers in a plane or a train.

On a ship, the body positions 'sitting' and 'standing' are of equal significance on the bridge for instance whereas 'lying' down is additionally relevant in a cabin. What makes the situation onboard ship more complicated is that the floor (deck) can vibrate in all three directions, affecting the person in different ways depending on the position he is in.

This diversity indicates that a practicable procedure for evaluating vibration on ships cannot work without a high degree of simplification. In the end, agreement was reached on a mixture of the sitting and standing positions and that was included in ISO 6954 (1984). The sensitivity curve (ISO 2631) with its kinks at 2Hz and 8Hz, was included in the old ISO 6954 with only one kink, at 5Hz. The mathematically closed expression is the 'whole-body combined' curve (ISO 2631) used in all cases where a specific body position cannot be assumed.

It is precisely this curve that the new ISO 6954 is based on; in other words, there has been no change at all in the estimation of human sensitivity. However, towards the end of the 20th century with the victory march of microelectronics and computers, there was a general feeling that one could do away with those practical simplifications, or rather that they were actually a problem because of the kinks.

The new ISO 6954 not only refers to ISO 2631 but, in Annex A, also includes the weighting curve in tabular (showing both dB and linear) and graph form. Moreover, the sensitivity curve that forms the basis is displayed in Annex B. The mathematical formula is treated in detail in ISO 2631 and ISO 8041 [5].

Fig 1 shows the sensitivity curve as well as the weighting curve of the new and old ISO in such a way that a comparison is possible of the various terms and their implementation.

In the author's view, the differences are basically not worth worrying about. For vibration onboard ship the weighting curve Wv ('whole-body

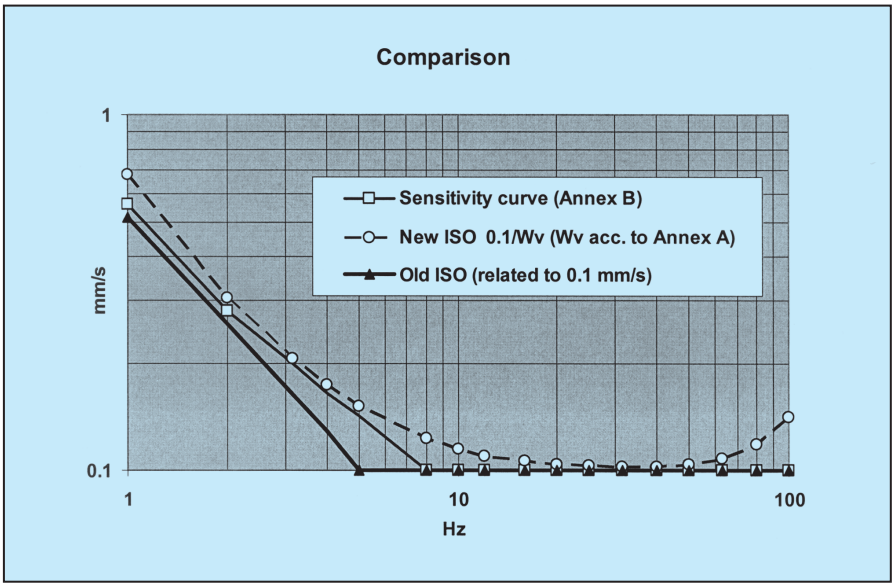


Fig 1. The sensitivity curves, as well as the weighting curve of the new and old ISO Guidelines.

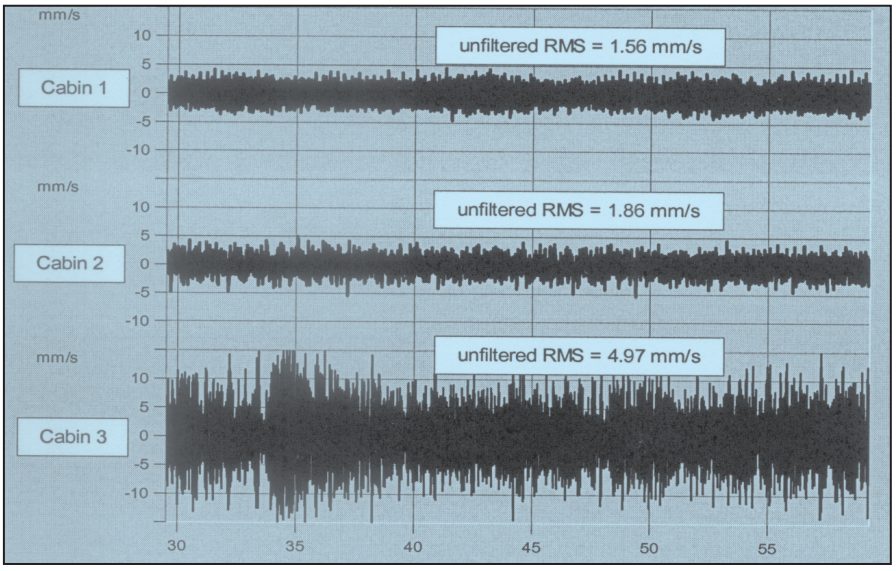
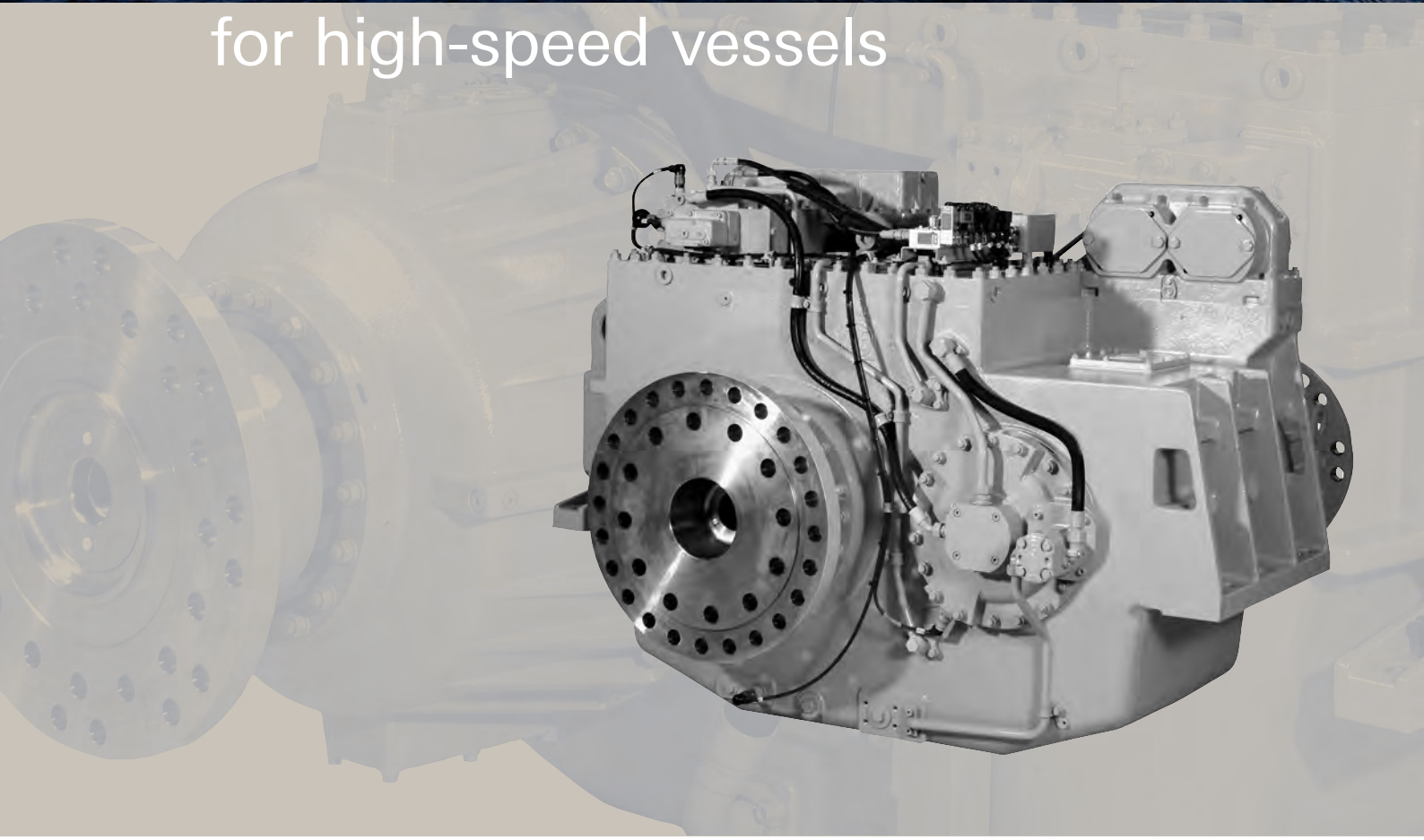


Fig 3. Time records (zoomed to 30 sec).

Photo courtesy of Incat

Propulsion systems for high-speed vessels



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combined') is now the equivalent of what the A rating is for acoustics – not entirely undisputed, but without an alternative and certainly the norm.

Thus far, in the author's view, there would be a consensus among those who apply the new ISO if prejudices, misunderstandings, or foggy representations had not obscured the above facts.

There has been no change in the measuring object either. It is still the floor (deck) of the room not the seat of a chair nor the mattress of the bed. It is totally unfounded to claim that the new ISO means a fundamentally different approach or a radical change in philosophy.

Reservations against ISO 6954?

The critical step implemented in the transition to the new ISO 6954 lies in the concept of considering the vibration energy of the entire frequency range (1Hz-80Hz), and not just the maximum amplitude. As explained above, there are good reasons for this – and not just to bring vibration into line with procedures in other technical fields, eg acoustics. There is no doubting the fact that the procedure, up to the point where the overall frequency-weighted RMS value is obtained, is now more complicated. Mention has to be made that perhaps the same people highly appreciate the hand-held sound-level meter with its seemingly simple dB(A) reading. However, one has to say that there is a lot of 'intelligence' inside such a meter, too. Maybe that is the crux of the matter.

Basically the new procedure offers clear advantages in that only the unit value but no longer the frequency and the excitation source and order need to be noted, and no amplitudes of similar magnitude spoil the schema.

One criticism comes from computation engineers. Vibration predictions are established with the help of extensive FEM analyses of the entire ship's structure. In the case of cruise liners they comprise the propeller excitation and in the case of freighters with 2-stroke engines, generally their excitation as well. If we assume that only one particular excitation order is of relevance, the resulting amplitude can be directly compared to the prescribed value of a building specification, based on the old ISO 6954. Although this amplitude will remain the dominant one under the new ISO 6954, there may be uncertainty as to the contribution of other values from the 1Hz-80Hz range – is the margin to the building specification sufficient?

By nature, there is no difference between the old and the new procedure if there is only one dominant excitation, since the weighting curve is virtually unchanged. However, if there are a number of vibration responses, the new procedure leads to noticeably higher results – and with broadband excitation, significantly higher ones. This tendency is precisely what was wanted, and results from the fundamentals of the energy approach.

Seaway-induced ship motions (seasickness) are claimed to interfere with the evaluation at the lower bound (1Hz). However, accelerometers appropriate to the low frequency range (1Hz-80Hz) distinguish very well between rolling and pitching of the vessel (approximately 0.1Hz or 10 sec), basic natural hull frequencies (0.4Hz - 3Hz) and excitation orders of the power train. Calm sea is still a requirement for acceptance tests. Moreover, the filter value at 1Hz is -16.68dB (=0.147), ie such an amplitude, is still of little significance when applying the new ISO.

Another criticism is that the new ISO is no good for trouble-shooting in that an individual value cannot indicate the source or order of the excitation. While this is correct, an efficient measuring engineer will store readings for the entire spectrum from 1Hz-100Hz or 1Hz-80Hz – just like he always did. Here there is really no difference to what went on before. If he used to focus on the maximum amplitude, revealing the source and excitation order via the frequency, he now looks at the new ISO value as well (see Fig 2). This unit value is computed from the spectrum, the spectrum keeps its old form; it is only subject to mathematical laws (FFT), but not some vibration standard or norm.

The spectra in Fig 2 are shown as RMS, and not as peak values, in order to illustrate the impact of the new procedure better.

Fig 2a is an example of a spectrum with just one dominant amplitude (1.14mm/s); the unit value computed according to the new ISO is hardly higher (1.34mm/s).

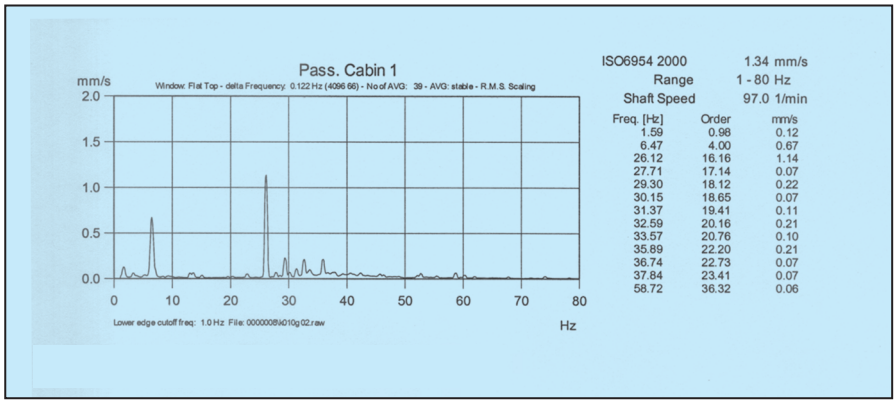

Fig 2a. Spectrum with one dominant peak.

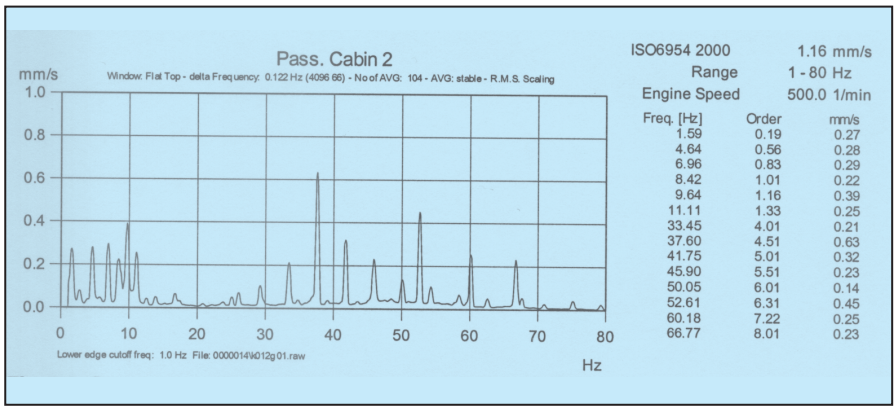

Fig 2b. Spectrum with several peaks of similar magnitude.

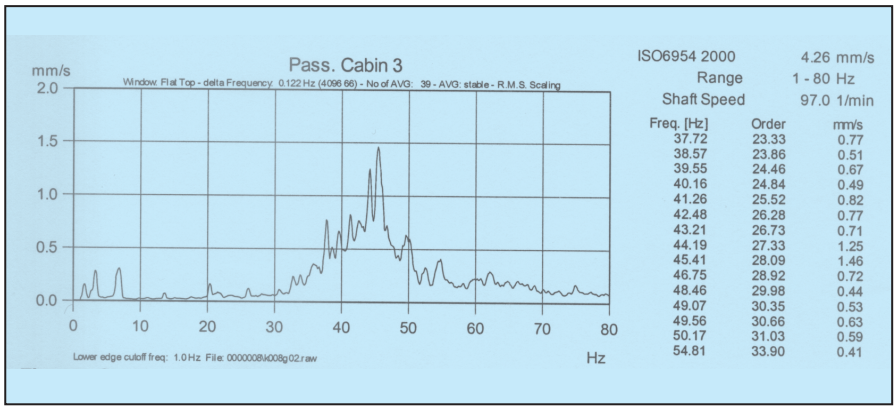

Fig. 2c Spectrum with broadband response.

Fig 2b, in contrast, shows several amplitudes of similar magnitude in the 0.2mm/s-0.6mm/s range with an unit value of 1.16mm/s that already deviates significantly from the maximum amplitude (0.63mm/s).

In the case of a broadband excitation, as in Fig 2c, the unit value of 4.26mm/s may already reach a critical value despite the virtually low vibration level (max value 1.46mm/s).

The reason why Cabin 3 does so badly in terms of its ISO value – almost three times higher than the maximum value of the spectrum – is clearly shown by the relevant time records (here highly zoomed to 30 sec).

The time records of Cabin 1 and 2 deliver roughly the same level. Cabin 2 has a more favourable ISO value because of the higher percentage of amplitudes below 10Hz in the range where the filter effect is clear. But the high level of Cabin 3 is very obvious.

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If we look at the time records, the unfiltered (non-weighted) RMS values and the ISO value, the ratio of Cabin 3 to Cabin 1 turns out to be about 3. The maximum amplitudes in the spectrum (Fig 2a and 2c) actually differ very little (1.14mm/s to 1.46mm/s).

The question is why the time record for Cabin 3 does not result in an amplitude of, for example, 4mm/s in the spectrum. This is firstly because the dominant vibration response varies a lot in frequency – from approx 35Hz-55Hz. It is not a case of numerous structural responses with differing frequencies that are permanently present, but it is one that varies in its frequency; an FFT with sensibly selected parameters is incorruptible. Furthermore, the amplitudes in this spectrum represent average values for the entire recording time (linear averaging). Put somewhat simply, this means that an amplitude of 12mm/s only occurring during 10% of the recording time leads to a harmless amplitude of 1.2mm/s in the spectrum. Put differently, a structural response concentrated on, for example, 45Hz would have given Cabin 3 an amplitude of approx 4mm/s.

The last example to be mentioned details the possible effects of a small change (eg 1rev/min-2rev/min) in engine speed. If the lower and higher engine speeds each account for 50% of the recording time, a high frequency resolution results in two amplitudes of, say, 2mm/s at both 15.2Hz and 15.3Hz because of the time averaging effect. A lower resolution, however, results in just one amplitude of 4mm/s at 15.25Hz. In this case the maximum amplitude even differs by 100%.

Particularly in view of the fact that the evaluation of extensive measurement data frequently allows no time for a consideration of the time signals, it is important to have a reliable, stable standard for evaluation. As shown, this requirement is not met by the maximum component of the spectrum, but is accomplished by the RMS value for the entire frequency range (1Hz-80Hz).

The energy approach could be advantageous in comparison to taking the maximum value into account. Moreover, one has to realise that amplitudes of varying frequency superpose in the time signal. This 'signal' acts on the feet and it is thus not explicable why the vibration felt should correlate with just one of its components. This aspect has been forgotten, overshadowed by the equally telling and practical spectral analysis (FFT). Unfortunately, however, a spectrum does not show the superposition of individual components.

In the hope of building up confidence in the new ISO norm, the author would like to point out that the German Employer's Liability Insurance Association (SBG) [6] has always built up the RMS value from the most relevant amplitudes on the basis of this sensitivity curve, and thus has largely taken the energy content of the entire spectrum into account. These rules were binding for ships sailing German flag and proved of value for owners, yards and crews. In 2003 the SBG adopted the new ISO procedure without changing their vibration limits as they already corresponded sufficiently well.

To complete the picture, one has to point out that the limits laid down in the new ISO 6954 for the categories A, B and C are just recommendations and that values at the lower limit should be selected to ensure a satisfactory vibration level.

Summarising, the author sees no tangible reason for distrusting the new ISO 6954. The procedure is clearly defined and, in contrast to the old ISO 6954, there is no room for interpretation. The new ISO 6954 is particularly suitable for extensive acceptance tests and as far as trouble-shooting purposes require a vibration standard at all, it also supplies important information beyond the spectrum. The fact that it demands a certain amount of time and effort in programming should not really be a hurdle in our day and age.

The question of whether or not the new standard is handy to use will become quite unimportant with time. The more interesting aspect is to be whether the principle is right, ie whether the energy approach together with the filter curve matches, on average, the human perception of vibration.

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[1] ISO 6954: Mechanical Vibration – Guideline for the Measurement, Reporting and Evaluation of Vibration with regard to Habitability on Passenger and Merchant Ships; 2nd edition 2000-12-15

[2] ISO 6954: Mechanical Vibration and Shock: Guidelines for the Overall Evaluation of Vibration in Merchant Ships; 1st edition 1984-12-15

[3] Technical & Research Bulletin 2-29: Guide for the Analysis and Evaluation of Shipboard Hull Vibration Data; Hull Structure Committee of the Society of Naval Architects and Marine Engineers, 1993

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AIDA applause for a real diva

THE first of AIDA's new 'club' class luxury cruiseships is delivered.

AS this issue was going to press, April 16th was the date set for the delivery of *AIDAdiva*, the first of class in a series of luxury cruiseships targeting the market for German cruisers.

The 'club' ship is the first of an initial four newbuilds due delivery up to 2010 for the specialised Carnival brand from Meyer Werft, Papenburg, whose yard laid the keel for the second ship – *AIDAbella* – on March 10th. On the same day, the 69,000gt *AIDAdiva* left Papenburg for its trial harbour, Emden.

These 252m-long, Germanischer Lloyd-classed ships will feature a breadth of 32.2m, offering capacity for 2050 passengers in 1025 cabins, plus space for around 1100 crew. They will continue to feature the well-known AIDA club ship decal, but their interior designs represent a distinctive departure. The ships feature the novel 'Theatrium', a three deck structure positioned in the mid-section. Uniquely, and as part of the 'club' concept, the theatrium is part of an open plan section of the ship, connected to contiguous restaurant and bar areas, and the ship's atrium, in a space designed to accommodate 1000 passengers at a time. One idea is that restaurant and bar-goers will not be denied the opportunity to enjoy the theatre experience while they eat and drink.

But the ship's interior is not the only innovation connected with this series of ships. For example, the owner has taken a forward-looking 'ship's lifetime' approach to the construction project, going so far as to undertake the extra work in drawing up a list of the harmful substances onboard the ships in anticipation of new regulations on ship recycling in the years to come. AIDA reckons it has been more economical to draw up this list with the yard early in the build process, also incorporating the list in the emergency plans.

***AIDAdiva*, ready for launch, March 2007.**

From the ship's equipment point of view, perhaps the most notable component onboard *AIDAdiva* is her main diesel electric propulsion, with main engines having provided a breakthrough order for Caterpillar Motoren Rostock in the cruise market.

Four large MaK9 M 43 diesel engines will generate 36,000kW (50,000hp). For Caterpillar Marine Power Systems this is another major step in its long-term cruise sector strategy.

Twin engines each drive two propellers via two 12.5MW main propulsion electric power generation and distribution systems from Siemens, operating at 514rev/min, as well as two 2300kW bow thrusters and two 1500kW stern thrusters. In addition, the plant produces the electrical power for all other high-consumption units onboard, including air conditioning, hotel/restaurant operation and the advanced health spa. Even then, there are still enough reserves of power to propel the vessel at a top speed of over 21knots.

A key feature of the two Siemens propulsion motors will be an extremely low level of noise and vibration.

The MaK M 43 C engine, meanwhile, is an upgraded and customised version of the M 43 generation of engines launched by Caterpillar in 1998.

The evolution of the long-stroke medium-speed marine engine generation followed extensive discussions with cruise operators, in 2004, when a new M 43 C version developing 1000kW per cylinder was made available. Further to this increase in cylinder output, safety levels have been enhanced according to latest Solas regulations: the M 43 C now features an explosion protection cover for the engine block, cladding over the complete fuel system and exhaust gas pipes, and turbine casings in stainless steel.

AIDA opted for a customised version of the M 43 C, additionally featuring a slow turning device to enable safe remote engine starting, a big-end bearing temperature monitoring system designed to prevent bearing seizures, advanced

TECHNICAL PARTICULARS
AIDAdiva

Customer:	Carnival plc
Yard of build:	Meyer Werft
Length overall:	252m
LBP:	226m
Breadth	32.2m
Draft:	7.3m
Depth:	9.6m
Freeboard:	2300mm
Tonnage:	69,000gt, 7500dwt
Decks:	13
Capacity:	2050 passengers can be accommodated in 1025 cabins
Engines:	Four large 9M 43C diesel engines made by MaK will generate a total power of 50,000hp(36,000kW)
Speed:	22.5knots
Propeller:	2 Rolls Royce CPP (5.2m diameter)
Main generator and electric systems:	Siemens
Bridge system:	SAM Electronics
Wastewater management systems:	Deerberg
Port of Registry:	Genoa
Class:	GL
Ordered:	Before Oct 1, 2004
Launched:	March 4, 2007
Delivery:	April 16, 2007

THE first of 72 blocks of the new 122,000gt passenger cruise vessel *Celebrity Solstice* for Celebrity Cruises was laid in the covered building dock II at Meyer Werft in Papenburg (Germany) last month.

Weighing in at more than 430tonnes, this first block is 16m long, 36.8m wide and approx 8m high. On its completion, the vessel will have a length overall of 315m and a breadth of 36.8m. The speed will be more than 24knots and she will be able to accommodate more than 2850 passengers in 1425 cabins. The new ship will have another two sister ships, *Celebrity Equinox* and *Celebrity Eclipse*.

The shipbuilder said *Celebrity Solstice* would feature plenty of technical innovations especially in the field of new energy saving solutions, and will be built in compliance with the latest stability rules which will take effect in 2009.

The newbuilding is scheduled for delivery to the owner Celebrity Cruises in October 2008.

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resilient mounting of the engine to minimise engine vibrations and their transmission to the vessel hull, and the 'DICARE' monitoring programme, which allows engine operating data to be called up at any time, even from locations ashore.

Each MaK 9 M 43 C will be equipped with Flexible Camshaft Technology (FCT), developed to reduce soot emissions below the visible limit at all loads and to minimise other exhaust emissions far beyond the IMO regulatory requirements.

'The AIDA engine plant features many technical improvements', said Jürgen Storz, head of mechanical engineering group at Meyer Werft, 'especially in the areas of emissions reduction, minimisation of vibrations and engine automation.'

The very strict limitations for smoke and NOx over the whole load range called for an advanced engine design – 'and the MaK FCT system selected performed very well', said Heinz-Hermann Jungeblut of Meyer Werft's mechanical engineering group. Likewise, strict requirements for vibrations led to careful examination of both engine vibrations and their influence on attached equipment and vibrations transmitted to the engine foundation, which strongly influence passenger comfort.

'Either way, the new elastic dampers proved their efficiency: all measured vibration values were well below the prescribed limits', Mr Jungeblut said.

'Special emphasis was put on the new automation system for the engine plant, requested by the yard and developed in close co-operation between Caterpillar and Meyer Werft,' Mr Storz stressed. The system incorporates a safety management system and an alarm/monitoring system, which utilises a buss link to the vessel's overriding automation system.

Other features onboard the new range of 'club' vessels include NACOS-65-5 integrated navigation command systems from SAM Electronics. These basically comprise two Multipilots (combining radar, Ecdis, conning and track control operations), a Conningpilot (central nautical display functions), and a Chartpilot Ecdis (for planning, navigation monitoring).

The systems are designed to DNV Naut AW and LR IBS classifications.

Sub-assemblies that are also being supplied include SAM 4630 navigation echosounders, 4683 doppler docking systems, Debeg 3400 UAIS units and Debeg 4300 VDRs.

Also notable is the main wastewater management systems, from Hamworthy. The supplier delivered its advanced membrane bioreactor (MBRs), as well as fresh water generation equipment via its subsidiary Hamworthy Serck Como.

The advanced waste water system supplied for *AIDAdiva*, comprises of two Hamworthy MBR 600 plants that will treat the combined black and grey wastewater produced by 3134 people. The wastewater is aerobically treated within each two-stage bio-reactor tank, which degrades the organic content of the blended raw water to acceptable levels. The final membrane filtration stage will remove suspended solids and coliforms in order to comply with the stringent discharge requirements of Alaskan waters. The fresh water system supplied comprises of two 500 tonnes per day, six-stage flash evaporators.

AIDAdiva will also be the first newbuild in the cruise sector to use the Ship Administration Management System (SaMS) from Logistik Systeme, a subsidiary of Germanischer Lloyd. SaMS permits comprehensive management of the ship for the areas of technology, ship operation, and crew. Over 200 ships worldwide are already being administrated by SaMS. Its functionality covers the primary areas of technical management, crew management, and ship management, with a total of 17 application programs (modules), including a port clearance unit to reduce the time needed to prepare all the necessary port documents, while increasing their quality and accuracy. The system is reckoned to increase the availability of ships, reduce downtime and repairs, and also optimise the procurement and stocking of spare parts – thus reducing the administrative effort and trimming the costs.

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NCL freestyles with new power combination

A NEW generation of ships for Norwegian Cruise Line includes a first-time propulsion combination.

NORWEGIAN Cruise Line will introduce a new generation of 'Freestyle Cruising' vessels, underlining its goal to have the youngest fleet in the cruise industry by 2010.

Aker Yards in Saint Nazaire, France has a firm order from NCL to build two cruise vessels under the project name 'F3' for delivery in 2009 and 2010, while NCL also has an option for a third vessel due for delivery in 2011.

The so-called third generation vessels will have state-of-the-art amenities for passengers, including multiple restaurant and entertainment options, to support NCL's freestyle cruising concept.

These ships will have capacity for some 6400 people. They will have 2100 passenger cabins with 4200 lower passenger berths and 2,200 crew. The 150,000gt post-Panamax vessels will be approximately 325m long and 40m wide. They will be designed for world-wide cruising, including the Caribbean and Europe.

The project sees another reference for the Caterpiller Marine Power Systems engines in the cruise sector. In this case, CMPS will supply 3x MaK 12 M 43 C and 3x MaK 16 M 43 C marine engines per vessel, which will form a power plant providing a total of 79.8MW for ship propulsion and onboard electricity supply.

Environmental protection is among NCL's highest priorities for the new ships and, once again, CMPS will deliver a customer-specific engine rating to address all areas of concern: NOx emissions, CO_2 emissions and smokeless operation.

The engines will not only meet DNV Clean Design requirements reducing NOx emissions to 10.4g/kWh, but lower cylinder rating also decreases the specific fuel oil consumption and thus also CO_2 emissions.

Finally, elements of Caterpillar's ACERT Technology and the unique Flexible Camshaft Technology (FCT) have been designed to ensure that smoke at all operating conditions is well below visibility. Utilising this package of innovations, the MaK engines for NCL will meet both the extended expectations of customers and the strict legislative rules which must be adhered to, for example the Alaska Marine Vessel Visible Emission Standards.

In this case, however, NCL ships will also be distinguished through the installation of the electric propulsion system from Converteam, which represents the first time cruiseships will be fully equipped with the supplier's new electric propulsion solution, based on high-torque density induction motors and MV7000 converters, associated with advanced digital propulsion control.

Also a first reference for Converteam from NCL, the supply contract will include 12 generators (six per ship) with a total power of 160MW, to be supplied by Converteam Ltd (UK), and 12 electric motors for thrusters (six per ship) with a total power of 30MW, to be manufactured at Converteam Motors' Nancy plant (France).

More power to come: MaK 12 M 43 C, preferred by NCL, in spray booth.

Each ship will be powered by two shaftlines, directly driven by two 24MW slow-speed induction motors. Supplied through four MV7000 converters using press-pack IGBT (Insulated Gate Bipolar Transistor) technology, these motors will help make the propulsion chain more reliable, more efficient, and more compact. Passenger comfort will be improved thanks to a low level of noise and vibrations, according to Converteam, and maintenance time will be significantly reduced by the use of induction motors and of converters with plug and play technology.

With the average size of cruise vessels growing continuously, driving the demand for propulsion and onboard power supply to new heights, CMPS said the 'enormous' power density of the, MaK 16 M 43 C V-type engines were a perfect match for the upcoming generation of cruise vessels.

NCL's new series of cruise vessels will be designed for optimal cost efficiency per capacity day, as well as being highly attractive in terms of cabin revenue mix and onboard revenue generation for the engineering teams involved at Caterpillar Motoren facilities in Germany.

CMPS said it had now established good business relationships with Carnival and NCL, two of the leading players in the cruise sector and with all three major yard groups involved in cruise vessel construction.

In addition to the NCL contract, and that covering four AIDA ships (see pp17-18), CMPS is to deliver three ship sets of 4x MaK M 43 C V-type and 2x MaK M 43 C in-line engines totalling 64MW each to Italian yard Fincantieri Cantieri Navali Italiani. These ship sets will supply propulsion and electricity for three newbuilds for Carnival subsidiaries Holland America Line (HAL, one vessel) and Costa Crociere (two vessels), and there is an option for another ship set.

CMPS said the NCL contract marked its final breakthrough in the cruise business. The current order book for engine deliveries for new vessel designs 'showed that CMPS already leads the way in the total number of engines and total MW supplied – and there is more to come.'

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Where is the book of boutique cruiseships?

LIKE any good interior designer, RPW's Jan Wilson has strong likes and dislikes, and she is not afraid to share them.

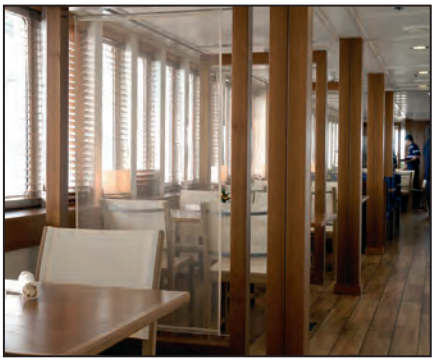
'Coming from a background of land-based hospitality development, my first venture into the world of cruiseship design was a fascinating experience,' she says. 'Designing for cruiseships offers its own particular set of challenges and also liberations that anyone involved in the industry will know far better than I do.'

Notable, she says, is 'that wonderful sense of freedom whilst working with a shipyard where the profiles and size of ships seem to be able to be changed literally in days at the touch of a welding torch'.

However, she tells *The Naval Architect*, that the sense of freedom is by no means all-pervading.

'What I found most incomprehensible was the use of the "reference vessel" as a means of setting the standard for the future development of a new ship. Can there be a more retrogressive way to design and produce a new ship?

'As I approach thirty years in hospitality design there has been one consistent factor through a number of recessions and the sundry terrorism attacks which so greatly affect our market. A steady rising expectation from our guests and clients in the quality fabric of the interiors we produce. Yet in the area of cruiseship design that I have been involved with, the starting premise is that we will design to the standard, and often a budget, of a ship already afloat. This I think is one of the root causes of cruiseship design being stuck in a time warp. In terms of service, quality of food and beverage, and holiday experience, the cruise industry has forged ahead - yet so many ship interiors seem stuck in a 1970's Las Vegas time warp - great if you want to be in Las Vegas, but the internet and increasing growth of the independent and design astute traveller have created the rise of the boutique hotel, the city break, five short holidays a year instead of an annual two week vacation.



Interior, *Spirit of Adventure* - all of the owners and operators of the ships that RPW has designed have risen to the challenge of having 'a feisty and opinionated' designer as part of their team, says Jan Wilson. Photography by Patrick Skinner/ Emma Aylett.

'In an age of ever more population density and space, both area and volume are the last great luxury. That is another challenge to this industry - another reason to design a cruiseship with greater design quality, ingenuity, and variety.

'And yet I can't see how the cruise industry, with a few exceptions, is responding to this challenge. If you don't believe me than tell me where is the Herbert Ypma book of boutique cruiseships; the Hotel du Vin/ Malmaison/"W" hotel to name but a few equivalents?'

To their great credit, she said, all of the owners and operators of the ships that RPW has designed have risen to the challenge of having 'a feisty and opinionated' designer as part of their team.

'We question all their assumptions, fight to extend what appears to be an appallingly limited range of materials and finishes available for use in cruiseship design, and argue for a variety of offer and design quality in cruiseship interiors that we have all grown to expect on land.'

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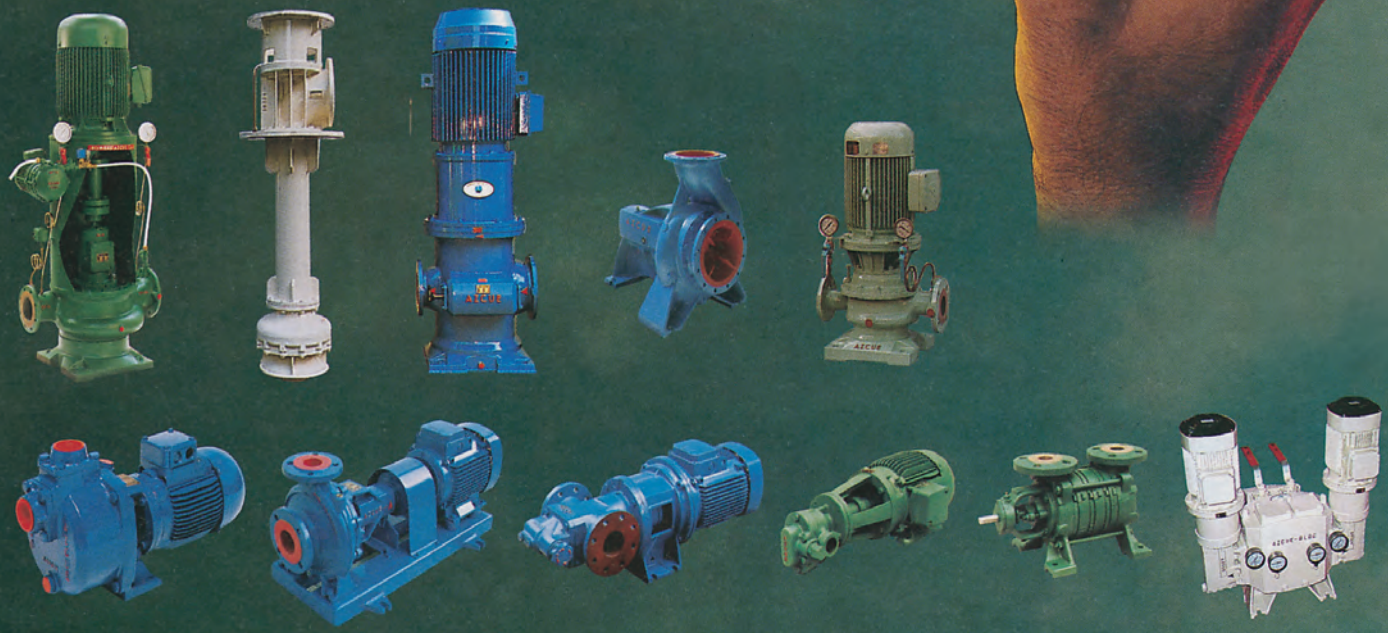

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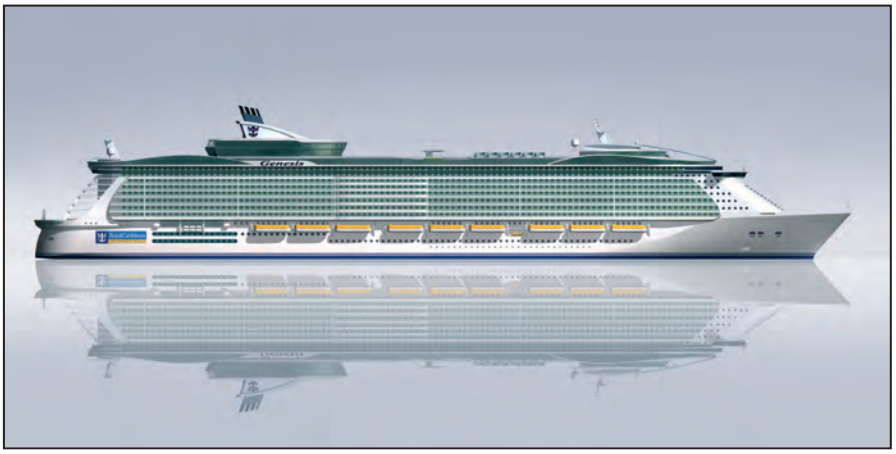
Second coming for Genesis

ROYAL Caribbean Cruises Ltd has ordered a second ship in the Genesis class from Aker Yards, in a deal worth €900m.

The second 220,000gt 'Project Genesis' vessel will be delivered from Aker Yards, Finland in August 2010. The order means 5800 man years of work for the yard.

As was the case with the first ship ordered in the series, the builder is under strict instructions to remain silent over the fine details of the project.

Yrjö Julin, Aker Yards cruise and ferries president, would only say: 'Genesis is a big challenge for us, when it comes to size and complexity in the numerous technical innovations. But we are well prepared and enthusiastic when taking on this challenge. Breathtaking might be an understatement of this giant, being 36m longer than the height of Eiffel tower and weighing 12 times more than the tower.'



Genesis – a second in the series, but still only one artist's impression.

Over the last 38 years, RCCL has contracted 24 newbuildings from Aker's yards and there are a further four cruise vessels in the orderbook for 2007-2010 deliveries. One of them, *Liberty of the Seas* is leaving the yard in the coming weeks.

It is the second in the series of what are (for the time being) the world's largest Freedom-class cruise vessels. Genesis will be 43% larger, with a length of 360m, width of 47m and accommodating 8400 passengers and crew.

Aker Yards said its current orderbook extended to 22 cruiseships and ferries, with 11 of them being cruise vessels.

All 15 of the world's largest cruiseships have been built or are in the orderbook of Aker Yards.

Emerald Princess joins the class

PICTURED is the 19 deck *Emerald Princess,* the latest cruiseship to be delivered by Fincantieri to Carnival Group for the Princess Cruises brand.

Built at Fincantieri's Monfalcone yard and delivered in the last week of March, *Emerald Princess* is a sistership of *Caribbean Princess* and *Crown Princess*, delivered in March 2004 and May 2006 respectively, and represents the evolution of the 109,000gt Grand Class series (*Grand Princess, Golden Princess* and *Star Princess*, delivered in 1998, 2001 and 2002 respectively).

Where the Grand Class delivered ships of 251m long and 36m across, *Emerald Princess,* at 113,000gt, is 288m long, but is also 36m wide. At 67m high, the ship is powered by six 12ZAV4OS Sulzer engines from Wärtsilä, generating 14,478kW and driving twin propellers to achieve a maximum speed of over 23knots. It has 1539 cabins for a maximum passenger capacity of 3500 guests, in addition to a crew of over 1,200.

***Emerald Princess* on her delivery, March 24th.**

Nearly 900 of these cabins are marketed as balcony staterooms. Registered in Bermuda and classed by Lloyd's register, *Emerald Princess* is the 40th cruiseship to be built by Fincantieri since the end of 1980s and the 22nd from the Monfalcone shipyard (the 12th for Princess Cruises).

The ship will likely have a long life in whichever ocean it sails, given the fact that it is too large for the Panama Canal.

With 18 cruiseships - including three options - under construction or scheduled for construction by 2012, Fincantieri said it was the 'undisputed world leader in the cruise sector', with a market share of approximately 45%.

Delivery of *Emerald Princess* came just one month after Fincantieri's Marghera yard delivered *Carnival Freedom*.

2006 was again positive for Fincantieri in the cruise sector. Its work was rewarded with the closing of a maxi-contract, announced in 2005, with Carnival Group. The contract includes a total of five ships: four for a value of €1.7bn, confirmed at the beginning of the year, plus an option exercised in December 2006.

In addition to this order there is also a contract for the construction of 2 panamax ships for Costa Crociere, worth over €0.8bn.

Considering events in early 2007, the ships on order for Carnival Group now amount to 13 - including an option for Holland America Line – with deliveries due up to 2011 and for a total value of over US$7bn.

During the year the company also turned its attention to the market sector of medium/small vessels which is characterised by a rapidly ageing fleets and where there is a clear growth trend.

MSC signs for *Magnifica*

MSC Cruises has signed with Aker Yards to build a fourth MSC Musica Class cruiseship.

MSC Magnifica will be built at Aker Yards, Saint-Nazaire and delivered in 2010, in a contract worth €410m, subject to financing.

Like her three predecessors (*MSC Musica*, *MSC Orchestra* and *MSC Poesia*), this 89,600gt cruiseship will be 294m long and just over 32m wide, and complies with the Panama Canal Standard.

MSC Magnifica will carry up to 4000 people onboard (including crew) and have 1275 passenger cabins, 80% of which will be outside.

Aker Yards is presently completing the construction of *MSC Orchestra*, which will be delivered in May. The order book also includes the third sistership, *MSC Poesia* (delivery: 2008) and two 1650 cabins cruise ships - *MSC Fantasia* (delivery: 2008) and *MSC Serenate* (delivery: 2009).

By 2009, MSC Cruises' fleet will include 10 modern cruiseships, all built by Aker Yards.

Aker Yards' business area, Cruise & Ferries, now has 21 vessels in its orderbook, 10 of which are cruise vessels. Its most recent delivery took place in April, when *Liberty of the Seas* was presented to owner Royal Caribbean, representing the second in the series of three of the world's largest cruise vessels built by Aker Yards.

***MSC Musica* is to have another sistership.**

YRJÖ twin, president of Aker Yards cruise and ferries said The latest deal strengthened Aker Yards relations with MSC.

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Cruiseships are his business

FINCANTIERI commands the lion's share of the world's current cruiseship building programme. *The Naval Architect* met Maurizio Cergol, the yard group's senior chief designer with responsibility for cruise vessels.

FOR a man who terms himself 'a humble naval architect', there is nothing humble about the scale of workload taken on by Maurizio Cergol. The senior chief designer responsible for cruise vessels basic design activities and cost estimations at Fincantieri, the major Italian shipbuilder. Mr Cergol has been responsible for developing, designing and contracting no fewer than 31 luxury cruiseships, 24 of them already delivered and in operation.

After gaining experience in civil architecture and interior decoration, Mr Cergol received an Honours Degree in Naval Architecture and Marine Engineering from the University of Trieste in 1981, going on to win the Costanzi Prize in 1982.

He joined Fincantieri in the same year, starting his career in the basic design department of the company's headquarters in Trieste, where he worked with designing teams on several ship types including containerships, ro-ro and passenger ferries, tankers and the like.

By 1986, he had been promoted to chief designer and started working on cruise vessels, participating in the design of Costa ships *Classica* and *Romantica*. Since then, as well as being responsible senior naval architect for developing, designing and contracting Fincantieri's live cruiseship projects, he has worked on what he terms 'countless' projects, studies and innovative concepts for cruiseship design. Today, he is described by one peer as 'possessing an aesthetic sense unusual in this field'.

Much of his subsequent work has seen Mr Cergol engineering the evolution of cruiseship designs in line with customer requirements. As far as ships in production are concerned, he points out that the pair of Fortune class ships in production for Costa (105,000gt) and the latest Conquest class ship in production for Carnival Cruise Line (110,000gt) trace their roots back to the Destiny Class ships developed for Carnival by Fincantieri in 1992-993 (101,000gt). *Carnival Destiny* was the first cruiseship to be built of over-Panamax dimensions.

Over the years, the original design has been stretched to meet its owner's developing needs, with partial or full decks added, funnels reconfigured, power increased and public areas reworked.

Indeed, while technically sisterships, the intervening period has also seen significant development in design terms. At 290.13m, the Conquest class, first embodied by *Carnival Conquest* in late 2002, for example, has not only been lengthened when compared to the Destiny class (272.35m); an extra deck has been added to yield a passenger capacity of around 3800, against 3336 for the Destiny. Necessarily, this development required extra power and more cabling and, in fact, these ships are so different

Maurizio Cergol (right) with friend Joe Farcus and his wife, Jeanne onboard *Carnival Freedom*, delivered in March.

Hull No.		Delivery	GT	Cabins
H.5941 -	CARNIVAL DESTINY	1996 MO	100 000	1321
H.5979 -	CARNIVAL TRIUMPH	1999 MO	101 000	1379
H.6045 -	CARNIVAL VICTORY	2000 MO	101 000	1379
H.6057 -	CARNIVAL CONQUEST	2002 MO	110 000	1487
H.6058 -	CARNIVAL GLORY	2003 MO	110 000	1487
H.6086 -	COSTA FORTUNA	2003 SE	102 200	1359
H.6087 -	COSTA MAGICA	2004 SE	102 200	1359
H.6082 -	CARNIVAL VALOR	2004 MO	110 000	1487
H.6111 -	CARNIVAL LIBERTY	2005 MO	110 000	1487
H.6122 -	COSTA CONCORDIA	2006 SE	112 000	1500
H.6129 -	CARNIVAL FREEDOM	2007 MA	110 000	1487
H.6130 -	COSTA SERENA	2007 SE	112 000	1500
H.6135 -	CARNIVAL SPLENDOR	2008 SE	111 000	1502
H.6148 -	COSTA CONCORDIA 3	2009 SE	112 000	1500
H.6151 -	CARNIVAL DREAM	2009 MO	128 500	1804
H.6167 -	CARNIVAL MAGIC	2010 MO	128 500	1804

KEY: MO=Monfalcone SE=Sestri MA=Marghera

Evolution of a cruiseship, from *Carnival Destiny* to *Carnival Magic*.

Maurizio Cergol, Fincantieri senior chief designer responsible for cruise vessels, cruiseship CV

- 1989 55.000gt Statendam Class for Holland America Line (4 ships)
- 1993 101.000gt Destiny Class for Carnival Cruise Line, first over Panamax cruiseship, and its stretched version (3 ships)
- 1995 62.000gt Rotterdam Class for Holland America Line (4 ships)
- 1996 110.000gt Conquest Class for Carnival Cruise Line (5+1 ships in production)
- 1999 82.000gt Vista Class for Holland America Line (4+1 ships in production)
- 2000 105.000gt Fortune Class cruise vessels for Costa (3+2 ships in production)
- 2004 83.000gt Arcadia cruise vessel for P & O (1 ship)
- 2005 89.000gt Cruise Vessel for Cunard (1 ship in production)
- 2006 128.000gt Quest cruise vessel for Carnival Cruise Line (2 ships in production)

today to the original *Carnival Destiny* that Carnival prefers to consider them to be in a completely new class.

By contrast, the 89,000gt, 294m-long *Queen Victoria*, for Carnival's Cunard brand, is an elongated version of the more recently developed Holland America Line Vista Class ships (*Zuiderdam* and her sisters), which has been stretched to Panama length limits and deeply modified in terms of interiors in public spaces and lay-out, and passenger cabin distribution.

But, as observers of the cruiseship market are aware, the scale of newbuildings is continually on the rise. 'Destiny was the first of class,' says Mr Cergol, 'but now all of the major players have over-Panamax ships. What was considered big 10 years ago is now an average ship. With every generation, ships are increasing by 20%-30% in size. Now, ships are being built of up to 130,000gt and beyond to 150,000gt.'

With Royal Caribbean Cruise Lines' 220,000gt, 6400 passenger capacity Genesis project the preserve of rival Aker Yards, Fincantieri has a mega-cruiseship project of its own, in the shape of the Carnival Corp 'Pinnacle' project, which reportedly looks to build a ship of the same size and for which Fincantieri is known to have developed two design concepts. In this case, though, Carnival has reportedly momentarily cooled in its ardour to take the project forward.

However, with a design for the 'International Urban Cruiseship', a 370,000gt, 500m-long ship capable of carrying 8400 passengers emerging from Japan Contents Network, via a concept study delivered by Aker Yards, the next generation of mega-cruiseships may be closer than anticipated.

Mr Cergol is necessarily reluctant to lift the lid on the confidential Pinnacle project. However, he does allow a general conversation over the consequences of building larger cruise tonnage.

He is clear that the only reason for taking ships up in scale must be that passengers enjoy an interiors experience they cannot get elsewhere – theatres must be spectacular, restaurants offer maximum choice, lobbies must be on the grandest scale. Otherwise, there is no reason for scaling up.

To achieve that scale, one compromise in terms of configuration is for the windows of inside cabins to face public areas. Mr Cergol did not say so, but it is now recognised that, when aboard such a ship, the occupants of these cabins prefer to keep their curtains closed most of the time.

Another solution in the scaling up process is to envisage a very narrow, very high superstructure, in order to maximise the number of cabins facing towards the sea.

Another problem faced in developing larger cruiseships is posed by the open deck. As tonnage grew in three dimensions - length, width, and height – the increase was not reflected in a proportionate increase in the open deck area within hull dimensions. This is probably the hardest problem of all for mega-ships, Mr Cergol says, and may ultimately limit their size. One solution is to increase deck area by means of an overhanging structure.

Opening doors for new concepts are the changes in regulation covering ship safety, with International Maritime Organization administrations irrevocably moving towards risk-based, rather than prescriptive rules on construction. 'The new rules on safety are based on a probabilistic approach,' says Mr Cergol. 'They oblige us to reconsider the possibilities when it comes to machinery and plant, or the modification of accommodation on the vessel.'

The new probabilistic approach gives the opportunity for radical solutions, where designers are free to modify dimensions, he says. Naval architects contemplating stability onboard larger design concepts will be faced with decisions over centre of gravity, and may look to trade off the move to wider beams against the use of lighter materials in the superstructure.

Larger ships may also suggest long, watertight bulkheads, but this might interfere with a real life vessel.

In terms of atrium design, the prescriptive demand for a 16,000m^2, 48m-long fire zone may be 'very difficult to keep, considering the need for a larger vestibule, etc, and this means we may have to find a solution to supersede it'. Mr Cergol says that, in light of equivalence criteria now in place under Solas, these limits could be increased if safety systems could be designed to compensate.

Wider beams may, indeed be the way to go and, with talk of cruiseships featuring beams of 40m-45m, the distance between fire bulkheads should be reduced, implying rooms that are wider and shorter, and are difficult for a naval architect to develop. Other solutions need to be found.

While larger scale ships may capture the headlines, designs are also being demanded for smaller, ultra-luxury cruiseships, Mr Cergol says, citing the recent order by Seabourn Cruise Line for a pair of 198m-long ships from T.Mariotti.

'The problem today is that the owner always wants something different', he observes.

Niche operations to remain key for de Poli

DE Poli beats off the competition by focusing on chemical and gas carriers with high technical standards and main dimensions not interesting to Far East builders.

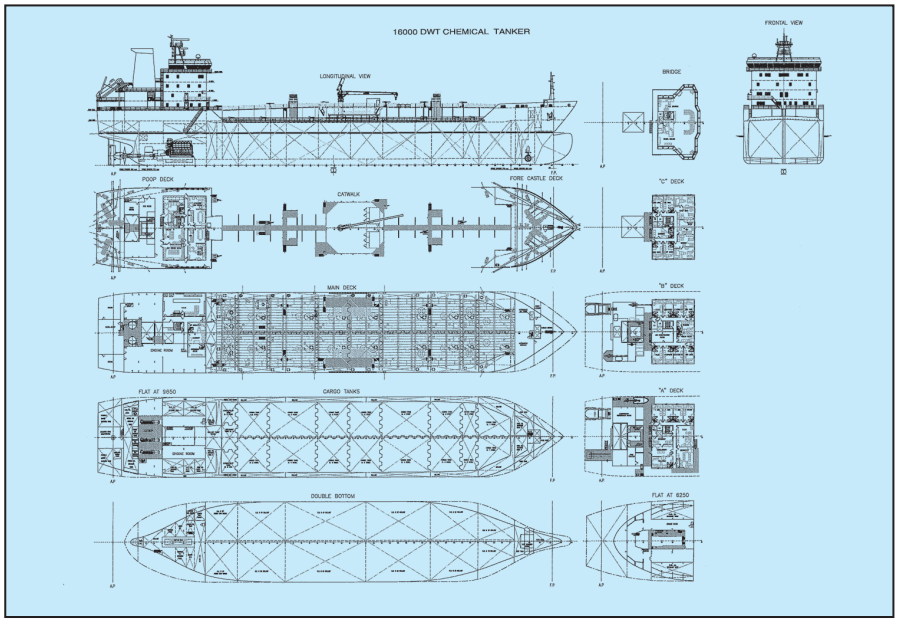
AN UNPRECEDENTED workload faces Cantiere Navale de Poli, but the Venice-based shipbuilder is alive to the fact that its niche remains under threat.

Last month, de Poli launched *Alessandro D*, a 16,780dwt chemical carrier that has been built for sister company De Poli Tankers - a ship size only available from the yard since 2001. It is also building a 7100dwt chemical carrier for El Bana Navigazione, to be launched in the autumn for delivery by the end of the year or early 2008.

CNDP's current workload outstrips anything in its history, and now consists in the repetition of a 5600m^3 gas carrier, the construction of three 9500dwt Ice Class 1A chemical tankers, El Bana's 7100dwt chemical tanker, plus the last of its sister company's four 16,780dwt chemical tankers. These deliveries take the yard's orderbook up to 2008.

De Poli said that, to compete with overseas yards, it was focusing on the building of chemical and gas carriers with high technical standards and main dimensions not interesting to Far East yards.

***Alessandro D*, a 16,780dwt chemical carrier that has been built for sister company De Poli Tankers.**



GA of *Alessandro D*, the oil-chemical tanker IMO II-III, delivered by Cantiere Navale de Poli.

TECHNICAL PARTICULARS
OIL-CHEMICAL TANKER IMO II – III,
ALESSANDRO D

Owner:	De Poli Tankers
Builder:	Cantiere Navale de Poli
	DWT 16000
SOLID STAINLESS STEEL TANKS	
- Stainless steel	
	DUPLEX 2205 for all cargo and slop tanks
Length overall	138.11m
Breadth	23.00m
Moulded depth	12.25m
Deadweight	16,000tonnes at mt. 9.10
Classification Society	RINA
Class	Additional Notations _C OIL TANKER – CHEMICAL TANKER – ESP UNRESTRICTED NAVIGATION
	100% cargo tank capacity abt 17,200m^3 (19 cargo tanks)
Maximum cargo specific gravity	1.9tonne/m^3
Service speed knots	15.0 at mt. 8.20 and 85% MCR
Main engine	6300kW @ 500rev/min
Diesel Generators	3 x 880kW
Shaft Alternator	1 x 1500kW
Boiler	2 x 2,500,000kcal/h Thermal
Pitch propeller	Yes
Bow Thruster	1 x 630kW
Cargo Pumps Hydraulic single stage submerged	12 x 300m^3/h @ 120mLC
	7 x 200m^3/h @ 120mLC
Cargo heating	total cargo up to 80°C coils part cargo up to 90°C
Midship crane	1 x 5.0tonnes
Aft Cargo Crane	2 x 2.5tonnes

Typical deliveries have been the 5600m^3 capacity 108m-long by 16.8m across the beam gas carriers - the already delivered *Coral Lophelia* (connected with Dutch company Veder) and *Coral Nettuno* (linked to beneficial owner Maritime Performance, also of The Netherlands) - and the still to be delivered 6175dwt chemical and oil carrier *Coral Leaf*.

'Instead of building a series of the same vessel, we try to meet the owners' requirement every time we receive a request for a newbuilding,' the yard said. 'Of course we always try to push ahead our projects, before examining the owner's request, which at the moment are chemical tankers of 7100dwt, 9500dwt, 16800dwt, and the 5600m^3 gas carrier. We are also interested in the possibility of building smaller vessels, such as tugboats, supply vessels, and other kinds of ships, like fast ferries, cruiseships, etc, but they have to be compatible with the dimensions of our facilities, ie maximum LOA about 140m, maximum beam about 24m.

'For the future, however, our market outlook could be very, very difficult, because of the strong competition from foreign yards. To be able to survive, this yard has to find a niche in the market which could grant adequate pay-offs and sustain the company structure. This is because the labour costs in Europe are substantially higher than in the rest of the world, and to stay in the game we need to emphasise the quality and the reliability of our vessels, instead of competing on price.'

Mariotti takes slice of ultra-luxury

T.MARIOTTI has finalised negotiations with Seabourn Cruise Line to build a pair of smaller cruiseships for the 'ultra-luxury' Carnival brand.

For delivery, one apiece in spring 2009 and 2010, the sisterships will have an all-in price of US$250m each.

The design specifications call for hulls 198.15m long, with a beam of 26m and a draft of 6.4m, reaching a service speed of 19knots.

To fulfill the contract, part of the hull construction will be performed by subcontractor CIMAR Costruzioni Navali, which is a new company established in Porto Nogaro, north-east Italy and formed by T.Mariotti and civil and industrial carpentry specialist Cimolai Group.

Artist's rendition of Seabourn's coming ultra-luxury cruiseships drawn by Yran&Storbraaten architects.

TECHNICAL PARTICULARS
ULTRA LUXURY CRUISESHIPS

Client	Seabourn
Builder	T.Mariotti
Gross tonnage	32.000gt
Length overall	198.15m
L.W.L.	179.80m
L.B.P.	169.20m
Breadth, moulded	26.00m
Draught	6.40m
Depth to upper deck	15.25m
Depth to main deck	9.00m
Service Speed	19knots
Suites:	225, 90% with private balcony
Delivery:	2009 and 2010

Final construction and fitting out will be performed at Mariotti's Genoa building site.

Marco Bisagno, chairman of Mariotti shipyard, described the cruiseships as having a very similar design to large yachts. 'They will have 225 cabins, 90% of them with a private veranda,' he said. 'Another key Seabourn brand feature, unusual on a vessel of this size, is the addition of a "marina" on the stern of the ship that lowers into the sea.'

This will involve an aft stern gate folding directly to the sea.

Mr Bisagno said that his engineers and experts were working not just on style but above all else on safety. Both ships will comply with the anticipated new International Maritime Organization safety standards for damage stability, even though construction will begin before the new rules come into force in 2009.

Carnival Corp chairman Micky Arison, said: 'This order represents our confidence in the luxury segment of the cruising market, which has shown significant and consistent revenue growth in recent years, with robust future potential. Through our own and independent research, we know that the luxury consumer views the Seabourn brand as the absolute ultimate in leisure travel. This new generation of yacht-like ships will secure its position at the top of the cruise industry pyramid for many years to come.'

RINa opens for business in Jakarta

RINa (Registro Italiano Navale) has opened new offices in Jakarta, signifying a stepping up of its commitment to Indonesian shipbuilding.

In April, Francesca Hadinata, managing director, PT. Mitra Bahtera of Jakarta, inaugurated the new premises in the presence, among others, of the Italian Consul in Jakarta and the head of the Indonesian Administration.

RINa chief executive Ugo Salerno said: 'For RINa, it is a great satisfaction to also be able to put up its flag in Jakarta, as part of our operational network in Asia, the dynamic centre of a country undergoing great economic expansion - a dynamic area, from an economic point of view and characterised by the presence of shipyards, specialising in the construction of different types of ships.

'Our objective is to assist clients and shipowners by foreseeing their needs and removing all obstacles which may hinder development.'

RINa's activities in Indonesia have been boosted by the entry into RINa class of some 32 tugs and 36 barges from the Mitra Bathera shipyard, one of the most important companies in Indonesian shipping.

Furthermore, RINa currently has four oil and chemical tankers under construction in Indonesia.

The new office in Jakarta is the 96th RINa office worldwide.

From left – The head of the Indonesian Administration, The Italian Consul in Jakarta, Francesca Hadinata and Ugo Salerno.

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Cosnav steps up search for partners

RESOURCEFUL Trieste-based designer Cosnav continues to cultivate new relationships with overseas yards.

SINCE its inception in 1990, naval architecture firm Cosnav has seen a sea change in the Italian shipbuilding industry, with many of the smaller shipyards eliminated, along with their technical offices.

In March the de Poli yard launched a 7000dwt chemical carrier for El Bana Navigazione featuring all stainless steel tanks, following the earlier construction of a sister ship in Turkey. It is understood the Italian owner returned to its home building market after Turkish prices for the second ship skyrocketed.

This, however, is something of an exception and Trieste-based Cosnav has had to be resourceful, effectively taking on the management of complete projects, and cultivating yards overseas. It has made successful efforts to bring on lower profile yards in Turkey, and more recently China, in the construction of the product carriers and chemical carriers that are, by and large, no longer accessible to Italian shipbuilders.

Using Autocad and Microstation software for its design, and GHS for its hydrostatics, the company has recently been testing new products from Rhino Marine for hull design, in line with the way shipowners, even of cargo ships, increasingly demand foresight of the vessels to be built.

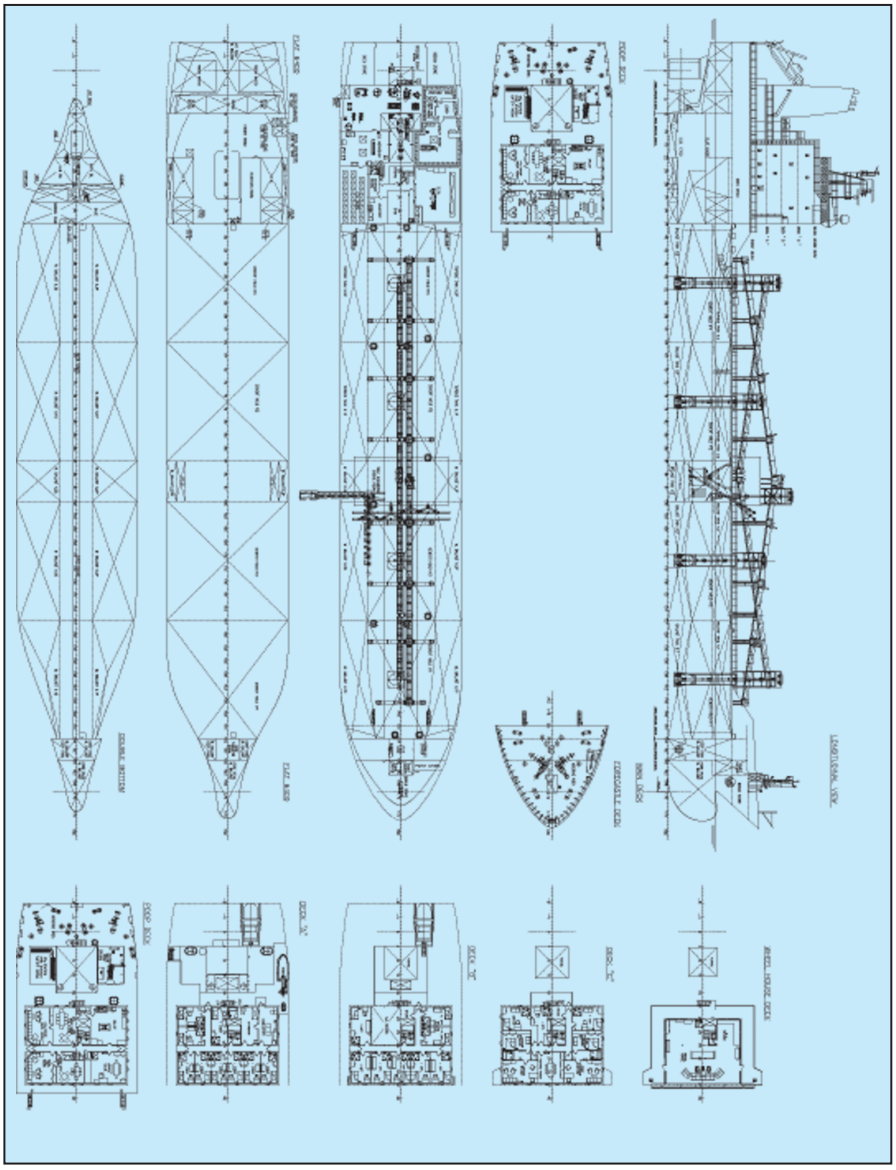
In search of competitiveness, the company has, in turn, farmed out a portion of detailed design works to other Italian companies and, increasingly in search of the type of rates to attract German and Nordic customers, to independent companies in Croatia – particularly around Rijeka and Pula.

Fincantieri recently acknowledged that it was exploring taking a leaf out of the book of North European shipbuilders by acquiring a shipyard in Ukraine for hull work, in order to bring the group back into contention for general cargo ship construction and possibly liquefied gas carriers, with a view to undertaking outfitting work in Italy.

However, for the moment, the most active Italian designers in the dry bulk carrier and tanker market remain those already established with yards overseas. Cosnav, for example, has a 20,000dwt cement carrier design on the table for Greek owner Naftotrade. If it follows the path set by two smaller 13,500dwt cement carriers also designed by Cosnav, and ultimately taken by Naftotrade, it is likely to be built at the Selah Makine ve Gemicilik Endustri Ticaret shipyard, in Tuzla. These ships, with one delivered at the end of 2006, and the other due delivery in the coming weeks, are 134m long overall (122.3m between perpendiculars) and feature a moulded beam of 20.6m, depth of 10.5m, draft of 8.5m, and freeboard of 2000mm.

They are of the fully automated, all enclosed self-loading and unloading type and, as such,

Cement carrier hull-48, the 13,500dwt *Nafto Cement* 15, taken over at build by Naftotrade and designed by Cosnav.



GA 13,500dwt cement carrier for Naftotrade.

nothing comparable has ever been built in Europe. With automation systems supplied by Kongsberg, Cosnav had to design a ship whose centre of gravity took into account the positioning of all handling systems being mounted on the superstructure.

Their pneumatic cargo discharging solution, which operates at rates of 1000tonnes per hour, includes a hot air feed into the cement to make it act like a fluid during unloading, which requires a sizeable filter connected to the tanks in order to avoid 'super pressure'.

It is understood that the first vessel has been so successful as part of its intra-Mediterranean operations that Naftotrade is now considering the larger 20,000dwt variant for operations connecting to India, where it already has a 9000dwt ship in operation.

Cosnav is also working on designs for six chemical carriers (two of 6500dwt, two of 10,000dwt and two of 16,000dwt) and one bitumen carrier, for an unspecified Italian owner.

It has been eight years since the design company had any involvement with ro-ro and ferry tonnage, when it designed two ro-ro carriers for Fred Olsen, which were built at Fincantieri. However, the firm is again returning to this specialised area, with a project for the Strinzis company Hellenic Seaway to design a 198m-long, 3000lane-m capacity ro-pax ship.

Another project the company is working on is for a Greek shipowner to build a product carrier in China.

Cosnav is also working to place a latest project to build two 9500dwt, ice class chemical carriers, featuring stainless steel tanks, on behalf of the Bertani family's Savona-based shipowning vehicle Finbeta. In this case, the designer is currently considering yards in Spain and Russia for the work.

Meanwhile, talks are progressing with Greek shipowners over the possibility of developing a design for a small liquefied natural gas carrier, of below 10,000m^3 capacity, to operate between the Greek islands to supply the electricity industry.

Among its other work is a consultancy project to install engines and equipment onboard and complete a larger bulk carrier for an unspecified Greek owner.

Ever alive to the shifting sands of international shipbuilding, Cosnav owner Cosmas Cosmidis said that the company was aware that detailed design work done in China could be secured for around 30% of the price he was able to offer. 'In the past, the Chinese did not have the experience, but now they have a big quantity of ships under construction. While they may not have arrived in Europe yet, they are clearly a big competitor. My idea is to realise an agreement with some Chinese company, based on doing the basic design here and them doing the detailed design. We are trying to do this with a project for a 4500dwt product carrier, where the shipyard is being arranged through Intermodal Shipbrokers [of Greece].'

Mr Cosmidis said Intermodal was trying to find a partner yard near Shanghai to build six ships to a 'normal' product carrier design.

Rendering of 4000dwt product carrier developed by Cosnav, but for unspecified owners.

MES pursues the spirit of adventure

A WILLINGNESS to be adventurous defines the successful European ship designer of specialised ships today.

Established in 1986, Marine Engineering Services is a ship design and consultancy company, which also offers construction surveying, and has been active in South Korea, Ukraine, Turkey and, most recently, Indonesia.

Giorgio La Valle, who presides over MES, is also president of Gas and Heat, an independent Leghorn-based company whose shareholders include Liquefied Gas Equipment Italy. The company was born out of his experience at Italcantieri and, subsequently, Gasocean. Its expertise in gas containment and gas cargo handling systems has extended across almost the entirety of the gas carriers built in Italy. Its most recent newbuild, a 40,000dwt vessel, is to be 182.8m long, 30.5m across the beam, with a depth of 16.2m, and offer 47,000m^3 of cargo capacity.

This trans-discipline capability allows the designer to offer a full service to shipowners, according to Mr La Valle. As a naval architect, it can study the marine part of the project and bring in G&H to develop the cargo handling solution.

He said that his investigation of Mediterranean trading patterns had resulted in a design for a general purpose gas carrier of 3300m^3, a design that subsequently led to his own company contracting four vessels of this size at the Madenci Gemi yard in Turkey. With the cargo system built in Italy, the ship build slots were subsequently sold to charterer Stargas before delivery. The first three of these ships have already been delivered, with the fourth due delivery in May.

Such was the success of this project, that Mr La Valle has repeated the exercise for Greek owner Stealth Maritime Corp, covering a four-ship deal at the Meridian shipyard, Nikolayev, Ukraine, where delivery of a first ship is due at the end of 2007, or early 2008. Again, cargo tanks will be delivered from Italy.

As a naval architect, MES has also developed a ship design for FVH Shipping, covering the speculative construction of six 4000m^3 LPG carriers at Italy's Pesaro yard. The first two of these ships have been sold to Australian concern Ocean, while the other four are understood to have been placed with separate owners.

The first example of an innovative stern section, for an 18,000dwt chemical carrier built for Mediterranea di Navigazione, under construction at the Celik Tekne Sanayii ve Ticaret yard, Tuzla.

Yards willing to build ships of this size and speciality at the right price are by no means easy to find, with prices escalating in Turkey, and Chinese yards more fixated on larger fish.

However, the oil majors are ever-alert to opportunities involving the capturing of resources hitherto deemed too hard to get for exploitation. Mr La Valle said that, after a feasibility study, Chevron had asked MES to develop a small compressed natural gas carrier design to recover gas in the US Gulf.

The company has also developed a design for the 18,000dwt chemical carrier *Saracena* for Mediterranea di Navigazione, under construction at the Celik Tekne Sanayii ve Ticaret yard, Tuzla, of which the first example is due delivery in June 2007. This 21,000m^3 capacity ship, including 13 tanks, will be 154m long and 25.6m across the beam. With Ice Class 1A notation, the ship has been fully winterised for White Sea operation, with all pipes in heated trunks and twin screw propulsion.

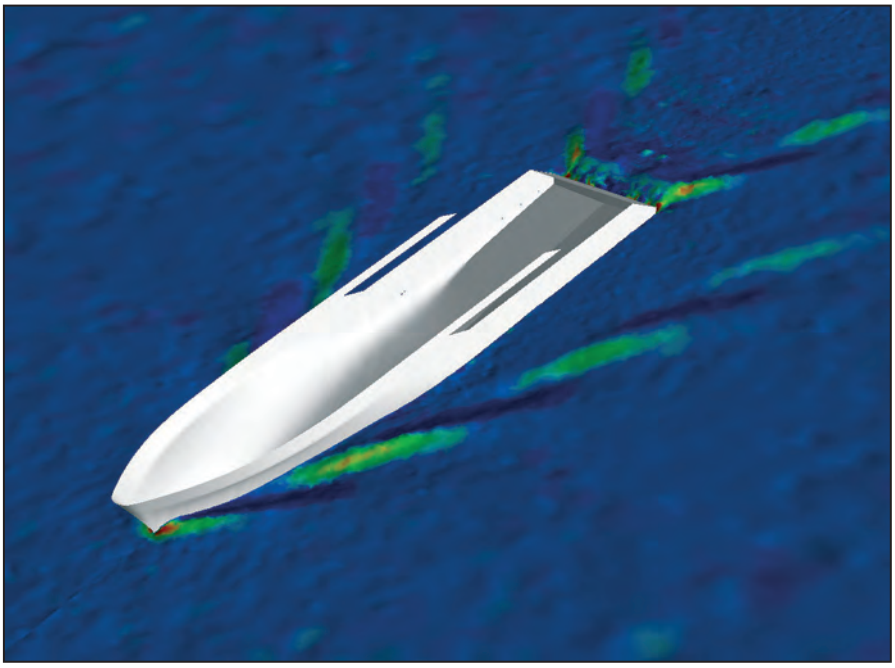
For some, though, its defining feature will be its 'ice astern' hull form, where the twin skegs reside under a 'tunnel pipe' transom, especially curved to improve astern operations for a ship blocked in ice.

While exhibiting a conventional twin screw propeller arrangement, the stern shape affords less pressure on the propellers and the opportunity during astern operations to have several attempts at driving the most resistant 1m thick ice. This is deemed particularly important, given that twin screw solutions generally offer a lower performance from a hydrodynamic point of view than their single screw counterparts – a fact mitigated by the resolution that propellers should rotate towards each other in a ferry-like solution, with 10% improved in efficiency.

Elsewhere, Mr La Valle adds that his design company is 'at the beginning of another adventure' on behalf of Mediterranea di Navigazione, because he is working for the first time with Indonesian shipbuilders in a construction project involving two 6500dwt stainless steel chemical carriers.

Balancing prestige with performance

A NEW multi-million pound research programme can benefit the design of the megayachts of the future, writes Rick Scott from Frazer-Nash Consultancy.



120m yacht vertical velocity component on water surface.

MEGAYACHTS are at the extreme end of pleasure craft, and as a result their form and function are a statement about the image and success of the owner. This introduces very specific challenges to the naval architect. Owners are asking naval architects to include novel or unique design features in the desire to stand out that can, if not addressed fully, lead to compromises in other aspects of yacht performance.

Furthermore, the requirements for the design of megayachts does, unsurprisingly, differ significantly from what is required of other types of craft. For instance, high aesthetic value will be required at the same time as a strong level of manoeuvrability. These two requirements may conflict with one another.

With the increasing expectations of megayacht owners, numerical methods – that is, computer analyses – are being used during the tendering process, and design and manufacture of such yachts. The questions being posed are diverse and in contrast to what have historically been required: the structural loading of a swimming platform when moored in the Cayman Islands is a problem many naval architects will seldom need to address. But it is tasks like this that are requiring the naval architect to seek a more detailed understanding of yacht motion in order to satisfy today's megayacht owners.

While questions may be easy to ask, the answers are seldom easy to obtain. The irregular nature of sea surfaces, the probabilistic occurrence of wave conditions, and methods of representing free surface flows all introduce significant complexities to numerical methods. As a result, such complexities have historically been reflected in the duration of analyses – which can be very time-consuming, especially for the largest yachts.

When numerical methods are used it is often later in the design cycle – for instance in the demonstration phase – to show if a design is suitable.

Bringing design forward

A truly integrated design process would see numerical methods informing the decision-making process from the very beginning. To do this, a reduction in the time needed to obtain an answer is required. Faster, bigger computers will inevitably help but they will not provide the step change in solution speed necessary to see numerical methods used at the start of the design process. To achieve the desired increase in speed in the short-term we must look for other ways of reducing the time to obtain a solution.

Broadly speaking, solving a numerical model can be divided into a number of stages: geometry definition, generation of computational mesh, solving, and interpretation of results. The outcome from this is either demonstration that the design is sound, or realisation that aspects of the design need to be changed to meet the design specification. Each of these stages and how necessary design changes are implemented can provide opportunities for a reduction in the overall solution time.

Frazer-Nash has a long history of providing detailed understanding of ship motions to naval architects. Throughout this time it has invested in enhancing numerical methods, and has been central to a recently started collaborative research programme, called Centre for Fluid Mechanics Simulation (CFMS).

CFMS is a £17m UK Department of Trade and industry funded collaborative research programme, which brings together world class organisations from a broad range of industrial sectors, including: marine, aerospace, automotive, motorsport, and information technology.

Its vision is to develop world-leading rapid fluid mechanics simulation methods to revolutionise the design process. This will be achieved by improvements not only to the speed and accuracy of flow solvers but also to how geometry is defined, meshes are created, models are optimised, how knowledge is stored and best used, and how all of these can be integrated. Therefore there are many improvements that megayacht owners could potentially benefit from.

Another key benefit of the collaborative nature of the programme is that developments and synergies in other industrial sectors, such as improvements in geometry definition, meshing, optimisation and techniques to solve problems, can also be exploited for the marine sector.

Megayachts have many conflicting requirements. A couple, which are demanded thankfully by very few owners, are at polar opposites: the need for very high speed and the need for sumptuous levels of comfort. The conflict occurs throughout the design of the boat: hull forms that are good for high speed in smooth water are usually poor for sea-keeping; the powerful engines needed for sustained high speed are large and noisy; and at the high cruising speeds of these yachts, the external areas of the vessel will be uninhabitable.

It is a classic case of multi-dimensional design optimisation, and the better the tools are that provide the design data, the better the compromise of the final design. Of course, yachts also have another design constraint seldom considered in other vessels – the need for an aesthetically pleasing solution. The CFMS marine programme will be looking at strengthening not only the modelling of the specific performance metrics of the boat, such as hydrodynamic efficiency and sea-keeping, but also the links between these metrics. With better predictions, and a better understanding of the effect of variations of one parameter on another, better performing design solutions will be found faster.

Hydro-dynamic assessment of boat hull forms has been traditionally done using tow tanks. However, the marine industry is beginning to embrace the use of advanced analytical methods such as Computational Fluid Dynamics (CFD). These methods only see limited use in the industry due to their complexity and subsequent long run times compared to traditional methods.

The advantages CFD has over tank testing are numerous: full scale representation of the yacht, scale of data collection, user interaction and results interrogation, cost, flexibility of design layout, and analysis of extreme sea states. However, these can only be utilised if the model definition can be made quicker and simpler and if the turn around time of numerical analysis can be significantly reduced.

A current CFD method for hull form assessment involves a long iterative process of analysis. A steady state solution using free-surface methods tends to be used, but the resulting hydrodynamic loads on the hull changes its attitude; a particular problem for high-speed planning craft. Moving the hull to balance these loads requires the solution to be re-analysed.

This process of finding the hull's equilibrium attitude can be very time consuming. Furthermore, analysis at high sea states requires that this process be carried out within the time domain, increasing

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the analysis requirement by a further magnitude. Finally it must be noted that because the analysis must be undertaken within a large far-field region, transient models are resolved for short intervals but long durations.

Due to the limitations in the CFD methods for this type of investigation, vessel manufacturers and operators still heavily rely on physical testing. Tow tanks are used to assess the performance of a design, with models taking several weeks to design and manufacture. Lastly, full scale testing and development is carried out prior to final launch and acceptance of the yacht by the owner. This whole process can take many months and at a significant cost. Current numerical simulation methods provide a limited alternative because of the length of time needed to obtain solutions.

A holistic view

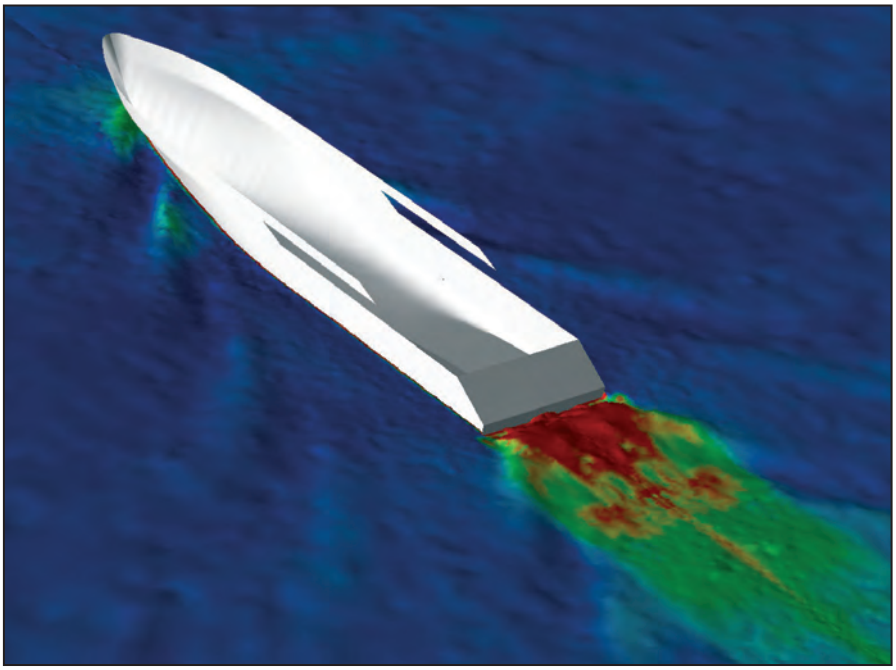
Rather than investing in developing numerical methods, the marine programme of CFMS takes a more holistic approach and will create a process to convert user requirements and design specification to a final hull form through the appropriate application of numerical methods.

While this will include the development of numerical methods to enhance - in terms of speed, accuracy, and extent - the analysis of marine vessels, it also looks at broader technologies such as information management and design optimisation. These are two important considerations for megayacht design.

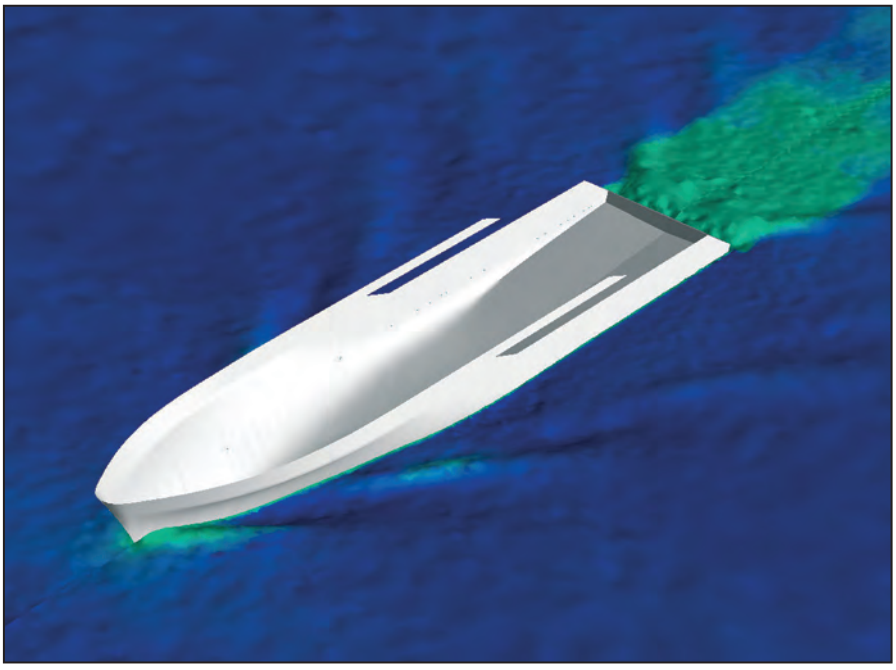
Advances in information management means that the knowledge from design rules and tank tests can be used in conjunction with detailed numerical simulation to guide the design of the hull form. An auditable design process will be developed by the integration of requirements definition, information management, and numerical models with optimisation software.

The user requirements and design specification will constrain the route the optimisation software will take to reach a satisfactory hull form. Aspects of the design that will be subjected to detailed analysis will include:

- Hydrodynamics – using CFD techniques already developed by Frazer-Nash for planing and semi-planing hull forms to predict powering curves and trim attitude, and to address areas of specific concern such as propulsor tunnels. Target to reduce drag, and hence engine size, weight, and fuel consumption.
- Motions and seakeeping – using the dynamic-FEA based HydroDyna code to predict motions at speed, and provide wave-slam force profiles. Target to reduce motions, and hence increase comfort and reduce structural weight.
- Structural analysis – using the calculated loads for FEA analyses of the whole vessel. Target to reduce weight by varying structural design and materials.
- Acoustic analysis – using FEA/Statistic Energy methods to predict noise levels in passenger areas. Target to reduce noise to minimum levels.



120m yacht forward velocity component on water surface.



120m yacht forward velocity component on water surface.

Form follows function, and engineers and naval architects invariably find a perfectly optimised design beautiful. However, the owners of these yachts, and those responsible for their styling, want their vessels to look distinctive. This desire runs counter to the optimisation process, as the underlying demands for these vessels for speed and comfort are usually very similar, and so would be expected to produce a similar solution. In fact, the analyst quickly concludes that the main differentiator between optimised solutions for different customers is the aesthetic.

The cost functions used in the optimiser will perhaps be somewhat unique for the design of megayachts. For example, performance in a rough seaway is harder to predict and in relation to megayachts, where image and aesthetics drive the hull form as well as sea-keeping and stability, often an area where specific understanding is required. In this case the naval architect may have cost functions relating to specific aspect of the hull form driven by aesthetics: the owner may require a near vertical rake to the bow and a steep cost function will be applied to rake angle deviating far from vertical. Only by adding heavy penalties to such key aesthetic requirements will it be possible to preserve differentiation.

These decisions (which within the pan-industrial CFMS community only really have parallels in the automotive world) are usually made by individuals. A naval architect will go as far as is possible towards compromising between aesthetic design and performance before finally deciding that it cannot be done and arranging to meet with the stylist. The ultimate CFMS vision is that the stylist will interact directly with a modelling system that reacts so quickly that the effects of his changes

will be instantly available to him, in the form of performance and comfort figures. Although a distant objective, it remains part of the core CFMS vision that this will one day be achieved.

In pursuit of comfort

'Comfort' is a broad category of requirements that can capture all manner of owner specifications. These can include:

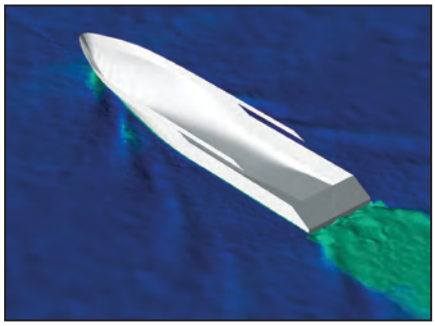
- Motions, varying from detailed levels of pitch acceleration, to a requirement that a gin and tonic must not spill on the fly-bridge.
- Noise, typically expressed in dBA, and often set at levels below those in a land-based domestic environment.
- Vibration, covering sources such as engines, ancillaries, and domestic equipment such as washing machines and tumble-dryers.
- Fumes and smells; usually requirements that engine fumes and galley smells are kept away from internal and external passenger areas.
- Temperature; ensuring adequate control of internal temperature.
- Drafts and wind-flows, both external and internal, which must be kept to a minimum.

These requirements are generally easier to consider as part of the broader design than aesthetics, although each requires a separate specific model that must be linked into the overall scheme. However, the actual target levels are usually extremely demanding, and often the cause of acceptance delays after build.

As a result, the greatest conflict within the design process is usually between comfort and aesthetics. Although it is early in the CFMS development process, a scenario can be envisaged where the owners or their agent will specify not only the performance targets, but also the importance they attach to each so that design compromises can be made if necessary.

Also, in an industry where environmental pressures are becoming more pronounced, issues such as wake and drag are requiring a greater level of understanding. Numerical models are currently seeing limited but growing use in these areas to look at basic hull forms, appendage drag, and propulsion efficiency. Increases in solution speed expected by the CFMS programme mean that numerical methods will be a practical proposition at the early stages of the design programme so their overall value to the design will be much greater and be able to inform decisions rather than demonstrate a decision was sound.

The obvious area of environmental benefit is that the reduced drag of the vessel will reduce fuel consumption and hence emissions. However, the automotive world has recently started assessing the complete environmental footprint of a vehicle, taking into account the energy and materials used in manufacture and disposal. It has become clear that considerable environmental benefits accrue from the use of less build material and more efficient techniques, and that these benefits can often outweigh the differences in fuel consumption between large and small vehicles.



120m yacht forward velocity component on water surface.

The CFMS programme can therefore also contribute to a 'beneficial spiral' effect, whereby improved assessment of hull loads can reduce the amount of hull structure required, and thus the amount of energy required in manufacture. There is currently no demand for a truly 'green' megayacht, and such a concept is perhaps an inherent contradiction, but perhaps these magnificent engineering achievements can be made a little more friendly to the world around them.

The complex set of requirements and the need for these to translate into a strong mega yacht design is nothing new for the marine industry. However, demand for the latest designs will require more modelling power than ever before – and this is where the CFMS programme has the potential to deliver.

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Elegance on a grand scale

FINCANTIERI'S diversification strategy within the higher added-value realms of the business recently reached an important milestone when the keel was laid for the Italian group's first megayacht newbuild.

Developed by Fincantieri Yachts on the basis of a design prepared by Espen Oeino, the 134m vessel is scheduled for handover in 2010 from the group's Muggiano yard, in La Spezia.

The project, to the account of an unidentified owner, was awarded to Fincantieri through Camper & Nicholsons International, a leading brokerage company in the super-yacht market. It is claimed that the seven-deck vessel would rank as the second largest, privately-owned modern yacht worldwide, and will be distinguished not only by scale but also by her blend of advanced technology and elegance.

Key features of the 134m newbuild will be two helicopter landing platforms, one of which is to be served by a hangar, storage for a submarine able to dive to depths of more than 100m, and a large internal seawater pool to be used for tender docking. The total 4500m^2 of interiors will include 2700m^2 of luxury space planned by the trendsetting interior designer Studio Pascale Reymond Langton Design.

The Muggiano cradle for the construction programme is one of two Fincantieri yards otherwise devoted to naval vessel production, with its attendant very high order of demand, as regards build quality, craft skills, and project management expertise. Muggiano's non-naval output has included large, fast ferries, and the unique *Destriero*.

Fincantieri revealed its decision to enter the megayacht sector at the end of 2004, and formed a dedicated business division in the shape of Fincantieri Yachts, for that purpose. The level of the group's allocation of resources to the operation gives substance to its bid to rapidly achieve a stance in the market akin to the very strong international position it has attained in the cruiseship and naval domains.

Since inception, Fincantieri Yachts has pursued a three-stranded market strategy. One line of approach is to develop concepts emanating from international designers of repute, as expressed in three megayacht design projects presented to date, namely the 70m *Prospect*, the 102m *Marco Polo* and the 115m *Morpheus*. Another approach is the development of Fincantieri in-house designs, based on the specific requirements outlined by the contractual owner, while the third course of action is to develop projects based on proposals supplied by the customer's chosen designer, as has been the case with the current 134m build.

Megayacht construction provides a sound complement to naval vessel building, and affords an increased opportunity to ensure production continuity across key trades and resources.

Reducing roll at rest

LARGE motor yachts require a specific design strategy for operational conditions, given the extent to which such vessels typically ride at anchor. According to the Dutch maritime research institute Marin, performance at zero speed thereby constitutes a very important area of technical assessment.

However, Marin warns that the determination to reduce vessel motions at rest should not produce an onboard system whose effectiveness prevails over the performance of the yacht as a whole. Indeed, motor yacht design may represent more of a compromise in meeting the needs of distinct operational conditions than is the case with a commercial vessel.

'Comfort, safety, aesthetics, and hydrodynamic performance have to be integrated into one design, meeting all the requirements of the owner. More model research into operational conditions is crucial to be sure that the yacht will make the owner's dream come true,' observed Marin.

The very high level of comfort required for zero speed conditions requires a certain transom immersion, which is not favourable from a propulsion standpoint. Trim wedges are a common feature used to reduce the required power around the top speed, while still enabling an adequate transom immersion. A trim wedge can cut the power need by up to 10% at around the design speed, but the resulting increased transom immersion has a negative effect on the power requirement at low speeds.

In optimising the hull for maximum speed, a well-designed bulbous bow can cut the required power by up to 15%, according to Marin, which acknowledges that this is often not an option in the luxury yacht sector, due to aesthetic considerations and the handling of the anchor. Nonetheless, the hull form can be optimised using CFD (computational fluid dynamics) calculations and well-considered decisions can be made by using a systematic hull form variation approach.

With the growth in motor yacht size, together with changes in the pattern of private use and the development of charter work, which have increased the amount of distance voyaging and long transits made by vessels, design aspects relating to seaworthiness in severe conditions have become an important consideration.

'A good balance of parameters such as stability, type and location of stabilisers, rudders, and skeg area, are a guarantee that the vessel will feature good course-keeping stability in stern-quartering waves, as well as good performance in calm water manoeuvres,' observed Marin. 'Freeboard height, forward deck arrangement, and bow flare shape are parameters that will influence the seaworthiness of yachts, and that must be carefully balanced with aesthetic considerations,' it added.

Design choices relating to seakeeping need to be made at a conceptual level, and refined through simulations. The Dutch institute is adamant that model tests in oblique sea scenarios are a vital ingredient in the task of accurately assessing the various design elements and factors in combination.

Damen leads search for cargo capacity

THE globalised shipbuilding group seeks out new opportunities to boost its cargoship delivering capability.

12,000dwt multipurpose carrier delivered to owner Wijnne by Damen Okean yard, Ukraine, in 2006.

A TIGHT hold is kept over global operations from Damen's Groningen headquarters, with sales, purchasing, project management, logistics, and warehousing all controlled centrally. Today, Damen's yards in The Netherlands undertake outfitting only, with hull production and many a complete shipbuilding project the preserve of its overseas holdings.

With the group reckoned to supply between 120 and 130 ships per year, ranging from small workboats up to frigates for the Royal Dutch Navy, facilities at Groningen are increasingly becoming about logistics and project management, with current plans to double the capacity of the warehousing operated by the yard group in the northern Dutch city. Indicative of the way things have changed over the years, of the 450 people who now work directly for Damen Groningen, only 80 work in the shipbuilding shed.

Roel J van Eijle, Damen sales manager Europe, is responsible for cargo vessels, which are mainly those built at Damen Galtz, Romania, but can also be built in Ukraine (Damen Shipyard, Okeon or in China (Damen Yichang Shipyard)).

'Our strategy is that we are not going to go after very large vessels – we limit ourselves,' said Mr Van Eijle. 'Perhaps in the future we will go further, but we say we will not go over 20,000dwt, while the containerships may go up to 1400TEU-1500TEU, but going any bigger would mean going into full competition with the Chinese and Korean yards, which would be very difficult. We are in a niche market, of ice class ships, vessels accommodating odd container sizes – non-standard vessels that are not bread and butter in Korea and China.'

He explained Damen's current philosophy as 'to buy as much as possible in the local market, but all equipment vulnerable to needing spare parts and service must be European. A winch can come from the local market but anything involving hydraulics and electric motors must be to a world standard so that spare parts for it can be bought anywhere.'

Mr Van Eijle said that Damen's cargoship orderbook extended in to 2009, with most of the production coming out of its Damen Galatz satellite operation in Romania.

Work at Damen Galatz is highly varied, and includes tugboats, dredgers, supply vessels, patrol vessels for the Swedish Coast Guard, and a second pair of heavylift vessels for Jumbo Shipping. However, a significant portion of workload is focused on 800TEU capacity container carriers, in the shape of the ice class 1A Damen Container Feeder 800, designed to accommodate 329 x 45ft containers. This 9300dwt ship is 140.64m long and features a beam of 21.8m, and a depth of 9.5m.

Last month, the builder delivered number 12 in this series of ships for four owners, with six more ships (in this case for HS Schiffahrt, of Germany) still on order.

All of these ships feature nine-cylinder MaK engines, generating 8400kW and are capable of a service speed of 19knots. They also feature a relatively high proportion of reefer slots – 120, with 60 in the hold – for their size.

Mr Van Eijle said that Damen had developed a 10,000dwt, slightly lengthened version (to 150m) of this ship, to bring its capacity up to 902TEU, while maintaining the same beam and depth, also adjusting the design to bring down its capacity for 45ft containers to 284 units. Retaining the same engine configuration brought the service speed down to 18.8knots.

Demand for the ships it builds in Romania remains strong, despite rising prices. However, like other builders in Romania, Damen Galatz has had to face up to a skilled labour force haemorrhaging numbers to higher paying markets overseas. Mr Van Eijle said that, over the last year, Damen Galatz had lost 600 of its 3000 workers. Efforts to cover the situation through subcontractors had only proved partially successful, with sub-suppliers facing the same dilemma. Project managers, engineers, welders, and painters were all leaving in droves. A knock-on problem was that new workers coming in to replace established workers took time to bed in, with implications for efficiency.

The situation in Ukraine has also been subject to change recently, although for different reasons. Aker Yards bought into the Okean yard, in a bid to boost output in its cargoship construction capacity. Damen is offering 12,000dwt ships out of Okean, and indeed has orders for four such vessels. However, the yard's true expertise lies in larger ships and, in giving up part of its capacity at the Ukraine yard, the Dutch group has been driven on to seek opportunities elsewhere.

For example, it recently concluded a new deal looking to develop shipbuilding in Vietnam. Vietnam Shipbuilding Industry Group (Vinashin) signed the joint venture with Damen Shipyards Group to establish the Damen Vinashin Shipyard (DVS) in Haiphong. The 42hectare site will include 500m of waterfront and, initially, will focus on building tugs, workboats, high-speed craft, and offshore vessels, mainly for the export market. The company is an extension of the existing co-operation between Vinashin's Song Cam Shipyard and Damen, will employ 400 people, and will create over 1000 jobs with suppliers and subcontractors.

'We will start with the tug and workboat range that we have over here,' said Mr Van Eijle, 'but we have it in mind to extend to larger vessels. It will take a couple of years to do that.'

In the meantime, Mr Van Eijle is focusing on China as the country best able to source new capacity.

'We are trying to increase capacity at the Yichang yard,' he said. The Damen/Yichang joint venture currently subcontracts hull work to Yichang Shipyard, then takes over the hulls to outfit the vessel.

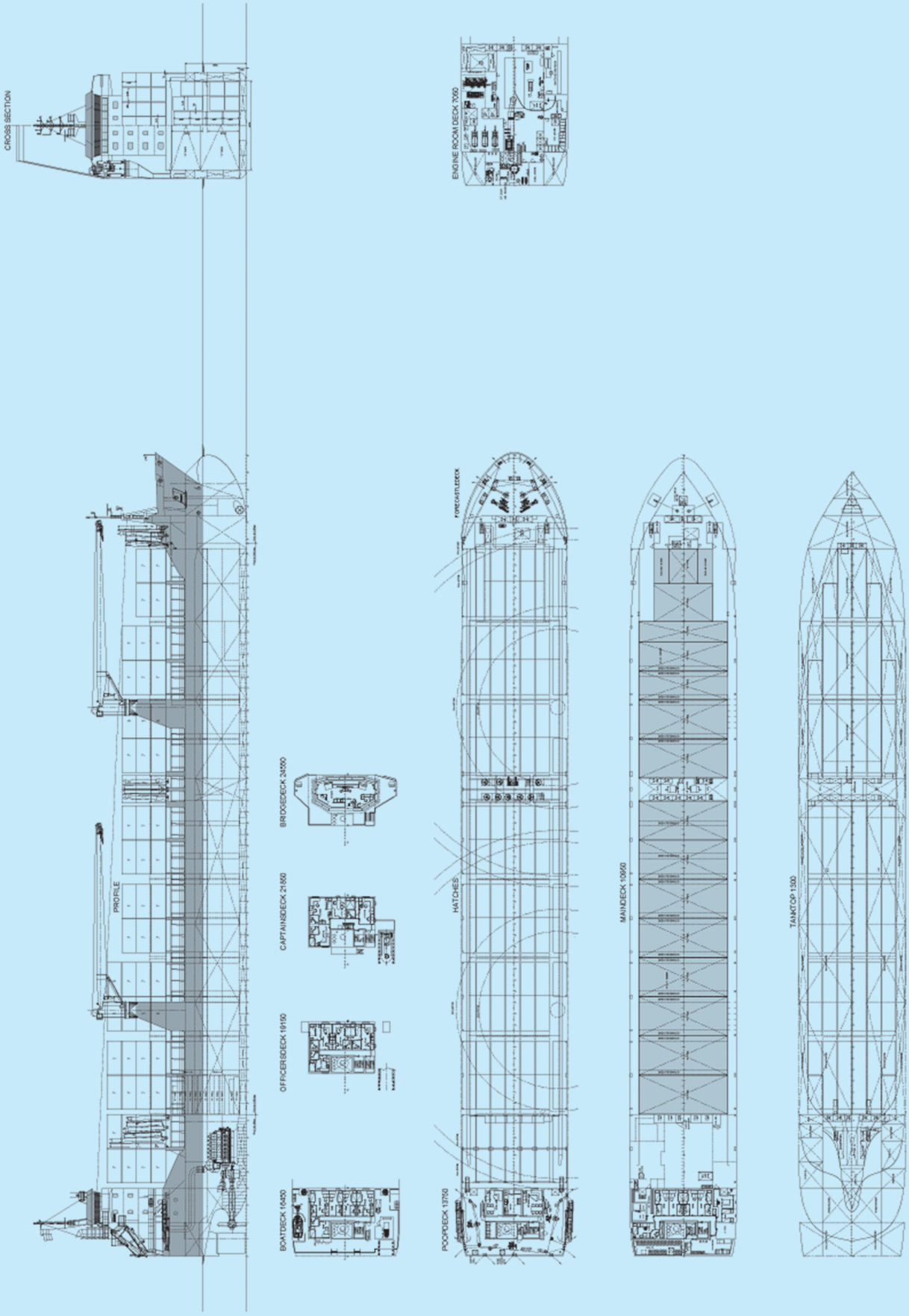
Yichang also does work in its own right and the Damen Yichang joint venture has, since its start up in 1998, built up production to a rate of around two and a half ships per year. As well as five 5000dwt and 10 10,000dwt multipurpose vessels, it is now building a series of 10,500dwt ships for European owners, with the opportunity to offer 11,000dwt, ice class ships that feature twin 80tonne-capacity deck cranes from the yard. Deliveries from Yichang are limited to a November-April window, due to water levels.

'We are trying to increase the output of the joint venture to three or four ships per year, not by increasing the workforce, but by bringing more work in to feed the yard,' said Mr Van Eijle.

'We are in discussions with our joint venture partner to increase capacity available to us and to have both the 11,000dwt and the 12,000dwt [the latter hitherto delivered through Okean] built there.' Where the 11,000dwt multipurpose ship features a simple hatchcover arrangement, handled by gantry crane, the 12,000dwt ship is slightly more complex, given that it features hydraulic folding hatchcovers.

Damen's further plans for this larger vessel include its lengthening and widening, to take it up to a 13,500dwt ship.

GA of the 12,000dwt multi-purpose cargoship hitherto available from Ukraine, but soon likely to be built in China.



Bijslma bounces back

THESE are exciting times for Bijlsma shipbuilding, situated in the beautiful town of Lemmer. The yard, whose building hall is snug against a town preoccupied more with tourist pursuits like fishing and sailing, has come a long way since the lean times experienced by Dutch yards five years ago, which saw its bankruptcy in 2003.

Taken on by Werkendam-based inland shipping specialist Veka Group in 2004 – the vehicle of dynamic entrepreneur Peter Versluis - Bijlsma management restarted work outfitting inland vessels, with hulls supplied from Eastern Europe and China, and has since completed between six and eight ships per year.

While still delivering river ships regularly today, in 2004, Bijlsma management persuaded its parent, whose power in the small ship market is to be reckoned with, of the opportunities afforded by taking the 138m-long by 18m-wide dock back into sea-going ships, with the Conoship group providing designs, Veka subcontracting hulls overseas, and Bijslma finishing the job.

The first of these sea-going ships are now due for completion, with a 350TEU containership alongside and a 3250dwt general cargo/containership in the drydock.

In the next three years, some 26 seagoing ships are due for completion. Eighteen of these ships will be 3250dwt general cargo ships for delivery to Wagenborg, due for on-sale to master-owners. The hulls for eight of these ships are coming from China, with 10 more hulls being supplied from the Veka Group-owned yard Lodanice Nova Melnik in the Czech Republic, once again bought out of bankruptcy by the wily Mr Versluis. Hulls arrive without bulwarks, with everything from the engine to the bridge superstructure inverted for shipment within the hull as cargo.

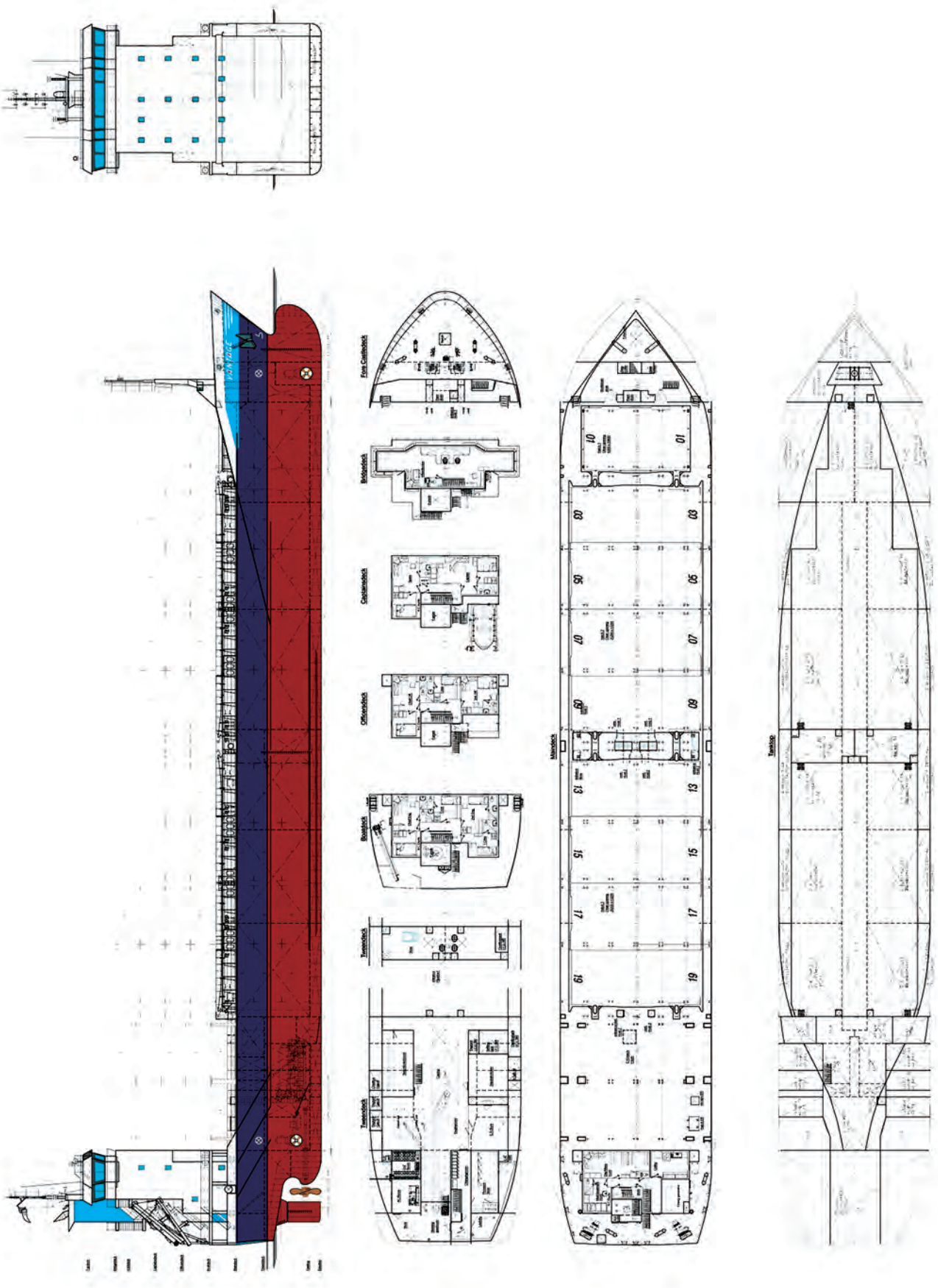
3250dwt general cargo ship for delivery to Wagenborg, due for on-sale to master-owners.

Four more 4500dwt multipurpose vessels, originally a design developed for Arklow but subsequently modified, are also due delivery to Wagenborg, on the same basis, while two more of the same size have already been ordered by 'captain-owners'. A further four 350TEU capacity containerships are due delivery through Veka.

Now, Bijlsma is trying to purchase a four hectare, neighbouring piece of land, in order to boost its output of sea-going and river-going vessels.It is also making grassroots investments in hand tools, like welding machines, in order to limit the amount of copper wire used in minor tasks, as well as grinding machines.

Bijslma's first 350TEU containership – the superstructure was installed and fitted out in Lemmer.

GA, Bijslma's first 350TEU containership, due delivery through Veka Group for master-owners.



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Den Breejen builds on variety

FAMILY-run yard Den Breejen seeks to add capability.

WITH a current output involving the outfitting of around 10 seagoing ships per year and complete construction of an average of two rivergoing vessels per year, independent yard Den Breejen has been gearing up production.

Having invested in new plasma steel cutting machinery within the last 18 months, the family-run yard is looking to expand its project management capability towards the end of this year, at the same time investing in new offices, and it is currently seeking new staff to add to its 45 permanent workers.

With orders running into 2009, Den Breejen's current workload necessitates the contracting out of detailed design work, although it uses Autocad for all initial designs.

At the end of April, it delivered its latest 125m-long, three deck river cruiser to Austria's GTA-Skyways, with capacity for as many as 226 passengers. This delivery will be followed by two 110m-long 'two and a half deck' (three decks at the front and two at the back) river vessels, with capacity for 152 passengers, for Rhine and Danube operations orchestrated by Scylla Tours, of Basel.

These all-steel river vessels cost between €11m-€15m to build, depending on the scope and level of luxury demanded, but tend to feature a standard propulsion solution, with two 800kW diesel engines driving thrusters.

However, the last few years have seen investment by Den Breejen in optimising the hulls of these specialised ships, with a view to reducing fuel consumption, using computer modelling facilities at Marin.

Again, much attention is paid to vibration, with the whole aft part of the GTA-Skyways ship above the engineroom fitted on flexible mountings. Engines, thrusters, and the deckhouse itself are also flexibly mounted.

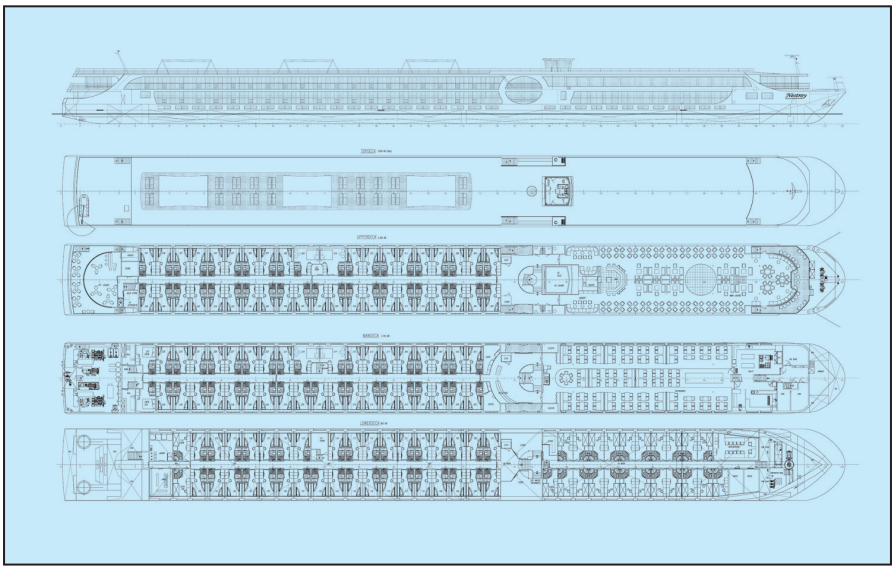
Den Breejen is also active in the construction of tankers and liquefied natural gas carriers. On order for Euromarine Shipbuilding are the tankers *My Way* (135m by 15m), *Commodore*, *Martin*, and *Hendrik Jan* (all three of 110m by 11.4m). Rensen, meanwhile, has orders for two 110m by 13.5m tankers, while RyGo of Basel has an order for a 125m by 11.4m tanker.

The yard will also fit out its 11th and 12th LPG carriers this year. All 12 of these 110m-long by 11.45m-wide ships have been built for Hamburg-based GEFO Gesellschaft Fur Oeltransporte.

Den Breejen is occupied in fitting out enginerooms, placing the LPG tanks in the hold, putting on decks and completing main propulsion, with piping work subcontracted. Hulls for GEFO are mainly supplied from the Czech Republic.

Luxury installation onboard the Den Breejen-finished river cruiser *River Empress*.

Den Breejen plans to add to its facilities and workforce.



GA of river cruiser *Hemingway*.

The Royal Institution of Naval Architects

Warship 2007: The Affordable Warship

BMT

20 - 21 June 2007, Bath, UK

Second Notice

This conference, the 27th in RINA's successful Warship series, will look at the 'Affordable Warship'. The conference will be held in Bath on 20-21 June 2007.

The ever increasing cost of warship procurement, upkeep and operations, whilst at the same time meeting the need for ever more capable and sophisticated platforms; a dilemma faced by most navies today. This conference will consider how advances in design, construction and operations can contribute towards lower through-life cost ownership whilst maintaining fleet capability.

RINA invites papers on the following related topics, covering all types of warship:

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- Designing to cost and capability
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Vosta reaches for the remote

VOSTA LMG delivers a dismountable cutter suction dredger, developed for remote locations.

VOSTA LMG recently delivered and assembled an innovative cutter suction dredger to Arab Potash Co, of Jordan, which is to be used for potash production in the Dead Sea.

Due to the location of operations, the dredger had to be transported by sea and land to its final destination, which meant devising a special dismountable design, specifically in order to reach the most remote areas.

The dredger was produced, assembled and tested at Vosta's neighbouring Shipdock facility, Amsterdam. After tests were completed, it was disassembled and transported by heavylift carrier to Aqaba, Jordan, moving on to its final destination on heavylift trucks.

Within three weeks the dredger was assembled in the Dead Sea and, at time of writing, was being floated into its operational position, for on-site performance tests.

The design of the dredger was conceived to allow coupling of main components in both dry and wet environments, in order that equipment could be launched in remote locations, where tools for a conventional assembly were not available.

What also emerged from the project was the embodiment of a design particularly for the harsh corrosive environmental conditions in which the dredger has to operate, implying the use of specific materials, adequate cooling capacity, and cooler cleaning devices.

The stationary dredger is equipped with two spuds, which can be hoisted and lowered. The bottom of the spuds has been weighted in order to increase the seabed penetration during controlled lowering. The use of a spud carrier system, which reduces positioning and handling time, guarantees an optimal production time, according to Vosta. The spud carrier is moved by means of a horizontal hydraulic cylinder. Swing is achieved by means of two side winches, which are installed on the ladder in way of the wheelhouse. The dredger is also equipped with an anchor boom installation to accommodate and simplify the anchor handling operation.

The cutter is driven by a hydraulic motor. For maintenance purposes, a cutter platform has been installed in way of the cutter head. The dredger is able to operate in shallow depths of 2m-3m, which is important for the production process. To be able to dredge at this shallow depth the draught is kept to a minimum.

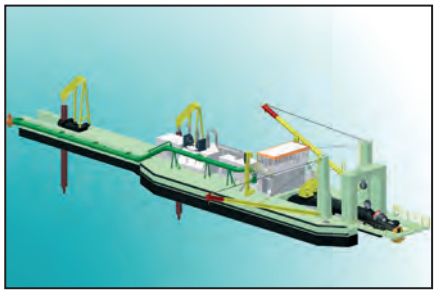
The dredger pump is located in a pump room which is separated from the engineroom by means of a watertight bulkhead. The HPD 550 white iron dredging pump is equipped with a mechanical seal, which does not require seal water and is wear resistant to abrasive water and solids mixtures.

The dredger pump is driven by a 16 cylinder V diesel engine type 3516, from Caterpillar, providing 1825kW of continuous power via a gearbox. The gearbox is equipped with a built-in hydraulic disc clutch and slip monitoring system that can be operated from the operator's cabin.

The cutter head itself is a Vosta type SC 25, featuring teeth that can be changed, based on the function required. The assortment allows installation of blade, pick point, and chisels.

Double generating sets, each capable of providing the electric power required, have also been installed. The vessel's main electrical functions are handled via a dual redundant PLC system, and the monitoring is done via a supervisory control and data acquisition (Scada) system presented in the wheelhouse on thin film transistor screens.

Furthermore, telemetrics have been installed to allow maintenance and guidance access from remote locations. The specific dredge monitoring system installed, has been integrated in the Scada system and provides the operator with a production overview. The dredger's operational data will be logged on a continuous basis.



Arab Potash design drawing.

En route – Arab Potash had to be transported to its final destination in sections, by land and sea.

The cutter section onboard a heavylift unit.

TECHNICAL PARTICULARS
ARAB POTASH

Type CSD 600S salt mushroom and reef dismountable cutter suction dredger.

Owner.....Arab Potash Co Ltd, Amman, Jordan
Builders.....Vosta LMG, Amsterdam, The Netherlands
Length oa (incl cutter ladder).....72m
Length over pontoon.....59m
Beam oa.....12.4m
Depth main pontoon.....2.90m
Design Draught with 45dwt.....1.6m
Weight.....550tonnes

Dredging capacity
Suction tube diameter.....600mm
Discharge tube diameter.....600mm
Cutter power.....600kW
Cutter speed.....0rev/min-30rev/min
Dredge pump engine power.....1825kW

Tank Capacities
Fuel oil.....100m^3
Fresh water.....40m^3
Ballast water.....140m^3

Deck equipment:
- two side or swing winches for positioning
- one ladder winch for lifting and lowering the ladder
- two anchor boom winches to lift the anchors
- two anchor boom guy winches
- one cutter platform winch
- deck crane is installed

Marin breaks through with compact simulator

RESEARCH organisation Marin has received a second order for its new Compact Manoeuvring Simulator, the equipment that has brought it into direct competition with mainstream commercial simulator suppliers.

Capable of simulating a variety of maritime applications covering virtually any type of vessel, the unit is aimed at training of general ship handling principles, specific manoeuvres, and emergency situations.

The first system was delivered in January 2007 to Sharjah-based tug operator LAMNALCO, which is using it for in-house training. Quickly, Marin has followed up with an order for a second system, featuring a 210° widescreen, this time from Antwerp pilot organisation BRABO.

While 50%-60% of its turnover continues to flow from model testing, the compact simulator is a potentially significant sideline for Marin.

For some years it has operated a full scale simulator at its Wageningen headquarters, training pilots and port authority staff, drawing on its deep-seated expertise in ship modelling, not least in the hydrodynamics of tug operations. It has supplied seven full scale mission simulators over the past decade.

In bringing the compact simulator to market, the system uses the same MERMAI500 Marin simulation software upon which its extensive and on-going research into ship hydrodynamics, port, and waterway design is based.

Marin has downscaled this technology for use in combination with PCs, to be handled by clients at their offices or, ultimately, onboard ship, delivering a tailor-made simulator, but based on standard hardware.

The Compact Manouevring Simulator consists of a trainee station and an instructor operator station. Optionally, a separate pilot/master station can be added, facilitating the control of an additional own ship, for instance to manoeuvre LNG tankers, shuttle tankers, and FPSO operations.

Marin has secured an order for a second compact simulator, this time featuring a 210° widescreen. It will be delivered to Antwerp pilot organisation BRABO.

Alewijnse makes power a matter of choice

CLOSE consideration should be given to the selection of power plant in the marine setting, based on the profile of an individual ship's operations, according to drive systems integrator Alewijnse Marine Systems.

With over 900 employees and a 2006 turnover of €100m, around 40% from marine-related activities, Alewijnse is a family-run firm with a difference. Its current workload involves equipping over 150 ships under construction.

Alewijnse managing director B Moritz Krijgsman considered plant efficiency had led towards the wider application of diesel electric power plant and, latterly, 'hybrid' diesel electric plant.

To make the decision between all-diesel, diesel electric, or a hybrid of the two, close attention needs to be paid to the operating profile of the vessel in question. 'If you have a diesel electric application, one of the problems is that at full power you have to convert all of the propulsion energy from the mechanical to the electric and back to the mechanical. This can mean that hundreds of kilowatts are lost. One solution is to combine the diesel electric system with the direct diesel.' Using this hybrid solution means using electric propulsion at lower speeds and the diesel option at full power.

'The important thing is to analyse the profile that the customer wants in terms of speed of operation,' said Mr Krijgsman. 'Apart from those involved in cargo shipping, there are all sorts of shipowners who are not clear what speed profile they have during sailing.'

There was a marked contrast between a cargoship moving from A to B, generally at cruising speed, and an offshore supply vessel, where flexibility and station-keeping were more important.

Mr Krijgsman said Alewijnse had assessed a variety of ship projects in order to recommend the appropriate propulsion solution. Among them, he cited the case of a 98m-long shortsea containership operating along the Rhine and to the UK. The owner asked if there would be any benefit in swapping his conventional plant for a diesel electric solution.

Alewijnse compared operations and manoeuvres executed by such a ship across a range of speeds at sea (11knots-15knots) and downstream in river (8knots-12knots). If the cost of a direct drive was at a base of 100, this compared to 102.7 for a diesel electric power plant and 87.7 for a hybrid direct/diesel electric plant. In terms of fuel consumption, the direct diesel plant scored 106, compared to 109.5 for the diesel electric plant and 100.6 for the hybrid direct/diesel electric plant. The conclusion was that 'no one operating a commercial ship running from A to B should go for a diesel electric plant,' advised Mr Krijgsman.

In the case of a patrol vessel, however, the goalposts were shifted. Operating across a range of anything between 7knots and 28knots, it would be more interesting to look at a hybrid direct/diesel electric plant for such a vessel, said Mr Krijgsman.

The same analysis used in the case of larger passenger ferries and cruiseships would arrive at a different conclusion, where a diesel electric solution might be preferred because up to 30% of the propulsive power could be demanded by auxiliary systems, with the ship required to reduce speed to accommodate hotel services.

Currently, Alewijnse was undertaking the same kind of analysis for a French dredging company. 'If you think it over a little longer you can come to the conclusion before doing the analysis that a dredger might be interesting for the diesel electric solution,' said Mr Krijgsman. 'When trailing, at 2knots-3knots, very low propulsive power is needed but a lot of dredging power, so a combination should be considered. Again up to 30% of the power can be demanded by the auxiliaries, so it might be interesting to look at diesel electric or other solutions.'

The Royal Institution of Naval Architects

DESIGN & CONSTRUCTION OF VESSELS OPERATING IN LOW TEMPERATURE ENVIRONMENTS

30 - 31 May 2007, RINA Headquarters, London, UK

Second Notice

Vast reserves of oil and gas are expected to be exploited in the Russian Arctic, including the Barents Sea, the Pechora Sea and Kara Sea. There are also new gas fields being developed on the Yamal Peninsula. There is a need for large tankers, LNG carriers and associated support vessels to transport the oil and gas and maintain operations in these far northern locations. Increasing numbers of passenger ships are also operating in low temperature environments.

Vessels operating in the Arctic regions are exposed to a number of unique demands. The pressure of first year and multi year ice imposes additional loads on the hull, propulsion system and appendages. New designs have evolved such as the Double-acting principle. The extreme environmental conditions can also have significant effects on vessel systems and machinery.

Low temperatures and poor visibility can have profound effects on the crew and vessel operations. Current operational experience in the Arctic is limited to much smaller vessels than those that are envisaged. There is great probability that new owners and operators without operational experience in these harsh conditions will enter the market. This will impose a need for guidance for these owners and operators, as well as shipyards building vessels for cold weather service.

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Bakker motors on

SYSTEM integrator Bakker Sliedrecht has been making significant strides to supply new generation frequency drives to the marine market.

Its latest products are more compact than ever before, while all-enclosed drives mean no air or dust can penetrate the cabinets that protect components. It is also no longer necessary to put the frequency drives in a climate-controlled area or room, so that no special spaces are required.

Dredgers have for many years taken the largest slice of Bakker's business, but part of the company's recent workload has seen it focusing on the booming offshore market. The company is supplying drives for three Subsea 7 vessels under construction at Merwede Shipyard.

Here, Bakker is working in combination with cabling company Croon as a partner in the turn-key electrical supply for diesel electric powered two pipelayers, offering lift capacity of 400tonnes and storage capacity for flexible pipes carried by two 1250tonne carrousels below decks and by a 3000tonne carrousel on deck, and one diving support vessel. Bakker is specialising in high voltage equipment and drives, power generation, and electric propulsion, and Croon is offering the complete installation of electrical systems. A large part of the automation will be supplied by Kongsberg, with the two partners responsible for implementation.

Scope of supply includes delivery and installation of generators, propulsion motors, frequency drives, high and low voltage power distribution systems, CCTV, lighting, communication systems, fire alarm systems, DP and ship management systems, and all other electrical systems.

With sea trials due in May for the first of these vessels, and the second due for September delivery, these first two DP2 ships in the series are to be rigid reeled pipelayers of 157m long and 28.4m wide. They will be able to position pipes at a depth up to 3000m below sea level.

The ships will feature completely redundant diesel-electric propulsion from Bakker, with two separate enginerooms, two propulsion rooms and two switchboard rooms. The main 6.6kV integrated redundant electric power, generating 21,600kVA, consists of six alternators, which power the electric drive thrusters, the pipe-lay installation, and the ship's crane through a combination of transformers. The thrusters are controlled by Bakker direct water-cooled frequency converters.

Subsea 7 – a landmark project for Bakker Sliedrecht.

The electrical propulsion system consists of three 2950kW fixed pitch propellers in azimuthing nozzles aft. Two 2400kW retractable azimuthing thrusters will be fitted in the forward part of the vessel, with one 2200kW transverse thruster arranged in a tunnel forward.

Huisman-Itrec, of Schiedam, is delivering the pipelay equipment and the offshore crane.

The third vessel in the series, due delivery in mid-2008, is a diving support vessel with a DP3 notation, which will demand Croon to develop cable separation to the wheelhouse, although Bakker said its scope of delivery, which includes all drive systems including propulsion, would more or less the same as for the first two projects.

Bakker is also involved in supplying crane drives and diesel-electric side thruster systems for the latest pair of innovative 800tonnes mast crane heavylift vessels under construction for Jumbo Shipping at Damen Shipyard in Galatz, in Romania, and due for delivery next year.

In this case, the frequency drives for the crane drive are air-cooled, while the two 1500kW units for the bowthrusters and the 1700kW unit for the azimuthing thruster are water-cooled.

Bakker is also delivering and commissioning the Kongsberg DP system, whose energy supply consists of two shaft alternators of 3750kVA and two auxiliary engine-driven alternators of 2280kVA.

Also initiated at Damen Galatz are two 80m multipurpose vessels for the Swedish Coast Guard, for which Bakker is supplying frequency drives including switchboards. Here, Bakker is delivering the Kongsberg vessel management system and developed a diesel-electric propulsion concept that features a redundant energy generation and propulsion solution of five main generators, two 3300kW propulsion motors, a 415kW tunnel thruster, and a retractable thruster of 850kW.

Further afield, and denoting that dredgers continue to form a mainstay product line, work is progressing at China's Xinhe yard, Tianjin, to build two cutter dredgers for Jan De Nul. In this case, Bakker is delivering the complete drive package, including switchboards, control desks, frequency drives, and assistance on site.

Versatility is name of Vuyk's game

VUYK Engineering Groningen stresses that it does not wish to become a niche player. Vuyk deputy director Hans Karel Stam emphasised that the company saw its biggest challenge as realising that there was never a niche where the naval architect was safe.

'As soon as a ship type becomes a niche, it becomes attractive to others,' he said. 'So the biggest test is staying ahead of the game. A lot of the designs we sell today were concepts two years ago.'

The company reports a surge of interest in megayacht design, but it is keen to maintain a broad portfolio of ship types. It is also working through a slew of projects for cargo and passenger carrying ships, with over 30 vessels in total under construction to its designs.

'We are not going to say we've found megayachts and we're going to focus on megayachts,' said Mr Stam. 'We could just as easily present a low cost bulk carrier.'

Among the cargoships on order to Vuyk design are a pair of heavylift vessels under construction at Lloyd Werft for Bremen-based Harren & Partner. Harren & Partner is putting financing together to cover a third ship in the series, and is contemplating a fourth.

Alongside these, Vuyk-designed ships under construction will include a four plus four options order for 3300dwt, 3100tonne cargo capacity multi-purpose vessels to be built in Vietnam, brokered for eight different shipowners through Dutch company Seatrium, in a first deal to cover a construction contract in that country involving Vuyk.

Vuyk said it was also close to a design deal covering between four and six 3200dwt multi-purpose ships that would be designed to sail with open hatches, with bilge capacity adapted accordingly and its depth increased over a conventional vessel of this size. All seakeeping tests had been done for the ships, Vuyk said, with Marin acting as the partner.

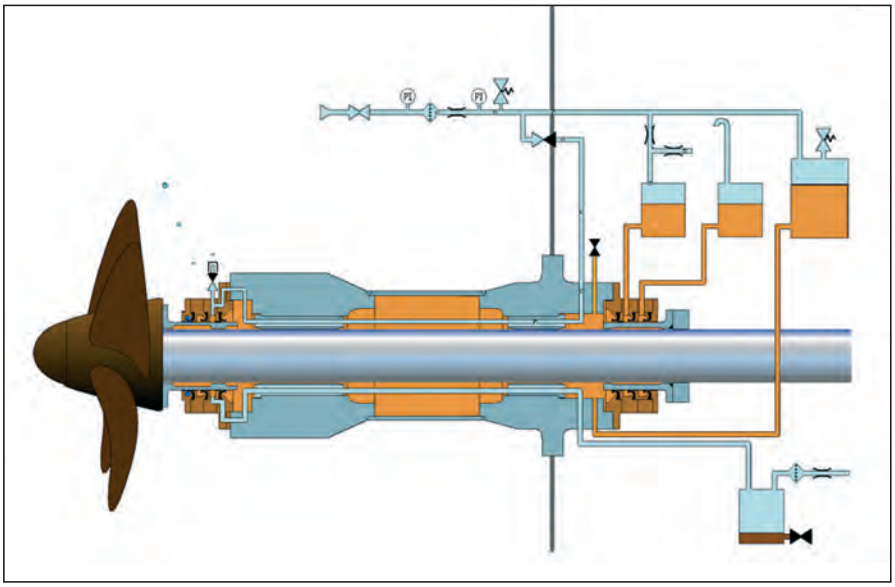
The idea was to develop a vessel versatile enough to carry conventional cargoes, but also appropriate as a low cost option for offshore supply charters. Discussions were ongoing with owners over whether the ship should be geared, and what dynamic positioning capability would be specified. Novel designs also include a small, 130m-long cruiseship for river and shortsea operations.

Zero emissions is SUPREME achievement

WITH SUPREME Ventus, IHC Lagersmit reckons to have developed a stern tube sealing system that offers zero-emissions, in order to protect the marine environment. But this is also a product imbued with increased reliability, due to its lower pressure differential across the sealing rings, the supplier says.

Lower pressure means lower ring-loading and minimised friction and heat generation, in turn ensuring long term, stable seal performances. The SUPREME Ventus can be delivered with both three (SUPREME standard) and four sealing rings (SUPREME SeaGuard).

To achieve zero-emission, a barrier must be formed to isolate the stern tube lube oil from seawater. The SUPREME Ventus system uses compressed air to form such a barrier. The chamber between the oil-sealing and water-sealing section of the aft seal is kept under a constant air pressure, almost equal to the seawater pressure. A newly developed air release valve continuously measures seawater pressure by spouting air into it. The stern tube lube oil pressure is kept at a slightly higher pressure than the seawater pressure. Any fluids that may enter the aft seal air chamber are actively drained by a collection unit.



SUPREME Ventus – the stern tube sealing system offering zero-emissions, but also increased reliability, according to IHC Lagersmit.

In detail, the SUPREME Ventus stern tube sealing system consists of an air supply unit, an air release valve, a drain collection unit, a pressurised stern tube LO tank, an aft seal assembly, and an optional forward seal assembly.

The air supply unit reduces the air supply pressure onboard to sea-water pressure levels. Pressure reduction is achieved by a fixed restricting orifice, so no initial settings or adjustments are necessary. The air supply unit feeds air both to the air chamber in the aft seal and to the stern tube lube oil tank.

The newly developed air release valve is fitted on the aft seal air chamber. Through this device, air is spouted into seawater. The special design prevents flooding of the air chamber in case air pressure is lost. Since no water can come into contact with the actual valve, there is no risk of fouling. The air release valve is fully self-recovering - once air supply is restored after a black-out, the system automatically resumes normal operation.

A small amount of air from the aft seal air chamber is vented through the drain collection unit, creating an active drain system. Any sea-water or oil entering the aft seal air chamber is 'blown' to the drain collection unit, thus preventing any leakage of oil into the sea-water or any water ingress into the stern tube. Since air flow through the drain connection unit is established by means of a fixed restricted orifice, no initial settings or adjustments are ever needed. By taking samples at regular intervals, the condition of the sealing system can be monitored.

Stern tube lube oil pressure is controlled by the air supply unit and automatically follows any changes in the ships' draught, thus ensuring optimum loading conditions for the oil-sealing section of the aft seal.

Where other air-type systems are only applicable to the aft seal, the SUPREME Ventus pressure control feature can also be used to improve sealing performance of the forward seal. At present, large draughts and large shaft diameters still impose heavy loads on the forward seal rings. The supplier says that the optional three-lip type forward seal combined with the SUPREME Ventus system distributes the load evenly between two seal rings, thus halving the load per individual seal ring. This considerably lengthens the lifecycle of this seal, IHC Lagersmit says.

The SUPREME Ventus zero-emission system can be incorporated into all existing SUPREME seal types.

HSH keeps pace with boom in gas

IF these are busy times at gas gauging specialist Henri Systems Holland, current orders suggest that there are busier times ahead.

The company supplied some 200 gauges in 2006, 25% above its output for 2005, and now claims to be by far the largest supplier of floating type level gauges for gas carrier applications, in the world. It commands an estimated 75% of the global liquefied petroleum gas carrier market, with all of the LPG carriers currently under construction at Hyundai Heavy Industries, for example, specifying HSH equipment.

HSH managing director Henk W Hetebrij expressed expectations that 2007 would see 'at least' the same level of production as 2006, with 2008 also expected to 'at least' match that output again. He said his company had orders for gauges into 2009 and 2010, with around 80% of demand flowing from the LPG sector.

He said customers were increasingly specifying level gauges with their own internal spring motor, in order to guarantee the availability of a local read-out, even in the case of a complete black-out.

HSH has also redesigned its level gauges, adding the Floating Type Level Gauge 807, featuring 25% larger read out digits, in order to enhance readability. Introduced at the beginning of 2006, the company closed the year with orders for more than 340 FTLG 807 level gauges for over 50 gas carriers.

Again, its latest model features a new float, said to be suitable for every application ranging from temperatures as low as -163°C and pressures of up to 20bar, whereas previously it offered separate floats for refrigerated applications.

Mr Hetebrij said the next task had been to develop the FTLG 808, which was specially made for tankers used for river transportation.

The company also has a smaller, but growing portion of the liquefied natural gas carrier market. Since its first LNG reference through Fincantieri in the mid-1990s, HSH has seen its orders take off in South Korea since 2000. It has now delivered or has on order 30-40 LNG ship-sets through Daewoo Shipbuilding and Marine Engineering, with a current order backlog through the yard covering 10 ships. HSH is also supplying its gauges for installation onboard the first LNG carriers to be built by Shanghai's Hudong Zhonghua Shipyard.

Marine ambitions from PPG

INVESTMENT in production, distribution, and product development after the US group's acquisition of Ameron's marine and protectives coatings business.

THE US$115m acquisition of Ameron International's performance coatings and finishes business by PPG Industries last August saw the formation of a new unit for PPG, expanding its protective coatings business into Europe, Africa, Middle East, and Australia, and bringing the group fully into the marine sector.

The acquired business employs around 700 people and recorded sales of US$210m in 2005. It operates manufacturing sites in the United States, Europe, Australia, and New Zealand, in addition to warehouses and offices around the world. The agreement also included Ameron's 40% ownership in Oasis-Ameron in Saudi Arabia.

PPG's protective and marine coatings group in Europe is now managed by PPG Industries Netherlands BV, whose location affords same-day communication opportunities with both the Far East and the Americas.

Wim ven Leeuwen, PPG protective and marine coatings marketing manager Europe, said the acquisition had been wholly positive for marine activities. 'PPG is one of the largest paint manufacturers in the world but it did not have a global protective coatings and marine business,' he said. 'Acquiring the business brought added value technically and PPG wants to grow the business aggressively. We will grow in the marine and industrial markets and add to our production and distribution network.'

Production for the marine market will soon start in China, with a first marine contract in Vietnam due to be supplied from China, while protective coatings production will be added to established Indian production.

A first newbuilding contract has also been secured in South Korea, covering a series of floating production and storage offloading vessels and chemical tankers to be built at Daewoo Shipbuilding and Marine Engineering. Marine coatings will be supplied via the PPG factory in Busan.

The company markets a full range of marine coatings, including tank linings and deck paints. Its tributyl tin-free, self-polishing anti-fouling offering, ABC3, was introduced as long ago as 1985, which meant that the product had a long track record by the time the International Maritime Organization arrived at its anti-fouling convention in 2001, looking to ban TBTs. This is a five year system claimed to perform well in motion, but also in static condition, because it is applied in combination with a water soluble binder that makes speed irrelevant. The company sees no pressing need to develop a product to supersede ABC3.

However, in the more competitive three-year coatings life market, the company says there is a continuous need to assess the 'biocide package' in maintaining the balance between product performance and price. Its ABC4 anti-fouling coating, launched five years ago, is also a self-polishing paint based on cuprous oxide, but including higher co-biocide content. PPG Netherlands said it was looking to develop alternative co-biocides in this market, without going into further detail.

While the EC last month effectively threw out Dutch tests purporting to show alarming levels of copper concentration in the environment, ruling that copper's bio-availability had not been factored in, copper concentration is still a hot topic. The US Navy has encouraged suppliers to develop products which limit copper leaching to 10mg/cm^2 per 24 hours. PPG's product in this case is ABC7, currently on test in Europe, in case the limitation comes into force, so that the company has a product on the shelf. PPG said it had modified the binder for ABC7 in order to limit copper leaching. It said that it considered 10mg/cm^2 per 24 hours to be the limit in terms of product effectiveness.

The alternative to the self-polishing system is, of course, foul release technology, where PPG offers a silicone-based product for ships operating at over 14knots. However, PPG protective and marine coatings manager, technical services and engineering, Rudi de Rijcke, stressed that non-toxic, foul release coatings were subject to a number of limitations that 'should not be underestimated'. These included mechanical weakness, overspray occurring during application, and problems with overcoating. In contrast to certain competitors, he said the market for such coatings was 'rather small'.

Veth takes on all comers

DUTCH thruster and rudder propeller supplier Veth Motoren is holding its own against significantly larger competition, and reckons to have doubled its thruster output over the last four years, to around 200 units per year.

In fact, the Veth orderbook is filled for the next 14 months, where its more customary lead time is to be working three to five months ahead. Plans are afoot to purchase land near its plant in Papendrecht and build a new 50m by 24m workshop before the end of 2008, with a view to doubling capacity to produce thrusters of all types.

This should open the way for Veth to take forward its aggressive product extension plans, which include a scheme to raise the capacity of the rudder propellers it supplies from its biggest to date, at 1250kW, to as high as 1800kW.

The company's latest coup saw 55 Veth-Jet bow thrusters selected by the US Navy. The equipment is being installed as part of the US Navy's plans to renew its landing craft. The order provides another significant reference for the equipment, whose horizontally-mounted propeller draws water up from underneath the vessel and, through a 360° rotating drum, bends the water flow by 90° and guides it (in the case of the US Navy) into one, two, or three channels to manoeuvre the vessel. Here, the third channel can be used for braking or for emergency propulsion.

The deal followed extensive testing by the Navy of two Veth-Jets in extreme conditions, during which the fact that no parts protrude from the ship's hull came into its own – in short, no damage could be done to the equipment.

The first 20 Veth-Jets, driven by Caterpillar C18 engines and featuring a propeller diameter of 1180mm, have already been delivered, with the rest to follow over the next three years.

Veth said the US Navy had demanded special features as part of the order, with the Veth-Jet needing to be supplied with an integrated disc clutch to match the ones Veth Motoren uses on its Z-drives. Other special features included electrical steering as well as manual steering, while special attention needed to be paid to the oil and cooling systems to achieve normal operations at high and low temperatures.

Veth Motoren is ramping up production to meet demand. Pictured is one its larger Veth-Jet units.

With production of its established products booming, Veth presented the 'Veth Steering Grid' at the last SMM, but has been obliged to put the brakes on sales for the time being, to around 10 units. This is a 360° rotating bow thruster whose major benefit is, once again, that with a minimal draught the maximum thrust can be achieved without parts protruding through the ship's hull.

The first installation of the Veth Steering Grid has been onboard the 135m-long by 11.4m-wide inland cargo vessel *Innuendo*, linked to owner Rensen.

Such is the demand for its stock in trade products that another recent innovation from Veth has gained little in the way of wider recognition. Specifically targeting the inland market, Veth has developed a patented telescopic spud, mounted forward and aft, to hold inland ships in the stream to depths of around 10m. It features a side-cylinder instead of conventional winch, so that the vessel can 'ride' the water while remaining in position. This system has already been fitted to 40 inland ships – most of them built for the Chinese market.

Environmentally-friendly deck clicks into place

DECK specialist Bolidt has introduced a sectional prefabricated version of its environmentally-friendly Bolideck Future Teak system, especially developed for rapid onboard installation.

Bolidt 'Click Deck' is the latest version of the material designed to look and feel like real teak while maintaining a 'neutral carbon footprint'. It is said to be particularly appropriate for ships' balconies, where deck installation or refurbishment can be a logistical nightmare.

Bolidt Click Deck is a modular system and, the supplier claims, is the industry's first, IMO-rated sectional 'click deck' system. 'This means it provides permanent corrosion protection, has a stiff surface, and is recyclable', says Bolidt.

The Click Deck balcony finish can be installed in less than one hour. 'So while passengers are having a shore excursion, the system can be applied or, in the future, removed for renovation or deck inspections. The installation is free of noise, smells, and dust. So it causes no disturbance for passengers in adjoining cabins.'

Click Deck consists of prefabricated sections, factory produced in The Netherlands and including the specified Bolideck finish. Sections click together in widths of 500mm and are end-fixed by using a special profile.

Bolidt introduced its Bolideck Future Teak material to the cruise industry two years ago, since when it has become the recognised alternative to natural teak for many owner's decks. The supplier said that, since introduction, it had supplied 8000m^2 of Bolideck Future Teak but that, in April 2007, it was due to supply the same amount of material again in a single month. Indeed, all of the cruiseships docked in April worldwide were due to be fitted with Bolideck Future Teak outdoor decking, according to the supplier, including Royal Caribbean's *Grandeur of the Seas* and *Journey of the Seas*, the Celebrity ships *Mercury* and *Millennium*, Princess Cruises' *Royal Princess*, and *The World* of ResidenSea.

HRP in power surge

DEMAND for larger power ratings for its thrusters systems is currently on the minds of managers at HRP. While its current range tops out at 2000kW, it has a larger 2500kW version ready for launch.

However, the company is convinced that any move up the power chain must not come at the expense of its strength in the market for smaller thrusters, of 200kW-1000kW, where HRP's Henk Terlouw says its market share is 'untouchable'.

Besides, he observes, the market for larger thrusters that is currently mainly the preserve of larger corporations, is subject to the vagaries of the offshore market. While this might be booming today, it will inevitably be subject to downturn, but the market for smaller thrusters will remain.

According to the company, the market continues to perform strongly. Output from its plant in Krimpen sustained double digit growth in both 2005 and 2006, not only because of brisk demand for new vessels, but also due to the expansion of the range of vessels which apply steerable thrusters for their propulsion.

Having witnessed double digit growth in its output for two years running, HRP recently doubled its production area at Krimpen.

Accordingly, HRP has doubled its production area in Krimpen, while its subsidiary in Indonesia has tripled the size of its facilities.

Its latest innovation saw the development last year of the patented shallow draft thrusters, used to optimise manoeuvrability of ships in shallow water and particularly appropriate for the offshore supply vessel sector.

Among recent landmark contracts has been the supply of HRP5000 thrusters, rated at 800kW each, to provide the main propulsion equipment for a tug under construction at the Erin Shipyard, Brazil.

As far as longer vessels are concerned, recent deliveries have included two HRP5111WM well-mounted azimuthing main propulsion units for the VB Shipping vessel *Jero*, a 135m-long river going vessel. Here, the thrusters offer rated power of 700kW at 1940rev/min.

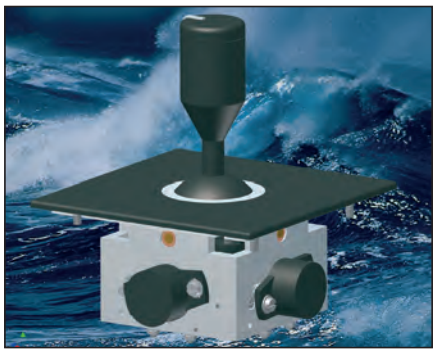
Four well-mounted azimuthing thrusters are also installed onboard the 97.5m-long 120TEU capacity containership *RMS Kiel*, the first of the innovative island vessel dubbed the 'Futura Carrier' concept to be delivered to New Logistics. In this case, the HRP5111WM thrusters were rated to 600kW each at 1800rev/min.

Smooth line controller from Kwant

KWANT Controls has launched a new joystick that dispenses with the customary heavy duty workmanship associated with 'harmonica'-type rubber housing.

The Sneek-based company said its new X-Y-Z joystick was flush-mounted from below the control panel, with only a thin, stainless steel ring and the joystick itself showing above its box. This meant that the dashboard design was not compromised by the 'usual black rubber harmonica' and therefore did not interrupt the design lines and intended colour scheme expressed by the naval architect, the company said. Instead, the head of the joystick could be tailored to customer's design.

'The fine mechanical design guarantees smooth operation of the joystick and, due to the low rotating point, the operator's hand can rest low on the dashboard, thus enhancing ergonomics,' the company added.



The new 'harmonica'-free joystick from Kwant.

Ned-Deck reaches out

LIFE-saving equipment supplier Ned-Deck Marine (NDM), of Barneveld, has taken over the business and product lines of SEC Davits, which manufactures a range of davit systems and SOLAS winches.

The acquisition strengthens NDM's life-saving equipment offering for all marine market segments, including the cruise and ferry market. NDM said it would continue to produce SEC Davits for SEC Davits' current purchase order file.

SEC Groningen would remain the manufacturer and supplier of the Ten Horn winches and capstans, the POOL anchor, Fairtrans Mooring Equipment, and Arkona emergency towing systems.

NDM will continue to produce SEC Davits for SEC Davits' current purchase order file.

Although the production of the dedicated products will be strictly divided between both companies, it was their joint goal to offer the possibility of ordering complete packages of deck equipment, giving clients all advantages of one stop shopping, the new parent said.

The NDM group has four companies in Eastern Europe, Vietnam, and The Netherlands.

CMD's rapid start

THE newly-established engine manufacturer, CSSC-MES Diesel Co Ltd (CMD) has quickly filled its order books with 61 large-bore low-speed diesel engines. A licensee of MAN Diesel and operating in China, CMD will produce 98cm-bore engines, initially building eight MAN B&W 8k98MC models, with the first due to be delivered by the end of October this year.

The engines are bound for the Jiangnan shipyard, China, for use onboard ships operated by the Chinese state-owned shipping company, COSCO. The CMD order comprises an additional series of 80cm- and 90cm-bore engines, due to be utilised onboard large containerships and VLCCs.

CMD is a joint venture between the China State Shipbuilding Corporation (CSSC), Hudong Heavy Machinery, an independent division of CSSC, and Mitsui, the Japanese ship and engine manufacturer.

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Sales for coatings company

THE 2006 Hempel Group annual report was recently published, and showed that total revenue had risen by 19% from €655m in 2005 to €780m in 2006. Total paint sales were also up from 225m litres in 2005 to 244m litres last year.

The protective business grew in all markets, especially within the oil and gas segment. Marine sector sales rose by 12%, with full order books for vessels in Asia and Europe.

However, the container market started slowly, following on from a 22% demand decline in late 2005, but finished strongly in the latter half of 2006.

Record increases in the cost of raw materials, such as copper, zinc, and crude, had a negative impact on gross margins, which meant that Hempel was not able to maintain profit margins. Overall higher operating profit in 2006 was therefore achieved by a planned organisational alignment and cost cutting, producing an improvement in the Group's productivity.

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Dyneema collaborations

SAMSON and Dyneema have joined forces to create a tug and mooring line which is claimed to contain the same strength as equivalent wire lines at a fraction of the weight. Quantum-12 is comprised of DSM Dyneema's SK-75 fibre, and Samson's patented DPX fibre.

The combination of the two is said to provide superior strength and abrasion resistance, and a higher coefficient of friction than standard high modulus polyethylene fibres, enhancing the rope's ability to grip capstans or bitts. The flexible 12-strand construction allows the line to conform to surfaces, rendering additional grip.

Quantum-12 is claimed to be light, easy to handle, buoyant, highly visible, and very durable. It can be used in multiple applications, such as on winches for lifting and lowering, a mooring line, or a tug working rope, and is available in sizes up to 120mm diameter and strengths of up to 816tonnes.

Dyneema has also worked together with Swiss offshore pipelaying company, Allseas Group, to improve the safety and speed of underwater pipelaying. The two companies aimed to replace steel wire rope to adjust pipelay stingers with a new product from Bexco ropes, which is manufactured using polyethylene Dyneema fibre.

The new rope has already been installed aboard Allseas' pipe-laying vessel, *Audacia*, and is claimed to enable faster, easier, and safer operations.

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New orders for MacGregor

Cargo access and ramp equipment will be supplied by MacGregor's ro-ro division across several different orders.

Aker Yards has signed a contract with MacGregor for cargo access equipment due for use onboard the world's largest ro-pax ferries. Stena Rederi AB has ordered two 62,000gt ships with an option for two additional vessels, which will be built in Germany by Aker MTW. The 240m-long, 32m-wide ships are scheduled for delivery in 2010 and will contain 5500m of trailer lanes, 700m of car lanes, and a passenger capacity of 1200 persons.

MacGregor's order includes the design, fabrication, and installation of 800tonnes of ro-ro equipment, representing one of the biggest contracts undertaken by the ro-ro division.

Another cargo access equipment order is for Wightlink, for a newbuilding taking place at Croatian yard Brodogradilište Kraljevica dd. These two 62.4m-long symmetrical double-ended ferries will be able to carry up to 360 passengers and 65 cars at a speed of 10knots – 12knots.

This MacGregor contract will be in co-operation with steel equipment manufacturer Radez dd, and the new ships will replace two older versions on Wightlink's Lymington/Yarmouth route in 2008.

Finally, four new PCTCs, due for delivery from 2009 onwards, being built at Kyokuyo Shipyard Corporation, Japan, for Norwegian owner Gram, will be fitted with MacGregor's equipment. The order comprises a stern ramp, a quarter ramp, two ramp covers, three internal ramps, and 10 hoistable car deck panels.

All internal equipment will be operated by electric drive, which is claimed to be an environmentally-friendly solution for operation, avoiding oil leakage and damage to cargo.

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CAD e-book update

THE e-book, 'Tailoring AutoCAD CUI 2008' has been updated by upfront.eZine Publishing Ltd, in conjunction with the release of AutoCad 2008 software from Autodesk. The PDF e-book is aimed at anyone who wants to customise the user interface of AutoCAD 2008 with its CUI command.

Changes to the CUI command in AutoCAD 2008 are detailed in the e-book, along with updates to all screen grabs and methods, and a chapter on customising dashboard panels. It also includes coverage of CUI, QuickCUI, and all related system variables, as well as step by step tutorials and tips.

The e-book is available as a single Adobe Acrobat file for delivery via e-mail, ftp, online, or on CD. The price is $13.20 for electronic delivery, with an additional $5 for postal delivery on CD.

Contact: upFront.eZine Publishing, Ltd, 34486 Donlyn Avenue, Abbotsford BC V2S 4W7, Canada. www.upfrontezine.com/tca

Caterpillar moves in Asia

THE regional headquarters for the Asia Pacific division of Caterpillar Marine Power Systems has moved to a new Shanghai office. The Caterpillar Marine Center building at Yan'an West Road is also the location of Lei Shing Hong Machinery, Caterpillar's marine dealer for eastern China.

The move to a larger office in Shanghai has seen the number of Caterpillar staff rise to 30, and new advanced capabilities of the centre have secured contracts for 16 MaK 7 M43C propulsion engines for a series of chemical tankers, ordered by Aquarius Marine Consulting, Germany, and built at three different Chinese shipyards.

Other recent contracts include four MaK 9 M43C engines built at Jiangdong Shipyard for SSW-constructed 1000TEU container carriers ordered by German shipping company Jüngerhans, and MaK 7 M43 main propulsion

Caterpillar Marine Center, Shanghai.

engines plus Cat 3508B generator sets for a series of four combination gas carriers, to be operated by I M Skaugen, Norway.

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Meshing software update

A NEW version of simulation software for the analysis of polymer processing and glass forming has been released. Polyflow 3.11, by Ansys Inc, extends the library of viscoelastic models by adding the Leonov viscoelastic model, and a simplified viscoelastic model for extrusion. The latter model requires six times less memory and could run 15 times faster for typical extrusion processes involving free surface.

For thermoforming and blow molding applications, Polyflow 3.11 offers a thermo-mechanical stress capability to calculate deformations during cooling, and enhancements to the 3-D adaptive meshing technique are claimed to make the simulation of glass pressing and blowing faster and more robust.

Polyflow is part of the Ansys suite, derived from the company's acquisition of Fluent Inc in 2006, and the software is designed to improve the quality of extruded, blown, and thermoformed products by electronically running trial and error processes, rather than on the production line. It is claimed that customers will also be able to speed up their design process.

Polymer thermoforming and blow molding can be aided with Polyflow by calculating deformation and stress after cooling. It creates a 3-D geometry out of the deformed shell, and the calculated thickness can then be used for advanced shrinkage and warpage simulation with structural codes. Additionally, it allows the user to conduct some simple thermo-mechanical stress and deformation analyses to obtain a qualitatively good estimation of these quantities.

Enhancements made to Polyflow's 3-D adaptive meshing techniques are claimed to help maintain a good mesh and results quality, while reducing the computational time.

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Metallurgical co-operation

Two UK companies have entered into an agreement to share their specialised skills and resources in the field of metallurgical consultancy. The deal between Atlantic Engineering Ltd and marine consultants Brookes Bell is intended to provide both companies with increased capability and resources.

Atlantic Engineering struggled to find suitably qualified metallurgists in its local Merseyside area to join its expanding operation, and so turned to Brookes Bell to use its expertise in advising on a wide range of marine casualties. Brookes Bell itself was searching for laboratory facilities, and through this deal can now access Atlantic Engineering's metallurgical equipment.

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The Modulift spreader system.

New version of ship design program

SHIP stability and structural assessment software programs, 'Paramarine' and 'Seagoing Paramarine' have been updated by GRC, a subsidiary of QinetiQ. Enhancements to the packages include new modules intended to be useful for ship designers and operators.

One of the modules in 'Paramarine' is 'Design for Production'. Used in conjunction with the 'Concept' and 'Structural Definition' models, it can generate a product model of every single item required for ship construction - from individual plates to weld junctions.

This can also identify specific construction issues, such as whether dockyard facilities have the capacity to meet a ship's build requirements, and it can also create a detailed cost assessment. Changes are automatically accounted for, allowing alternative design arrangements to be investigated in detail.

'Seagoing Paramarine' is being evaluated onboard HMS *Monmouth*, especially the ship structural analysis feature, jointly developed by the UK MoD's Sea Systems Group, QinetiQ, and BMT Defence services. In support of this, the 'Paramarine' structural definition and analysis modules have been enhanced to allow for the creation of more detailed and accurate ship structural models.

'Paramarine' also includes sea-keeping analyses, with two sea keeping codes being integrated into the program. They are: PAT-2000, developed by GRC, QintetiQ, and Southampton University/ Hydrotech, and secondly, ProteusF, from Strathclyde University/Safety at Sea Ltd.

Other updates for this new version include an increase of up to 300% in computational speed, an upgrade to the 'Powering' module with new high-speed resistance prediction methods, advanced methods for evaluating the endurance of ships and submarines, and the launching calculations incorporate the McNeil Method. 'Paramarine' is used by the UK MoD and maritime industry, as well as in the USA, Canada, Norway, France, and Pakistan.

Contact: Graphics Research Corporation Ltd, Baker Building, Haslar Marine Technology Park, Gosport, Hampshire PO12 2AG, UK. Tel: +44 23 92 334003. Fax: +44 23 92 334004. E-mail: sales@grc-ltd.co.u

Heavy lift vessel Modulift

CLIPPER Elite Carriers' (CEC) 9000dwt multipurpose container/heavy lift vessel, CEC *Century* is to be fitted with a Modulift spreader system. This order follows the successful installation of 18 Modulift sets by operator Flamar, onboard other CEC owned vessels.

The Modulift modular spreader system is flexible and can be used for lifting loads of varying size and weight by bolting together different sections of the beam itself to make different sized spreaders. This is in comparison to traditional spreaders with only one use.

CEC has chosen two sets of type Mod 110 from the Modulift heavy range, with each set having a span capability of 7m, and can be joined together for a span of 12m and a load capacity of 100tonnes. The Mod 110 is aimed at lifts with longer span requirements, and also has an increased load capacity as a result.

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Radar package for tankers

A CONTRACT has been signed between Northrop Grumman Corp and Norwegian shipowner Odfjell ASA for the installation of radars and other navigational systems aboard Odjfell's fleet of parcel tankers. The equipment will be supplied by Northrop Grumman's Sperry Marine division.

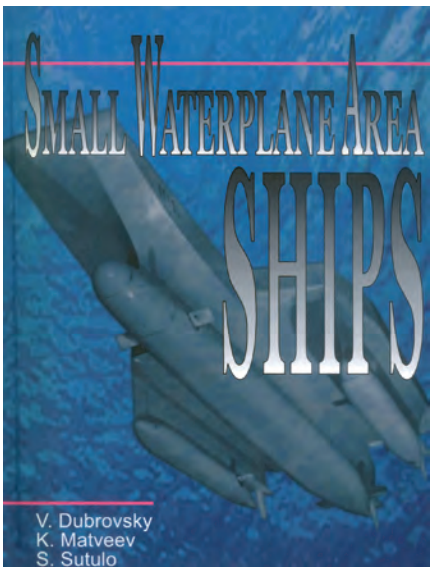
The initial order is for 20 Sperry Marine VisionMaster FT radars to be fitted on ten Odfjell ships, with options for additional radar purchases for other ships in the fleet, as well as voyage data recorder and electronic chart display retrofits on existing ships.

Odfjell's fleet consists of 123 ships and newbuilds, transporting chemicals and other specialty bulk liquids, with a total capacity of about 3.4 million deadweight tonnes.

Contact: Northrop Grumman Sperry Marine, 1070 Seminole Trail, Charlottesville, VA 22901, USA. Tel: +1 (434) 974 2656. E-mail: sales_commercial@sperry.ngc.com www.sperrymarine.northropgrumman.com

Three generational eye-opener on waterplanes

Small Waterplane Area Ships, by V Dubrovsky, K Matveev and S Sutulo, ISBN-13: 978-09742019-3-1, US$149. Hardback, 255 pages: 7.5"x10", Backbone Publishing Company.



THIS is an unusual book. The three authors represent three generations of Russian naval architects. Dubrovsky is the main author and his long involvement in the Krylov Ship Research Institute is clear throughout the pages. For instance there is a chapter on gas injection for drag reduction – a technology that has been put to practical use in Russia yet is hardly known elsewhere. Apparently it is also applicable to small waterplane area ships. The book is not just about SWATHs, the title gives the clue; the 'twin hull' bit is missing. So all manner of futuristic single, twin, and triple hull forms are discussed all having a common goal of possessing a small waterplane area. The simple principle of such forms is that the seakindlyness can be massively improved over a monohull or a catamaran.

The book is a companion to '*Multi-Hull Ships*' and '*Ships with Outriggers*' by Dubrovsky (and Lyakhovitsky in the first one) and is in similar eye-opening vein to any naval architect interested in innovation. Be sympathetic to the odd strange word or typo and the paucity of guidance on nomenclature. This loss is made up fulsomely by a mass of 'rules of thumb' a tool which this reviewer thinks is an essential antidote to the six decimal point 'accuracy' of the computer!

So this book is unusual. There are chapters that you might expect like General Arrangement and Hydrostatics (but not much on damage stability) and Resistance (not much on propulsion though) Seakeeping, Manouvering, and Structural loads. Then there is a chapter on Design but strangely only one actual SWATH is written about in any detail. Not many existing SWATHS are even mentioned throughout the book. The chapter deals mainly with detail design of a mythical fast frigate. However what I have skipped over is the wealth of model test data included in the Resistance chapter. There are so many variables compared to a monohull, the optimisation of the hulls, the struts (two or four) and hull spacing, is complex.

There is also a lot of resistance data in the appendices, for example, interaction coefficients for the various forms of small waterplane area ships. Wave profile along the sides is a subject of another appendix and also a review of seakeeping standards. There is a large appendix on hydrofoil hydrodynamics and another large one entitled 'Mathematical models of SWATH Dynamics'. This chapter includes a section on stabilising control surfaces. And finally one on the resistance of Semis (which are actually SWATHS). A large number of references close the book.

A fascinating book but one that could be enhanced by photographs and examples of existing SWATHS. Also as someone who has designed several SWATHS, this reviewer feels that many practical aspects should have been discussed including the subject of weight control on such draft sensitive vessels.

Nigel Warren

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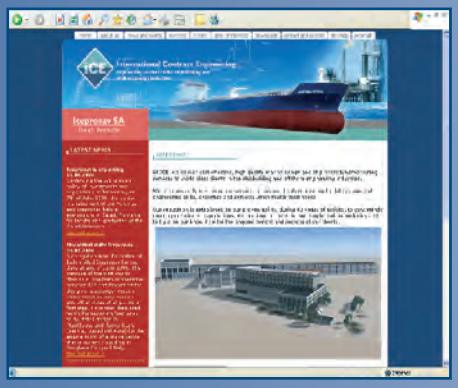

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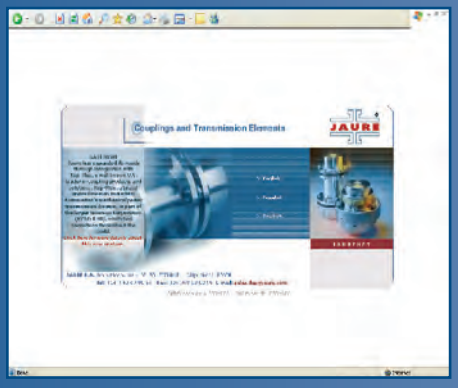

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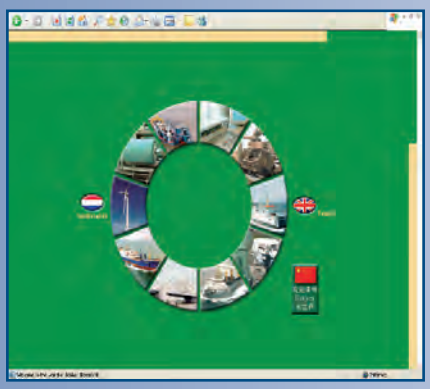

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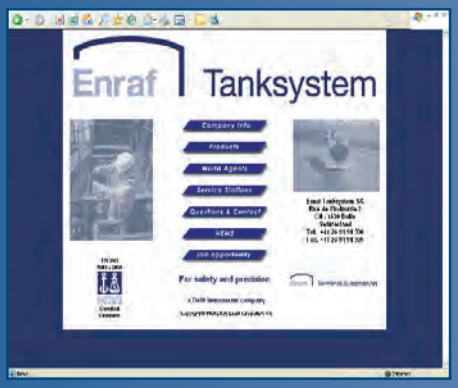

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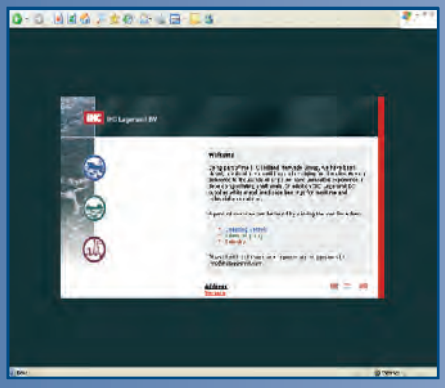

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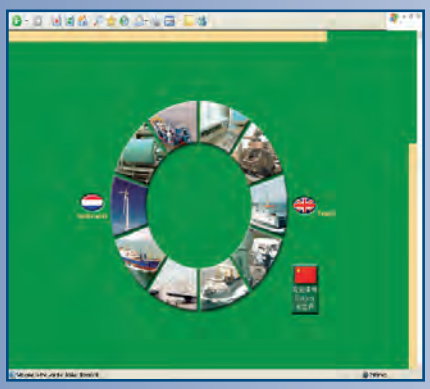

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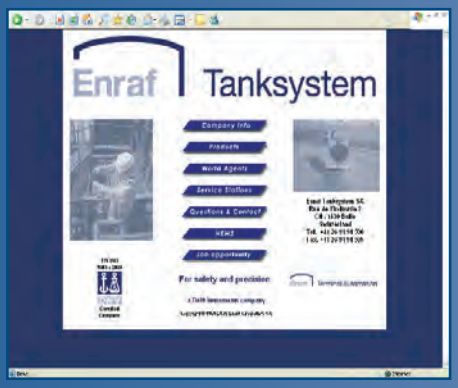

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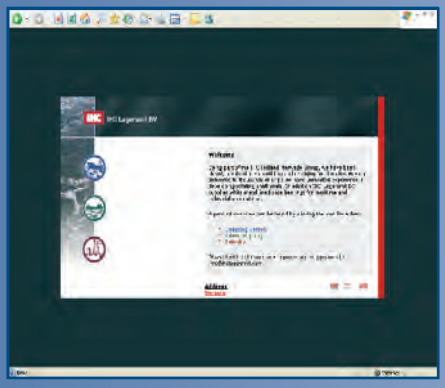

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August 6-10, 2007: Naval System Architecting/ Engineering, course, Washington DC, USA. Contact: Kristine Wielopolski, University of Michigan, Marine Hydrodynamics Laboratory, 1085 S University, Room 126 West Hall, Ann Arbor, Michigan 48109 1107. Tel: +1 734 764 9452. Fax: +1 734 763 3488. E-mail: snssdp@umich.edu www.umich.edu/~snssdp

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October 1-5, 2007: PRADS 2007, international conference, Houston, Texas, USA. Contact: Dr Ge (George) Wang, ABS Corporate Technology, 16855 Northchase Drive, Houston, Texas, 77060 USA. Tel: +1 281 877 5785. Fax: +1 281 877 5945. E-mail: prads2007@eagle.org

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