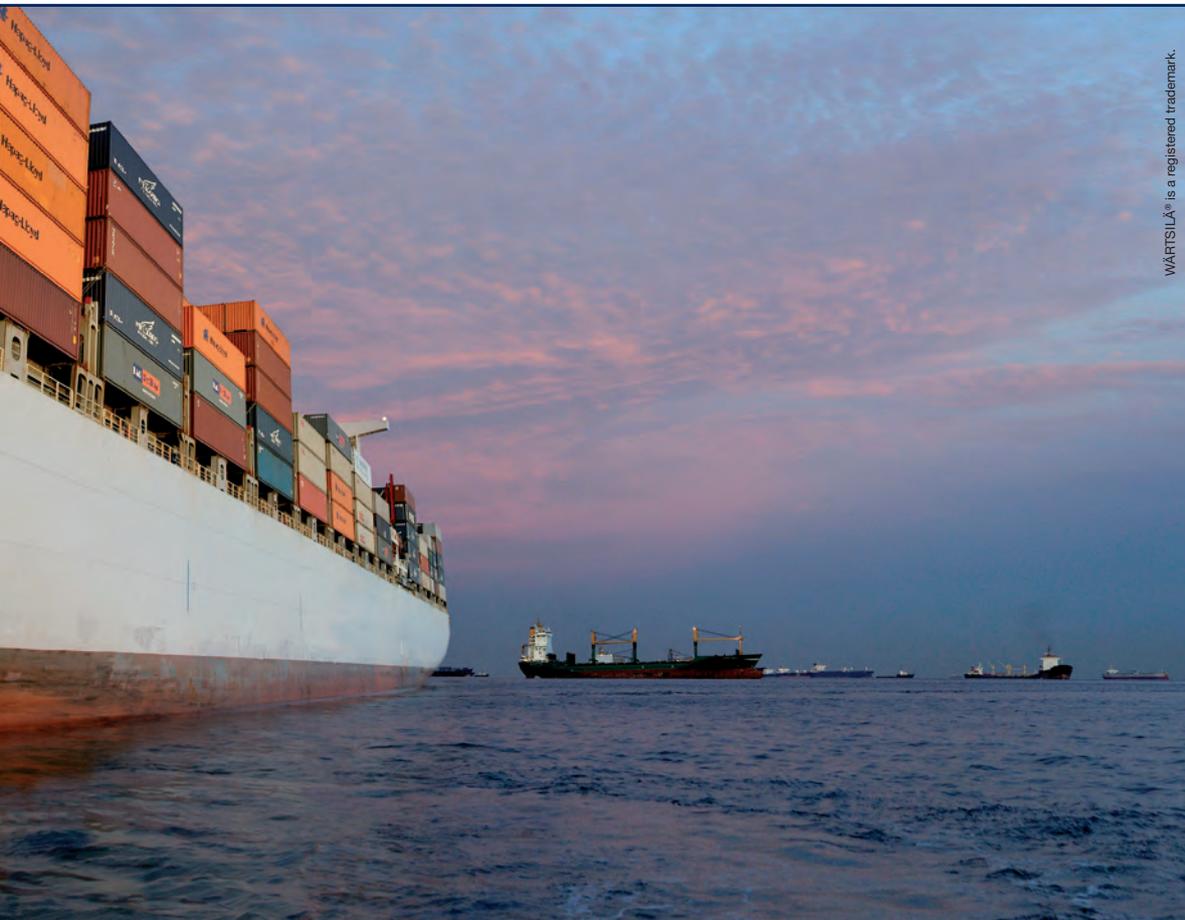


# THE NAVAL ARCHITECT



SEPTEMBER  
2007



WÄRTSILÄ® is a registered trademark.

**EVERY THIRD SHIP YOU SEE IS POWERED BY US.**

The reason isn't just our solutions, excellent though they are. Just as important is the around-the-clock lifecycle care offered by 15,000 of us all across the globe. This is the kind of simple, practical thinking that will give a better return on your investment, whether you need it on land or at sea. Learn more about what we can do for you at [wartsila.com](http://wartsila.com)

**WARTSILA.COM**



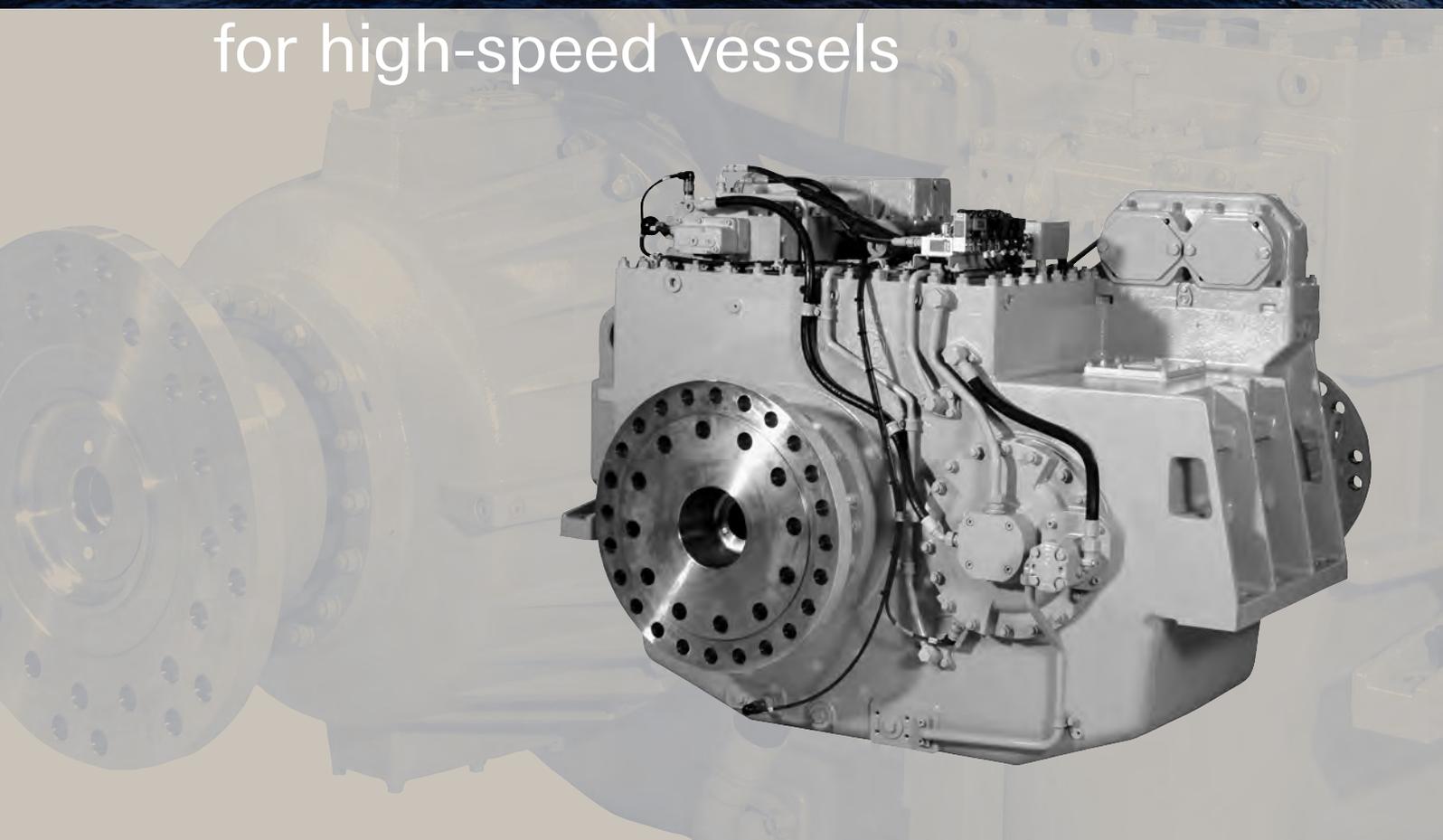
**WÄRTSILÄ**

[www.rina.org.uk/tna](http://www.rina.org.uk/tna)



Photo courtesy of Incat

# Propulsion systems for high-speed vessels



Fleet operators as well as ship owners want efficient vessels with high availability and reliability. This means installed equipment must be easy to maintain, have low through-life costs and perform around the clock in the most demanding conditions and meet Classification Society rules. ZF Marine provide complete systems comprising of gearboxes, shafts, bearings, propellers and control systems to satisfy these requirements and has a worldwide after-sales and service network on call at all times. We help you run a profitable business!

Please see our comprehensive product portfolio, dealers' addresses and much more, at [www.ZF-Marine.com](http://www.ZF-Marine.com)

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

**Editor**  
Hugh O'Mahony

**Editorial Assistant**  
Clare Nicholls

**Design/Production Manager**  
Sandy Defraigne

**Group Sales Director**  
Debbi Bonner

**Assistant Advertisement Manager**  
Matthew Clifton

**Advertisement Production Manager**  
Stephen Bell, PGDip

**Marketing Manager**  
Adelaide Proctor

**Publisher**  
Mark J Staunton-Lambert

Published by:  
The Royal Institution of Naval Architects

Editorial & Advertisement Office:  
10 Upper Belgrave Street  
London SW1X 8BQ, UK

Telephone: +44 (0) 20 7235 4622  
Telefax: +44 (0) 20 7245 6959  
E-mail: editorial@rina.org.uk  
advertising@rina.org.uk  
Website: www.rina.org.uk/tna  
Subscriptions: subscriptions@rina.org.uk

Printed in Wales by:  
Stephens & George Magazines  
Merthyr Tydfil

The Institution is not, as a body, responsible for opinions expressed in *The Naval Architect* unless it is expressly stated that these are the Council's views.

Registered charity No. 211161

© 2007: The Royal Institution of Naval Architects. This publication is copyright under the Berne Convention and the International Copyright Convention. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted without the prior permission of the copyright owner. Permission is not, however, required to copy abstracts of papers or of articles on condition that a full reference to the source is shown. *Multiple copying of the contents without permission is always illegal.*

A one-year subscription in 2007 to *The Naval Architect* costs £110 (UK), £110 (Europe), and £125 (Rest of the world).

Audited Circulation 11,312  
JAN - DEC 2006  
ISSN 0306 0209



# THE NAVAL ARCHITECT



## PRINCIPAL ARTICLES

### 10-17 Safety

- 10-13 Goal-based, but what was the aim?
- 14-16 Limits to growth
- 17 Stability assured automatically

### 18-28 Environment

- 18 New legal driver for emissions monitoring
- 20-22 Ballast water solutions come to market
- 24 Anti-fouling tests offer preliminary results
- 26 Going green means size at lower speed
- 28 ACO prepares for sewage treatment

### 30-35 New vessels

- 30-31 Floating hotel stretches capacity boundaries
- 32 New *Champion* of pipelaying sector
- 35 Shipbuilding supply super cycle

## SPECIAL FEATURES

### 36-67 Shipbuilding in China

- 36-38 Becoming an innovative shipbuilding country - a naval architect's perspective
- 40 Worldyards review of China tanker market
- 42 ABS plays role in shipbuilding transformation
- 45 Pleas to save Shanghai Towing Tank
- 47 Eight in a row from Jiangnan
- 49 First steps for homegrown LNG
- 51 Making a mark with ro-ro tonnage
- 52 Classed for growth
- 54 Accessing China through DF Marine
- 56 Prepared to meet coating standards
- 57 Design side feels growing pains
- 59-60 Neutrally buoyant hull aperture blanks
- 63 Biggest ore carrier to enter water
- 67 Bring on the FPSOs

### 68-87 German marine industries

- 68 SSW feeder makes super debut
- 70-71 GL forum addresses PSPC issues
- 72 Sietas delivers multi-purpose ice class
- 73 Innovation and competence key says VSM
- 74 SEC says confidence in FATs growing
- 75 Three bladed prop for reduced fuel consumption
- 76-77 SAM's research pays off
- 78-81 The story of the hungry Caterpillar
- 83 Becker at leading edge of rudder technology
- 84 Latest Safety Tanker Class 2010 delivered
- 85 Propulsion specialist Schottel reorganises
- 86 Software tools for pipe production
- 87 Schiffko now part of Wärtsilä

### 88-96 Poland report

- 88-89 Polish restructure gets underway
- 90 CTO prepared to support change
- 91 Genfer Lloyd bridges the design gap
- 93 Baltic Design Centre joins in the fast lane
- 95 StabPRS to aid ships' officers
- 96 Aura for a new heavylift era

### 99-135 Passenger and freight ferries

- 99-103 New concepts for ferry propulsion
- 105 Color arrives at Superspeed
- 107-109 Landmark wave piercer makes its debut
- 110-114 New standards for catamaran sea-keeping
- 116 Common rail engine installed on Baltic Sea ferry
- 119-123 RANSE codes challenge podded advantage
- 125 Largest freighter for the Channel
- 127 Super C-class to set sail
- 129 On to the next Galaxy
- 130 Grimaldi wheels on the orders
- 133 SODENA ECDIS eases into harbour
- 134 Solasafe puts the rest in the shade
- 135 *Traveller* completes Stena's step up

### 137-167 CAD/CAM update

- 137-147 CFD possibilities and practice
- 149-151 Simulating safe shipping of LNG
- 153-157 Arriving at a schematic model
- 159-165 Rule-based ship design
- 166-167 The tools are at hand

## FEATURES

### 168-175 Profiles

- 168-170 Design for life
- 173-175 Sember adds a touch of class

176-179 **Research and development:** Innovation is the key to success – people are the key to innovation

184 **Environment:** Cup could run over for Aquatankers

## REGULAR FEATURES

- 3 Editorial comment: China aims for strength in depth
- 4-9 News round-up
- 181-183 Trade and equipment news
- 189 Book review
- 189 Diary

ABB HZTL216657P1

from 18 000 to **36 000**  
running hours

ABB TPL...-B  
2-stroke turbochargers  
run 36,000 hours  
without a bearing inspection.

Long-distance runners.  
www.abb.com/turbocharging

**ABB**



## DELIVERING THE FUTURE

AVEVA software supports the world's marine and plant industries with solutions for the entire engineering lifecycle – from initial design, through fabrication and construction, to lifetime support of facilities.

For 40 years, AVEVA has been empowering its customers to meet the challenges of the ever shifting business environment... offering more capability, more productivity, more flexibility.

AVEVA's unique and proven technology is unrivalled in safeguarding customers' data and protecting their investment in technology.

**Don't get left behind.**

Find out more about us at [www.aveva.com/future](http://www.aveva.com/future) or alternatively, contact us by email on [future@aveva.com](mailto:future@aveva.com).

**AVEVA**  
CONTINUAL PROGRESSION

OIL & GAS

POWER

MARINE

PAPER & PULP

CHEMICAL

MINING

**AVEVA MARINE LAUNCHED!**

*(Image courtesy of Daewoo-Mangalia Heavy Industries)*

[www.aveva.com](http://www.aveva.com)

# China aims for strength in depth

**I**MAGINE, in the days after Asia's 1997 financial crisis, lobbying for new shipbuilding capacity.

Now, with the booming shipbuilding market continuing into its fifth year, and with orderbooks stretching well into 2010, new shipyards are springing up in South Korea and in China, but also in India and Vietnam.

In China, the availability of low cost labour, a strong, heavy industrial base, well-established tertiary institutions for the marine industry, and the availability of low cost coastal sites required for building shipyards, plus large import and export volumes, have stimulated domestic fleet construction, increased international trade, and promoted the ship-repairing business. These factors, alongside strong government backing for shipbuilding and shipping, have all pointed to the nation achieving its aim of becoming the world's top shipbuilding nation by 2015.

But, while a new shipyard in China may seem to be opening every week, our report, starting on *p36*, shows that there are weaknesses. There are inadequate incentives to retain technical talents, while technical manpower has been thinly spread, due to a too-rapid expansion of the industry. The rapid expansion of shipbuilding facilities and their related industries, as well as

**Aframax tanker built at Dalian, one of the shipyards that is turning out vessels comparable to those on offer anywhere in the world.**



of the loss of technical talents to foreign enterprises, has resulted in the thinning of technical manpower and the premature promotion of less experienced assistants.

It is also fair to point out that, at present, in terms of the full range of Chinese yards, both quality and innovation lag behind other shipbuilding regions, namely Japan, Korea, and the EU; it will take some time to catch up. It is inappropriate to think merely in terms of quantity, especially if no integrated, long-term goals and strategies for research in shipbuilding technology are set and implemented along with the expansion of shipbuilding capacity.

There is also an inadequate reward system in state-owned shipyards. The levels of salary and compensation have been increased during recent years, but they are still inadequate when compared with either their foreign or private counterparts. Meanwhile, a heavy reliance remains on foreign technology for shipbuilding and design software and systems. Almost all major shipyards and design and research institutes use foreign-licensed ship design and production software. The licensing arrangements discourage the development of local software.

High foreign content prevents effective cost control. With foreign content still maintaining around a 60% share of marine equipment, it is extremely difficult for Chinese shipyards to exercise cost control on their equipment purchases. As most

of the vessels ordered are for foreign owners, that percentage is unlikely to change for some time to come, especially if Chinese equipment manufacturers are not being developed as viable alternatives.

What matters, then - as Chinese shipbuilding's profile is raised in the media by the major yards on a stage showcasing top-end capacity in the bulk carrier, containership, tanker, and floating production and storage offloading vessel markets - is that Chinese ship production can be seen to be demonstrably competing across the board. It is more likely than not, for example, that owners of smaller tanker tonnage will try to find a small yard in China to make economic their building plans. The sub-segment of 10,000dwt to 19,999dwt and below is the most difficult to track, because yards tackling such projects are very often players in China that were previously building for the domestic market.

For the emerging Chinese yards, some ships have been built to the 'China Classification Standard' class, but most are familiar with the construction of so-called 'ZC' ships. This is a registration for domestic trading ships but it is not a class standard. There are an estimated fifty to sixty branches of the Maritime Safety Agency which are authorised to issue ZC construction certificates. Thousands of small shipyards not yet on the international radar screen are building vessels ranging from small fishing craft up to 20,000dwt tankers.

Chinese shipbuilders also face a dramatic challenge in new IACS coating rules for orders signed after December 2006, which is one-and-a-half years earlier than the IMO standard. Most of the shipyards cannot meet the requirements of the new coating standard in terms of production capacity, shipbuilding technology, techniques, or work environment. New coating standards require a benchmark that the damaged area of the coating after each big combination of the blocks shall not account for more than 2% of the total cabin, which is hard to achieve by Chinese shipyards. Usually, the domestic damage rate of the coating in Chinese yards will be above 10%. Most Chinese shipyards also lack segregated sandblasting capacity.

Experienced surveyors have had to be placed in the yards - surveyors with a lot of newbuilding exposure gained at the established yards in the other Asian shipbuilding centres. Extensive technical and engineering support has had to be supplied locally, to help the yards as they develop new designs.

Today, a shipyard such as Waigaoqiao in Shanghai, or the Hudong yard that is building China's first liquefied natural gas carrier series, or Dalian that is building jack-ups, or the Yantai Raffles yard that is producing a range of offshore related facilities, or NACKS, which is building the 10,000TEU containerships, are modern, highly professional yards with a strong pool of expertise, turning out vessels comparable to those on offer anywhere.

That means that class societies are able to concentrate resources on the newer yards that are still finding their feet, and at the more than 25 repair yards that are tackling increasingly sophisticated projects, such as the conversion of single-hull tankers to a double hull-configuration. ABS, the largest class body active in China, is spending more time at the growing number of equipment and machinery manufacturing plants that are producing everything from complete engines to anchors, cables, pumps, and containers. Encouraging a consistent level of quality in the ships and their components, a level that is in accordance with international standards and acceptable to the international market, is the challenge and the goal. 

## New era for North East design

THE UK's Minister of State for Defence Equipment and Support, Lord Drayson, ushered in a new era for North East ship design at August's unveiling of the new £2.3 million Marine Design Centre in Newcastle upon Tyne – the first of its kind in the UK.

Paying tribute Northern Defence Industries Ltd and Regional Development Agency One NorthEast, he said: 'It is more than just the building here – it is about the network of experts. It's a fantastic model for the future.'

'The Marine Design Centre deserves to succeed; I am confident that it will do so, and I am certain that it will make a significant contribution to the economic well-being of the North East.'

The official unveiling coincided with the announcement that the Government would proceed with the £3.9 billion project to build two new 65,000tonne aircraft carriers. Lord Drayson confirmed that two north-east companies (A&P Tyne in Hebburn and Pallion Engineering in Sunderland) were among those being considered for work to construct the upper sections of the new carriers, to be named HMS *Queen Elizabeth* and HMS *Prince of Wales*.

The Marine Design Centre - located at Central Square South in central Newcastle - has been set up as a subsidiary business of Northern Defence Industries (NDI), to which around 200 regional companies are affiliated. The Centre has a stated aim of adding £100 million to the regional marine and defence sectors through new contracts by 2016.

The MDC's purpose is to act as a focal point, providing marine design companies in the region with a platform of competitive advantage in competing for – and winning – substantial design contracts from the major players in commercial shipping, the oil and gas sector, and defence.

NDI Group managing director Trevor Harrison said: 'We may no longer build ships here - but we still have the skills and the talents to design the ships of the future. The Marine Design Centre will service the needs of three distinct global markets – commercial shipping; oil and gas; and, of course, defence.'

Regional Development Agency One NorthEast has partnered with NDI in the creation of the Marine Design Centre, and has provided £1.5 million in initial funding for the project.

### SINGAPORE GEARS UP...

THE number of newbuildings being built in Singapore has increased and is today at a higher level than for the past decade.

Class body Det Norske Veritas reported that the number of newbuildings from Singapore under its class would most probably be close to 30 by the end of the year.

Although Singapore could not compete with China, Japan, or South Korea in terms of volume production, the class body said the nation was reaping the benefit of its concentration on niche products – either smaller or bigger vessels. 'The common denominator is higher value vessels whose hulls are built outside Singapore and whose outfitting is completed in Singapore,' DNV said.

One of these, the world's largest single pedestal 5000tonne heavylift crane vessels, was recently



Margaret Fay OBE, chair of One North East, Trevor Harrison, managing director of NDI, and Lord Drayson, UK Minister of State for Defence Equipment and Support.

signed to DNV class. The Dyvi Offshore ship will have its hull built in China, while the vessel will be outfitted in Singapore, with delivery destined by mid-2010.

The giant crane vessel is an example of the really big vessels to be built in Singapore, but the majority of the other newbuildings are smaller high-value vessels for the offshore industry – for example anchor handling tugs, supply vessels, and standby vessels.

Before that, between 2008 and 2010, 24 more vessels will be delivered to DNV class from Singapore and Batam, 20miles across the Singapore Straits in Indonesia.

### ...AND DUBAI MUSCLES IN

RECENTLY-launched Dubai Drydocks World has made its first major overseas acquisition, with a voluntary conditional cash offer reported to be worth \$424m for a 70% controlling stake in Pan-United Marine Ltd (PUM) of Singapore.

DD World, which also controls shiprepair and newbuild yard Dubai Drydocks and the Jadaf Dubai Shipyard, is to take control of PUM's facilities in both Singapore and Batam, Indonesia.

Like DD World, PUM is involved in shiprepair, shipbuilding, and conversions.

Sultan Ahmed Bin Sulayem, chairman, Dubai World, said: 'Acquiring a controlling stake in Pan-United Marine Ltd is integral to our investment strategy for Asia. Maritime services are part of our Group's core business profile and it is our aim to position Dubai Drydocks World as a dominant player in the international market.'

Geoff Taylor, chief executive, DD World, said: 'The acquisition of Pan-United Marine Ltd, an established shipyard in Southeast Asia, is a strategic first step in taking the expertise of the DD World group companies to the international stage. The senior management of DD World intends to work closely with the senior management at Pan-United Marine Ltd to ensure a smooth handover

of the business. We are also keen to safeguard continuity of operations. At this time, DD World does not envisage making major changes to the business, redeploying assets, or discontinuing the employment of any of PUM's employees.'

### MAN SIGNS NEW LICENSEE

MAN Diesel has signed a new Chinese licence contract with Wuxi Antai Power Machinery Co, Ltd.

The Chinese company will deliver small-bore MAN B&W two-stroke engines to small yards. The engines will have cylinder diameters up to 46cm and will be targeted at bulk carriers and tanker vessels for domestic trades.

Since the beginning of the 1980s, MAN Diesel has had licence agreements with three state-owned engine builders at Shanghai, Yichang, and Dalian, and earlier this year it signed a licence contract with CMD (CSSC-MES Diesel Co Ltd), near Shanghai.

### BIGLIFT EXTENDS FLEET

BIGLIFT Shipping, currently operating 13 heavylift vessels with a maximum lifting capacity of 1400mt, is undertaking an investment programme to extend the fleet.

It has signed a contract with Larsen & Toubro of India, for the construction of two multi-purpose heavylift vessels. The 18,680dwt ships will be 154.8m long by 26.5m wide, and feature a scantling draught of 9.5m. They will be equipped with two Huisman heavylift mast cranes, each having an SWL of 900tonnes, yielding a combined lifting capacity of 1800tonnes.

The ships will have 1A Finnish Ice class, and feature hydraulically-operated upperdeck hatch covers, pontoon tweendeck covers at adjustable heights, two trolley cranes of 37.5tonnes SWL, hold ventilation and heating, CO<sub>2</sub> and sprinkler systems in the hold.

# Intershield®300

Abrasion resistant aluminium pure epoxy



## Need to comply with the IMO PSPC?

“ For almost 20 years, Intershield®300 has successfully enhanced shipyard productivity and delivered long term corrosion protection. ”

Intershield®300 allows you to do exactly that. A light coloured, abrasion resistant aluminium pure epoxy coating with a proven ballast tank track record on over 800 vessels worldwide, Intershield®300 delivers long term asset protection, maximised operating efficiency, control of through life maintenance costs and optimised return on investment.

Intershield®300 meets and exceeds all requirements of the IMO MSC.215(82) Performance Standard for Protective Coatings.

To find out more visit:  
[www.international-marine.com](http://www.international-marine.com)

\* and International, and all product names mentioned in this publication are trademarks of, or licensed to, Akzo Nobel. © Akzo Nobel, 2007

**NEWS ROUND-UP**

They will be able to carry all kinds of dry cargo, with grain capacity given as 20,500m<sup>3</sup>, as well as project cargoes.

To carry very tall heavylifts such as cranes, the ships will be able to sail with their upperdeck covers totally or partially open.

Main propulsion will come courtesy of a Wärtsilä 8L46 engine, generating 8775kW at 500rev/min. The ships, which will achieve 16knots, will also be equipped with a 1000kW bow thruster.

The vessels will be delivered end 2009 and early 2010. BigLift and Larsen & Toubro agreed on two further options for sister vessels.

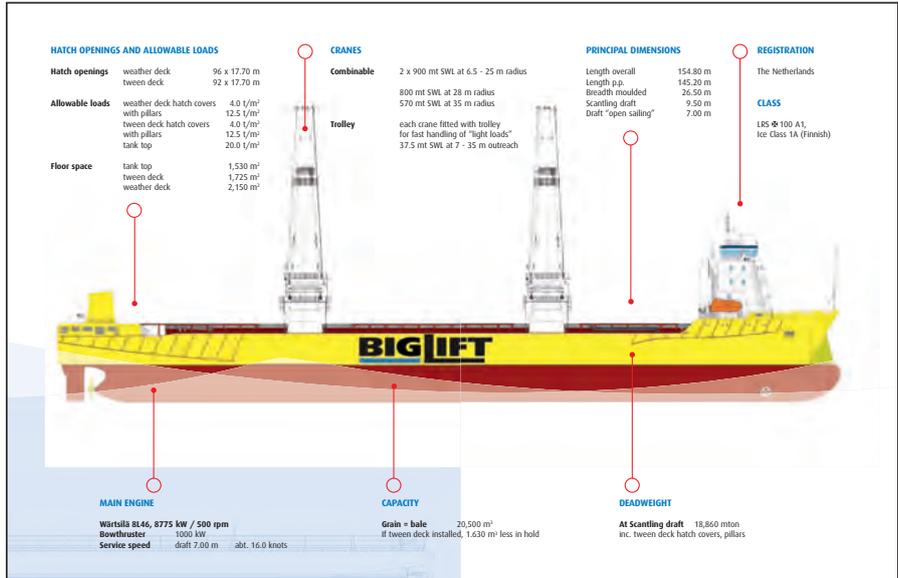
The vessels are built at the brand-new shipbuilding facility of Larsen & Toubro at Hazira.

**SIMENTERPRISE BLESSED BY FINCANTIERI**

FINCANTIERI Cantieri Navali has adopted SimEnterprise software from MSC.Software as standard across all company sites and its extended supply chain.

The shipbuilder and its software supplier jointly undertook a detailed programme of evaluation, aimed at rationalising the simulation environment and significantly reducing the overall design-to-manufacture process. This included a full process assessment.

Under the new agreement, the Fincantieri group will extend its existing simulation capabilities, by introducing a range of next-generation technologies from MSC.Software's SimEnterprise portfolio, most notably the multidiscipline solver,



BigLift's new heavylift ships represent a diversification for Indian shipyard Larsen & Toubro.

MD Nastran, the process management solution, SimManager, and the simulation process automation environment, SimXpert.

'The ability of Fincantieri to retain a commercial advantage in today's competitive markets is based on continually enhanced product performance and a quest for new and innovative solutions in design and

construction,' said Mr Giorgio Bacicchi, responsible for ship design integration at Fincantieri. 'In order to accomplish this, Fincantieri strongly relies on the engineering capabilities within its product design process, of which MSC.Software's technology is already considered a core component. We are confident that by standardising on the company's new



A hard hat, a flashlight and sound, professional judgement will always form the bedrock of effective classification services.

SimEnterprise solutions we will be able to achieve the 50% productivity gains that we are targeting within the group.'

The application of the template approach in SimXpert will allow Fincantieri to leverage experts knowledge, reducing the time needed for repetitive activities and increasing the usage of simulation in more departments.

#### SILENT RUNNING FROM GUASCOR

SPANISH company Guascor has secured an order covering its new technical solution to reduce the vibration and noise levels transmitted to the sea by the ship's propulsion system.

*Miguel Oliver*, recently delivered by Vigo shipbuilder MCías to Spain's Fishing Directorate in the Ministry of Agriculture Fishing and Food, MAPA, is the first fisheries and oceanographic research vessel in the Spanish fleet to comply with the stringent International Council for the Exploration of the Sea standards on underwater radiated noise generated by research vessels.

The 70m-long vessel, with 2000kW of propulsion power is fitted with a 'silent' diesel-electric propulsion system. This consists of four generator sets driven by Guascor diesel engines, with an output of 845kW at 1500rev/min.

Noise and vibration experts from the Spanish engineering firm TSI prepared the curve with the maximum force values that the engine could transmit to the vessel's seatings, so that the underwater radiated noise would fall under the curve specified by ICES.



*Miguel Oliver*, featuring a new engine mounting solution designed to suppress noise and vibration.

Test-bench testing showed that in conventional installations, the motor-generator set (common baseplate for the engine and generator, supported on the floor with resilient mountings), the levels of vibration produced by the set clearly exceed the values of the ICES curve.

In view of these results, a new engine-support device was designed that absorbed a larger percentage of the vibration potentially generated by the engine. The calculations and simulations done in collaboration with Guascor and Vibrachock (a resilient mountings supplier) led to the dual-baseplate design that doubles the frequency attenuation levels.

# Setting the Standard for Service.



FOUNDED 1862

# ABS

Setting Standards of Excellence

World Class?

Yes!

ClassNK  
20%  
148mGT\*

We are a World Leader in Ship Classification.

Being world class brings with it world-class responsibilities.

Only a true dedication to technical excellence, superior service, cutting-edge research, uncompromising quality, and global leadership makes it possible to meet these challenges.

This forms the cornerstone of ClassNK's mission of ensuring the safety of life and property at sea and preventing pollution of the marine environment.

Our global network of more than 100 offices stands ever ready to help you with solutions that are truly world class.

\* As of the end of June 2007.

**ClassNK** NIPPON KAIJI KYOKAI

Head Office

4-7 Kioi-Cho, Chiyoda-Ku, Tokyo  
102-8567 JAPAN  
Tel: +81-3-3230-1201  
Fax: +81-3-5226-2012

London Office

6th Floor, Finsbury Circus House  
12-15 Finsbury Circus, London EC2M 7EB  
Tel: +44-20-7628-5102  
Fax: +44-20-7628-3691

[www.classnk.or.jp](http://www.classnk.or.jp)

The new system includes resilient mountings between the upper and lower baseplate, and between the lower baseplate and the floor.

To verify the results of this design modification, a finite element geometric model was created for the entire assembly. The results obtained, in both the initial model, which used rigid baseplates, and in a second version (closer to the real design) that considers baseplates to be flexible elements, and takes into account their deformation, predicted that the resulting reaction forces would be below the limits of the curve prepared by TSI, and would therefore comply with the ICES requirements.

### STRONG INTAKE FOR WÄRTSILÄ

WÄRTSILÄ reported continuing strong demand for its marine engines in the first half of 2007. New orders contributed to yet another all-time high orderbook of €5.5 billion. Demand in the ship power and energy markets looked likely to remain active for Wärtsilä for the next two quarters, the company said. Based on the strong orderbook, Wärtsilä's net sales were expected to grow this year by around 15%.

The shipbuilding market during the first half of 2007 was very active, despite a somewhat slow start at the beginning of the year. Measured in number of vessels contracting was above the level of the corresponding period last year with 1676 (1566) vessels registered. Measured in deadweight tons, the order level was also higher than in the same period last year, especially due to the very high volume of dry bulk vessels ordered.

The shift in focus from smaller to larger vessels and revitalisation of the container vessel market evened out the differences between the geographical shipbuilding markets. China remained the biggest beneficiary, having a share of 42% in the number of vessels ordered. Korea has closed the gap from the beginning of the year, raising its share to 33%. Europe received 8% and Japan 9% of the new orders.

The total market volume for medium-speed main engines for the last 12 months at the end of the second quarter 2007 was 9400MW. Wärtsilä's share fell slightly from a very high level to 42% (46% at the end of the previous quarter). The change in the order mix from big engines to smaller ones was the main factor behind this development. The low-speed main engine market grew to 29,400MW (27,700). Wärtsilä's market share in this market was 15% (14% at the end of the previous quarter). In auxiliary engines, Wärtsilä's market share was 5% (6% at the end of the first quarter of 2007).

In the review period January-June Wärtsilä's order intake totalled €2526 million (2214), representing growth of 14%. The Ship Power order intake grew further by 3% from the high level in the corresponding period last year (1161) and was €1194 million. Offshore vessels and platforms continued to dominate the new orders.

### STENA LINE CONTRACTS RO-PAX PAIR

STENA Line has ordered two new ro-pax vessels valued at around Skr2 billion from Samsung Heavy Industries in South Korea. The vessels will be put into service in 2011 and they are planned to operate the Harwich to Rotterdam route.



Norwegian Gem, before her float out.

'We have invested about Skr7 billion in recent years in new and modernised vessels and we have decided to invest a further Skr6 billion in new ships. The new vessels are part of Stena Line's strategy of improving capacity, service, and quality, for our freight customers,' says Gunnar Blomdahl, Stena Line chief executive.

Samsung Heavy Industries has previously built a number of shuttle tankers and ice-class tankers for Stena Bulk.

The two new ro-pax vessels are sisterships to *Stena Trader* and *Stena Traveller*, which went into service on the North Sea earlier this year. The vessels will also be equipped with the latest energy management technology, making them as efficient as possible to run.

### EPIC GOES FOR SIX

ODENSE Steel Shipyard has won an order for six ro-ro vessels from the UK's Epic Shipping.

The 193m-long by 26m-wide vessels will offer 3700 lane metres of capacity and will be delivered in 2009 and 2010.

### FIRST IN ETHYLENE SERIES

THE first ethylene tanker in a series of four has been delivered by Meyer Werft to Norwegian shipping company Solvang ASA (Stavanger).

The 154m-long LEG/LPG tanker *Clipper Hebe* has a breadth of 22.70m, a cargo capacity of 17,000m<sup>3</sup>, and can operate at a speed of 17.7knots. Fully loaded, with ethylene cooled down to minus 104°C, these ships will have a draught of 8.10m, with vinyl chloride monomer onboard approximately 10.60m, and an engine output of 9720kW.

In addition to ethylene and vinyl chloride monomer, the tankers will be able to carry other gases, and also ammonia and propylene oxide, cooled down to minus 48°C.

The first ship proved its seaworthiness during the sea trials when all systems and plants were tested. Delivery of the second ship is scheduled for end of November 2007. Another two tankers will follow in the third and fourth quarters of 2008.

Neptun Werft in Rostock/Warnemünde, a sister company of Meyer Werft in Papenburg, built the cargo tanks made of low temperature steel and other components for this ship.



Clipper Hebe – the first in a series of four ethylene carriers from Meyer Werft.

### GEM TO SHINE

MEANWHILE, upon completion of tests and engine trials the Norwegian Cruise Line's 93,500gt cruiseship *Norwegian Gem* left the covered building dock of Meyer Werft on Sunday, 12 August.

With the ship being berthed at the outfitting pier, outstanding work is being completed onboard. The Ems passage of the newbuilding to the sea trials port in Eemshaven/Netherlands is planned for the middle of September 2007.

The new luxury cruiseship has a length overall of 294.13m, is 32.2m wide, and will reach a speed of more than 24knots. More than 2400 passengers can be accommodated in 1197 cabins and are taken care of by a crew of about 1100.

### SPLENDOR SPLASHES OUT

FINCANTIERI's Sestri Ponente shipyard has celebrated the technical launch of *Carnival Splendor*, the cruiseship due for delivery in Spring 2008 for Carnival Cruise Lines.

The 113,500tonne ship is 290m long and has 1638 cabins, including 52 suites, and a passenger capacity of 4914, comprising 3734 guests and 1180 crew members.

One of the main innovations onboard *Carnival Splendor* will be the 'Spray Park', a water fun park for children.

Sestri Ponente shipyard is currently also building *Costa Pacifica*, due for delivery in summer 2009, and two super-luxury 65,000tonne cruiseships for Oceania Cruises, due for delivery within autumn 2010 and summer 2011. ☺

## Goal-based, but what was the aim?

Dr Heike Hoppe has been with the International Maritime Organization for 13 years, where she is senior technical officer, and Secretary of the Sub-Committee on Ship Design and Equipment. This is an edited transcript of a presentation she gave to RINA's 2007 annual meeting on Goal-Based Standards.

**S**URPRISINGLY, IMO does not have any regulations that concern hull construction. The SOLAS convention contains hundreds of very prescriptive regulations for everything, from the number of fire exits that have to be onboard to the number of life jackets, but the only regulation that concerns hull construction is in SOLAS chapter II-1 and it just states that ships should be constructed according to the requirements of the classification society which is recognised by the administration.

Many member states felt that this was not enough and they did not have enough influence on the standards that were eventually used to construct ships. So at the 89th session of the IMO Council in 2002 there was a proposal by two members, the Bahamas and Greece, to start work on ship construction standards. After discussions, IMO's Assembly and the membership agreed that this was an issue that IMO should take on and work on, and it was included in the strategic plan of the IMO. It was also included in the work programme of the Maritime Safety Committee.

It was also agreed that this should not be a very explicit prescriptive standard but that these standards should be goal-based. We have used as an analogy to explain what we understand by goal-based, something borrowed from the Civil Aviation Authority of the UK, not something IMO has invented.

The distinction between goal-based and prescriptive: prescriptive means you shall install a one metre high rail at the edge of the cliff. Goal-based means you should just prevent people from falling over the edge. That is what we tried to do in IMO.

### Very different views

From the outset there were quite extensive discussions in IMO and very different views on how this issue should be approached. There was one half of the membership that felt there should be a complex holistic safety level approach, which should start with the determination of the current safety level inherent to IMO instruments, and should then continue to be done as a risk-based safety level approach. There was another half of the membership which felt that we had enough data and experience, in particular, as far as bulk carriers and tankers are concerned, to use this more prescriptively, whilst still maintaining the goal-based nature of the regulations.

These discussions carried on for quite a long time, actually about four sessions of the Maritime Safety Committee, and in the end the Committee decided last year to take a twin-fold approach - to do both at the same time: to follow the safety level approach but for bulk carriers and oil tankers, and to follow a more prescriptive approach, and we actually now have two correspondence groups working on both approaches at the same time.



Dr Heike Hoppe, IMO senior technical officer, and Secretary of the Sub-Committee on Ship Design and Equipment.

We have come quite a way as far as the achievements are concerned and what was actually agreed in MSC. The basic five-tier system that was proposed in the beginning by Greece and the Bahamas in cooperation with IACS was basically supported by the membership. Following discussions, MSC 80 agreed on basic principles and, MSC 81 in 2006, approved tiers one (goals) and two (functional requirements), and MSC 82 in autumn last year agreed to start work on tier three, which is the verification of compliance with the goal-based standards, and we have initiated a pilot project.

The work started off by agreeing on basic principles of goal-based standards, whereby it was understood that these basic principles are not only applying to hull construction; these should be applied to any kind of goal-based standards that the organisation might be dealing with later on, so it is just stating that they should be broad overarching safety environmental security related standards; that they should represent the required level to be met by recognised organisation, in particular, classification societies; that they should be clear, demonstrable, very viable, long-standing, and that they should still be specific enough not to be open to differing interpretations.

For the goal-based standards for oil tankers and bulk carriers, the IMO membership agreed on this basic five-tier system whereby:

- tier one are the goals/safety objectives
- tier two functional requirements that should be met as far as hull construction is concerned
- tier three verification of compliance with the functional requirements
- tier four technical procedures, guidelines, classification rules, and this also includes IMO requirements and national standards done by administrations

- tier five industry standards, codes of practice, anything that goes into more specific detail as far as ship building operation, maintenance, repair, and so on is concerned.

The tier one goals basically stipulate that ships should be designed and constructed for a specified design life, whereby the IMO agreed that this design life should be 25 years, they should be safe and environmentally friendly when properly operated and maintained under normal operating conditions.

There is one goal that says they should have adequate strengths, integrity, and stability to minimise the risk of loss of the ship or pollution. The second goal here is to be environmentally friendly - especially where recycling is concerned.

And the last point in the goals concerns the specified design life, which was agreed is the nominal period that the ship is assumed to be exposed to operating and environmental conditions, corrosive environment, and so on. It was agreed that the actual service life might be longer or shorter than the design life; that depends on many factors.

### Getting it to function

The second tier of this five-tier system are the functional requirements. It was agreed, after long discussions over several sessions of the committee, that 15 functional requirements should be fulfilled. They have been divided into design-related functional requirements, the design life, environmental conditions, structural strength, fatigue life, residual strength, corrosion, coating life corrosion, additional structural redundancy, and watertight/weathertight integrity.

At the last session the human element was included, and there's a fairly new issue for IMO to be dealing with - design transparency - which is still under discussion. As far as construction related functional requirements are concerned, there are construction quality procedures, survey conditions,

## *No. 1 Engine in the world*

Doosan Engine's core line of business includes the production and supply of low and medium speed marine diesel engines operating between 700 to 10,000 bhp, as well as the construction and maintenance of diesel power plants up to 200MW in capacity. With an annual production capacity of 9 million bhp, Doosan Engine has the second largest production capacity and market share in the world. Its high-quality, continuous technology development and 20 years of experience has been the root of Doosan Engine's ability to manufacture diverse engines. Doosan Engine is celebrating the world's fastest production of 40 million bhp and is holding an integrated factory completion ceremony to represent their leap into a new era of professionalism.

# **WE ARE BUILDING THE HEARTS OF THE OCEAN.**

All Great Revolution Have Been Started  
My Conviction and Trust For The Future.  
Doosan Engine is Already Be with you.

Kyusang Cho,  
CEO of Doosan Engine

*K.S. Cho*



**Doosan Engine**

HEAD OFFICE

69-3, Sinchon-Dong, Changwon-City, Gyeongnam, Korea 641-370  
Phone + 82-55-260-6000 Fax +82-55-283-2233 [www.doosanengine.com](http://www.doosanengine.com)

## What goal-based standards mean

### On class:

'We will, of course, not interfere with the competency of the classification societies. We know that the expertise for hull construction rests with them and we know that the IACS common structural rules have been decided, and IMO regulations could never go into any kind of detail like that. What the membership wanted to have is some kind of oversight about what classification societies or recognised organisations are doing so far, since there is nothing in international conventions. Administrations could not go back and say we don't agree with this, or shipowners for that matter, didn't have a leg to stand on if they didn't agree with what the shipyard was doing or what the classification society was approving. And the objective is to have something in the SOLAS convention that gives our membership something to provide some oversight about what the organisations working on behalf of the administrations are doing. Regarding the progress, for bulk carriers and oil tankers, we will probably come to a conclusion quite soon. We will have, and that is quite clear now, some kind of provisions, probably in SOLAS chapter II-1, that will include these goal-based standards, and it is then up to the classification societies to adapt their rules if necessary. Because we have been cooperating closely with IACS, they know what we are doing and they have structured their common structural rules to tally with the functional requirements so there shouldn't be any problems for them, I think, when it's finally adopted. I don't know about all the other classification societies that are operating worldwide. That is a different matter.'

### On Load Line:

'As far as the connection to the provisions of the Load Line Convention is concerned... this was discussed in quite some detail in IMO and the result was that it would be more appropriate to amend the SOLAS convention accordingly to include these requirements, not Load Line, because it was felt that the Load Line convention is too specifically tailored to Load Line, whereas the SOLAS convention is more all-encompassing and it was felt that was the better place to put it. The functional requirement on structural

strengths actually goes into quite some detail and has borrowed heavily from the Load Line provisions in there, which basically says that structures will be designed with suitable safety margins to withstand environmental conditions anticipated for the ship's design life and the loading conditions appropriate for them. And it goes into more detail there as far as structural strength is concerned but, as I said, the general agreement was to put it all into SOLAS and leave Load Line out of it. As far as the linkage between goal-based standards and formal safety assessment is concerned, this was also discussed in detail in the committee meetings and we have an MSC working group on formal safety assessment that was involved in these discussions. It was actually agreed that there is a linkage and that the formal safety assessment would be a good tool to use in the safety level approach, maybe not in its entirety but at least to follow the basic steps of formal safety assessment. This is still under discussion. We are discussing it in two places, in the goal-based standards working group and in the formal safety assessment working group, and it has not been finalised in any way, so there's work ongoing on this.'

### On security:

'Just to reflect the mission statement of IMO, security is so important today and they wanted it in, just in case. It doesn't have any direct influence at the moment on how the hull is constructed.'

### On the complexity of the goal-base approach:

'In reply to these very complex and difficult discussions we had on this, just a little example, when we had the pilot panel doing the verification, we had independent experts from all over the world that had not previously been involved in the discussions ongoing in IMO. Now, they looked at this system we had agreed already, and they said what the hell are you doing? This is not going to work. And they tried to restructure the whole thing again. So it is not the final product; it will develop in the future, I'm quite sure of that.'

Think of us **when you are**



and in-service considerations, also concerning survey maintenance, structural accessibility, and as a special point, recycling considerations.

Tier one and two have basically been approved, subject to any further adjustments that might be necessary. IMO administrations are now working on tier three verification. The purpose is to make sure that the technical requirements in tier four, which are the classification requirements, IMO requirements, and requirements by national administrations, comply with the functional requirements in tier two.

An expert group is now working on this. There is a pilot project ongoing in IMO that is testing the verification system that has been developed using the IACS common structural rules. A report is expected to the next Maritime Safety Committee in October this year and IMO should then be able – although that might be a bit optimistic – to finalise tier three.

This verification is currently restricted only to classification society rules, recognising that this tier also includes IMO requirements and requirements from national administrations. The reason why the membership agreed to restrict it, for the moment, to classification society rules is because that was the original purpose of the exercise - to give administrations a better oversight over the rules that are used by classification societies for hull construction.

It was extensively discussed how exactly this verification should be carried out and who should actually do it. MSC agreed that this

should be done by a group of experts that is convened at IMO and looks at the classification society rules that have been submitted for verification by a classification society. This expert group will be selected from a pool of experts that have been nominated by all member states and submitted to IMO, and it has actually been left to the discretion of the IMO Secretary General to select and appoint these experts who will be working at IMO at predetermined periods of time.

#### Still under discussion

The final set-up of this group is still under discussion. This expert group will then look at the classification society rules whereby there is also a system for appeal and for presentations by the classification society, and the MSC will then, following the report of this expert group, issue relevant recommendations. What form exactly that will take is also under discussion. It will definitely not be a kind of blacklist, that's for sure, because that's not the way IMO is working.

Regarding the other way of looking at the goal-based standards, the safety level approach, the discussions at IMO centred basically on what should be done, safety level or prescriptive, whereby the concrete method on how to carry out this - what we call safety level approach - has not been determined in any detail.

A correspondence group is working at it; they are supposed to report to the next Maritime Safety Committee. We will see what they

come up with in this regard. The discussions have been very heavy-going; opinions are quite divided on how to go about it.

There is no agreement at the moment on a risk model to be used - and how actually to determine the current safety level inherent in IMO instruments. It is to be expected that this whole issue will take a long time.

IMO is not a body that carries out research; it solely relies on member states to do that, and submit their results, so it remains to be seen how the IMO membership will be deciding to go ahead with this, taking into account that much more basic research is needed. And the expert knowledge that is needed is probably either not available or the IMO meetings do not provide enough time to go and consider this in detail. So it is to be expected that this will take another number of years to come to a tangible result.

Although the goal-based standards and their application to hull construction are quite new, the notion of goal-based standards is not a new one at IMO. They were introduced regarding fire-fighting provision in SOLAS; that was the SOLAS chapter II-2 revision in 2000, which now includes goal-based provisions that allow for alternative design arrangements following relevant engineering analysis being carried out and approved by the administrations, and the goal-based approach for the new packet of SOLAS amendments concerning large passenger ship safety was adopted at the last session, which includes the strategic goals and objectives. 

# planning clean ships

Certification (ISO 14001 for example) requires shipowners to minimise the environmental impact of their operations. For over 70 years MacGREGOR has come up with innovative engineering solutions, and its latest is a range of cargo systems – cranes, hatch covers and RoRo – that all use electric drives.

Development focused on three main aims: compared with hydraulic systems the new products had to be environmentally friendly, they had to provide equal or better performance, and they had to cost the same. The main advantages are that hydraulic oil leakages are eliminated, there is no need to fit hydraulic pipework on board, electric drives are easy to monitor and maintain, and they offer energy savings.

We understand ships and we know about cargo handling.

**Profit from our experience**

**MacGREGOR**

[www.macgregor-group.com](http://www.macgregor-group.com)

## Limits to growth

**IS there a 'moral' case to limit the size of ships? A view from Patrick G Martin, CEng, FRINA, FIMarEST.**

\*The writer's qualification for raising the various issues in the following article may be judged from his book *Fifty Years a Shipbuilder*, reviewed in the February 2007 issue of *The Naval Architect*.

◈ EDITORIAL Comment' (*The Naval Architect*,

April 2007) headed 'Size from a different angle' discusses, for the most part, the increasingly numerous challenges that are presented to the salvage and insurance markets by bigger and bigger containerships and cruiseships in particular and, for different reasons, by the new generation of double-hull tankers. The probability of a successful and timely salvage operation following a casualty involving one of these huge ships is, in some categories of accident, obviously diminishing to the point where the declaration of CTL becomes unavoidable, hopefully (but never inevitably) without loss of life.

And so we are quite seriously confronted by the hypothesis of 'Limits to Growth'. Such limits may be imposed by physical or market constraints. From the middle of the last century we were confidently preparing for the million-tonne tanker. Hull construction design was speculatively completed and approved by Classification; building/repair drydocks were built by two or three shipbuilders/repairers for million-tonne tankers, and so on. But these ships were never built. Their huge draught, particularly alongside loading/discharging terminals, was prohibitive; drydocking facilities were too remote; reception tankage at refineries was inadequate; reservations existed concerning a number of navigational, berthing, and safety issues; the economics of building and operating such ships were far from proven. In other words, the million-tonne tanker was a self-defeating project, which duly died.

So we had to lower our sights to the half-million tonne tanker, but for all practical purposes this did not take off either - the reasons did not materially differ from those which defeated the million-tonne ship.

Today, the biggest ULCCs in appreciable numbers lie in the bracket 300,000dwt to 350,000dwt, and there they are likely to remain for the foreseeable future. So the deadweight capacity of big tankers has effectively been self-limiting.

Turning to foreign-going containerships, the story is (so far) somewhat different, because no self-imposed size limit has yet emerged, notwithstanding a number of problem areas associated with the ever-increasing capacity of ocean-going containerships.

An important parameter of containership design is that of speed. A service speed of 25knots has developed as a 'standard' (at the time of writing). A few ships have been ordered with a service speed of 26knots, but when we consider the significant increase in horsepower required to achieve the extra knot, this is unlikely to mark the beginning of an upward trend. Looking at the depth of water alongside quays at the world's container terminals, a maximum loaded draught limit has



**Emma Maersk is the world's largest container vessel, measuring 397m long, by 56m wide.**

standardised at about 15metres. If it is impossible to increase draught, some compensation can be sought by increasing breadth, in order to accommodate an extra row of boxes, both in the holds and on deck, over the length of the ship. The largest containerships have post-Panamax beam in any case, so that breadth constraint is history. But other problems begin to emerge as containerships are built with more beam. The L/B ratio has significant influence on hull resistance, particularly on fine, fast hullforms, so that installed horsepower increases fairly dramatically as breadth is increased, if the service speed is to be maintained at 25knots. Moreover, there is a practical limit to breadth in terms of the outreach of shore side container gantries' ability to cover the furthest row of boxes, which presents a generally global constraint concerning ship breadth.

Thus we come to other aspects of the propulsion of very large containerships. This question acquires a relevant perspective when we consider the single screw *Emma Maersk*, which has the capacity for over 11,000TEU; her main engine is a Wärtsilä 14-cylinder RT-flex 96c which develops almost 109,000bhp and weighs 2300tonnes - the most powerful marine engine ever built (so far!).

The owners of large containerships have remained stoutly loyal to the time-honoured economy of one slow-speed two-stroke engine directly coupled to a single screw. The builders of such huge two-strokes are quite prepared to go further with longer and heavier engines, provided the shipbuilder designs ships with longer enginerooms and sufficiently stiff bottom structures to support the weight and thrust of engines with even more cylinders; but greater power output for bigger ships is ceasing to be the sole criteria supporting the existing order of things. We have already touched upon the more-or-less 'standard maximum' loaded draught of containerships, which imposes constraint on propeller diameter - which has already reached

its limit for these ships. For all intents and purposes, the efficiency of large propellers (according to the prevailing state-of-the-art) is at or near its maximum design capability to efficiently absorb very high power on a restricted diameter. We may legitimately ask the question, 'is the two-stroke engine/single-screw propulsion concept, so favoured by the owner, effectively limiting further growth of the size of containerships?'

If not, surely it very soon will.

This is not, perhaps the place to discuss alternatives. Twin screws? Different types of engines? Even alternatives to the traditional propeller? From the shipowners' point of view, the most probable loser is bound to be propulsive efficiency and hence increased fuel cost.

The naval architect can design bigger containerships; only the shipowner can assess whether the overall economy of doing so has reached a self-limiting constraint on continued growth, bearing in mind the ever-increasing cost of those fuels which meet demands for reduced harmful emissions.

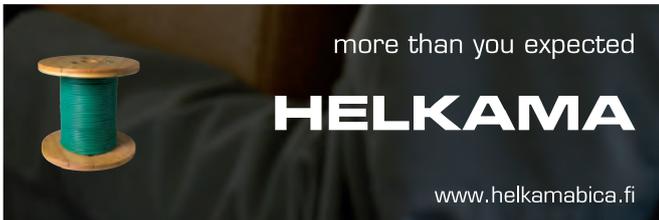
Commercial rivalry concerning whose ship can lift the greatest number of boxes cannot continue forever, and some realisation must emerge when the race has reached its practical limit.

Finally, we come to cruiseships - that huge section of the shipbuilding/shipping market, which is vibrantly expanding, with bigger ships and ever-increasing numbers of passengers and crew.

What features of cruiseship design can we regard as approaching their technical limit? The smaller the draught, the greater the number of out-of-the-way but fascinating places the cruiseship can include in her itinerary. Deeper-draughted ships are more restricted, but not excluded from excellent cruises. So draught is a limiting factor in some instances, but not in others - maybe not in the majority of cases.



Our service chain is unbreakable, as are our marine cables.  
**Guaranteed.**



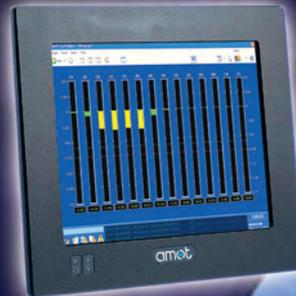
more than you expected

**HELKAMA**

[www.helkamabica.fi](http://www.helkamabica.fi)

SEE US AT MARINTEC CHINA  
STAND NO 2H01

# Protect your large investment... ...with a small investment



The XTS-W is a unique Bearing Condition Monitoring System for 2-stroke slow speed diesel engines. It protects all the crank train bearings by detecting the onset of bearing wear before expensive and potentially catastrophic secondary damage occurs.

Considered to be the industry standard by the world's major engine manufacturer, the XTS-W avoids unnecessary opening of engines and bearings, minimising the risk of engine damage and exposure of key personnel to hazardous situations.

- Easy to install and use
  - Auto calibration
  - Continuous protection
- Worldwide AMOT sales and support

## Protect your engine

[www.bearingwear.com](http://www.bearingwear.com)

**amot**

AMOT, Western Way  
Bury St Edmunds, Suffolk IP33 3SZ UK  
Tel +44 1284 762222  
Email [info@amot.com](mailto:info@amot.com) [www.amot.com](http://www.amot.com)

Compared with containerships in particular, cruiseships are powered by a wide diversity of propulsion systems - practically all of them driving twin screws or pods. Two-stroke engines are, perhaps, conspicuous by their absence, mainly due to height restrictions and too low rev/min for small propellers, but practically every other propulsion concept is to be found, ranging from a plethora of four-stroke diesel engines to gas turbines and variations of electric drive systems.

Most cruiseships make a short or overnight port-to-port passage at reduced speed, which has a bearing on the choice of machinery. Few can match the 25knot 'standard' of containerships, and those that can only use maximum power for relatively limited periods; that is to say, the maximum power available for propulsion, bearing in mind that the hotel load of cruiseships accounts for a very significant part of overall power availability. We may conclude then, that power and speed are not yet limiting factors in bigger ships, and additionally there is a very versatile choice of power systems to meet widely varying power profiles of cruiseships.

As far as all cruiseships are concerned, it goes without saying that safety is the biggest issue. There is never smoke without fire; both are drastic killers very soon after fire takes hold. The location and cause of fire may be quite unexpected - who had anticipated the catastrophic fire in *Star Princess* when combustible divisions separating weather balconies outside cabins took fire, spreading over several decks with devastating consequences? Automatic fire detection/extinguishing systems had simply not been anticipated to protect what were effectively weather spaces, nor had fire-resistant divisions between them been considered.

A vital factor concerning all aspects of safety in cruiseships lies with the crew - where a full complement of over 1000 crew personnel has already been exceeded. But of those 1000 people, only between a quarter and a third are directly engaged in the running of the ship itself - all the remainder are employed solely to attend to the requirements of the passengers. An army of cabin stewards, waiters, bar staff, cleaners, and part of the commissary complement form the majority of the ship's crew. For the most part they are recruited from Third World countries and in no sense are they 'seamen' or even remotely acquainted with life at sea. Regrettably, they may have received little or no training in the affairs of the ship, other than their own jobs, before setting forth on their first voyage. In the case of an audible alarm throughout the ship, their first instinctive reaction is self-preservation, though that first reaction (particularly if they are asleep) by no means equates to the instant response we expect from trained seamen. Moreover, many of these passenger-service crew speak little or no English so that they have difficulty in understanding orders or effectively assisting passengers in an emergency. The writer's experiences of 'non professional' crew performance during safety drills at sea - particularly fire drill - is not a happy one. Many, for instance, simply cannot understand how to put on a lifejacket, which is

not encouraging for passengers who are able to manage after an initial demonstration at their first boat drill.

A carefully-designed and fully comprehensive fixed automatic fire detection and extinguishing system throughout the entire ship will deal with a small outbreak faster than a crew fire-fighting party can be deployed - or such is the objective immediately following an alarm.

Reservations persist regarding some aspects of the design of large cruiseships; very large atria may be seen as effective conduits for smoke, for example; the proliferation of superstructure decks extending over most of the ship's length are pushing the limits of damage stability criteria, which are addressed by designing with shorter watertight compartments below the freeboard deck. This solution not only complicates the arrangement of lower decks due to the increased number of WT compartments, but it necessitates, of course, a greater number of transverse watertight bulkheads with all the associated problems of penetrations for cables, piping, and service trunking, not to speak of sliding WT doors in some approved locations.

And so we come to LSA (Lifesaving Appliances), being, for the most part, the means by which all hands are evacuated from a ship which the Master has decided to abandon at sea. There is (at last) a general consensus that a passenger ship's number one LSA is the ship itself which, after a serious incident such as fire or collision, must (to the last possible moment) remain afloat, upright and stable, even if no means of propulsion remains operative. Passengers, distressed and shocked though they may be, are not half as distressed and shocked as they will be should the time come to abandon ship, using the appliances provided for doing so. The aged and infirm, the halt and the lame, and the very young will all be called upon to jump through the same hoop, be it night or day, in fair weather or foul, in searing heat or bitter cold, to take their chances in boats or liferafts until such time as the enormously difficult task of rescuing them - all 6000 of them - is able to begin.

Anyone who has seen 'survivors', weakened (quite quickly) to the extremes of utter exhaustion, in body and mind, by seasickness, hypothermia, and shock, will do all in their power to enable everybody aboard a damaged

ship to stay there, no matter how many new and improved devices are invented to get them off the ship if the worst comes to the worst.

Having considered the potentially limiting features of large cruiseships, we are inexorably driven to the conclusion that there are, in fact, no immediate technical limits to size and capacity. Neither naval architects nor shipowners are normally given to limiting their onward endeavours by ethical concerns, but is there, in fact, a moral obligation to voluntarily limit the number of people who could conceivably become the collective victims of some failing in design or operation of cruiseships, or the failure of equipment upon which builders and owners chose to depend?

'Unsinkable' remains the taboo word that it became following the loss of *Titanic* - not without some measure of success we strive towards it but it will forever remain expunged from the maritime dictionary. An accident will occasionally happen that a ship cannot survive.

Is the airline industry touched by the same moral consideration, taking into account their own risk assessments? Some versions of the double-decker Airbus A380 can, it is said, be arranged internally to accommodate up to 800 passengers. Lord Brabazon (who held the official Pilot's Licence No 1) envisaged the mass transport by air of huge numbers of passengers - the writer well remembers his big 6-engined aircraft flying over Fifeshire in or about the year 1950. His dreams were frustrated by technical rather than ethical objections, but such is no longer the case. Is it morally acceptable to subject, say, 1000 aircraft passengers to sudden death in the event of the aeroplane crashing or colliding with another in mid-air? That, in the context of statistical probability, is for the aircraft industry to decide, but the ethical criteria are the same as those which the cruiseship industry may, or may not, take into account at some point in the future.

The writer, for his part, favours an international limit on the number of persons which may be carried in any ship, excluding warships or commercially-managed troopships in time of war.

This subject may be the first moral argument ever to be presented to both designers and operators of ocean-going passenger ships as a conscientious issue; will it be taken to heart or will the lust for profit continue to prevail? ☹



**Freedom of the Seas** – among the largest cruiseships ever built.

## Stability assured automatically

CAR carriers, containerships, and similar vessels where the amount of cargo is based on shore declaration and not on measured values are among the leading vessel types that will benefit from an updated version of IMACS, the Totem Plus automation system dealing with transverse stability parameters (GM, VCG) and their determination.

IMACS stands for Integrated Monitoring, Alarm and Control System, and its scope covers engines and machinery onboard ships. The system is comprised of Siemens PLC units in full redundancy, PCs, and powerful software. It provides integration of the power management system, the tank level indication, anti-heeling and loading program, in addition to providing 'standard' engine monitoring and automation features. Multi-sensor analysis, preventive maintenance modules, and fault analysis are part of the system as well. IMACS is also designed to provide a complete and integrated solution for determining and monitoring ship stability, thus enhancing overall vessel safety.

Wrong cargo figures are not as common as they were when the container trades started, but nevertheless they pose a continuing risk, says Totem Plus. Exemplary was a case from some years ago, when a containership sailed west from a US port, with more than 200 empty containers entered on the manifest. In fact, the containers were not empty but were laden, and were waiting to be shipped eastbound on another vessel. While this illustrative case is possibly an extreme scenario, wrong information can come from many sources: shippers declaring false weights, terminals (loading different containers than planned), planners, stevedore companies, tally companies etc. Naturally, such discrepancies affect the stability of the vessel, which assumes a different distribution of cargo than the one actually onboard.

In addition, stability parameters can be altered by other scenarios, not necessarily fully known to the operator, such as flooding of cargo holds and so forth. Needless to say, the risk to seafarers from a situation where the stability parameters are wrong cannot be over emphasised, and requires determination methods that will not depend on any assumptions.

### Stability determination before sailing

Accurate calculations of stability parameters, mostly done with the aid of a loading computer, are a mandatory procedure. But these calculations are based on various assumptions that can lead to erroneous results. To determine if the results of the stability calculations are correct, and to verify that the stability of the vessel is not jeopardised by a different weight distribution, Totem Plus IMACS offers the operator the opportunity to perform a quick 'inclining experiment', which will be carried out automatically.

The inclining experiment method for determining the Metacentric Height (GM) is used while the ship is docked, after the cargo operations are completed and just before sailing. The principle behind this method is that the shift of a known weight across the ship (by using the ship's ballast system) causes a heel angle that is directly related to the GM. The result depends on the displacement of the vessel, which can be determined exactly from the measured draught. The shifting of the test weight and the

measurement of the resulting heel angle are done automatically on request. The operator can decide between options, like the number of ballast tanks and pumps used to transfer the test weight, and the method to determine the displacement from the draught. After the test is performed, the calculated VKG and GM are displayed.

This method is especially useful and effective when performed right after the ship is loaded, in order to determine the actual GM on departure, which might be different from the theoretically calculated GM due to erroneous weight distribution.

Knowing the stability parameters (GM) at all times is of utmost importance. Furthermore, such information can help in avoiding parametric rolling in rough weather.

The Totem Plus method for calculating GM while the vessel is at sea requires no user intervention or assumptions. The ship's rolling angle (caused by wave and wind forces acting on the ship's hull) is constantly monitored. Advanced mathematical algorithms are applied to the data to deduce the rolling period and the GM. This process is performed continuously, in real-time, and provides a visual representation of changes in GM over time. ☺

# PROVEN RESULTS FOR RUDDER BEARINGS

Reliability, proven performance and superior customer service have made Thordon the logical choice in pollution free rudder bearings for over 30 years. With over 4,000 rudder bearings installed, Thordon self lubricating SXL pintle, stock and carrier disc bearings are guaranteed for 15 years in newbuilds and twice the life of the replaced bearing in conversions (to a max. of 10 years). Supported by a worldwide distribution network, Thordon rudder bearings, as well as steering linkage bearings and stock seals, are recognized internationally as the proven choice for value and guaranteed performance.



## THORDON

BEARINGS INC. A member of the Thomson-Gordon Group

Tel: +1 905 335 1440

E-mail: [feedback@thordonbearings.com](mailto:feedback@thordonbearings.com)  
[www.thordonbearings.com](http://www.thordonbearings.com)



## New legal driver for emissions monitoring

**C**ONCERN that others may follow Norway's lead in imposing duties on Nitrogen Oxides (NOx) emissions from ships - the first environmentally driven penalty tax in shipping working on the principle that the polluter pays - is pressing the case for continuous emissions monitoring, according to Martek Marine. The company has made the running in developing 'MariNox' as viable monitoring technology for shipboard operations since its launch at Nor-Shipping two years ago.

As of 1 January 2007, the Norwegian authorities introduced a new excise duty on emissions from energy production to fulfil Norway's commitment under the 1996 Gothenburg Protocol. Shipowners fear that the same penalties may soon be imposed by EU administrations.

Martek, which recently announced approval from DNV of the MariNox system, said the new NOx Tax affected companies operating vessels in Norwegian waters, where a fee of Nkr15 (US\$2.5) per kilo of NOx emitted has been due since April. It is expected that the tax will double in 2008.

The Excise Duty is incurred on emissions of NOx from propulsion engines with a total certified engine rating of more than 750kW.

Even today, owners of tankers operating in Norwegian waters, such as shuttle tankers working between the offshore fields and terminals, are promised tax savings and refunds of over 20% on many engines. This can result in savings/refunds that run into hundreds of thousands of US dollars per year.

Norwegian registered vessels in waters less than 250nm from the coast are liable, while emissions from any vessels operating within Norwegian territorial waters - 12nm of the Norwegian base line - are also within the tax's grasp.

Vessels sailing direct routes between Norwegian and foreign harbours; fishing and whaling vessels on discharge made in distant waters (outside 250nm) are exempt, however, as are vessels with environmental agreements with the government (Ministry of Environment) on the implementation of NOx-reducing measures.

There are three ways of calculating the total amount of emissions:

- 1) NOx Tax Calculations Table - The government has produced a pre-defined table of NOx calculations, based on the engine size and the amount in kilograms per tonne of NOx they claim is emitted. This is the most expensive option, as the rates set are higher than the actual levels shown on measured engine emissions.
- 2) Manual Onboard Measurement - If actual emissions are unknown, the duty is calculated based on a source specific emission factor and the amount of the engine product used.

### Consilium enters emissions monitoring market

**C**ONSILIUM Marine AB has launched the Salwico Emissions Monitoring System for the measurement of NOx/SO<sub>2</sub> and CO<sub>2</sub> that it says is in full accordance with IMO Resolutions and the NOx Technical Code.

The system, fully type approved by Lloyd's Register (certificate number 07/00043), measures emissions of Oxides of Nitrogen (NOx), Sulphur Dioxide (SO<sub>2</sub>) and the greenhouse gas CO<sub>2</sub> from the engine exhaust of marine diesel engines.

It uses monitoring technology including Chemiluminescence, as prescribed in the NOx technical code, meets IMO guidelines for both onboard NOx verification procedure (direct measurement and monitoring method), and guidelines for onboard exhaust gas cleaning systems.

Designed to be permanently installed on vessels and rigs, the supplier said the Salwico system offered key benefits to shipowners and operators as a solution that verifies compliance with regard to SOx emissions within existing and upcoming Sulphur Control Areas (SECAs). It should be noted that to meet the sulphur guidelines for SOx scrubbers as a whole, however, the Salwico system would need to install a seawater scrubber, as referred to in Regulation 14 (4) (b) of MARPOL Annex VI, which is only applicable in SECA areas. 



The new Salwico Emissions Monitoring System, from Consilium.

- 3) Continuous Onboard Monitoring - The tax is calculated on the basis of actual emissions of NOx.

Of these three options, Martek Marine says that the calculation table is not really a viable option for companies, as the figures are set high to make it an expensive option and thus it encourages operators to adopt a more pro-active environmental approach. Continuous onboard measurement is the only option that will provide an exact reflection of the NOx emitted, says the supplier, meaning companies only pay for the amount they actually produce.

The manufacturer, which said it was moving towards its first sales in Norway for MariNox, said that owners faced a straight choice in calculating the savings made using a continuous monitoring system, against the costs of its installation and operation. The MariNox monitoring system

would more than pay back its monthly rental fee, which was said to be less than \$2000 per month.

Martek added that owners that fitted emissions monitoring equipment by a 31 December 2007 deadline would be able to claim back NOx emissions savings made on their tax bill.

It is well known that, as engines wear with age, the NOx emissions actually reduce. With a continuous onboard monitoring system installed, this reduction in NOx is immediately delivered as a tax saving, Martek pointed out. The system also allows the ship's crew to determine the optimum operating profile of their vessels to minimise their tax liability.

On post 2000 built engines, specialist NOx reducing parts can only be fitted when an onboard NOx measurement system (Type Approved - in accordance with MARPOL Annex VI Reg' 13 The NOx Technical Code & MEPC 103(49)) is fitted. 

# Choose the right partner to power your vessels

We thank DSME and Knutsen OAS Shipping AS for choosing our innovative electric propulsion solution to equip three LNG Carriers.

The vessels will be of twin skeg design and will be driven by two 13.6MW – 570 rpm high torque density induction motors each fed by PWM type MV7000 converters associated with an advanced digital propulsion control system. We will also supply the generators and the Main and Cargo MV switchboard.

This new solution is built on Convertteam's extensive expertise in electric propulsion systems, electric rotating machines and power converters. It significantly increases propulsion performance by offering far better availability, higher efficiency and reduced operational and maintenance costs.

You choose and we make it happen!

Powering your business into the future

**CONVERTEAM**  
THE POWER CONVERSION COMPANY

[www.convertteam.com](http://www.convertteam.com)

## Ballast water solutions come to market

**THREE treatment technologies aiming to solve the challenges set for ballast water management are close to being brought to market.**

ADMINISTRATIONS representing 35% of the world's fleet will have to ratify the International Maritime Organization's 2004 Convention for the Control and Management of Ships Ballast Water & Sediments before it can enter into force. So far, only 3% have.

With even the leaders in developing the Convention, such as Sweden and Finland, slow to prepare legislation to ratify, entry into force will undoubtedly be a protracted process. Indeed, the International Chamber of Shipping has already, through the IMO's Sub-Committee on Bulk Liquids, lobbied for a suspension 'for a limited period of time' of the first application date of the treatment portion of the the BWM Convention - 1 January, 2009 - covering newbuild ships of below 5000m<sup>3</sup> ballast water capacity. Under the current sweep of the convention, all newbuilds will have to feature ballast water treatment systems from 2012, while all existing ships will need to have the technology fitted by 2016.

ICS does not dispute that these dates are appropriate for the alternative ballast water exchange approach to be adopted, but it is concerned that the off-the-shelf technology to be used for ballast water treatment onboard newbuild ships from 2009 does not yet exist.

Latest soundings suggest that there is a body of sympathy at the IMO for the ICS view, and that a two year delay in the due date for the first mandatory use of ballast water treatment systems onboard newbuildings may be in the offing.

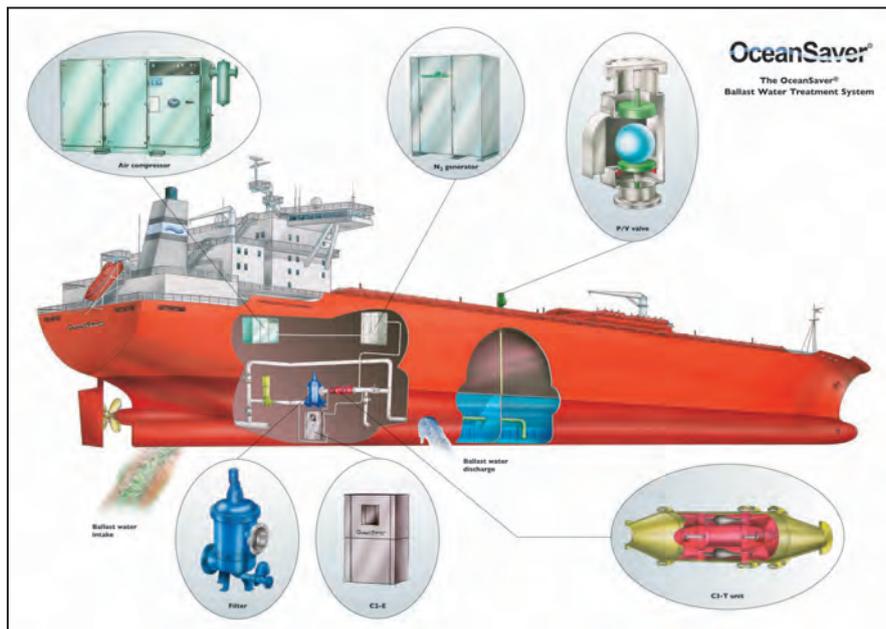
Even if this is so, however, regional regulators may not take the same view. On 18 September last year, for example, Arnold Schwarzenegger, signed legislation that requires the California State Lands Commission to adopt regulations for ballast water discharges from cargo ships, cruiseships, and other vessels by January 2008.

Therefore, it is worth catching up with the innovators aiming to make technology available in time for the Convention as it stands, and three companies promising to offer shipowners viable solutions took a high profile at this year's Nor-Shipping.

Alfa Laval and OceanSaver chose to stage press events; while competitor Hamann did not, the company offered strident promotion of its latest developments.

Alfa Laval emphasised that its PureBallast system offered a chemical-free solution to treating ballast water, whose design was also modular, so as to be installed between existing pipes in an engineroom environment. The company said the system was available in ballast water capacities ranging between 250m<sup>3</sup> and 5000m<sup>3</sup> per hour, with a single unit using 60kW of power and able to handle 250m<sup>3</sup> per hour, and larger capacities requiring multiple units.

A system capable of handling 5000m<sup>3</sup> of ballast water would be appropriate for a ship the size of a VLCC, with Alfa Laval saying that it was 'looking to increase capacity'.



The technology of the OceanSaver ballast water treatment system.

The company announced that, in what it claimed to be an industry first, it had received land-based type approval from Det Norske Veritas (DNV), based on IMO regulations for its treatment system. In a series of tests, undertaken at the hitherto unique ballast water test facilities run by NIVA (Norwegian Institute of Water Research), PureBallast overcame nine samples of organisms of over 50µm, nine samples of organisms ranging between 10µm-50µm, and 21 different bacteria. Alfa Laval said that the tests demonstrated that PureBallast would meet the IMO discharge standards.

Gesamp, (the IMO/FAO/UNESCO-IOC/WMO/WHO/IAEA/UN/UNEP Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection) has apparently recommended PureBallast for final IMO approval, although Alfa Laval concedes that PureBallast has not yet been prepared for explosion-proof areas.

Ongoing shipboard biological tests pointed towards full marine type approval by early 2008, the company said.

Besides filtration, PureBallast uses an advanced oxidation technology, developed by Alfa Laval in cooperation with Wallenius Water. This draws on both a light source and a catalyst to create free radicals that destroy the cell membranes of organisms found in ballast water. When light hits the catalytic surface of the device, the free radicals are created. UV light kills the organisms, while the system uses another wavelength to kill their DNA. Put another way, the PureBallast units contain titanium dioxide catalysts, which generate radicals when hit by light. The radicals, whose lifetime is only a few milliseconds, break down the cell membrane of micro-organisms – without the use of chemicals or the creation of harmful residuals.

Ballast water is treated on its way into the tank and on its way out, in order to deal with re-growth in water which will be in the tanks for an indeterminate period of time.

Alfa Laval said that while the system itself had the same lifetime expectation as a ship, UV lamps would need to be changed every three years, while the catalyst would have to be replaced once every six years.

Alfa Laval said a system of around 1000m<sup>3</sup> capacity would set a shipowner back €530,000 – a piece of information that brought a sharp intake of breath from shipowners attending the Nor-Shipping presentation. One said that while such a price could be buried in the case of newbuild project, the same could not be said when it came to retrofitting ballast water treatment technologies onboard a series of existing vessels.

### Shipboard trials

Thus far, the PureBallast approach has seen three iterations, with a prototype installed onboard the Wallenius car carrier *Don Quijote* in 2003, and subsequent more compact installations either made or in the process of being made onboard a series of Wallenius car carriers delivered by Daewoo Marine & Shipbuilding Engineering through 2006 and 2007. Alfa Laval said that it had also reached verbal agreement with two other, unspecified shipowners of non-car carrier tonnage regarding future installations of units of 500m<sup>3</sup> per hour capacity.

Alfa Laval was very keen to emphasise its size and geographic reach, as well as its marine sector credentials, by way of contrast to some of the other organisations offering ballast water treatment solutions, which it labelled 'inexperienced in marine', 'very small and without worldwide representation', or even as 'having gone bankrupt'.

Three thirds of the world are covered by the Rolls-Royce global customer support network.



Wherever in the world you move your marine assets, you can rest assured Rolls-Royce will be there to support you with the best aftermarket services in the marine world. Our global network with offices in 34 countries provides outstanding levels of support and a complete range of 'cradle to grave' services to both

commercial and naval customers. Tailored support packages delivering all the benefits of a proven global marine capability with all the advantages of a local service. Whatever your requirements and wherever you are in the world, Rolls-Royce is all the support you need.

**Trusted to deliver excellence**

Who could they mean? Certainly not Norwegian outfit OceanSaver, which recently received a Nkr65m cash injection from Statoil, Leif Höegh, and insurance company Storebrand Livsforsikring, plus Nkr50m worth of contracts from Höegh, to develop its super-saturation solution for ballast water treatment.

Nor-Shipping saw the official launch of a system that has, in reality, been involved in shipboard trials for over two years. Yngvild Eriksson Åsheim, president, Höegh Fleet Services, said that the company realised it would need a ballast water treatment system in 2002, to comply with future regulations, and has been working together with OceanSaver ever since.

Also claimed to be compliant with the International Maritime Organization's (IMO) ballast water performance standards, the supplier said the active substance used in OceanSaver - nitrogen - was 'close to receiving approval'. Approval is expected around the first quarter of 2008. A land-based type approval test also took place at NIVA in May 2007, and will be finalised by the end of this year.

DNV said it believed that comprehensive tests showed that the OceanSaver treatment technology met strict environmental standards. Egil Dragsund, principal marine biologist, DNV, said: 'The OceanSaver technology has proven readiness according to part I of the type approval guideline (G8) of the IMO convention.'

**Super saturation**

The OceanSaver system works by supersaturating the ballast water with nitrogen in a two stage process. Combining cavitation with other treatment methods is claimed to ensure that the different principles operating within the system work well together.

Ballast water is pumped onboard a vessel from its sea chest, then the process continues with separation and filtration. Next, the water is exposed to extreme pressure pulses in the C3-T cavitation chamber, followed by the super-saturation and disinfection procedure - injecting a mixture of nitrogen and activated water produced onboard.

The C3-T concept is thought to provide proximity between system surfaces, particles and organisms, and the energy zone of the imploding bubbles. The released energy can then be targeted for its specific use, that of destroying organisms.

Filtered, cavitated, supersaturated, and hypoxic water enters the ballast tanks, which are equipped with pressure/vacuum control systems to prevent nitrogen leakage from the tank, as well as contamination of air into the tanks. The super-saturation elements are intended to prevent regrowth.

The cavitation device is said to cause around a 1.5bar - 2bar pressure loss, but that is compensated by the water pump. For discharge, an aeration process re-establishes the gaseous balance to avoid oxygen-deficient water being released.

A claimed advantage of this process is that it reduces the corrosion rate of coatings in the ballast tank, due to the low-oxygenated water.



PureBallast AOT unit from Alfa Laval.

nonetheless found time to update *The Naval Architect* on its hydrocyclone approach to ballast water treatment, which has been under development for five years.

Hamann's 'SEDNA' system treats water in-line and features hydrocyclones specifically developed for ballast water.

After physical filtration, the ballast water is dosed with 150ppm Peraclean Ocean, a chlorine free oxidant that is fully biodegradable and has received preliminary approval as an active substance at IMO. Peraclean reacts aggressively to organisms in the ballast water but does not end up in the food chain.

Hamann said the SEDNA system had been tested extensively at different locations and had been running for more than 2500 operating hours over the past three years without any problems. Both the mechanical performance and the biological efficacy had been tested at a variety of different ballasting scenarios (eg varying flow rates, different pressure, and back pressure scenarios, simulating different levels of tankfilling). The biological efficacy was evaluated with both naturally occurring plankton organisms and with surrogate species (ATS, Artemia Testing System).

Hamann sales manager, commercial, Mathias Schmidt, said that Germanischer Lloyd was in the process of extending land-based approval for the SEDNA system. Two 250m<sup>3</sup> capacity units had already been installed on a 2100TEU capacity containership for an unspecified owner.

He said that only water moved within the SEDNA system, meaning that it did not incur wear and tear. Furthermore, where other systems tend to clean ballast water twice to deal with regrowth, Mr Schmidt said this was not necessary using Peraclean. 'If you do not kill the organisms the first time round, all that happens is that a new generation is created within three days that can be potentially more damaging to the environment than before. While all of our competitors need to treat the water twice, we have zero regrowth after three weeks.'

Mr Schmidt added that the Hamann solution, which has been modified, offered the most compact kit in the market, suggesting that claims by competitors to the contrary were based on the fact that they chose not to count associated piping. A system with capacity to handle 750m<sup>3</sup> of ballast water per hour would occupy an area of 9.3m<sup>2</sup>, with width of a second generation system reduced to 1.54m, against 2m in the case of the original model. Hamann had also developed a third, modular version of its system for the retrofit market which, in being installed inside an ISO container, could be lowered on top of the engine room and connected to the ballast water tanks through intermediary piping.

He said that the SEDNA system was available with capacities ranging between 250m<sup>3</sup> and 2000m<sup>3</sup> per hour, with six intermediary models also available. A 250m<sup>3</sup> capacity unit would set a shipowner back €400,000, including all software and tanks.

Corrosion can be a frequent cause of ship loss, but the OceanSaver system is thought to be inert. Consequently, there is a claimed cost advantage for both yards and owners.

Stein Foss, managing director, OceanSaver, said that five large coatings manufacturers were involved in corrosion testing the system.

Parallel shipboard testing took place on MV Höegh Trooper and MV Federal Welland, with installation of a system on each vessel during drydocking in 2005. The installation included all sub units. The crews found that it was easy to operate, and Höegh now plans to install it onboard car carriers and LNG carriers.

A 15 month coating study was part of the Trooper trial, while during the same period a corrosion study was carried out onboard Federal Welland. Corrosion test results are claimed to have been very promising, with the elimination of the 'creep element' over those 15 months. Four types of coatings were used.

Speaking for Höegh, Ms Åsheim added that two newbuild shuttle and regasification vessels were on order, which were due to have the OceanSaver product installed, but the system could also be retrofitted, as in the test installation aboard Trooper.

Deliveries of the system were due to commence from 2008 onwards, she said.

**Hydrocyclones**

Also showing at Nor-Shipping, though lower profile, was German supplier Hamann, which

# Heavy Fuel Oil Generating Sets

- ✓ Robust design for long-term reliability
- ✓ Long time between overhauls
- ✓ Service friendliness



## Most efficient conversion of HFO into electrical power

With MAN Diesel GenSets you are ensured an economic and most reliable power source. A long term partnership with fuel saving generating sets means unrivalled operating economy. The additional benefits of 'UNI-FUEL' solutions, modularised maintenance concepts and minimal daily service requirements are just part of the MAN Diesel GenSet concept for the 500-4000 kW range.

**MAN Diesel** - a brand of the MAN Diesel Group



# Anti-fouling tests offer preliminary results

THE status of the Marintek research project into tributyltin (TBT)-free anti-fouling paints has been updated. The test programme was initiated in the run up to the 2001 adoption of the IMO Convention for the control of harmful anti-fouling systems on ships, which looks to prohibit the presence of organotin compounds that act as biocide compounds, such as TBT, from 1 January 2008.

In fact, the convention will only enter into force one year after 25 administrations representing 25% of world tonnage ratify it. So far, 24 administrations, representing 16.63% of world tonnage have ratified, although Panama has indicated it intends to rectify, which would trigger entry into force.

In the meantime, the European Union has banned the application of TBT-based paints on EU-flagged vessels and, as of 1 January 2008, it will be an offence for any ship visiting an EU port to have TBT present on its hull.

What is critical, then, is that TBT-free coatings can be shown independently to perform at least as well as their TBT-containing forebears.

In the run up to the adoption of the IMO Convention, several unsuccessful tin-free anti-fouling paint tests were undertaken by various shipowners, which led to some opposition to the ban, and requests for more time to investigate alternatives. This prompted the Norwegian Marine Technology Research Institute, Marintek, to examine the latest generation of systems, with the cooperation of major suppliers of tin-free anti-fouling paints, as well as shipowners.

The project was formally established in June 2000, and the first test ship, MV *Tancred* from Wilhelmsen, was drydocked in July that year to have its test patches applied. Before the drydocking of each ship for test patch application, there was a meeting arranged between the shipowner, the paint suppliers, and Marintek. Each vessel's operational profile, docking interval, and the positioning of the patches were discussed. Based on this, each paint supplier made up the paint specification.

Sixteen test ships were chosen for the project, broadly reflecting different operational conditions for the world fleet, with regards to trading waters, speed, activity levels, and docking intervals.

The most demanding operational conditions for anti-fouling systems were also covered. A full list of vessels, owners, and periods of application can be seen in Figure 1.

Fourteen of the ships had patches of self-polishing anti-fouling paints, and the last two had biocide-free paint systems. The self-polishing products utilised copper-oxide as biocide, and the biocide-free products were silicone- or teflon-based.

The coatings suppliers and individual products tested are shown in Figure 2.

A control patch of TBT-based anti-fouling paint was included in each test, with a new coat applied on top of an old intact coat, and a sealer in between. For the TBT-free paints, all test areas of the hulls were fully sand blasted, giving conditions comparable to new ships.

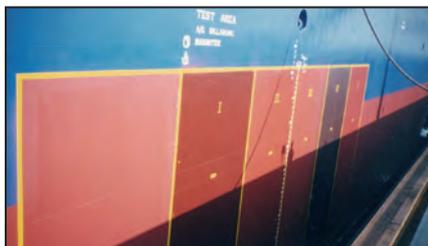
Paints were tested in patches between 3m and 5m wide, located mid-ship, and preferably on the same side of the ships. For ships with

Ship type	Ship owner	Ship name	Dock	Period	00	01	02	03	04	05	06	07
Car carrier	Wilhelmsen	Tancred	7/00	36	●	→	→	→	→			
Gas carrier	Bergesen	Helice	8/00	60	●	→	→	→	→	→	→	
Chemical	Stoll Nielsen	Stoll Egret	9/00	30	●	→	→	→	→			
Shuttle tank	Knutsen OAS	Vigdis Knutsen	10/00	36	●	→	→	→	→			
Chemical	Stoll Nielsen	Stoll Sapphire	10/00	60	●	→	→	→	→	→	→	
Tanker	Red Band	Knock Muir	12/00	60	●	→	→	→	→	→	→	
Open hatch	Billabong	Star Harmonia	12/00	36	●	→	→	→	→			
Coastal express	TFDS	Kong Harald	1/01	36	●	→	→	→	→			
Coastal express	TFDS	Polarlys	1/01	36	●	→	→	→	→			
Cruise ferry	Color Line	Kronprins Harald	1/01	24	●	→	→	→	→			
Cruise vessel	Red Band	Black Watch	3/01	24	●	→	→	→	→			
OBO carrier	Frontline	Front Breaker	4/01	60	●	→	→	→	→	→	→	
Bulk carrier	Heegh	SG Prosperity	8/01	60	●	→	→	→	→	→	→	
Supply	Farslad	Far Fosna	11/01	30	●	→	→	→	→			
LPG Carrier	Bergesen d.y	Berge Ragnhild	2/02	30	●	→	→	→	→			
General Cargo	Greig Billabong	Star Fuji	3/02	30	●	→	→	→	→			
	Klaveness	NN										

Figure 1: The total test ship programme.

Suppliers	SP-Products	Biocide-free Products
Jotun Paints/NOF Kansai Marine Coatings	SeaQuantum	Everclean
International Coatings/Nippon Paint	Intersmooth Ecoloflex	Intersleek
Hempel's Marine Paints A/S	GLOBIC SP-ECO	HEMPASIL SP-EED
Star Marine Coating/Chugoku Marine Paints	Sea Grandprix	Sea Grandprix ECO-Speed
Sigma Coatings	AlphaGen 20	Sigmaglidle LSE
Ameron International	ABC#3	

Figure 2: Tested products by suppliers.



Test patch layout, MV *Star Harmonia* from Greig International/Billabong.

single side loading arrangements, test areas were on the side facing the sea, and vertical test areas went from the deep load line to the bilge keel. The sequence of patches was altered from ship to ship, to give the best relative comparison between the products.

Different ships had different test periods (as seen in Figure 1), but on average, the application was for two or three years. Det Norske Veritas provided the evaluation test methods and quality assurance, and was responsible for all laboratory activities and wet sample analysis.

Intermediate subsea inspections of five test ships were carried out between 2002 and 2003, and at that point, seven vessels had already passed their final drydock inspection.

There was a detailed drydock report compiled for each vessel, including a review by coatings manufacturers and the shipowner. The final vessel finished its test period at the end of 2006, but that result is still to come.

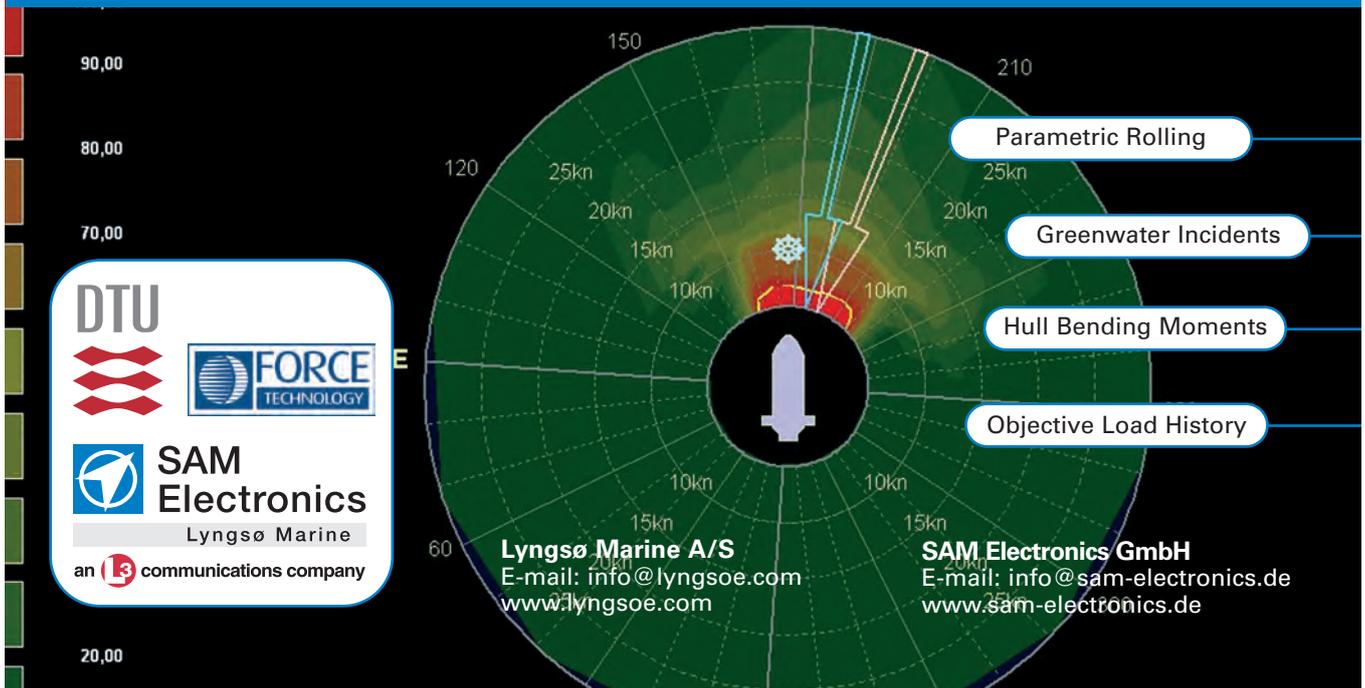
The preliminary conclusion is therefore that the new TBT-free types of self-polishing anti-fouling paints look to be able to solve fouling problems to about the same degree as the old TBT-based systems. There is even a suggestion that they may be more effective, but this is not conclusive, especially as the old systems used in the project were not necessarily the most effective on the market before the ban. The polish rate of the self-polishing versions also appears to be slower, particularly in cold waters.

Weed fouling was reported to be a problem with several products, but apart from a few small acorn barnacles, no other fouling was recorded. The test patches for the silicone-based products also look promising so far.

Out of the six types of product tested, each performed best on at least one vessel. However, there seems to be no correlation between the position of the test patches, and the effectiveness of the products.

These preliminary results, although inconclusive, are important to raising support for the TBT ban. When the full results are available later this year, they should prove useful as a guide to the choice of coatings available for shipowners, which comply with the introduction of the IMO Convention for the control of harmful anti-fouling systems on ships.

# SeaSense Seakeeping Decision Support System



Please visit us at Kormarine 2007, 24 - 27 October, German Pavilion, Booth No. R12

Specify SOLASOLV® anti-glare, heat rejecting roller screens for your navigation bridge windows

- Brand leading solution to 'IMO Resolution MSC.31(63) Regulation 22 - Navigation Bridge Visibility'.
- The only roller screens in the world to be Type Approved by Lloyds, DNV and ABS
- 20 years experience in the design and manufacture of specialist roller screens for ships.
- 70,000 supplied to over 7,000 vessels worldwide.



ALL CLEAR AHEAD?

NOT EXACTLY!

SOLASOLV® - The Seegoing Solution for SAFER Navigation®

Solar Solve Marine Tel: +44 (0) 191 454 8595 Fax: +44 (0) 191 454 8692  
Email: info@solasolv.com Web: www.solasolv.com

*Danfoss*  
SEMCO  
FIRE PROTECTION

High-technology fire fighting solutions  
for any maritime application

www.danfoss-semco.com

## Going green means size at lower speed

**B**OTH Det Norske Veritas (DNV) and Germanischer Lloyd (GL) have put forward their ideas regarding the environmental future of the shipping industry. Both classification societies have called for immediate action to ensure emissions are reduced and regulations are complied with.

DNV said it believed that it would be more advantageous for shipping to search for voluntary improvements to emission levels now, rather than having regulations imposed upon the industry in the near future and leaving regulators to set the environmental agenda. A restricted timeframe of two to three years was suggested for demonstrating results.

Tor E Svensen, chief operating officer, DNV Maritime, claimed that improvements would not only be achieved by identifying the newest or the best available technology, but by optimising transportation and existing technology. He added that large vessels are more environmentally friendly, with emissions being reduced by between 20% and 40%.

With that statistic in mind, Mr Svensen announced that DNV is to class what are currently the world's largest iron ore carriers, four 388,000dwt vessels being built for Bergesen Worldwide by Bohai shipyard, China, part of the CSIC Shipbuilding Group. The largest dry bulk carrier until now has been *MS Berge Stahl*, at 360,767dwt.

These Very Large Ore Carriers (VLOCs) will be 360m long with a breadth of 65m, and construction will start in January 2010. The first vessel will be delivered in April 2011, and the last is due by April 2012. The VLOCs will be chartered by Brazilian iron ore mining company Companhia Vale do Rio Doce, transporting steel to China.

The demand for bulk carriers is increasing, and the market is moving towards larger vessels. There are 85 bulk carriers of more than 200,000dwt in operation, whereas there are currently 87 on order. DNV estimated the number of large bulk carriers would double within the next four to five years.

Comparing the new 388,000dwt VLOCs to a standard capesize bulk carrier, it is thought that both fuel consumption per tonne carried and emissions to air will be reduced by 30%. For the Brazil to China voyage, the estimated 'reduced emission cost' would be US\$300,000 per voyage.



**Tor E Svensen, chief operating officer, DNV Maritime.**

The speed of the bulk carriers will be 14.8knots, which will save fuel compared to a faster standard-sized ship, and the 'go slow' message is echoed by GL. It has estimated that for an 8000TEU container vessel, there would be approximately 20,000kW of power saving if the speed was reduced from 25knots to 22knots.

GL said it believed that although more vessels would be needed for the same amount of cargo, should lower speeds be implemented, overall emissions would be reduced. More efficient fleet scheduling would also help to combat the problem.

GL said it considered that shipping would play a decisive role in reducing air emissions. According to Dr Hermann J Klein, member of the executive board of GL: 'Shipping is not the primary source of emission. It is the quality of fuel burnt by ships which causes an unwanted impact upon the maritime environment.'

In comparison to air and road transport emissions, shipping's NOx, particulate matter, and CO<sub>2</sub> levels

are fairly environmentally friendly. Shipping produces below 2% of CO<sub>2</sub> emissions for moving 90% of world trade, but there are plans to include the industry in the EU's CO<sub>2</sub> cap and trade scheme. Nevertheless, it is the SOx levels which are still the main problem.

DNV's Mr Svensen commented: 'Although transportation by ship is far more efficient and causes fewer emissions than the alternatives, the shipping industry will have to pay much more attention to the environment in the future than it does today.'

The two main options available to cut emission levels are higher quality fuel, including reduced sulphur content or burning distillate fuel instead of residual fuel, and treatment technology like scrubbing. However, there is widespread political support for cleaner fuel qualities, and DNV also backs this method, with Per Wiggo Richardsen, information manager, DNV, saying: 'In principle, we support reducing emissions at the source. Scrubbing technology adds complexity, but the simplest method is usually better.' GL believes that both methods are possible, but feels that it would be easier to reduce the sulphur content at the refinery.

Other suggestions from GL were enhancing engine and propulsion efficiency, optimising hull design, and using low NOx combustion. There is also pressure on engine manufacturers to reduce specific fuel consumption.

Long term alternatives include fuel cells, with DNV already investing in a fuel cell project. GL's Dr Klein remarked: 'It is high time to analyse the long term alternatives for power propulsion, well before the end of the fossil era.'

Another aspect of the environmental impact of shipping was discussed by chief operating officer and division manager for Europe, Middle East, and Africa, GL, Torsten Schramm. 'Ship recycling is a hot topic,' he explained, as there is a proposal for an IMO Ship Recycling Convention.

GL called for the IMO to take the opportunity to clarify what controls apply to ships destined for recycling, and whether they should even be classified as waste. The Convention is due to apply to shipyards, owners, new ships below 500gt, as well as existing ships, and recycling yards.

The convention is due for completion by the end of this year, and recycling may be restricted to approved and licensed facilities. Checking hazardous materials and compiling the documentation for the certification of inventories onboard both newbuildings and existing vessels is an enormous undertaking for shipyards, shipowners, suppliers, and maritime equipment manufacturers. For this reason, GL has developed an inspection plan, and offers full-scale software documentation for compliance with the convention.

Throughout all of the environment issues facing the shipping industry, it is clear that corporate responsibility will become increasingly important. Environmental issues are now being raised frequently, and it is up to individual companies to voluntarily improve their environmental profile, before regulations are imposed upon them. ♻️



**Berge Stahl, currently the largest ore carrier in operation, at 360,767dwt.**

# The secret of prosperity. Safe returns.



## More payload at higher speed with less power



Azipod® offers great flexibility in overall vessel design, creating the opportunity for larger, faster and more fuel efficient ships.

Improved vessel hydrodynamics, high propulsion efficiency, space and weight savings are all hallmarks of Azipod® propulsion. This has inspired naval architects, yards and ship owners to develop new vessel designs and concepts that transform the unique advantages of Azipod® into more competitive ships and more profitable ship operations. **Visit us at [www.abb.com/marine](http://www.abb.com/marine)**

# ACO prepares for sewage treatment

THE effective management and treatment of ships wastewater has always been a contentious issue, but never more so than at present. The International Maritime Organization recently adopted Resolution MEPC 159(55), providing revised guidelines on the implementation of effluent standards and performance tests for sewage treatment plants.

The new test standard and discharge requirement will apply to all sewage treatment plants installed on, or after, the 1 January 2010. All vessels of 400gt and above and ships of less than 400gt which are certified to carry more than 15 persons are required to comply, with effect from that date.

The new guidelines represent a step change in discharge standards that can only be addressed by the use of advanced treatment technologies. However, these technologies have been, until now, very expensive and the preserve of those passenger cruise lines operating in environmentally sensitive areas such as Alaska. The new requirement will affect most, if not all, foreign-going vessels, all of which will need to have this advanced technology installed onboard and in operation.

The successful implementation of the Alaskan requirements has demonstrated to the legislators that industry is capable of developing solutions to much higher discharge standards than those currently legislated in IMO, not just for black water treatment, but also grey water. Whilst nothing has yet been proposed for grey water treatment by the IMO, it must surely be only a matter of time. In the grey water it is the galley water – with its Fats, Oils, and Greases, or ‘FOG’s – that is the most difficult to cater for. Effective pre-treatment is crucial to ensure reliable operation of the wastewater treatment plant downstream. A suitable grease separator will have to be incorporated into any system intended to treat grey water and meet the proposed 2010 amendment.



The internal membrane structure of the Maripur allows for a remarkably small footprint and exceptionally low power requirement.



Lipatomat system.

Details of the draft guidelines, as well as current legislation, are summarised as in the table below. In addition, the sewage treatment plant must demonstrate its ability to operate at an inclined angle of 22.5° for a period of 24 hours in any plane from the normal operating position.

Almost daily, greater pressure is being applied to shipowners and operators by both legislators and enforcement authorities alike. Never has there been a greater need for a manufacturer to step up to the plate and offer a complete system solution to the growing wastewater issue.

ACO Marine, a division of the ACO Group of companies, offers a complete range of wastewater system components such as advanced Maripur membrane black and grey water treatment, Lipator and Lipatomat fat, oil, and grease separators, as well as all aspects of the piping systems that serve these components.

The company said that ACO Maripur already exceeded the very latest high standard of wastewater treatment for marine applications. Already MEPC 159(55) compliant, full certification was on schedule to be achieved in time of SMM, 2008.

The ACO Marine range of Lipator and Lipatomat grease separators is believed to be the largest currently available on the market, accommodating capacities up to 15litres/second. Larger capacities are also available on request, up to 25litres/second. In cases where grease extraction is not required (direct overboard discharge or to holding tanks) the area of greatest concern is grease and fat build up within the extended pipe work system. Blockages are the largest single cause of system failure in such cases, and the smell is repugnant. ACO Marine’s range of Biological Grease Traps use an enzyme (ACO Clear) injection system which breaks the molecular chain within the greases and oils, preventing the build up of solids - and odours - within the pipe system.

Completing the package is ACO Marine’s range of bespoke gully and channel drainage components, push-fit stainless steel and/or coated galvanized steel pipe work systems for vacuum and gravity applications. The GM-X-F range of high pressure push-fit galvanized pipe systems for fire protection sprinkler systems is rated to 16bar and tested to 64bar mains pressure. 

	IMO MEPC.2 (VI)	USCG 33CFR 159 PT1-300	USCG/Alaska 33CFR 159.309	IMO MEPC 159(55)	ACO Maripur® IMO certified values
Coliform bacteria (n/100ml)	200	200	20	100	4
Total Suspended Solids (mg/l)	100	150	30	35 (70 if tested at sea)	<10*
BOD <sub>5</sub> (mg/l)	50	-	30	25	<5*
COD (mg/l)				125	<25
pH	Not req'd	Not req'd	6 - 9	6 - 8.5	6.3 - 8.3
Chlorine (mg/l)	As low as practicable	Not req'd	10	below 0.5	zero (not used)

\* actual values for TSS and BOD<sub>5</sub> were below the level at which accurate measurement tolerances are possible. Default figures are therefore indicated



# MegaBoxer: new heavyweight boxships of the seas

11,000 TEU, 12,000 TEU, 13,000 TEU ...  
GL is your perfect sparring partner.

Germanischer Lloyd Aktiengesellschaft  
Vorsetzen 35 · 20459 Hamburg, Germany  
Phone +49 40 36149-0 · Fax +49 40 36149-200  
headoffice@gl-group.com · www.gl-group.com



## Floating hotel stretches capacity boundaries

EDDA Accommodation has placed an order for what will become the world's largest purpose-built offshore accommodation and service vessel with Astillero Barrera in Vigo, Spain.

THE construction and maintenance of offshore plants (for example oil platforms) in the shelf areas of the world's oceans call for highly specialised supply vessels. These vessels have to fulfill several functions: accommodating staff, providing suitable tank and storage capacities, as well as offering deck areas large enough for assembly and repair jobs.

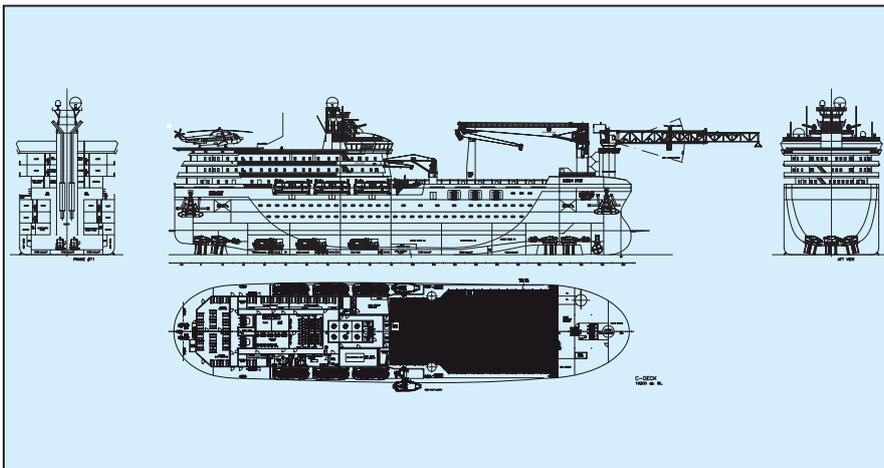
Edda Accommodation, part of Norway's Østensjø Group, is extending its services by presenting a vessel with a total capacity for 600 personnel. The vessel will be delivered at the end of 2009, in a deal worth Nkr850 million.

The vessel, which is yet to be named, has been designed to meet clients' requirements for safety, efficiency, comfort, and low emissions to the environment.

At 130m long x 27m breadth, she will be equipped with a telescopic gangway installed on the 1400m<sup>2</sup> deck, with one heave compensated knuckle boom crane and two marine deck cranes. The gangway will provide safe passage of personnel from the vessel to offshore installation.

The cabins and offices onboard will be built to executive standard with the additional of recreation areas, such as fitness rooms, sauna, swimming pool, and cinema.

The new vessel will be particularly suitable for operations in Gulf of Mexico, West Africa, and South East Asia, but will also be appropriate for more exposed areas, such as the North Sea, Canada, and the Northern part of the Pacific Ocean.



GA Edda TBN accommodation vessel for offshore duties.

The accommodation and service vessel will also be suited for transporting personnel to and from offshore installations.

Since 2004, Østensjø Rederi AS has provided offshore accommodation by using the platform support vessel *Edda Fjord* for Shell's Bonga FPSO offshore Nigeria with 330 beds, and later 450 beds to the BP Thunderhorse platform in US Gulf of Mexico.

### Growth into offshore

With its new vessel, Edda Accommodation said it was now expanding to offer the offshore industry 'a unique accommodation and service vessel'. In addition, the vessel may also be used as quarters for personnel working onshore. For such operations the vessel may be moored alongside a jetty and the total capacity may be increased to 1000 beds.

Its dynamic positioning system (DP 3) and the five Voith Schneider propellers will provide a precise and stable position, resulting in low fuel consumption compared to other propulsion systems.

'Compared to a traditional propulsion system, the Voith Schneider system will offer a very precise, fast, and accurate positioning capability combined with a considerable reduced fuel consumption,' said the company.

The five 2500kW Voith Schneider Propellers size 32 R5 EC/265-2 will be delivered to the shipyard for installation at the end of 2008. Three of the propellers will be operating at the stern and two in the bow of the supply vessel, resulting in a sailing speed of approximately 12.5knots. Yet for vessels such as this one, speed is secondary. What counts is excellent manoeuvrability, achieved through the VSPs, which increase safety and efficiency.

With its DP3 system, the new supply vessel will offer the most advanced technology in terms of dynamic positioning currently available. For this, Voith Turbo Schneider Propulsion is not only supplying Voith Schneider Propellers with fast control times, but also a roll stabilisation system to keep the vessel automatically at its given position. As a result, the crew will be able to enter the platform safely via a gangway at the bow, even if the sea is rough. The telescopic gangway is fitted with a special device, which adapts hydraulically to the prevailing sea movements.



Edda Accommodation's new floating hotel will have capacity for 600 personnel in its offshore support role.

**TECHNICAL PARTICULARS****Edda TBN**

**Multi-purpose accommodation and service vessel, designed to cater for the highest standard of reliability to the customer.**

Builder:..... Astillero Barrera Yards  
in Vigo, Western Spain  
Delivery:..... 2009  
Classifications: ..... DNV +1A1,  
SUPPLY VESSEL, SF, EO, ICE C,  
DYNPOS AUTRO, CLEAN DESIGN,  
COMFV(3), COMF-C(3), NAUT  
AW, POSMOOR-V  
Regulations and  
standards: ..... MCA - NMD, SOLAS  
- MARPOL, ISPS - USCG  
Length o a:..... 130.0m  
Breadth: ..... 27.0m  
Depth 1st deck: ..... 9.7m  
Draught scantling: ..... 7.0m  
Capacity: ..... 600 beds in total in  
1, 2, & 4 bed cabins,  
300 beds in single cabins  
Deadweight: ..... 7500MT  
Deck area: ..... 1400m<sup>2</sup>,  
including 260m<sup>2</sup>  
covered workshop area  
Deck equipment:..... 1 x heave  
compensated knuckle  
boom crane 10T at 55m  
2 x marine deck cranes 15T at 20m  
Cargo and discharging  
system: ..... Potable water  
and fuel oil for  
delivery to installations  
Propulsion: ..... Aft 3 x 2500KW  
Voith thrusters. Forward 2 x 2500KW  
Voith thrusters  
Forward 1 x 2000 KW tunnel thruster  
Speed: ..... 12knots - 13knots  
Auxillaries/electric  
power: ..... 6 x AC generators  
of 2925KW 1 x harbour  
generator of 500KW  
Total output 18,050KW  
Dynamic positioning: ..... DP 3 with 3  
reference systems  
Accommodation:..... High standard  
Executive cabins, offices,  
conference rooms, satellite  
communication, internet access,  
wireless net, television/  
DVD players, fitness room, sauna,  
swimming pool, library,  
recreation areas, and cinema  
A total of 300 single cabins  
Gangway:..... 1 x heave compensated  
hydraulic telescopic gangway  
for transfer of personnel to  
and from installation/FPSO  
Design criteria for gangway  
is 5m significant wave height  
Crew boat access via gangway  
on both sides of vessel  
Gangway control  
system: ..... Electronic personnel  
tracking system  
Four point mooring:..... 4 x  
anchors connected to  
1800m of wire  
Helideck:..... Acceptable for S-61  
and S-92. Refuelling plant

**EXCELLENCE IN ELECTRIC**

## Electrical systems that make great vessels even greater

Scandinavian Electric Systems (SES) is a system house and supplier of low voltage electrical systems, services and components, such as:

- Diesel-Electric propulsion systems
- Multi-Purpose propulsion solutions
- Electric Motors
- Starters
- Generators
- Frequency converters
- Electric winch and crane solutions
- Clean Power Systems
- Switchboards
- Power Management Systems

SES delivers complete services, from initial concept design to equipment selection and supply, as well as field support. We develop both tailored and general systems of highest quality.



Scandinavian Electric Systems AS | Janaflaten 28 | P.O. Box 80 Godvik | N-5882 Bergen | Norway

Tel.: +47 55 50 60 70 | Fax: +47 55 50 60 52 | Email: ses.mail@scel.no | www.scel.no

# New Champion of pipelaying sector

**I**NTEGRATED offshore support and marine services provider Ezra Holdings celebrated the official christening ceremony of *Lewek Champion*, in Batam, Indonesia, during August, marking acceptance of its first heavy-lift, accommodation, and pipelay vessel.

Into the bargain, Ezra subsidiary, EOC Ltd announced that its wholly-owned subsidiary, Emas Offshore Construction and Production Pte, had secured a milestone pipelay and construction contract to provide services as part of a US\$888m subsea installation project in Southeast Asia for a national oil company.

*Lewek Champion* will play a key role in the installation of subsea pipelines as well as the transportation and installation of drilling, production, and wellhead platforms in the offshore field.

Ezra managing director, Lionel Lee, said: '*Lewek Champion* has helped us to broaden our market reach in the offshore production and construction segment, where we expect demand to take off.

'It also entrenches our position as a leading player in offshore deepwater vessel charters. We have deliberately enlarged our fleet to cover the different stages of an oilfield's life cycle and Ezra, with its modern fleet and expertise, has room to grow further.'

The class DP2 Dynamically Positioning *Lewek Champion* can be upgraded to a DP3, and is equipped with an 800tonne heavy-lift crane. She is purpose-built for subsea pipeline construction support work and can accommodate over 500 men.

'We expect the field exploration and development market to continue to thrive in the medium term as we continuously seek to participate in field work where we can tap on even higher charter rates in the still-buoyant industry,' Mr Lee added.

In June, Ezra announced that *Lewek Champion* would be chartered to international integrated energy major ConocoPhillips for accommodation support and decommissioning work in the planned shut-down of the Bayu Undan platform, located in the Timor gap, an area of ocean flanked by Timor, Indonesia, and Australia.



The pipelayer *Lewek Champion*, christened in August, represents the next stage in Ezra's unfolding offshore strategy.



The newbuild will initially be deployed for accommodation support and decommissioning the Bayu Undan platform, located in the Timor gap.

The Group expects to take delivery of its second pipelay, accommodation, well service, and maintenance vessel in the first half of 2009. This ultra-large vessel will also be equipped with a Class DP2 system, upgradable to DP3.

Through wholly-owned Lewek Shipping, it awarded a US\$25.6m contract, which excludes owner furnished equipment, to build the ultra-large pipelaying, accommodation, well service, and maintenance vessel to Labroy Shipbuilding and Engineering. The vessel will be the second of its kind in Ezra's fleet after Hull 600, and the second to be equipped with a Class DP2 Dynamic Positioning system, upgradable to DP3.

The vessel will be engineered, like its sister vessels, for safety, efficiency, and speed to provide pipelaying, maintenance, installation, well service, and construction services to deepwater rigs and platforms. It, too, will

accommodate 500 men and meet high safety and living standards for long sea voyages, as well as offshore construction and production projects. Ezra will finance the construction of the vessel through a combination of internal funds and bank borrowings.

The Group also recently ordered the world's first two 30,000bhp large Rolls-Royce-designed multi-functional support vessels to enhance its service offerings to its target market of deepwater construction, production, and maintenance projects.

The \$98 million contract, excluding certain owner furnished equipment, went to local shipbuilder Pan-United Marine. The two 30,000 brake horsepower (bhp) large Rolls-Royce designed multi-functional support vessels, which are capable of service in depths of 3000m, will be built in PUM's Singapore yard with delivery for one scheduled in the first half of calendar year 2009 and the second one in the second half of calendar year 2009.

According to Mr Lee: 'This contract will be for the first batch of large multi-functional support vessels to be built by a Singapore yard, and possibly Asia's first as well. These Rolls-Royce designed vessels are the first two of their kind in the world. As oil exploration moves further into deepwater and more hostile environments, we will see greater demand for such larger and sophisticated support vessels to meet this challenge. These additional capabilities will further strengthen Ezra's position as an integrated offshore support services provider.'

EOC Ltd group also recently awarded a contract to convert a 127,533dwt shuttle tanker into a floating, production, storage, and offloading vessel. 

## TECHNICAL PARTICULARS LEWEK CHAMPION

Type: .....	Pipelayer
Builder: .....	Nanindah, Pulau Batam
DW: .....	n/a
GT: .....	25,112
Length oa: .....	142m
Breadth: .....	40m
Depth: .....	10m
Draught: .....	6.5m
Freeboard: .....	3500mm
Build Material: Steel Deck(s): .....	1 Water Tight Compartments
	Single Bulbous Bow
Flag: .....	Republic of Singapore



ESAB's high-speed plasma cutting, up to 30 % faster and super smooth. That's high productivity and increased efficiency. That's ESAB's new cutting system – with new controller and new Columbus™ nesting software for up to 7 % higher material usage.

Shouldn't we be talking to you?

Visit us at [www.esab.com](http://www.esab.com)



# Fast **finish**

**GLOBAL SOLUTIONS FOR LOCAL CUSTOMERS – EVERYWHERE**

# Build the requirements of the future into your fleet today.

It's about leadership.

"No one knows what the future holds." Actually, in shipping we do know quite a bit. We know it will hold more regulations and more demands for environmentally sustainable and efficient operations – in short more challenges to deal with. Your vessels may be intended for 30 to 40 years of operation. As a leading classification society, DNV is at the forefront of developments. We can help you build the requirements of the future into your fleet today, so you can go ahead – with confidence.

Classification • Certification • Statutory Services • Maritime Consulting

## Shipbuilding supply super cycle

**DEMAND for new ships, in this case mega containerhips, has surprised the market, and South Korean shipbuilders are rapidly scaling up production.**

**N**EWs of a tenth drydock at Hyundai Heavy's Ulsan shipyard (640m x 92m, January 2009 completion) underlines the acceleration of capacity of South Korean shipbuilders. It is clear, according to Worldyards.com, that we are in supply super cycle with a doubling of capacity through to 2010. Demand has been vigorous for most of 2007 in the bulk arena, while a surge of mega containerhip contracting has added an unexpected dimension to the newbuilding juggernaut.

Unlike the multi-pronged demand of last year with owners chasing bulkers, tankers, containers, and liquefied natural gas carriers, this summer's hunger in the newbuilding market has clearly been for big containerhips.

There has been a recent flood of containerhips bigger than 10,000TEU. Since May this year, a total of 32 x 12,500TEU firm ships were amassed (eight for NSC at Hanjin Subic, four by B Rickmers, and eight by Erck Rickmers at HHI, four by Peter Doehle, and eight by Claus Peter Offen at Samsung), plus four 10,000TEU ships for APL at Daewoo.

The latest news is that Seaspan is said to have placed an 8 x 12,500TEU capacity ship order at HHI, whilst China Shipping has confirmed a 13,400TEU order.

That is 48 x 12,500/13500TEU + 4 x 10,000TEU since May. This extra production of newbuilding tonnage during this time bracket would have been relatively unthinkable even just two years ago.

The casual explanation is that these were slots reserved for LNG ships, which either did not materialise, or had to be postponed. Worldyards, on the other hand, contends that the real answer is that the leading Korean yards have managed to increase their capacity dramatically by a mixture of greenfield facilities (Hanjin Subic), new production methods (skid method and others), and indirect facility expansion (Samsung's big block factories in China).

Compensated gross tonnage for a 10,000TEU to 12,500TEU vessel is roughly 60,000cgt to 65,000cgt respectively. The 48 x 12,500TEU ships plus four x 10,000TEU equals about 3.25m cgt, which is larger than the size of the Hanjin orderbook (which is the world's seventh biggest shipbuilder and controls 2.5% of the world total orderbook).

To put it another way, 52 x 10,000TEU-12,500TEU ships, about 6% of the current container fleet, or the fleet size of Evergreen, the world's fourth largest liner operator, have been injected into the tonnage pipeline since May this year. This comes on top of the other stream of tonnage such as capesize (30 ships), 4250TEU, 6500TEU, and 8500TEU (65 ships), and large tankers (VLCCs, Suezmaxes, and Aframax, totalling 21 ships) that Korean yards have managed to contract since May this year.

Worldyards has been accused of overstating the rapidity at which capacity is growing, yet it stands by its sum-of-all-parts approach in which it cumulates capacity developments at a micro, individual shipbuilder level.

Such data-intensive work is certainly more accurate than that of a mathematical forecast based on

regression. The estimates are therefore in line with what is happening on the ground at shipbuilding facilities.

The capacity expansion estimates for the four leading Korean yards seem substantial, but are not suspect when we compare them to actual orderbook data. The increase of orderbook in 2008 compared to 2007 looks something like the figures below (all in CGT):

HHI - up 32%, Samsung - up 47%, Daewoo - up 48%, Hanjin - up 21% (followed by 29% in year 2009 over 2008).

If HHI can take in 30% more orders, this equates to the equivalent of two Shanghai Waigaoqiao, which is one of the most productive yards in China with a 2006 delivery of about half a million cgt. This was certainly true two to three years ago,

when South Korean yards said that they were at full capacity. Today, in the fullness of time, the 'fullness' of the shipbuilders has been overtaken by dramatic capacity improvements. To sum up then, demand for new ships has been a dynamic and bullish ride, but for those chasing the 'absolutely last' and 'secret' slots, there is substantial new supply of shipbuilding capacity right around the corner.

Worldyards research shows that Korea is consistently a bigger source of growth than China (again in CGT terms).

With the advent of new production technology lubricated by hefty margins, the traditional bottlenecks (turn-around time of drydock/slipways) of shipbuilding are disappearing fast, and the entry barrier is lower and lower. 

## BRONSWERK® MARINE

### MARINE HVAC & REFRIGERATION SYSTEMS

**Bronswerk Marine Inc.**, (formerly Stork Bronswerk), is a world leader in the field of HVAC / Refrigeration systems design.

From the harshest climate of the Alaskan coast to the tropical waters of Mexico and the Caribbean, from Tugs to Tankers and Ferries to Frigates, Bronswerk Marine has the experience and expertise to satisfy all of your **Marine, Offshore** and **Military** needs in the most demanding of environments.

- ◆ Custom Design
- ◆ Equipment Supply
- ◆ Commissioning
- ◆ Engineering
- ◆ Installation
- ◆ Spares
- ◆ Project Management
- ◆ Testing
- ◆ After Sales Service



**Canada**  
**Head Office**  
 3755-C Blvd. Matte  
 Brossard, Quebec  
 Canada  
 J4Y 2P4  
 Tel: (450) 659-6571  
 Fax: (450) 659-1035

**USA**  
**Sales Office**  
 2468 Dauphine St  
 Suite A  
 New Orleans, LA  
 70117  
 Tel: (504) 943-6284  
 Fax: (504) 943-0268

**China**  
**Shanghai Liaison Office**  
 Factory 7  
 Lane 1365 East Kang Qiao Road  
 Kang Qiao Industrial Zone  
 Pu Dong, Shanghai PC201315  
 Tel: 86-21-6818-3098  
 Fax: 86-21-6818-3115

Toll Free Canada & USA : 1-800-465-7749

Visit our full range of products and services at:

[www.bronswerk.ca](http://www.bronswerk.ca) - [info@bronswerk.ca](mailto:info@bronswerk.ca)



## Becoming an innovative shipbuilding country - a naval architect's perspective

THE thoughts of Dr Peter Cheng, one of Asia's leading naval architects, on the past, present, and future of Chinese shipbuilding. Shipbuilding in China report by Matthew Fynn, managing director of Worldyards.com.

DR Peter Cheng, born in Shanghai, was educated in the discipline of Naval Architecture in the United Kingdom, and then established himself as one of the leading Naval Architecture practitioners within Asia, based in Hong Kong. Few people have been in his position to watch the development of the Chinese shipbuilding industry.

'I can still clearly remember my first visit to Jiangnan and Hudong Shipyard in the winter of 1979, when I was invited by the then No 6 Machinery Ministry,' he says. 'It was evident then, that the challenges facing the Chinese Shipbuilding industry were tremendous. Not only was there a disparity in the technology level and knowledge, but the language problem was also a great obstacle in the technology transfer.'

Twenty eight years later, he spoke with *The Naval Architect* about where China is on its road to shipbuilding dominance. The following is a summary of his thoughts:

### Striving, then stagnation

After the establishment of the People's Republic of China in 1949, there was a period during which the shipbuilding industry was encouraged by the Government, especially for the building up of military capabilities. New shipyards for both military and merchant ships were built and developed.

Large up-to-date research laboratories were established, such as the 701 Institution in Wuxi.

Special design institutes for naval and merchant ships were also set up, such as the 708 Institution in Shanghai, and 'SDARI' of the Ministry of Communication. Marine-related educational institutions were expanded, such as Jiao Tong University in Shanghai.

Unfortunately, the Cultural Revolution put a stop to all of the development, and China stood still while Europe and Japan were experiencing rapid advancement in shipbuilding technology.

### 1970s re-awakening

Adopting an 'Open Door Policy' to the outside world, the Government realised that huge gaps existed in all types of industrial technologies, including shipbuilding. As such, in December 1977 the Central Government decided to implement a policy to enter the world ship export market, and so solicited the support of world-renowned shipowners in Hong Kong, such as C Y Tung of Island Navigation, Y K Pao of World Wide Shipping, and Frank Tsao of International Maritime Carrier (which was then known as the 'Great Southern Shipping Co Ltd'). Dr Cheng was also invited to contribute expertise, but as with the owners, the reason for development had more to do with patriotic feeling than commercial agendas. YK Pao's gamble, to build the first ships, paid off and they were delivered, although late and with minor problems.



Dr Peter Cheng, managing director, Peter Cheng Naval Architect & Marine Consultant Ltd, Hong Kong SAR, China.



LR-classed Aframax tanker built in Dalian.

With the successful completion of the Hong Kong orders, other foreign owners started to probe and enter the Chinese shipbuilding market, but some of these ended as disappointments for both parties.

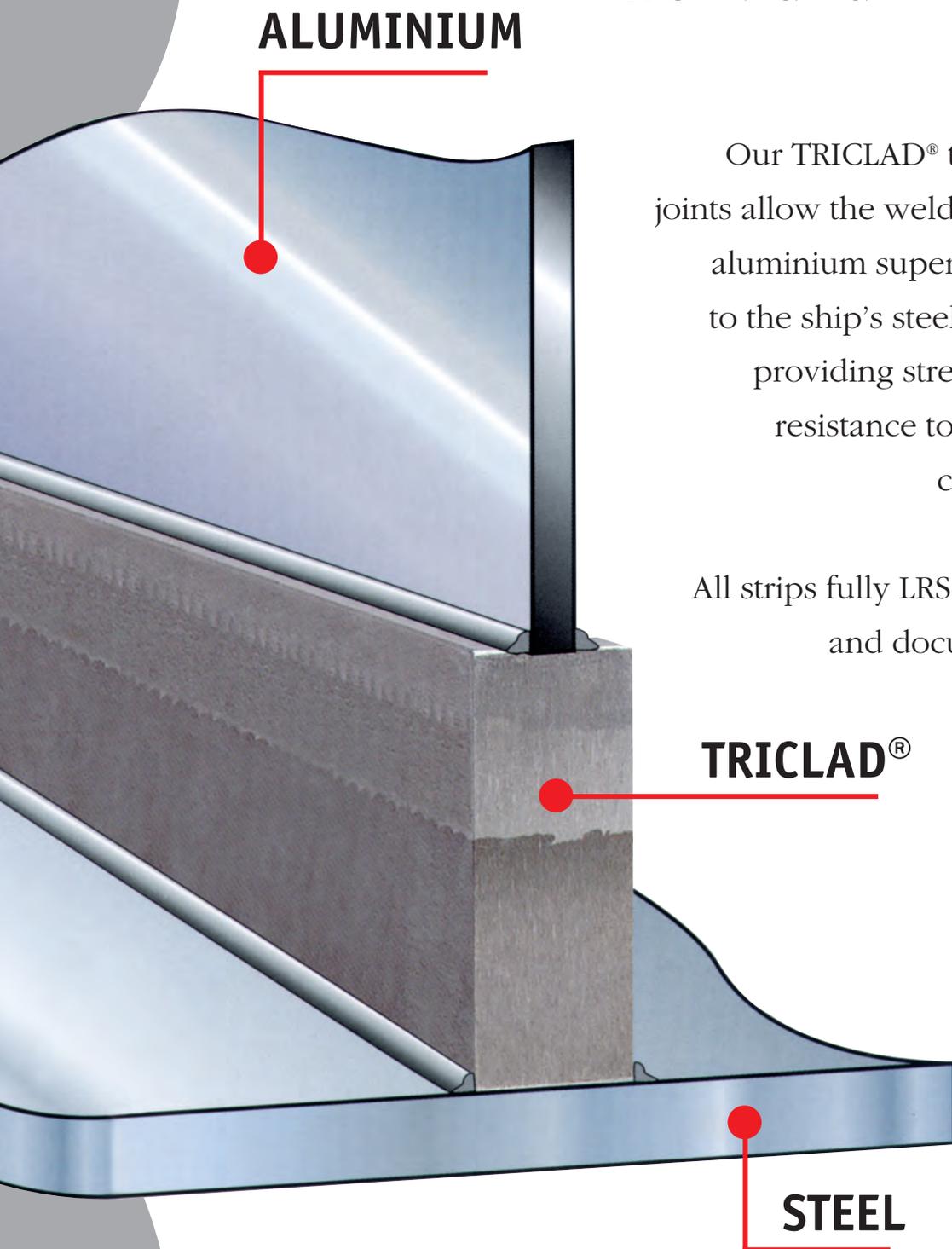
Some of the key reasons leading to the unfortunate results included misinterpretation and misunderstanding of the specifications, often due to language problems and lack of knowledge. This was partly caused by the translators, who were fresh from foreign language institutions and were without any training in the shipbuilding industry.

In many cases, shipyards suffered heavy losses due to their ignorance and lack of experience in dealing with the complex shipbuilding documentation provided by the owners, while some owners simply walked away from unwanted orders when the market soured.

Nevertheless, one early milestone was the successful fulfillment of an order for three 18,000dwt bulk carriers from Guangzhou Shipyard in early 1982 for Wheelock Marden Co Ltd, and also the 64,000dwt Panamax Bulk Carrier from Jiangnan Shipyard in 1985 for Tai Cheong Chong Steamship Co Ltd, both of Hong Kong. In both

# Joining aluminium to steel?

Then here is the product to save money on both construction work and maintenance!



**ALUMINIUM**

Our TRICLAD<sup>®</sup> transition joints allow the welding of an aluminium superstructure to the ship's steel sections providing strength and resistance to galvanic corrosion.

All strips fully LRS stamped and documented.

**TRICLAD<sup>®</sup>**

**STEEL**



**TRICLAD<sup>®</sup>**

For detailed information contact:

**Merrem  
& laPorte**

Phone +31 (0)418 578 882

Fax +31 (0)418 540 134

[hitech@merrem.nl](mailto:hitech@merrem.nl)

[www.triclad.com](http://www.triclad.com)

cases, the conceptual, basic, and technical designs were provided by Peter Cheng Naval Architect & Marine Consultant Co Ltd, by working with technical engineers from the shipyard, who did the detailed designs and drawings. Both projects were successfully completed without any technical problems, and both were uncommon successes.

**1990s recovery**

By the early 1990s, with the shipping market starting to recover, ship designs had also become more rigidly standardised. Japanese and Korean shipyards were becoming less flexible, and changes in design were mostly refused. Owners, especially Europeans who traditionally wish to order ships to their own specification, started to look into the Chinese shipbuilding market. With no standard design of their own, Chinese shipyards were more than happy to work with such owners who were able to provide design assistance.

The invisible technology transfer took place silently, but effectively, with the assistance of the willing European shipbuilding representatives of the owners.

With the reorganisation and division of the giant China State Shipbuilding Corp into the North and South entities, the sense of competition was sharpened, not only domestically but also internationally. It was realised that, in order to compete, the only solution was the development of world class vessels of standard design, with high quality and performance, and which could be sold in large quantities.

So, one of the major steps taken by Shanghai Waigaoqiao Shipbuilding Co Ltd (SWS) was to engage Peter Cheng in early 2000 to undertake the design of a 175,000dwt capesize bulk carrier, given the support from the owner, Tai Cheong Chong Steamship Co Ltd of Hong Kong. The high quality vessel is now known in the market as 'Green Cape,' with Chinese brand identity well established.

At the same time, there have been other significant developments in terms of design capabilities and construction technology, especially in the last five years. The design of the 8530TEU containerships was successfully completed by Hudong-Zhonghua, and the steel cutting of the first vessel was started in 2006. The new VLCC design by MARIC was also completed.

**Looking ahead**

With the booming shipbuilding market continuing into its fifth year, and with orderbooks stretching well into 2010, a phenomenon which has not been seen for at least the past 50 years - a false sense of security - has been created.

Shipbuilding is a capital intensive industry with a long payback period. If asked to invest in a new shipyard eight years ago, most would have been waiting for the punchline. Today, new shipyards are springing up everywhere, not only in China, but also in India and Vietnam.

The strengths of the Chinese shipyards are obvious but worth listing:

- The availability of labour at lower cost compared with Japan and Korea
- A strong, heavy industrial base for supporting the shipbuilding industry, built up since the 1950s with the intention of being self reliant.

Although disrupted during the Cultural Revolution, the basic technical skills remained to form the basis of the present developments, together with the introduction and absorption of foreign technology

- Well established tertiary institutions for the marine industry. Education had always been a strong point with the PRC Government (except during the Cultural Revolution). The well established universities and research institutions, knowledgeable in shipbuilding and marine-related technology, quickly provided avenues for the training of the naval architects and marine engineers needed for both the shipbuilding industry and the other supporting industries
- The availability of low cost coastal sites required for shipyard constructions
- Large import and export volumes stimulated domestic fleet construction
- Increased international trade promoted the ship repairing business
- Strong government backing for shipbuilding and shipping.

There are, however, at least as many weaknesses:

- Inadequate incentives to retain technical talents. The establishment of foreign, marine related enterprises, and the expansion of existing ones such as foreign classification societies, as well as new domestic and foreign-owned or related shipyards, provided an attractive promotion prospect for many young and talented technical personnel in the middle management positions who were working for national shipyards, design institutes, or marine-related industries
- Thinly spread technical manpower due to a too rapid expansion of the industry. The rapid expansion of shipbuilding facilities and their related industries, as well as the loss of technical talents to foreign enterprises, has resulted in the thinning of technical manpower and the premature promotion of less experienced assistants
- Inadequate integrated long-term goals, strategies for research in shipbuilding technology, or the involvement of innovation. At present, both quality and innovation concepts are lagging behind those of other shipbuilding countries, namely Japan, Korea, and the EU; it will take some time to catch up. It is inappropriate to think merely in terms of quantity, especially if no integrated, long-term goals and strategies for research in shipbuilding technology are set and implemented along with the expansion of shipbuilding capacity
- Inadequate reward system in state-owned shipyards. The levels of salary and compensation have been increased during recent years, but they are still inadequate when compared with either their foreign or private counterparts. A talented young engineer, asked by Dr Cheng why he had left a major shipbuilding enterprise, gave a typical answer; 'I am getting married and we'll need a roof over our heads, and therefore more money.'
- Heavy reliance on foreign technology for shipbuilding and design software and systems. Almost all major shipyards and design and research institutes are using foreign-licensed ship design and production software. The

**Key recommendations for Chinese shipyards**

MEETING the client's business requirement by providing market-oriented, innovative design and services:

- Anticipate the owner's requirement and trade development and develop innovative design with cost advantages in both building and operation. Closely monitor the performance of the vessel delivered, with constant investigation for improvement. The focus should be on 'anticipation' and 'innovation'. Provide the environment and incentive to encourage the development of innovation in design, production technology, and software development
- Provide an amicable working environment and establish organisational structures which encourage the liberation of minds and the free flow of innovative ideas in both design and construction. Promote the creation of a crop of talented and innovative designers in the fields of naval architecture and marine technology, with strong theoretical backgrounds and yet with practical experiences. Reorganise the structure of the state-owned shipyards, whilst introducing advanced management systems for industrial planning and development
- Set up a transparent, merit assessment system with incentives and rewards for outstanding achievement
- Reorganise the system of the enterprise with clear identification of personal and company interest.

licensing arrangements not only discourage the development of local software, but also its technological advancement in software development. Dependence on foreign ship designs and software is like opium; the more you use, the more you will be addicted, and then you will not have the desire to do anything by your own efforts

- High foreign contents prevent effective cost control. With the foreign content still maintaining around a 60% share of marine equipment, it is extremely difficult for Chinese shipyards to exercise cost control on their equipment purchases. As most of the vessels ordered are for foreign owners, that percentage is unlikely to change for some time to come, especially if Chinese equipment manufacturers are not being developed as viable alternatives
- A lack of intensive marketing strategies. The Chinese shipbuilders' marketing strategies are traditionally weak and inadequate when compared with either Japan or Korea. 📍

Specialist manufacturers of neutrally buoyant  
**HULL APERTURE BLANKS**

TECHNICAL SOLUTIONS FOR AFLOAT SURVEY, MAINTENANCE AND REPAIR

**SAFE AND RELIABLE**

UMC's neutrally buoyant hull aperture blanks are supplied to ships in service, new builds and to vessels such as FPSOs. They allow sea valves to be opened up inboard for survey, maintenance or repair whilst the vessel remains afloat.

Thousands of our blanks have been supplied to literally hundreds of vessels and individual blanks have been fitted and refitted many times without one recorded failure. Our design incorporates a minimum factor of safety of 4 and is approved by all the principal Classification Societies.

**EASILY FITTED BY DIVERS**

Because our blanks are designed to be neutrally buoyant, even the largest of our blanks can be readily handled by divers underwater. Provided the blanks are stored with reasonable care they have an indefinite life.



**MAGNASEAL™**

Introduced by UMC in 2005, the MAGNASEAL™ device (pictured right) enables quick external blanking of all overboard discharge pipes up to 110mm diameter. One MAGNASEAL™ can therefore cover a range of overboards, reducing equipment requirements and costs.



**UMC INTERNATIONAL PLC**

Worldwide Headquarters: Warrior Close, Chandler's Ford, Eastleigh, Hampshire SO53 4TE  
T/ +44(0)23 8026 9866 F/ +44(0)23 8025 3198 email/ blanks@umc.co.uk

[www.umc.co.uk](http://www.umc.co.uk)

SOUTHAMPTON | PLYMOUTH | PORTLAND | ROTTERDAM | DUBAI | FUJAIRAH



## Worldyards review of China tanker market

FOR owners building small tankers, it is more likely than not that they will try to find a small yard in China. The sub-segment of 10,000dwt to 19,999dwt and below is the most difficult to track, because yards tackling such projects are very often players in China that were previously building for the domestic market.

The revisions to Marpol Annex II, that took effect at the beginning of 2007, were a bit of a surprise for some Asian owners. The result was a sudden and extensive interest in the small tanker sector, attracting small yards with little experience of building any kind of export ships.

Historically, there is a short orderbook time frame, but by late 2006, main engines could take up to 30 months, compared with the traditional one year wait of several years ago.

China is seen as the answer by many who are looking for small tankers, yet the domestic Chinese shipbuilding industry is fragmented, with variable technical and commercial capabilities. Chinese yards would typically deliver ships seven months after main engine delivery, and this was after a 37 month wait. But the 2006 pricing for a 7000dwt ship was \$12m in China versus \$16m in South Korea, though owners would pay half a million more per ship in supervision.

For the emerging Chinese yards, some ships have been built to the 'China Classification Standard' class, but most are familiar with the construction of so-called 'ZC' ships. This is a registration for domestic trading ships but it is not a class standard. There are an estimated fifty to sixty branches of the Maritime Safety Agency which are authorised to issue ZC construction certificates. Thousands of small shipyards not yet on the international radar screen are building vessels ranging from small fishing craft up to 20,000dwt tankers.

From December 2006, China Classification Society has been tasked with classing 'ZC' newbuilds. Many Chinese coastal tankers are also trading on rivers which are sources of drinking water, hence the desire to focus priorities on tightening construction standards for tankers.

In the 1950s and 1960s, the country's standard barges were built with cement because of the lack of steel and wood available in those days. Many of the same Yangtze shipyards building barges in the early 1990s graduated to building very sophisticated ships of various tonnages for foreign owners. The competencies of the next wave of Chinese newcomers is much more variable, but the increased velocity of technology transfer means that new yards are able to emerge much more quickly. Worldyards adds two new Chinese shipbuilders per month to its database, and very often such builders appear because they are contracting for the export of small tankers.

By the end of 2004, Japan's efforts in chasing stainless chemical tankers had stagnated. In the summer of 2005, SUS316 steel escalated the level to 600,000-650,000 Yen per tonne, up from the 300,000 Yen per tonne level in mid-2003.

Some Japanese builders considered shifting to coated tanks, but in early 2006 the lull in stainless prices prompted Japanese builders to reactivate marketing activities. Kitanihon, Asakawa, and Murakami Hide expanded slipways for 19,000dwt vessels, while Fukuoka also bought Nagasaki Shipyard and focused it on tankers.

Elsewhere in Asia, PT Pal is the only Indonesian yard building for export, while Malaysia and Vietnam have not shown much promise in getting into this sector. Meanwhile, South Korean shipyards are moving into bigger ships. INP, Samho, 21st Century, and Nokbong graduated from the 8000dwt-13,000dwt sector up to the 17,000dwt-25,000dwt sector.

The Won has also surged to decade-year highs against the US Dollar and the Yen. The field of play would seem wide open for Chinese yards.

However, Chinese shipbuilders face a dramatic challenge in new IACS coating rules for orders signed after December 2006, which is one and a half years earlier than the IMO standard. Most of the shipyards cannot

meet the requirements of the new coating standard in terms of production capacity, shipbuilding technology, techniques, or work environment. New coating standards require a benchmark that the damaged area of the coating after each big combination of the blocks shall not account for more than 2% of the total cabin, which is hard to achieve by Chinese shipyards. Usually, the domestic damage rate of the coating in Chinese yards will be above 10%. Most Chinese shipyards also lack segregated sandblasting capacity.

From Worldyards' vetting of shipyards, we have seen a variable performance of welding. Some of the inspections have found welding examples that are unacceptable by any standard. Other welding seams demonstrated the simple problem of an unsteady hand of the welder. In many cases there were instances where the inside radius of the bend was uneven, and the undulating surface suggested that the inner surface of the bend has deformed. It is fairly certain that many newbuilding tanker orders at newcomer yards will never see the light of day. If an early slot is available at a new shipyard, one should consider that there is probably a good reason for that.

The shipbuilder candidates that have been fabricating non-marine-related steel structures, have also been block builders for other yards, and/or have built low value ships using the model of 'assembly processing.' The buyer provides most of the main equipment, even steel, whilst the builder only provides labour and the facilities.

Done in such a way, there is no need for refunding guarantees. Normal shipyard inspections focus on technical capabilities, but less attention is given to the commercial viability of their contractual counterpart.

Wordyards urges better due diligence be paid to the financial background of the shipyards. Eventually, it comes down to how comfortable the owner is with the trading house, but even then there are cases where a poorly built ship would restrict trading potential. 

# The Interior Supplier of Choice



[www.norac.no](http://www.norac.no)

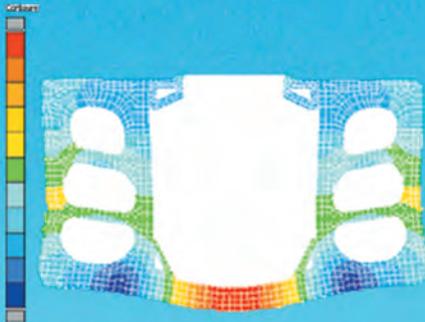
- Walls
- Ceilings
- Doors
- Glazed Partition
- Windows
- Wet Units
- Furniture

• Sound reduction up to 54dB • Fireclass B-0 to H-120




# Your Design Partner

FKAB in Uddevalla and Gothenburg (Sweden) with the daughter company DF-Marine in Dalian and Shanghai (China) have more than 100 engineers eager to assist you. This can be in China, Europe or where you may desire. We do all from concepts, approval, detail and production design. We can also support you locally in China.



We use modern design tools like AutoCAD, Nupacadmatic, NAPA, Nauticus and other Classification software



Bi cultural work and exchange of Chinese and European staff



We design any type of specialised vessel



973 TEU Container Vessel for American Owner



6,800 dwt tanker for Singaporean Owner



We are also specialists within extreme environmental conditions



**DF-Marine**

Dalian  
+86 411 8363 800  
www.dfmarine.com

Shanghai  
+86 21 6100 9088



**FKAB**

Uddevalla  
+46 522 981 00  
www.fkab.com

Gothenburg  
+46 31 744 5650

# ABS plays role in shipbuilding transformation

ABS is playing a leading role in supporting China's massive shipbuilding expansion plans. Here, ABS senior vice president China, Kingsley Koo, gives an insider's perspective.

'It is almost as though a new Chinese shipyard opens every week,' says Kingsley Koo, ABS senior vice president for China. 'The transformation of the Chinese shipbuilding industry over the last 10 years is amazing. Their shipbuilding capability has gone from barges to technically advanced LNG carriers, to 10,000TEU containerships, and sophisticated offshore drilling rigs in almost the blink of an eye.'

As the leading classification society providing services to the Chinese shipbuilding market, ABS has been positioned to both monitor the remarkable growth of the last decade and to play a specialised but significant role in assisting the yards to adopt the practices and meet the standards required to succeed in the international shipbuilding market.

'It has been a whirlwind,' says Mr Koo reflectively. 'We established our first representative office in Shanghai in 1994. By the end of this year we expect to have at least 300 surveyors, engineers, and support personnel operating in the country with offices from Hong Kong in the south to Dalian in the north.'

With China openly planning on becoming the world's leading shipbuilding nation by 2015, based on a 29% annual growth rate over the last seven years, and with Chinese shiprepair yards springing up almost as rapidly as new construction facilities, ABS is preparing for continued rapid growth in its activities in the country.

'It has been a tremendous challenge,' says Mr Koo. 'Because so many of the Chinese yards, both newbuilding and repair yards, had or still have relatively little experience, they have relied on the classification societies, like ABS, to help them along the learning curve.'

'It means we have had to place experienced surveyors in the yards – surveyors with a lot of

newbuilding exposure gained at the established yards in the other Asian shipbuilding centres. It means that we have had to provide extensive technical and engineering support locally, here in China, to help the yards as they develop new designs. And most of all, it has required a real partnership between ABS and the yards to allow for a transfer of technology and experience between our staff and the shipyards' staff in the design offices, on the production floor, and at the berths.'

Being a large, multi-national classification society, has been a critical element of the ABS response. 'We were able to draw on a large pool of experienced Chinese surveyors and engineers that were already within the ABS global family,' says Mr Koo. 'We have moved key Chinese personnel in from Singapore, Taiwan, and the US. And we have also recruited heavily within China where we have found a large pool of highly qualified applicants from which to choose. What we have done is develop intensive training programmes so that these new staff members can quickly benefit from the experience of their long serving ABS colleagues. And we have brought in selected experienced personnel from Korea, Japan, and the US to provide additional leadership and guidance.'

The programme has been very successful, as evidenced by the 36% share of all new construction class contracts at Chinese shipyards that had been placed with ABS as at the end of July 2007. Not only was this almost 20% greater than the next class society but accounted for over 830 vessels aggregating more than 17m gross tons.

'Chinese shipbuilding would not be the force it is today without the boldness and courage of the owners who were prepared to order here when the facilities and experience were very limited,' says Mr Koo. 'Many of those owners had an extensive in-house technical capability that meant they were able to put enough experienced personnel of their own into the yard to monitor their projects. As the



**Kingsley Koo, of ABS: 'Shipbuilding capability has gone from barges to technically advanced LNG carriers, to 10,000TEU containerships, and sophisticated offshore drilling rigs in almost the blink of an eye'.**

facilities have improved and the experience of the yards has increased, there has been a growing influx of orders from owners from all corners.'

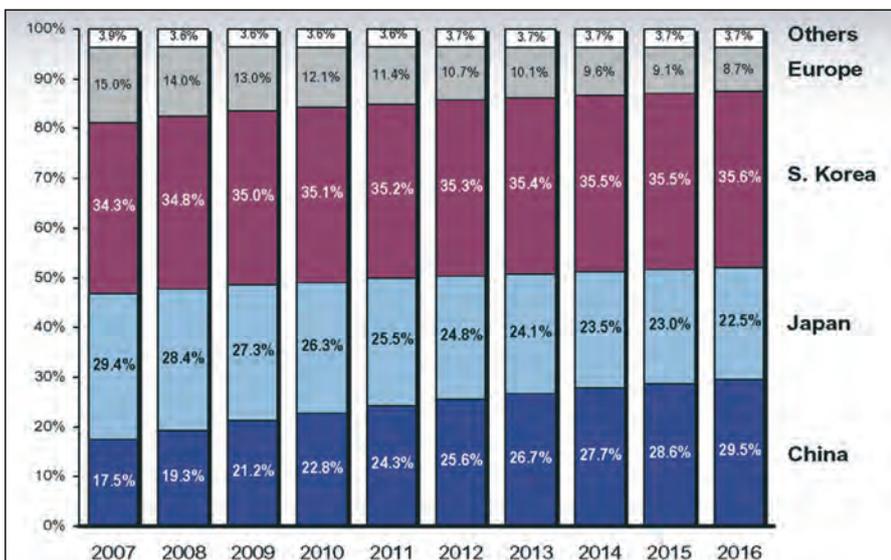
In assessing ABS' performance in China, Mr Koo considers that a key element has been the appreciation by so many of the Chinese shipyards of the extensive technical support ABS has given them. 'Yes it is business,' says Mr Koo. 'But personal attributes are highly valued within China. Loyalty and service bring their own rewards.'

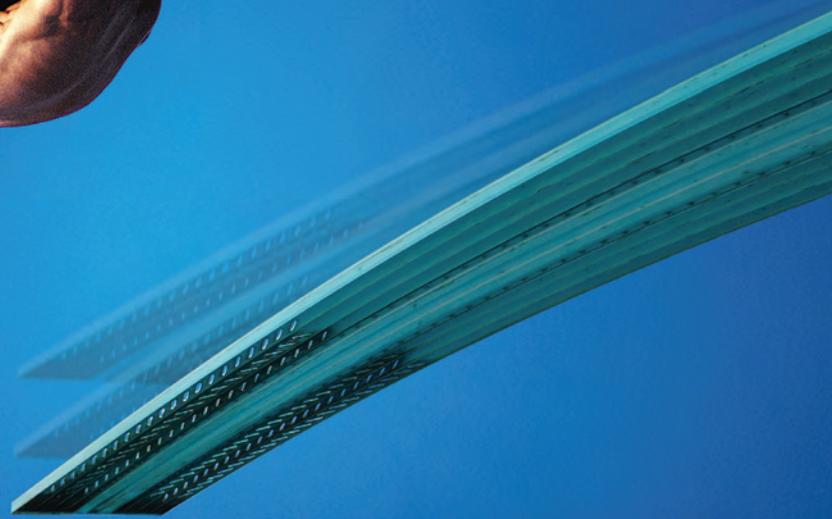
Although the number of new orders and the volume of shiprepair activity at Chinese yards is expected to continue to rise rapidly over the next five years, the equally rapid evolution in the yard's technical capabilities is expected to somewhat ease the demands being placed on the classification surveyors.

'Five years ago the quality standards at many of the Chinese shipyards were marginal,' says Mr Koo. 'Today a shipyard such as Waigaoqiao in Shanghai, or the Hudong yard that is building the LNG carrier series, or Dalian that is building jackups, or the Yantai Raffles yard that is producing a range of offshore related facilities, or NACKS which is building the 10,000TEU containerships, these are modern, highly professional yards with a strong pool of expertise, turning out vessels comparable to those on offer anywhere.'

'That means we are able to concentrate our resources on the newer yards that are still finding their feet, and at the more than 25 repair yards that are tackling increasingly sophisticated projects such as the conversion of single hull tankers to a double hull configuration. We are also spending more time at the growing number of equipment and machinery manufacturing plants that are producing everything from complete engines to anchors, cables, pumps, and containers. Encouraging a consistent level of quality in the ships and their components, a level that is in accordance with our standards and acceptable to the international market, that is our challenge and our goal.'

Projected share of world orders: source ABS.





*HEMPADUR FIBRE 4760 combines strength and flexibility to prevent cracking in ballast tank coatings*

# HEMPEL



**The Best "à la carte" Marine Services from Newbuilding  
to Vessels in Operation by World Leader  
in Classification, Conformity Assessment and Certification**

● [www.bureauveritas.com](http://www.bureauveritas.com) ● [www.veristar.com](http://www.veristar.com)



For the benefit of business and people

## Pleas to save Shanghai Towing Tank

THE towing tank of CSSC 708 Institute (MARIC) is known in China as the 'Shanghai Towing Tank.' It is 70m long, 5m wide and 2.5m deep. Located in the MARIC's courtyard at the institute's Xizang Road South, the towing tank is the first ship model test tank in China, and has been functioning since its completion in 1953. The tank has been used for tests of over 2000 designs and boasts extensive data.

'It is a great contributor to China's shipbuilding industry and a great witness as well,' said Xu Xueyan. Mr Xu is one of the 13 academics who have written a jointly signed letter to State leaders, calling for the preservation and protection of this internationally famous towing tank. According to Shanghai's plan to host the World Expo in 2010, a large part of the courtyard of the 708 Institute, including the tank, is to be demolished so as to double the breadth of the existing Xizang Road.

China has over a dozen towing tanks, mostly in universities or institutes engaged in ship design, such as MARIC, and Wuxi-based 702 Institute, under CSIC, has the largest towing tank in China, which is 474m long, 14m wide and 7m deep.

'The towing tanks cannot be judged by their dimensions, but by how accurate the test results are,' Mr Xu said. Different dimensions will create different jamming coefficients, so



Shanghai Ship and Shipping Research Institute towing tank, not related to Maric, but one of over a dozen such facilities in China.

the test results must be modified by people based on experience and the historic data the tank has accumulated. In terms of accuracy, MARIC's towing tank would be top ranked thanks to the accumulated data, claimed Mr Xu.

'Due to our smaller size, the cost of each test is more competitive than other towing tanks,' he added. He also said that over

100 staff of the institute have written to the new party secretary of Shanghai, who has designated related departments to see what can be done to protect the towing tank.

'Outsiders say it is okay for us to build a towing tank somewhere else,' Mr Xu said. 'They don't know that it takes at least eight to ten years to completely understand and make the best out of a towing tank.'



PEMA. Superior welding automation for shipyards.

Quality

Productivity

- HEAVY ROBOTICS AND AUTOMATION
- ENERGY SECTOR AUTOMATION
- SHIPBUILDING PRODUCTION AUTOMATION

- POSITIONERS
- ROLLER BEDS

PEMAMEK OY

P.O. Box 50  
FI-32201 Loimaa  
Finland

Phone +358 2 760 771  
Fax +358 2 7628 660  
www.pemamek.com

All areas.  
All seasons.  
All in one  
anticorrosive.



UNDERWATER HULL



DECKS



BALLAST TANKS



SUPERSTRUCTURE



INTERNAL SPACES

Simplified specification and application,  
superior performance, cost savings – in one.

- Apply to virtually all vessel areas, inside and out
- All year round application
- Excellent, long term anti-corrosion protection
- Superior crack-resistance and enhanced edge coverage
- Increase speed and quality of coating process
- Reduced application and maintenance costs

Fully compliant with new IMO Ballast Tank Regulation

There's only one choice

# SIGMA PRIME

Over 20 million m<sup>2</sup> applied

*For more information speak to your nearest SigmaKalon  
Marine & Protective Coatings representative or  
visit our website*

SigmaKalon Marine & Protective Coatings B.V.

P.O. Box 58034 | 1040 HA Amsterdam, The Netherlands | Tel: +31 (0) 20 407 5050 | Fax: +31 (0) 20 407 5059  
E-mail: [sigma.marinecoatings@sigmakalon.com](mailto:sigma.marinecoatings@sigmakalon.com) | Website: [www.sigmacoatings.com/marine](http://www.sigmacoatings.com/marine)



The Science  
of simplicity

Sigma Coatings is a brand of the SigmaKalon Group



## Eight in a row from Jiangnan

ACCEPTANCE testing has started, covering delivery of the eighth MAN Diesel engine destined for installation onboard a series of 16,500dwt oil products and chemical tankers built by the Jiangnan Shipyard for shipowner Harren & Partner, of Bremen.

Of the eight vessels, six were delivered between November 2004 and November 2006 with the final two scheduled for handover later in 2007.

These tankers have a liquid cargo capacity of 19,500m<sup>3</sup>, an overall length of 144m, a beam of 23m, and an 8.4m draught.

On the propulsion side, the tankers feature a single six cylinder inline version of the 48/60B heavy fuel main engine. Rated 6300kW at 500rev/min, the 6L 48/60B engine transmits propulsion power to a single MAN Diesel Alpha CP propeller via a Renk reduction gear.

Built to Ice Class 1A, the vessels also feature a take-home device whereby the 1500kW A van Kaick shaft generator on the reduction gear can act as a motor, drawing electrical power from the ship's auxiliary engines.

MAN Diesel noted that the eight engines were among the first examples sold of the further developed 'B' version of its 48/60-type diesel, featuring enhanced fuel consumption and reduced emissions among other improvements.

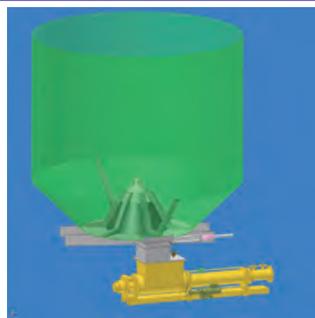


The last of eight 16,500dwt oil and product tankers is due delivery to Harren & Partner from Jiangnan Shipyard by the end of 2007.

### REVOLUTIONARY MULTI APPLICATION CARGO SOLUTION

## PG-MACS®

When flexibility, efficiency, environment compliance and high capacities below- and on deck counts ...



#### Features:

- No dedicated dry-bulk pressure vessels!
- **Drill Cuttings** transported below deck: safe, and relieve deck-space for other cargo!
- Extremely **flexible** tank-configuration!
- **Block coefficient** dramatically improved: loss of cargo space due to Clean Class eliminated!
- Discharge of dry bulk down to batches of **4m<sup>3</sup>** enabled!
- **100% continuous** dry-bulk discharge!
- ORO **NOFO 2005+** conform!
- Integrated MACS-tanks = **yard supply** – special tanks avoided!
- All Dry- & Liquid Cargo handling over **one LCC**, fully IAS-integrated!

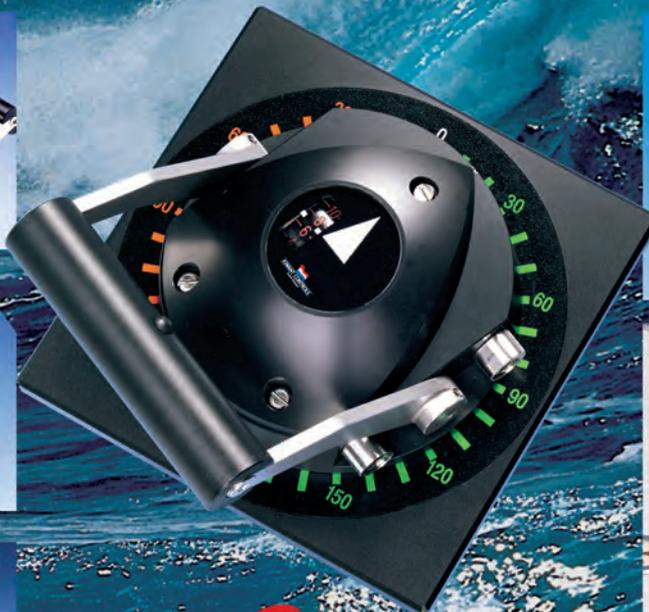
3000m<sup>3</sup> NOFO 2005 Oil Recovery capacity, 1000m<sup>3</sup> **Drill Cuttings** capacity below deck, full flex between liquid- and dry- cargo, and the best load / unload ratios against any benchmark – are all facilitated by implementation of the revolutionary **PG-MACS®**

call for details at : [www.pg-marinegroup.com](http://www.pg-marinegroup.com)



PG Marine Group – Ing Per Gjerdrum AS  
[www.pg-marinegroup.com](http://www.pg-marinegroup.com) [pg-pumps@pergjerdrum.no](mailto:pg-pumps@pergjerdrum.no) Tlf.: +47 66 77 56 00

# TOUCHING TECHNOLOGY



**KWANT CONTROLS**  
Sneek-Holland

T +31 (0)515 413745  
F +31 (0)515 422478  
www.kwantcontrols.com  
kwant@kwantcontrols.nl

**QUALITY IN  
COMMAND**



innovative reefer vessels



innovative ship outfits



offshore field development ships



semi submersibles



heavy lift ships



inland innovative transport systems



multi purpose vessels



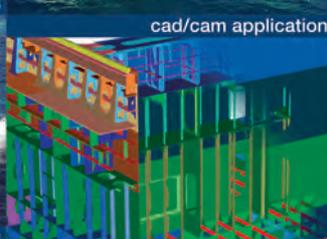
bulklers



container vessels



research vessels



cad/cam application



navy supply vessels



**SCHIFFKO GmbH**

Member of the Wärtsilä Group of Companies

Stubbenhuk 10  
20459 Hamburg  
Tel.: +49-40/376090  
Fax: +49-40/373315  
E-Mail: info@schiffko.com  
Web: http://www.schiffko.com

**Marine Design Services, Research and Consulting**

Consulting, naval architecture, engineering and CAD/CAM services, initial, basic and detail designs, development of technical innovations ready for construction and operation of ships. Plan approval, inspection and construction supervision. Application of CAD/CAM in technical areas including consulting and training. Onboard computer systems for ships loading and stability, safety operation and maintenance. Designs of all kinds of commercial craft and ships like tugs, patrol boats, yachts, floating cranes, supply boats, crane ships, pipe- and cable layers, research vessels, container ships, bulkers, tankers and various offshore supply and support vessels.

SCHIFFKO's expertise and engineering covers Hull, Machinery, Electric, Outfit and Accommodation as well as integration of specialized systems.

## First steps for homegrown LNG

**AS the first domestically-built liquefied natural gas carrier nears delivery, China has clearly shown that it wants to be involved in the whole LNG supply chain, rather than just be a buyer of cargo.**

**F**OUR summers have passed since the first deals were signed for China LNG terminal in May 2004. After inviting independent LNG operators and shipbuilders in China to sign up as joint venture partners for the Guangdong LNG project, Beijing decided to create 'China LNG Shipping (International) Co Ltd' with BP as a 40% shareholder, together with China Merchants and Cosco sharing a 60% share through China LNG Shipping (Holdings) Ltd, the latter being a 50/50 joint venture between COSCO and China Merchants.

The discussions for the owner participation also started as far back as 2002, when officials from Guangdong LNG Transportation Project Office (GLTPO) invited six owners, namely MOL, K Line, NYK, SK Shipping, Golar LNG, and Exmar, to bid for the work. Response from foreign owners was muted because the profit-sharing structure limited them to a 30% stake in the venture.

Discussions with shipbuilders for technology transfer were also slow, but Hudong Zhonghua focused on a 2001 technology transfer agreement that it inked with French shipbuilder Chantiers de l'Atlantique. After the shipbuilder signed the 2001 initial technical agreement with Chantiers for the cryogenics, it then firmed it into a formal arrangement in 2004.

The first two vessels ordered were reportedly based on five 130,000m<sup>3</sup> vessels built by Chantiers for Malaysia's Petronas between 1994 and 1997. They use a standard steam turbine propulsion rather than dual fuel diesel-electric systems or slow speed diesels in combination with reliquefaction plant. Chantiers also signed technical cooperation agreements for the construction of LNG carriers with three other leading Chinese yards: Jiangnan and Waigaoqiao in Shanghai, and Dalian New Shipyard.

There were also discussions with Kvaerner Masa-Yards about licensing of the Moss system, but the Finnish party did not conclude any package because it wanted to retain more of the production content in Finland than Hudong Zhonghua was happy with.

The first 147,210m<sup>3</sup> Hudong Zhonghua LNG ship is due delivery on 29 November 2007. It is 292m long, 43.35m wide, and 26.25m deep. The design speed is 19.5knots. Its construction was started on 15 December 2004, with the keel laid on 28 June 2005, and launch undertaken on 28 December 2005.

Hudong Zhonghua has invested RMB880m in research and technological renovation, so as to pave the road for the construction of the first five ships. Three of them will be used to transport LNG from NW Shelf, Australia, to Guangdong Dapeng LNG terminal. The other two ships will transport LNG from Indonesia's Tangguh LNG project in West Papua, Indonesia, to the Fujian LNG import terminal.

Under the contract for the Guangdong project, Australia will provide 3.7m tonnes of LNG annually to China, which will supply domestic users in Shenzhen, Dongguan, Guangzhou, Foshan, the Huizhou cities of Guangdong, and Hong Kong. From September 2006 to February 2007, the facility operated at about half of its designed capacity of 3.5m tonnes a year, with about three years for the terminal to reach full capacity. The



Even before the first ship is delivered, Hudong-Zhonghua is already discussing building LNG carriers of 200,000m<sup>3</sup> capacity.



First Hudong-Zhonghua LNG carrier, to be delivered in November.

primary reason for the gradual ramp-up is that some downstream gas utilities need time to convert from liquid petroleum gas (LPG) to LNG. All the terminal's downstream customers have started using regasified LNG. The terminal project, with a total investment of RMB7.12bn (\$890m) for its first phase construction, is the first ever project for China to import LNG from abroad. The first vessel for the Guangdong LNG project is to be delivered at the end of 2007, the second in 2008, while the third will be delivered at the end of 2009.

The entire 147,210m<sup>3</sup> LNG ship, classed by ABS, has a welding length of 130km for the cargo tanks. The prefabricated Invar pieces for the GTT No 96 design include Invar pipes, Invar trihedrons, and other small Invar parts which are used to connect the membrane and the hull. There are about 400 Invar pipes and Invar trihedrons on the LNG ship, as well as 60,000 small Invar parts. By 13 March 2007, Hudong Zhonghua had installed the last pump tower on the first LNG ship, which meant that the main installation work of the containment system was basically completed. The second and third ships have already been launched, while the keel for the fourth LNG ship was laid on 31 May 2007, and steel cutting and block assembly has been started on the fifth unit. It might be noted that not many of the components were homegrown, but Shanghai Baosteel Group Co Ltd (Baosteel)

delivered 8000tonnes high-quality LNG carrier-use plate to Hudong-Zhonghua Shipbuilding, marking its capability in producing high-end vessel-use plate. According to the company, from the end of 2006, Baosteel, Baosteel branch offices, and Hudong Zhonghua Shipbuilding carried out technological exchanges. As a result, they signed a new agreement, to the effect that Baosteel was in charge of producing 35% of the steel for the third LNG carrier manufactured by Hudong-Zhonghua.

After the examination by American Bureau of Shipping (ABS), the performances and specification of the plate all met requirements.

Now, Hudong Zhonghua is tightening its cooperation with 708 Institute (MARIC) and other units in the development of a 200,000m<sup>3</sup> LNG carrier, which will adopt more advanced and environmentally-friendly propulsion equipment. China itself targets achieving more breakthroughs in independent intellectual property rights, in terms of LNG ship construction, during the '11th Five-year Plan' period (2005 to 2009).

Hudong-Zhonghua Shipbuilding Group will also potentially compete in the LNG arena with 'Nantong Cosco KHI Ship Engineering Co' (the Sino-Japanese shipyard), Dalian Shipbuilding Industry Corp, Jiangnan Shipyard Group Corp, and Waigaoqiao Shipbuilding.



**Engineering. Solutions to your expectations.**  
Visit us online at [www.nasdis.com](http://www.nasdis.com)

NASDIS is a flexible, multidiscipline network of design companies, capable of covering the full design flow stages – functional, basic, class and detail design including production information and 'as built' documentation – in commercial and naval shipbuilding as well as marine and offshore engineering.

NASDIS also provides IT technical assistance for integrated ship design, CAD, systems management, installation, configuration, customisation and software development.

GERMANY	ROMANIA	TURKEY	UNITED KINGDOM
<b>NASDIS GmbH</b>	<b>NASDIS Consulting SRL</b>	<b>NASDIS Ltd</b>	<b>NASDIS UK Ltd</b>
Hermann Blohm Strasse 3 20457 Hamburg	Rosiori 16 Bl G4 Ap 8 800055 Galati	Mustafa Kemal Pasa Bulvari Fatih Mh. 18, Sk No 4, Mezitli / Mersin	62 Close, 14 Quayside Lofts Newcastle Upon Tyne NE1 3RF
Contact: <a href="mailto:office@nasdis.de">office@nasdis.de</a>	Contact: <a href="mailto:office@nasdis.ro">office@nasdis.ro</a>	Contact: <a href="mailto:office@nasdis.eu">office@nasdis.eu</a>	Contact: <a href="mailto:office@nasdis.co.uk">office@nasdis.co.uk</a>

		<b>ENGINEERING</b>
<b>IDEAS</b>	<p>Meet us in Sharjah <i>'Gulf Maritime'</i> Exhibition 16th - 18th April Stand 55</p>	
		<b>SOLUTIONS</b>
<b>FREEDOM</b>	<p>Meet us in Romania <i>'Black Sea Defense and Aerospace'</i> BSDA Exhibition and Conference 24th - 27th April ROMAERO Centre</p>	



**Smooth, Versatile, Dependable.**



**47M HIGH SPEED PASSENGER FERRY**  
Soft-Ride Hull Form  
Sumidagawa Shipyard Co. Ltd., Japan  
Produced with ShipConstructor

**ShipConstructor®**  
Shipbuilding Software Solutions

[www.ShipConstructor.com](http://www.ShipConstructor.com)

Courtesy General Dynamics Team: Austal Ships Pty. Ltd., Australia and Austal Ships, USA; Bender Shipbuilding & Repair Co., Inc., USA and Guido Perla & Associates Inc., USA; Bodewes Shipyards B.V., The Netherlands; Genoa Design International, Canada and Marinette Marine Corp., USA; J. Ray McDermott Inc., USA & J. Ray McDermott Far East, Inc., Indonesia; Wipack Yachting International Naval Architects B.V., The Netherlands.

## Making a mark with ro-ro tonnage

**CHINESE shipbuilders are increasingly forging ahead in the construction of ro-ro tonnage.**

**I**N the early days of China's re-opening, there was not much call for domestic ro-ro ships or car carriers, hence the business was an export-focused one. The earliest instance of this ship type appearing in a Chinese dock was when Ahrenkiel commissioned two 3500 unit vessels in 1985 from Jiangnan in China.

The first ship, named *Wolfsourg*, was started in December 1986, launched on 8 January 1988, and delivered on 5 October 1988. The second ship, named *Hannover*, was launched on 30 August 1988 and delivered on 18 February 1989.

After that, the ro-ro sector in China remained pretty quiet for over a decade. Today, however, more and more international shipowners are coming to China to build such ships and the Chinese fleet of ro-ro ships is also expanding due to the booming auto-making business in China.

On 2 May 2002, Dalian Shipbuilding Heavy Industry Co delivered a 12,300dwt speed ro-ro ship named *Stena Foreteller* to Swedish owner Stena. The fourth-generation ro-ro ship was a first for China. Its delivery symbolised the fact that the building technology of ro-ro ships in China had reached an internationally advanced level.

Later in May 2002, Hudong Zhonghua delivered a 13,000dwt ro-ro ship to its Swedish owner Da Engstron Rederi AB. The ship is 182.2m long, 25.8m wide, and 17.4m deep. It is able to carry 870TEU or 600 cars.

In 2003, Guangzhou Shipyard International then built two higher speed ro-pax ships for Swedish owner Gotland, a project that was one of the most advanced ever undertaken by a Chinese shipyard. The ships have been highly praised by the owner, which apparently wanted to exercise options, but the yard was unable to commercially commit to a repeat of what was a money losing project.

Bringing things up to date, CCS Jinling Shipyard in Nanjing launched an 11,300dwt ro-ro ship on 21 June 2007. The ship is 187.06m long, 26.5m wide, and 21.55m deep. Her service speed is 20knots and she can navigate in zones of -35degs. This ship has been installed with a controllable pitch propeller with the diameter of 5.8m.

The bottom of the ship is also painted with anti-ice coating. Jinling Shipyard claims to be the only shipyard that has mastered this special coating technique in China.

This is the first of the four ships Jinling is building for Swedish owner Seatreasure Ltd. They will be used for transporting rolled paper and trailers. Jinling has previously built two 8050dwt and four 10,300dwt ro-ro ships for Swedish owner Nordic.

Jinling Shipyard, set up in 1952, has been something of a favourite among Scandinavian owners, and even built a 5200dwt ro-ro ship in 2004 to transport aircraft components for Air Bus.



*Stena Foreteller*, whose delivery symbolised the fact that the building technology of ro-ro ships in China had reached an internationally advanced level.

Xiamen Shipbuilding Industry Co, meanwhile, has also been distinguishing itself in the sector, building its first 4943 unit ship for Zodiac in 2005. In April 2007, it launched the fifth of the ten ro-ro ships ordered by Zodiac. On 29 January this year, the company also won a contract for 4+2+2 4900 unit ro-ro ships from Maersk. The first four ships will be delivered between 2010 and 2012.

In 2005, meanwhile, Nantong Cosco KHI Engineering Co, Ltd. (NACKS) delivered the first 5000 unit ro-ro ship to K-Line. The ship is 179.99m long, 32.2m wide, and has 12 decks. K-Line built three ships of the same type in this shipyard.

On 23 March 2007, CCS Shenzhen, which is a subsidiary of Wuhan-based Changjiang Shipping Group, signed a contract with Jinling Shipyard covering the construction of four plus two 2000-slot ro-ro ships. The first four ships represent a contract value of over 1.1bn yuan. The ships will be 140.5m long, 24.4m wide, 22m deep, and have nine decks for car loading. She will be able to carry about 2200 medium-sized vehicles at one time. This batch of ships is to be delivered in early 2009 and used for coastal shipping to serve Tianjin Toyota, Guangzhou Toyota, and Hainan Mazda.

On 20 October 2006, *San Xia Zhong Jian I* - a heavylift ro-ro ship designed by CCS Changjiang Ship Design Institute (of Wuhan) -

successfully delivered the 490tonne component for the power plant of the Three Gorges Dam. This ship can carry a single piece which weighs 710tonnes at one time. The ship can be used to transport heavy and large commodities, loaded vehicles, and other break cargo.

The ship, launched in Yichang Gezhouba Shipyard in April 2006, is a sign that the design of heavylift ro-ro ships has also reached a strong level.

Ro-ros are even built in the far inland reaches of China, such as at the north-eastern city of Harbin on the Songhua River.

On 27 June 2007, Harbin Beifang Shipbuilding Industry Co successfully built a Z-type twin propelling system ro-ro ship for Russian owners. The ship is 58m long and 13.6m wide, and is able to carry six fully-laden trailers and 80 passengers.

Huanghai Shipyard in Shandong has built two passenger ro-ro ships, *Bohai Jinzhu* and *Bohai Yinzhu*, for transport between Yantai in Shandong and Dalian in Liaoning. The ship is 161.2m long, 24.8m wide, having 1300 seats for passengers and 1800m long lanes for vehicles.

There are more players entering the industry. Zhejiang Yangfan and South Korea-invested STX Dalian have also both, within recent months, landed contracts for car carriers of 5000 units, while other newcomers are also looking for a place at the table. ☺

## Classed for growth

**ANOTHER milestone year for China's classification society.**

**B**Y any count, the year 2006, its 50th, was a milestone one for China Classification Society (CCS). At the end of last year, CCS classified 1892 ships with 23.9m gt, 1.88m gt more than in 2005.

There was also substantial progress in the offshore segment. CCS offered a third-party certificate survey to 11 fixed platforms, and also 13.5km of submarine pipes and a classification survey to eight movable platforms and two 100,000dwt floating production storage and offloading vessels.

In addition, in 2006 CCS won the bid to survey a 3000m-depth drilling platform for China National Offshore Oil Corporation, a project which is China's first deepwater semisubmersible drilling unit. The platform is designed on the basis of the most advanced drilling unit currently in the world, a sixth generation deepwater semisubmersible drilling unit, applying DP-3 dynamic positioning system and equipped with two derricks, while maximum drilling depth is up to 12,000m.

In CCS's own development programme, the core technology in deepsea oil and gas exploration and exploitation facilities is regarded as one of three breakthroughs during the 'Eleventh Five-Year Plan' period. There have also been qualitative breakthroughs: in technology, CCS developed its own common structural rules software and started construction on the first 54,500dwt bulker



**Li Kejun, the president of China Classification Society (CCS), emphasises that IACS has a unique position in the maritime world.**

to CCS class. Added to this, CCS pushed forward the development of 43 ship types, including a 300,000dwt very large crude oil carrier and a 177,000dwt 'green', environmentally-friendly capesize ship. Key technological projects of the state include the new train ferry, a national ship databank, and a very large ore carrier (VLOC).

The 'Construction Rules for Domestic-navigating Sea Boats (2006)', designed by CCS, will come into effect on 1 December 2007. This is China's first set of rules dedicated to the construction of domestic vessels, and they are applicable to newbuild steel sea boats of and above 20m.

CCS was also able to claim the lowest detention rate in Tokyo Memorandum of Understanding last year. On 18 April 2007, the secretariat of the Tokyo MoU published its 2006 annual report. Throughout the year, 12,148 ships from 96 countries were inspected, and CCS ranked as one of the best among the 60 classification societies or recognised organisations involved in Tokyo MoU inspections. A total of 30 detentions occurred out of 2104 inspections of CCS classed ships, so that the detention rate of 1.43% is the lowest among all classification societies. Added to this, CCS had the lowest detention rate among IACS member societies for three consecutive years from 2004 to 2006, during which 113 detentions occurred out of a total of 6419 inspections, representing a detention rating of 1.76%.

On 11 January 2006, CCS teamed up with Registro Italiano Navale (RINA) to form 'Yizhong Marine Technical Service Co Ltd'. By using the technical strength of both RINA and CCS, Yizhong aims to provide services by providing technical transfer ship type specifications, construction quality control, contract management, and personnel training for small and medium shipyards in China's coastal areas.

**vacon**  
DRIVEN BY DRIVES

# SAVE FUEL!



We have a passion - we make AC drives, and AC drives only. They serve your needs from 0.25 kW to 5000 kW, all voltage ranges from 220 V to 690 V, from air-cooled to liquid-cooled.

Our Vacon drives optimize your main propulsion to save more fuel, make your winch system more compact and silent, and make your seawater pumps follow the real cooling need. Moreover, not forgetting the comfort in ventilation, which is achieved with our drives.

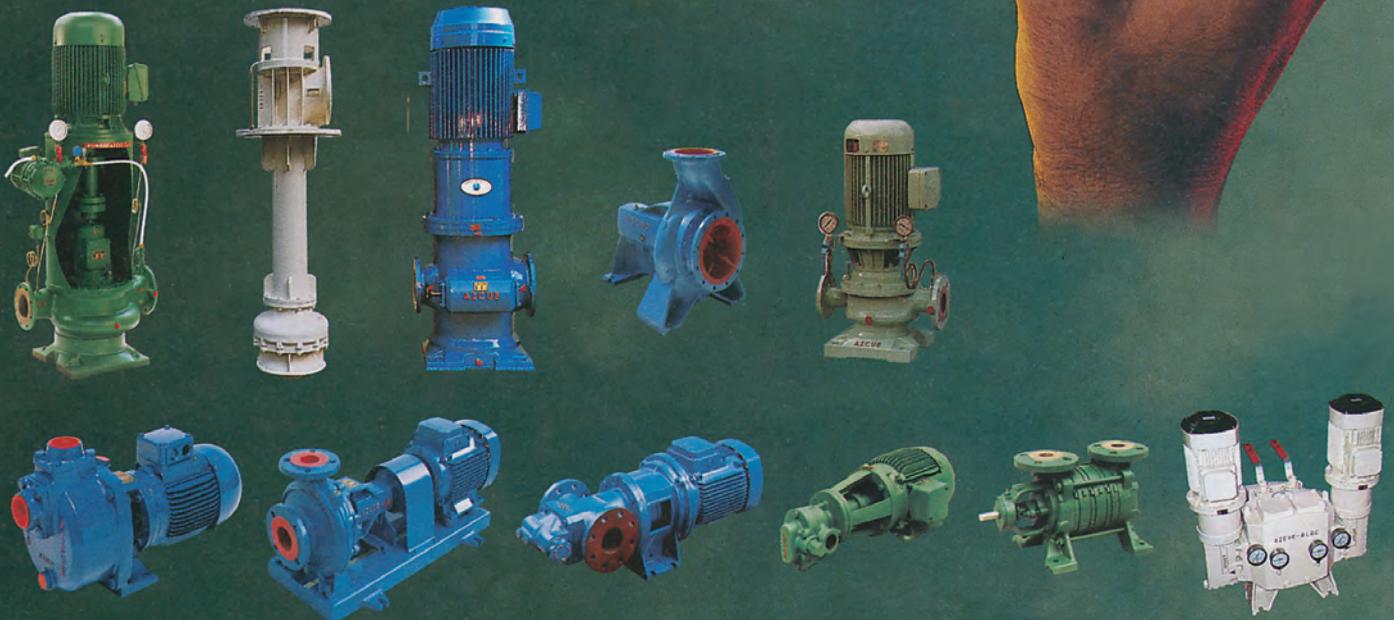
See [www.vacon.com](http://www.vacon.com) for more information.

[WWW.VACON.COM](http://WWW.VACON.COM)

1910  
2000

90 years to your service

# Building the future in pumping technology



pumps

pumpen

**azcue**

bombas

pompes

FACTORY AND HEAD OFFICE

P. O. BOX

Tel.: +34 943 14 70 47\*  
Fax: +34 943 14 74 40  
ARRONA - (Guipúzcoa) Spain

Apartado de Correos, 34  
20750 ZUMAIA  
(Guipúzcoa) Spain

PUMP MANUFACTURERS  
Since 1910

## Accessing China through DF Marine

**THE Naval Architect** recently met with Peter Rösholm, chairman of DF-Marine, who detailed this joint venture company's recent projects and designs in China.

A JOINT venture between FKAB (Fartygskonstruktioner AB), naval and marine engineers in Sweden, and DASTEC (Dalian Shipbuilding Technology Research Centre Co), in China, named DF-Marine, was established in Dalian 2001. Since then the company has grown, and in early 2005 an office was opened in Shanghai, and the business now employs 60 Chinese staff in total.

DF-Marine's core of work includes conceptual and basic design, detailed drawings, project management, supervision and inspection, and agent support activities for companies outside China. The company mainly works alongside Chinese shipyards, international and Chinese shipowners, European marine equipment suppliers, as well as with international shipyards and design agencies.

### Vessel design

DF-Marine has carried out the basic and detailed design of five 3700m<sup>3</sup> split barges and one split hopper dredger. These were based on the design of a split barge built at Tianjin Xinhe Shipbuilding Heavy Industry Co Ltd, for Belgian owner Jan de Nul. This fifth-in-series vessel was successfully delivered in July this year. Vessels in the series so far delivered include: *L'Aigle*, *La Boudeuse*, *L'Etoile*, *Le Spinx*, and *Le Guerrier*.

The design for another split barge, this time with a capacity of 1800m<sup>3</sup>, is also being worked on by DF-Marine. An order jointly taken with FKAB, for a Danish owner, is a 4500m<sup>3</sup> split barge, which is also to be constructed at Tianjin Xinhe Shipbuilding.



The split barge/hopper dredger *L'Aigle*, built by Tianjing Xinhe Shipbuilding Heavy Industry Co Ltd.



The 174,000dwt bulk carrier *Katerina M* was built by Bohai Shipbuilding Heavy Industry Co Ltd.

### TECHNICAL PARTICULARS 174,000DWT DOUBLE-SKIN BULK CARRIER SERIES

Length, oa.....	289.00m
Length, bp.....	278.20m
Breadth, mld.....	45.00m
Depth, mld.....	24.65m
Draught, design.....	16.5m
Draught, scantling.....	18.2m
Deadweight.....	174,000dwt
Cargo capacity.....	186,000m <sup>3</sup>
Main engine.....	17,640kW
Propeller.....	FP 8.2m
Speed (16.5m) 85% MCR.....	15knots
Accommodation.....	29
Flag.....	Cyprus
Classification.....	Class NK NS+BC-A (holds 2,4,6 & 8 empty) (PS-DA & PS-FA) (ESP/ MNS*, MO, PSCM

DF-Marine is also working on the total basic design package for four 7900dwt chemical/product tankers and four 11,000dwt chemical/product tankers for SUMEC. These ships will be constructed by Kejin for the eventual owner, Honglam Marine of Singapore.

Meanwhile, in breaking news, the conceptual and basic design for two 18,000dwt/22,000dwt product tankers has also just been secured. These are to be built at the same shipyard for the same owner.

### Successful bulk carrier series

The largest vessel so far designed is a 174,000dwt double-skin, *Katerina M*. The conceptual and basic design was carried out by FKAB/DF-Marine, together with Bohai Shipbuilding Heavy Industry Co Ltd (Bohai).

This ship design, part of a series of 14, was created for Transmed Shipping Ltd, of Greece. The first vessel was delivered two and a half years ago, with regular handovers every three months since then, from Bohai.

The bulkers have a length overall of 289m, a length bp of 278.2m, and a design draught of 16.5m. Fitted with main engines which generate 17,640kW, the vessels can reach speeds of 15knots at 85% MCR. The series has been classified by Class NK.

DF-Marine is also currently working on a 177,000dwt bulk carrier with Bohai, for the latter to market and build.

### Conversion capability

A 20-year old Japanese-built car carrier has also just been re-delivered by COSCO Dalian for Wallenius Lines after refurbishment. DF-Marine was responsible for the design of the new accommodation block, the cargo ventilation, and all the structural changes. A sister vessel is also expected in the yard for the same amendments very soon.

DF-Marine has also been creating designs for conversions from old single-skin VLCC to VLOC (very large ore carrier) for Greek and American shipowners. 



**TALK  
TO TTS**

**Why?** Because we work closely with our customers to increase their profitability and competitiveness by improving productivity, system capacities and quality. All our businesses are organised to respond rapidly to customer requirements, no matter where in the world your project is based.

**Call +47 55 94 74 00** [www.tts-marine.com](http://www.tts-marine.com)

Marine and offshore cranes; deck and mooring equipment; hatch covers; equipment for RoRo and cruise vessels; shipyard material handling; offshore equipment; harbour terminal equipment; drilling equipment; side-loading systems; ship conversion; aftersales service and support.



**DESMI pumps**  
integrate  
integrate  
knowledge & technology



**DESMI Marine Pumps -  
The Naturel Choice for high quality pumps**



Cargo pumps - submerged deepwell pumps, booster and horizontal cargo pumps - type DESWELL, DESBOOST and DESCARGO



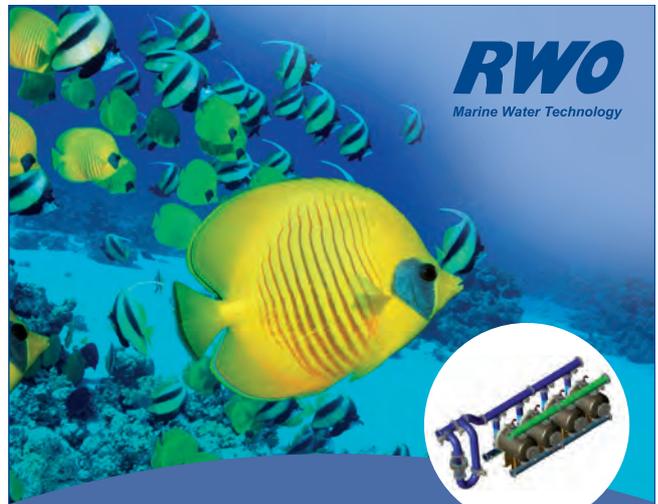
Vertical in-line centrifugal pumps - type NSL & SL



Horizontal gear pumps - type ROTAN ED/GP/HD

**DESMI  
MARINE PUMPS**

Tagholm 1 - 9400 Nørresundby - Denmark - Phone: +45 9632 8111 - Fax: +45 9817 5499  
E-mail: [marine@desmi.com](mailto:marine@desmi.com) - web: [www.desmi.com](http://www.desmi.com)



**RWO**  
Marine Water Technology



**CleanBallast!**  
**The optimal Ballast Water Treatment System**

- Designed to meet all global water qualities
- No costs for consumable logistics, storage and handling of chemicals
- Fast ballast water production at high sediment load
- No hazardous environment

RWO GmbH Marine Water Technology  
Thalenhorststraße 15A - 28307 Bremen  
Phone: +49 421 53705-0  
Fax: +49 421 53705-440  
[rwo@veoliawater.com](mailto:rwo@veoliawater.com)  
[www.rwo.de](http://www.rwo.de)



## Prepared to meet coating standards

**CHINA'S shipbuilding industry faces urgent challenges on vessel coating.**

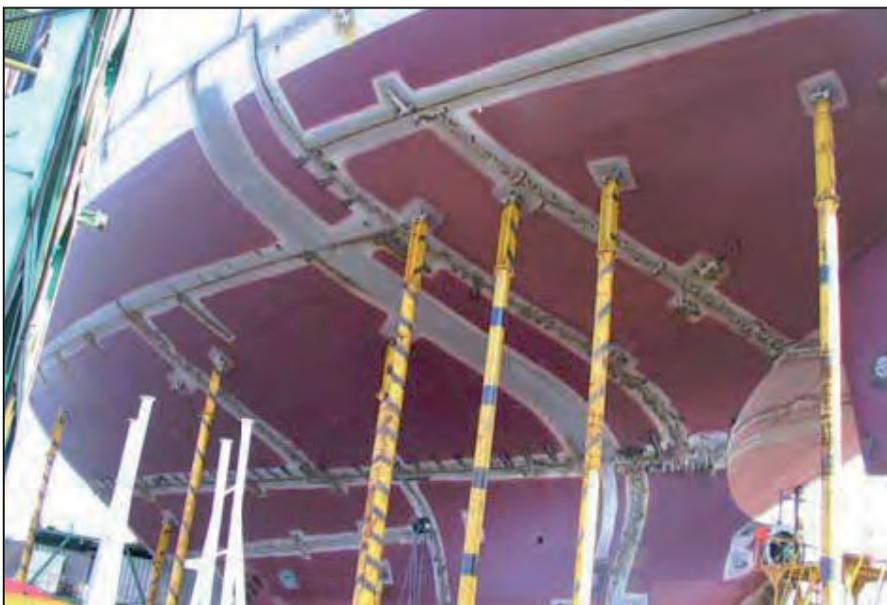
FOR some Chinese yards, the simple question of access to clean water and sand grit are a major challenge when conducting sandblasting in order to comply with new coating rules.

Chinese yards very often use river water and sand from various sources. Thus the challenges of achieving Performance Standard for Protective Coatings (PSPC) compliant coating are of a different order than in South Korea, where yards are focused on technical interpretations.

In some ways, the Chinese preference for brushes, rather than rollers and manual edge finishing, makes them better positioned in terms of application than the South Koreans, who are much more automated. That said, there are few, if any, PSPC-compliant orders booked in China.

As for Japan, whilst she has been slow to bring PSPC to market, there is now a concerted effort to build new paint shops.

There has been extensive coverage of coating challenges in the Chinese language paper *China Ship News*. As early as November 2006, the flagship paper warned, 'It is not exaggerating to say that the Chinese shipbuilding industry is facing the most urgent situation.' The paper suggested that if Chinese shipbuilders adopt the new coating standard, the annual output will be cut by 20%. If calculated by 12.12m dwt, which is the actual



**Coatings in China.** New standards require that coating inspectors should have qualifications, such as NACEII (American standard) and FROSIO red grade (Norwegian standard), or equal qualifications as identified by administrative authorities.

2006 output, and the 14m dwt expected this year, the lost business would be 2.4m dwt and 2.8m dwt respectively.

In practical terms, the paper said that Chinese shipbuilders, 'don't have a qualified lab for their coating system - a workshop primer that complies with the coating, or qualified training and certifying systems, for testers of coating.'

It warned of 'disastrous aftermaths', considering that Shanghai Waigaoqiao - the most advanced shipyard in China - needs at least one year to prepare to meet the standards of the new coating standard in terms of hardware facilities, construction techniques, technological capacity, and management level. Cost increase estimates were 10% to 15% for major yards and even more for smaller yards, which also stand a chance of being rejected in the international market.

COSTIND has also become actively involved, and formed a working team to tackle the issue of new coating standards. A May 2007 report in *China Ship News* said that: 'Once the new coating standards, which are very demanding, come into effect, a majority of the small shipyards will be forced to shut down or transfer to other business. During the 12-13 May, the COSTIND Work Team on Coating went to inspect the shipbuilding industry at Wenling in Zhejiang Province, suggesting that all small shipyards should actively take up M&A methods so as to form larger shipyards, integrate advantageous resources, and invest more in the coating area so as to face the severe challenge.'

China State Shipbuilding Corp lately issued three instructive documents, including: 'Instructive Opinions on Simulated Implementation of IMO Performance Standards for Protective Coatings'; 'Evaluation and Calculation Methods of Damaged Area of Protective Coatings'; and 'Technical Requirements for Protective Coatings.' These are to serve as references for the simulated

implementation of the new coating standards, and this is the first time that the Chinese shipbuilding industry has launched practical instructive documents regarding these new standards.

CANSI recently organised CSSC, CSIC (China Shipbuilding Industry Corp), China Classification Society, and the Ship Division under 'China Chamber of Commerce for Import and Export of Machinery and Electronic Products' to conduct a study and establish a document under the title of 'Notable Problems in Business Contract of Newbuilding Generated by the Implementation of the New Coating Standard.' The document alerts shipyards to pay attention to three contracts: a construction contract between shipyard and shipowner and appendices to the contract; the contract between a shipyard and a supplier of paints, and the contract between a shipyard and a classification society on ship survey.

As a next step, the Maritime Safety Agency of China authorised CCS to be the identifier of the qualifications of coating inspectors. IMO's (International Maritime Organization) new coating standards require that coating inspectors should have qualifications, such as NACEII (American standard) and FROSIO red grade (Norwegian standard), or equal qualifications as identified by administrative authorities.

Foreign class has been particularly active in helping to patch the 'China paint gap.' Lloyd's Register and International Paint have teamed up to offer shipyards in China some step-by-step advice on how to prepare to meet the requirements of the new PSPC. The partnership has been offering interested Chinese shipyards a free consultancy, or 'gap analysis' survey, comparing their current processes for coating ship's water ballast tanks to those that will be required under the new PSPC regulations adopted late last year by IMO. 

### Institute to focus on coatings

A JOINT venture agreement named 'CCS & DNV Technology Institute' was signed in January 2007 by China Classification Society (CCS) and DNV. The Institute, which is to be established in Shanghai, aims to support both the maritime and offshore industries on various laboratory and research challenges, initially related to coatings.

The agreement includes the setting up of the Technology Institute in Shanghai. This institute will be the first of its kind in China, and will initially focus on coating and corrosion services. The Institute will perform tests according to international standards, in particular the new IMO performance standard for protective coatings. Areas of cooperation will also include laboratory facilities, expertise, and services related to materials, welding, fuel, and lube oil analysis.

Coating experts from DNV headquarters gave six coating seminars in Greater China this January. Sille Grjotheim, a senior engineer at DNV, said: 'Shipbuilders have two main concerns with the new rules - increasing man hours, and also the subsequent logistics/facilities challenges these new regulations may bring into focus.'

## Design side feels growing pains

**CHALLENGES face Chinese shipbuilders, if naval architect numbers are to keep pace with expanding capacity.**

**P**LENTIFUL and low-wage labour resources have been the advantages that China's shipbuilding industry can boast about. However, high-quality professionals for design, development, and management, and also technical workers are in seriously short supply.

With the booming of the Chinese shipbuilding industry, such a shortage is a potential bottleneck.

Professor Zhang Weijing is deputy director of the Naval Architecture and Offshore Engineering Department under the Naval Architecture, Offshore, and Construction Engineering College at Shanghai Jiaotong University. He said that China now has a dozen universities and institutes that offer full-time education on naval architecture and offshore engineering. The number of graduates with a bachelor's degree and a master's degree is almost 5000 each year, but even this number seems insufficient to meet demand. Even adding graduates from junior colleges and technical secondary schools, the technical pool of talent is far from meeting the demands of the rapidly developing shipbuilding industry in China.

One reason is that quite a few of the graduates prefer companies with foreign investors, while others simply jump to industries that have nothing to do with shipbuilding. According to Professor Zhang, only about 30% of naval architecture graduates of Shanghai Jiaotong University will stick to shipbuilding.

He explained that low pay of shipyards is an important reason why these graduates will reject working in the sector, especially some state-owned shipyards, where the pay package is far less than foreign shipyards or employers in other industries. Usually the monthly salary for a new graduate is around RMB2000 for shipyards such Hudong Zhonghua.

Many students also nurture the prejudice that shipbuilding is a traditional manufacturing industry, which only offers poor working conditions and limited space for personal advancement.

According to Professor Zhang, his department usually recruits about 90 undergraduates, 45 master's students, and around 30 to 40 doctoral students every year. Many of the students will be chosen by classification societies, ship design institutes, or institutes under China State Shipbuilding Corp (CSSC) or China Shipbuilding Industry Corp (CSIC), and shipyards in Shanghai and Guangzhou.

In 2007, Mr Zhang said that about 30 students have been transferred from majoring in other subjects to naval architecture.

Shanghai Jiaotong University is also cooperating with the shipyards, ship design institutes, and classification societies by offering training courses for them.

In addition to Shanghai Jiaotong University, the other well-known centres for naval architecture education include Harbin Engineering University, Dalian University of Technology, Northwest Polytechnical University, Tianjin University, Wuhan University of Technology, and Huazhong University of Science and Technology.

The Chinese society of Naval Architects and Marine Engineers (CSNAME), set up in 1943, is an academic organisation which has set up branches in all major shipbuilding areas in China. It is responsible for organising the shipbuilding industry to conduct academic communications, science promotion, consulting, and training, in a bid to improve China's shipbuilding science and technology and facilitate China's dream to become the leading shipbuilding nation in the world.

CSNAME arranges for symposiums attended by experts and practitioners in the shipbuilding industry and organises training classes for representatives from shipyards. The society also publishes Chinese language magazines such as *The Naval Architect*.

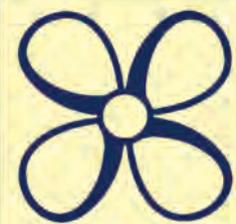
China Association of National Shipbuilding Industry (CANSI), set up in 1995, is another active organisation engaged in shipbuilding industry. It now has over 530 members including almost all large and medium-sized shipyards, ship research and design institutes, related universities and academies. It is under the supervision of the Commission of Science Technology and Industry for National Defense (COSTIND).

CANSI is involved in drafting, revising, organising, and supervising the implementation of national and industrial standards. It also organises symposiums and trainings to shipyards in a bid to boost China's shipbuilding industry.

China Classification Society (CCS) set up in 1956 is responsible for ship survey and classification. Usually CSNAME, CANSI, and CCS will cooperate with one another in conveying ideas to shipyards and help promote the development of the Chinese shipbuilding industry. 

### Naval architecture companies in China

Bangda Marine Consultancy  
C S Marine  
Changjiang Ship Design Institute  
China Ship Research & Design Centre Co Ltd  
Dalian FKAB Marine Engineering Co  
Dalian Shipbuilding Technology Research Centre Ltd  
Fujian Marine Design & Research  
Graig Carl Bro Ship Design  
Guangzhou Marine Engineering Corp (Gumeco)  
Guangzhou XED Ship Design Co Ltd  
Marine Design & Research Institute of China (Maric)  
Ninth Design & Research Institute (NDRI) of CSSC  
Peter Cheng Naval Architects & Marine Engineers  
Shandong Deltamarin Ship Design Co Ltd  
Shanghai Bestway Marine Engineering Design Co Ltd  
Shanghai CSIC Merchant Ship Centre Co  
Shanghai Design Associates  
Shanghai Jingrong Merchant Ship Design Co Ltd  
Shanghai Merchant Ship Design & Research Institute (SDARI)  
Shanghai Odely Marine Engineering Co Ltd (Odely Marine)  
Shanghai Ship and Shipping Research Institute (SSSRI)  
(source: *Worldyards.com Pte Ltd*)

**Stone Manganese Marine**

*The World's  
Propeller Specialist*

Website: [www.stonemanganese.co.uk](http://www.stonemanganese.co.uk)

Email: [sales@stonemanganese.co.uk](mailto:sales@stonemanganese.co.uk)

Tel: + 44 (0) 151 652 2372

Fax: + 44 (0) 151 652 2377

# ELECTRIC PROPULSION AND THRUSTER SYSTEMS



Bakker Sliedrecht is a company, which designs, manufactures and delivers well thought out electrical propulsion and thruster drive systems.

Our systems are characterized by their optimum of control and availability, efficient power management and diesel engine load, balanced fuel-oil consumption and emissions, a low vibration and noise level, high redundancies and flexible installation possibilities.

We are specialized in turn-key deliveries, including energy supplies, switchboards, drives, automation, control desks, cabling, training, etc.

Bakker Repair is specialized in maintenance, repair and winding of motors, generators, transformers, in high as well as low voltage.

Bakker Sliedrecht stands for top quality and excellent after-sales service 24 hours a day, anywhere in the world.

Bakker Sliedrecht  
Electro Industrie B.V.  
Postbus 25  
3360 AA Sliedrecht  
Tel.: +31 (0)184 436666

Bakker Repair B.V.  
Postbus 212  
3360 AE Sliedrecht  
Tel.: +31 (0)184 410555

Bakker Sliedrecht China  
- Shanghai: HMHC  
Tel.: 86-2164166733  
- Dalian, Hongkong  
Tel.: 86-41182529217

See you at:  
Offshore Europe 2007 - Aberdeen  
Europort Maritime 2007 - Rotterdam  
Marintec - Shanghai

[www.bakkersliedrecht.com](http://www.bakkersliedrecht.com) **BAKKER**  
SLIEDRECHT



## NED-DECK MARINE

survival systems & deck equipment



Bringing Safety to Life



### Ned-Deck Marine takes over SEC Davits

The acquisition of the business unit SEC Davits gives Ned-Deck Marine access to products that make Ned-Deck Marine an even stronger supplier of life saving equipment for all marine market segments, including the Cruise & Ferry market



[www.NEDDECKMARINE.com](http://www.NEDDECKMARINE.com)  
Barneveld, the Netherlands



## SURVEYOR™

### AUTOMATIC TANK GAUGING, MONITORING AND CONTROL SYSTEMS WITH INTEGRATED VALVE & PUMP CONTROL

Approved by: DNV, BV, LRS, ABS, GL, RMRS, CCS, KR, NKK



[www.ariston.no](http://www.ariston.no)  
[www.wateringress.com](http://www.wateringress.com)

**FOR TANKERS, BULKERS, CONTAINER CARRIERS,  
COAST GUARD AND OFFSHORE VESSELS**

## Neutrally buoyant hull aperture blanks

**T**HE ability to blank off sea inlets and overboard discharges safely and quickly underwater for emergency repairs at sea is essential if costly delays or even unscheduled dockings are to be avoided.

Blanks allow sea valves to be safely opened up inboard for survey, maintenance, or repair while the vessel remains afloat.

UMC blanks have been supplied to most of the major shipbuilders around the world for more than 30 years, with the largest concentration being in South Korea. But with the expanding market in China, UMC is now supplying hull aperture blanks to many of the Chinese yards through their local agencies.

New orders for 2007 have included China United Shipbuilding and the Kouan Shipbuilding industry. With the continuing increase in Far East output, it is expected that blanks production will increase over the next few years.

UMC's blanks project manager, Syd Hutchinson commented: 'It is expected that our blanks production will double over the next year as more shipowners and operators learn about the savings and benefits of keeping a full set of blanks onboard their vessels.'

The theory behind internal blanking is that a cover is fitted externally over the opening in the hull shell, and the water is drained from the sea chest by opening a valve or by cracking a



Unblanked apertures.



Forepeak blanks.

flanged joint. Once the pressure in the chest is released, the pressure of water outside the cover forces it into close contact with the hull plating. If the materials used are from a watertight seal around the edge of the cover, there will be no further ingress of water, and the valve can be opened up or removed for repair. If the valve is removed completely, it is always best to fit a steel blanking flange to the sea tube as a safety backup.

By using a neutrally buoyant hull aperture blank, one or two divers can easily man-handle the blank to any location beneath the vessel, then secure it in place using two or more hook bolts attached to the sea chest grid. These hooks

only act to prevent the blank from drifting away on the tide; they are not used to compress the gasket. Therefore, there is no great strain on what may be a fragile grid. However, blanks are never exactly neutrally buoyant, the preference being for slight buoyancy. If the diver drops your valuable asset, it bobs to the surface rather than sinks to the ocean floor.

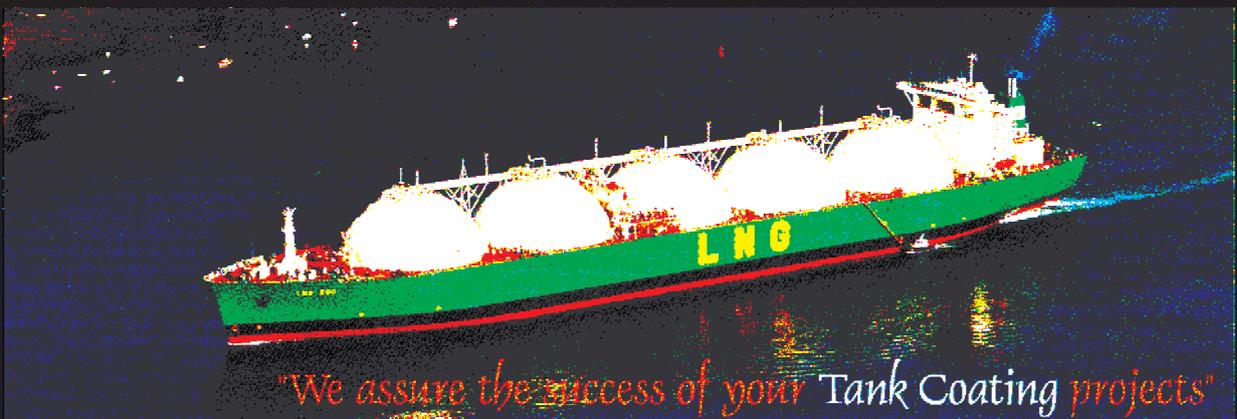
It may be very cheap to send a diver down with a few sheets of plywood and a tarpaulin to cover the inlet. When the water pressure on a small aperture amounts to 15tonnes at a depth of 15metres, would you risk taking the value out while relying on an improvised blank supported by a corroded grid with possible



NEVER TAKE RISKS WHEN IT COMES TO QUALITY. AFTER MILLIONS OF SQUARE METRES OF CARGO AND BALLAST TANKS SUCCESSFULLY BLASTED AND COATED, WE ARE SURE TO KNOW HOW TO MEET THE STRICTEST REQUIREMENTS FROM WORLDWIDE OWNERS. EXCELLENCE IS OUR TRADEMARK.



c/Cabrales 12 - 35201 Gijón - (Spain) Telf.: + (34) 985.35.54.78 - Fax: + (34) 985.35.02.91



*"We assure the success of your Tank Coating projects"*



# INDASA

missing fastenings? Even on a new vessel, was the intake grating designed to withstand the load imposed by an improvised blank?

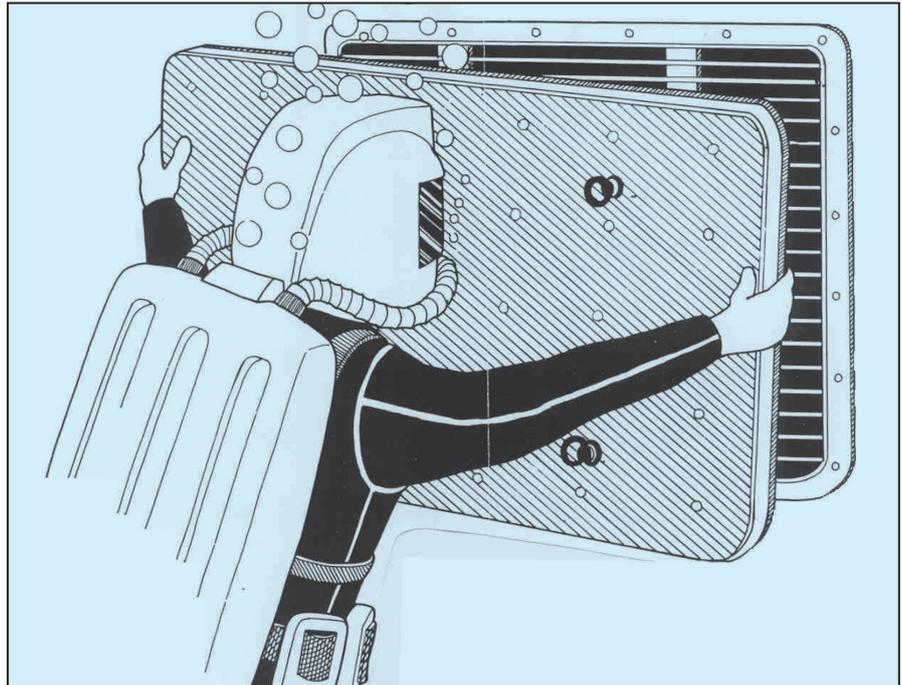
The only and secure method of keeping the sea at bay is to use a properly designed pressure blank, which has the correct curvature to fit the hull shell in way of the aperture.

For over thirty years, UMC has been manufacturing neutrally buoyant hull aperture blanks to a unique design, and has supplied thousands to new vessels as well as those in service, for onboard storage for use during in water survey and emergency repairs to valves. They are fabricated from an aluminium/marine ply sandwich to make them lightweight in air and neutrally buoyant in water. The calculations used have been approved by Lloyd's, ABS, BV, and DNV, and are accepted by other classification societies.

Blanks are normally designed using ships' drawings, however, if they are not available, UMC divers can attend the vessel, measure up the aperture, and e-mail the relevant information back to the design office.

Some shipowner/operators think the provision of these blanks is an unnecessary expense for the few occasions that they actually may be required. However, the cost of a full set of neutrally buoyant hull aperture blanks is a fraction of the cost of an unscheduled drydocking.

With vessels now seeking to have longer periods in between scheduled drydockings, and the subsequent requirement to carry out an in-water survey, neutrally buoyant hull aperture blanks have become a vital asset. FPSOs,



Drawing of a diver placing an aperture.

which are on station upwards of 10 to 15 years, are reliant on this kind of technology to enable them to remain on station.

UMC's design is equally suitable for semisubmersible oilrigs and other offshore

structures, which often have seawater intakes, which cannot be brought above the surface by de-ballasting and blanks, and can be supplied for fitting at full operating depths. ⚓

[www.navalia.com.es](http://www.navalia.com.es)

©VIGO

# NAVALIA

FERIA INTERNACIONAL DE LA INDUSTRIA NAVAL

VIGO 2008

20, 21 y 22 de Mayo

---

INTERNATIONAL SHIPBUILDING AND MARITIME  
INDUSTRY EXHIBITION  
VIGO 2008 (SPAIN)

20th, 21st and 22nd May

**Los 7 mares  
se unen en Vigo**

**The seven seas  
join at Vigo**

XUNTA DE GALICIA  
CONSELLERÍA DE INNOVACIÓN,  
INDUSTRIA E COMERCIO

caixanova

IFEVI

Organiza:

muéstralo  
organización de eventos



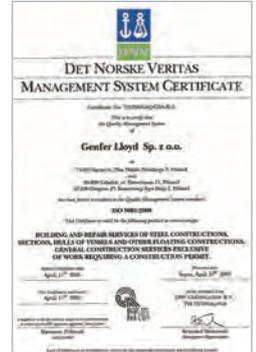
Genfer Lloyd Sp. z o.o.  
pl. Hołdu Pruskiego 9  
70-550 Szczecin  
Poland

## GENFER LLOYD SHIP DESIGN OFFICE

Genfer Lloyd Ship Design Office employs around 70 designers of all applicable disciplines. Our Designers have at least 10 years experience within design offices of leasing shipyards in and outside of Poland.

Their experience with the up to date software and systems means that the project can be advanced from the preliminary basic design up to the more detailed engineering development. On site project assistance can be provided for design prototypes.

During the course of their careers the designers have established contacts with leading Shipowners world wide, classification societies such as like DnV, GL, LR, ABS, RINA as well as Flag Authorities.



## OFFERED SERVICES

- + preparation of documentation of all design stages
- + assistance in model tests
- + theoretical calculations, hydrostatics, intact & damaged stability
- + hull structure design, incl. strength calculations with FEM
- + 3D modeling & design visualization
- + technical assistance in maker selection process
- + technical assistance in documentation approval process
- + technical assistance during construction, dock trials and sea trials of designed object
- + additionally: resin handmade models of designed vessels till 1 m size
- + deck equipment, machinery and piping design, including coordination and material lists



## USED SOFTWARE

NUPAS/CADMATIC, AutoCAD, TRIBON, NAPA, NISA/DISPLAY II, NAUTICUS, POSEIDON, RULESCALC, SHIPRIGHT, RHINOCEROS, EXPANDER.

## REFERENCES

- + Skipteknik AS, Norway: workshop documentation of research vessels, PSV, Trawler /hull and machinery part. Support in preparation of machinery/piping class documentation.
- + Fjellstrand, Norway: workshop documentation of flying cats/catamarans.
- + Bergen Mekaniske Verksted AS, Norway: workshop documentation, including outfitting 3D coordination for Y160 project (seismic vessel), workshop documentation of hull and Engine Room 3D coordination for Y161 project (ROV/Construction vessel).
- + Gdansk Shipyard, Poland: supervision of hull construction and piping of Y160 vessel.
- + Lloyd's Register EMEA: Gap analysis between DnV's and LR's class notation, FEM calculation, Napa modeling.
- + Cooperation with Groot Ship Design, The Netherlands: hull outfitting and ER arrangement documentation for general cargo vessel
- + Marin Teknikk AS, Norway: FEM calculation, Classification Documentation and workshop documentation hull and piping for soil investigation vessel.



## Contact persons

Mr Leszek Zbizek  
Design Office Manager  
e-mail: leszek.zbizek@genferlloyd.com  
Mobile: +48 600 208 906

Mr Marek Nowak  
Senior Chief Designer  
e-mail: marek.nowak@genferlloyd.com  
Mobile: +48 600 208 913

Ms Justyna Trebaczkiewicz  
Sales Engineer  
e-mail: j.t@genferlloyd.com  
Mobile: +48 600 208 903

# YOUR BEST PARTNER IN MARINE INSTRUMENTATION

- Cargo tank monitoring systems
- Float type level gauges for LNG & LPG
- High level & overflow alarm systems for chemical tankers



Scheepmakersstraat 33  
P.O. Box 198  
3330 AD Zwijndrecht  
Netherlands

t: +31 78 6100999  
f: +31 78 6103214  
e: info@hsh.nl  
w: www.hsh.nl



## Black and Grey Wastewater Management Solutions

Complete system solutions for wastewater management. Advanced Maripur® membrane black and grey water treatment plants exceed all current and future legislation including MEPC 159(55) which comes into force for STP installations on or after 1st January 2010.

Fully automated Lipatomat® fat, oil and grease separators handle wastewater from the galley. Push-fit pipe systems in both stainless and galvanized steel complete the system.

 **ACO marine**  
Advanced Wastewater Solutions

**ACO Marine s.r.o.**

Mark Beavis - Managing Director  
Nádražní 72, CZ - 150 00 Praha 5, Czech Republic  
Tel.: +420 257 217 990, Fax: +420 257 310 718  
E-mail: info@acomarine.com

For further information or contact please visit [www.acomarine.com](http://www.acomarine.com)

See Maripur® and the rest of the ACO Marine product range at Marintec Hall W3, Stand No. 3H21



## Biggest ore carrier to enter water

ON 30 April 2007, Bohai Shipbuilding Heavy Industry Co and China Shipbuilding & Offshore International Co, jointly signed a contract with Singapore-based BW Shipping in Beijing for the construction of four 388,000dwt very large ore carriers.

This ship type, classed by Det Norske Veritas, is the largest ore carrier in the world, and arguably the most environmentally friendly.

Bohai Shipyard holds the intellectual property rights for the mass production of this type of ship. The successful development of this capability marks another breakthrough for the shipbuilder.

In recent years, Bohai has been reinforcing its internal management and improving its operational capability.

The shipbuilder has already developed and built the optimised 174,000dwt bulkers and 297,000dwt very large crude oil carriers as independent brand ship types specific to the Bohai Shipyard.

Through market analysis in 2006, the shipyard established that China imported 326m tonnes of iron ore, accounting for 45% of global imports in 2006. This prompted Bohai Shipyard to develop the 388,000dwt VLOC, which is the largest vessel in Chinese history and also the largest bulk carrier in the world.

The ship can call at many ports in China including Caofeidian, Dalian, and Majishan. The design speed is 14.8knots. According to the shipyard, compared with foreign VLOCs this ship type developed by Bohai Shipyard is faster and can bring many more economic benefits to the shipowner. The design has also taken into consideration both heavy and light load situations, which will reduce the operating costs of the ship.

Tor E Svensen, chief operating officer of DNV Maritime, has pointed out that these vessels are examples of how to reduce emissions by optimising transportation. By using the 388,000dwt ships instead of standard capesize bulk carriers for the same trade, the fuel consumption per tonne carried will be reduced by almost 30%. Air emissions will be reduced by a similar figure.

The ship can navigate for 25,000 sea miles, making it a good match for plying the trade route between China and Brazil. These VLOC giants will supersede another BW vessel, *Berge Stahl* (1986-built, 364,000dwt), which was built specifically for the trade by Norwegian shipping group formerly known as Bergesen. It is currently in service with the Brazilian iron ore mining giant, Companhia Vale do Rio Doce (CVRD).

While much of the BW fleet, from both World-Wide and Bergesen lineages, was built in Korea and Japan, more recently, China has been the shipyard destination of choice.

Commenting on the new Bohai purpose-designed shipbuilding facility incorporating the latest technology and practices, Paul Dunn, general manager of the technical department said: 'The marriage of the shipyard's ambition and commitment with the experience of the newbuilding team should

### TECHNICAL PARTICULARS BOHAI SHIPYARD VERY LARGE ORE CARRIER

DWT.....	388,000
Speed.....	14.8knots
Range.....	25,000miles
Length oa.....	360.6m
Length bp.....	345.6m
Breadth.....	65m
Depth.....	20.5m
Design draught.....	22m
Structure draught.....	23m
Class.....	DNV

**Now fitted to  
1,280 vessels.**

**Up to 5% FUEL SAVINGS  
or  
BOOST SPEED BY 2%.**

**PBCF breaks up the hub vortex.**

**MOTech** PBCF & SHIP'S MACHINERY DEPT.  
Mitsui O.S.K. Techno-Trade, Ltd.  
3-4, 2-Chome Uchikanda, Chiyoda-ku, Tokyo, 101-0047 Japan  
Tel:81-3-3258-7180 Fax:81-3-3258-7356  
URL: <http://pbcf.motech.co.jp/> E-Mail: [pbcf@motech.co.jp](mailto:pbcf@motech.co.jp)

**SHIPBUILDING IN CHINA**

ensure there is no compromise in the quality expected in a BW vessel.' Mr Dunn added: 'I am confident the vessels will be built to the highest standards.'

This four-VLOC contract follows the contract for two 320,000dwt VLCCs, signed in February 2006 between Bohai Shipyard and BW Shipping. These two vessels will be the largest VLCCs ever built in China, are due for delivery in 2009 and 2010, and represent a return to Chinese shipbuilding for BW. The company's long-standing interest in Chinese shipbuilding capability started with founder Sir Y K Pao placing China's first export orders at the Hudong and Jiangnan Shipyards in Shanghai in 1979.

'Given the group's heritage in China and our work with the Chinese shipbuilding industry since the 1980s, we are delighted to be building these vessels in China,' said Andreas Sohmen-Pao, managing director of BW Shipping (Singapore).

**First for CSRs**

In particular, the two new VLCCs also represent a significant investment in time and relationship-building. They are amongst the first vessels built in China to follow the new common structural rules (CSRs) for double-hull oil tankers. As such, the specifications were jointly developed between BW Tankers, Bohai Shipyard, and DNV. Technical discussions were underway for over a year before contract signing.

'When we started, all we had was the VLCC hullform. Everything else we created just for our specifications,' said BW's newbuilding manager, T C Lee, who made over ten visits to Bohai in order to ensure that the specifications and design were developed appropriately.

The expansion of facilities at Bohai Shipyard, which has just been completed, will triple the annual production capacity of the company up to 2mwt.

The investment in the shipbuilding facilities, which cover a construction area of 210,000m<sup>2</sup>, totals RMB2.53bn. The value of new contracts in 2006 was 7.6 times that in 2005, and Bohai Shipbuilding plans to deliver nine ships to clients and to start construction of a further eight ships in 2007.



Manufacturer of:

- New Unique Fischcon Step Up Gearbox FiFi-I Pump Combination (1200 to 1600 m<sup>3</sup>/h)
- FiFi I, II & III Systems
- Portable/Skid Mounted FiFi Units (50 to 3600 m<sup>3</sup>/h)
- Telescopic Monitor Masts
- Marine Gensets (50 to 2500 kW)
- Hydraulic Power packs (up to 5000 l/m)



*Design in accordance with all marine Class Society rules*

**Fischcon Trading & Engineering B.V.**

P.O. Box 231  
4130EE Vianen  
The Netherlands

Tel: +31 347 329 020  
Fax: +31 347 373 459  
www.fischcon.com

**SOLAS - WATER INGRESS ALARM SYSTEM**

**new amendment for single hold cargo ships**

**CAN YOU TRUST A FLOAT SWITCH?**

Don't trust to luck that a float will not jam or stick just at the time it should trigger an alarm. For peace of mind fit a PSM system with solid state 'live zero' sensors to continuously monitor for water ingress and provides a constant 'sensor health' confirmation.

- Available from stock in Europe, USA and Asia
- Low cost system uses only one sensor per cargo space
- Remote alarm test facility as standard - to be doubly sure
- Self Contained testing - No need for HP Air or Water supplies
- No replacing filters or messy routines between voyages
- Versatile sensor mounting options provide for lowest installed cost



Optional Dewatering systems available

**FULLY IACS TYPE APPROVED WIS SYSTEMS FOR SINGLE HOLD VESSELS OR BULK CARRIERS**



[www.bulksafe.org](http://www.bulksafe.org)



PSM Instrumentation Ltd

Tel: +44 (0) 1444 410040 Fax: +44 (0) 1444 410121 Email: [info@bulksafe.org](mailto:info@bulksafe.org)

Bulksafe is a Registered Trademark of PSM

# Yanmar Makes the Most of the World

EcoDiesel  
SAVETEN

## FUEL SAVINGS AND LOW NOx? IS THAT POSSIBLE?

Yanmar's new ASSIGN combustion technology consigns that old trade off between fuel consumption and clean exhaust to the past. You no longer have to choose between low fuel consumption and low NOx emissions. With ASSIGN, you win both ways. The EcoDiesel SAVETEN is the new generation diesel engine that's kind to the environment. As early as August 1998, Yanmar was the first Japanese manufacturer to win approval on atmospheric pollution under the new IMO regulations.



Model	Generating Capacity	Model	Generating Capacity
6EY18(A)L	360 - 750kW	8N280L	2000 - 2200kW
6N21(A)L	600 - 960kW	6N330L	2200 - 2500kW
8N21(A)L	800 - 1270kW	8N330L	2600 - 3300kW
6EY26L	1300 - 1720kW		

Generating capacity varies depending on generator efficiency.



Large Products Marketing Dept. Export Dept. Marine Group. 1-1, 2-chome, Yaesu, Chuo-ku, Tokyo, Japan Tel:+81-3-3275-4909 Fax:+81-3-3275-4969 <http://www.yanmar.co.jp>  
**YANMAR EUROPE B.V. (YEU)** Brugplein 11, 1332 BS Almere-de Vaart, The Netherlands Tel:+31-36-549-3200 Fax:+31-36-549-3209  
**YANMAR ASIA (SINGAPORE) CORP. PTE. LTD. (YASC)** 4 Tuas Lane, Singapore 638613 Tel:+65-6861-3855 Fax:+65-6862-5189  
**YANMAR AMERICA CORP. (YA)** 901 Corporate Grove Drive, Buffalo Grove, IL 60089-4508, USA Tel:+1-847-541-1900 Fax:+1-847-541-2161  
**YANMAR ENGINE (SHANGHAI) CO., LTD.** Room 2002, China Insurance Building, 166 Pudong LuJiaZui East Road, Shanghai, China 200120Tel:+86-21-58795090 Fax:+86-21-58798090



# Start And End Your Sea Voyage In Comfort With Daikin's Reliable Advanced Scroll Technology.

Reliable air conditioning and refrigeration equipment are essential to a comfortable sea voyage. Not only can Daikin offer suitable models to meet every application and size but also by applying the innovative technology of our unique scroll compressor, we can provide low maintenance high durability marine products that will bring you the best in comfort and reliability whenever you are at sea.



## Galley Air Conditioner

It is a dedicated air conditioner for "all fresh system" corresponding to a high load of the galley, in accordance with SOLAS 2000.



## Packaged Air Conditioner

Daikin's low profile, high performance models offer more freedom of design in limited cabin space. Available in a range of capacities from 2 to 20Hp. Daikin has a wider selection of products to meet virtually any cabin size.



## Deck Unit

Daikin deck unit is compact and silent. In addition, it is compatible with the usual separate system. Its scroll compressor is maintenance free for 40,000 hours. Even in the event of a breakdown in one circuit, the use of multiple compressors guarantees continuous operation.



## Small Size Condensing Unit

Daikin's exclusive refrigeration technology keeps provisions fresh, making for pleasant meals during the voyage. A wide variety of models are provided.

**All Models with Ozone Friendly HFC Refrigerants.**

**DAIKIN MARINE TECHNOLOGY [ Air Conditioning & Refrigeration Unit ]**

**DAIKIN INDUSTRIES, LTD.** e-mail:marine.aircon@daikin.co.jp

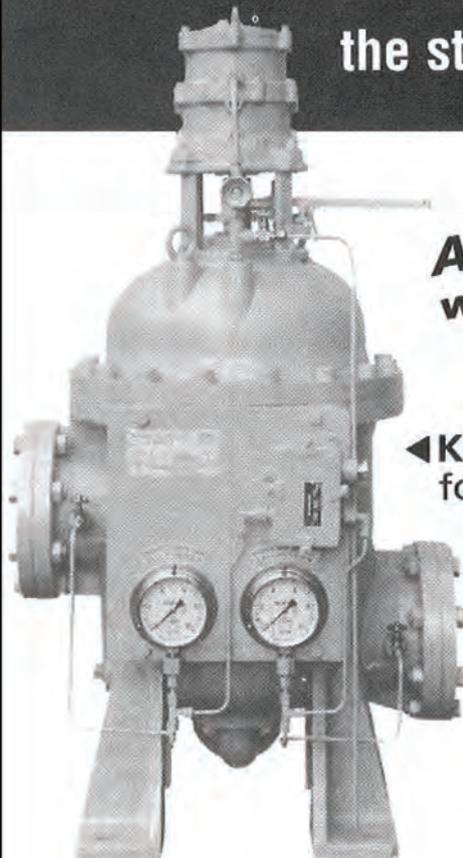
### Head Office

Umeda Center Bldg., 2-4-12, Nakazaki-Nishi, Kita-ku, Osaka, 530-8323 Japan  
Phone:(06)6373-4338 Fax:(06)6373-7297

### Tokyo Office

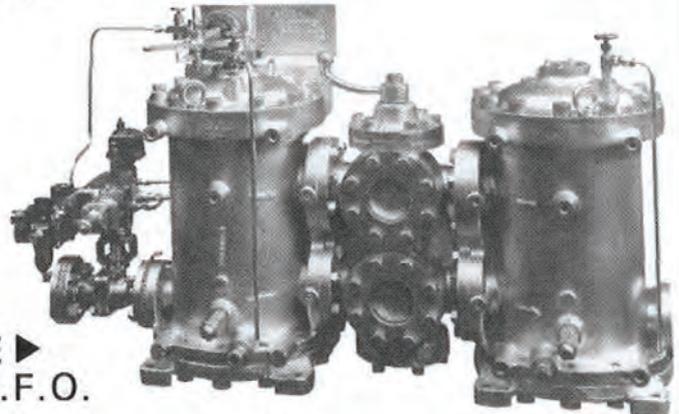
JR Shinagawa East Bldg., 2-18-1, Konan, Minato-ku, Tokyo, 108-0075 Japan  
Phone:(03)6716-0420 Fax:(03)6716-0230

# The manufacturer straining for the future, makes the strainers straining on the seven seas.



## AUTO BACKWASH w/notch wire element

◀ **K8E**  
for LUB. OIL



**K8FE** ▶  
for H.F.O.

# KANAGAWA KIKI KOGYO CO., LTD.

Main Office & Factory : 8-19-1, OKAMURA, ISOGO-KU YOKOHAMA, JAPAN  
PHONE : 81-45-753-3800 FAX : 81-45-755-0089 TLX : 3823-439 KANAKI J

## Bring on the FPSOs

**E**ARLIER this year, the Shanghai Waigaoqiao shipyard delivered a 300,000tonne Floating production storage and offloading (FPSO) vessel - the biggest and the most advanced FPSO to have been turned out by the Chinese shipbuilding industry to date.

The delivery, which is reckoned to have turned a new page in the history of Chinese shipbuilding, will be used in Bohai Penglai 19-3 oil field.

The hull was designed by CSSC with double bottom and double shell structure. The overall length is 323m and the breadth is 63m, equivalent to the total area of three football fields. It is 32.5m deep and 71m high from the bottom of vessel to the stack - the same height as a 24-floor building. The loading draught is 20.8m, with daily processing capacity reckoned to be around 190,000 barrels of crude oil, storage capacity of 2 million barrels, while the vessel comes complete with its own helicopter pad, and will be capable of accommodating 140 people working and living on the vessel at any time. 

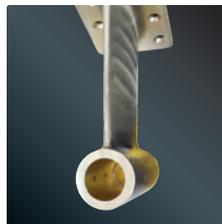


The launching ceremony of the largest FPSO to have been built in China, in April. Vice president of CPPCC and the dean of the Chinese Academy of Engineering Xu Kuangdi, secretary of Shanghai Municipal Party Committee Xi Jinping, mayor Han Zheng, the vice minister of Ministry of Education Wu Qidi, and the president of CSSC Chen Xiaojin attended.



## SILENT EFFICIENCY

CJR is the hidden strength behind many of the world's top boatbuilders



PROPELLERS AND STERNGEAR SYSTEMS

[www.cjrprop.com](http://www.cjrprop.com)

CJR has combined decades of marine experience, design innovation and engineering excellence to supply the builders of the world's finest motoryachts with the ultimate in propellers and sterngear systems.

The ocean is no place for compromise. That's why our solutions deliver maximum efficiency with unrivalled performance, responsiveness, fuel economy and quiet vibration-free operation.

Contact us now for more information.



# SSW feeder makes super debut

**S**CHICHAU Seebeck Shipyard (SSW) in Germany recently launched the latest example of the feeder ships in which it has come to specialise, in the form of the 152m *Anne Sibum*, the first example of the new SSW Super 1000.

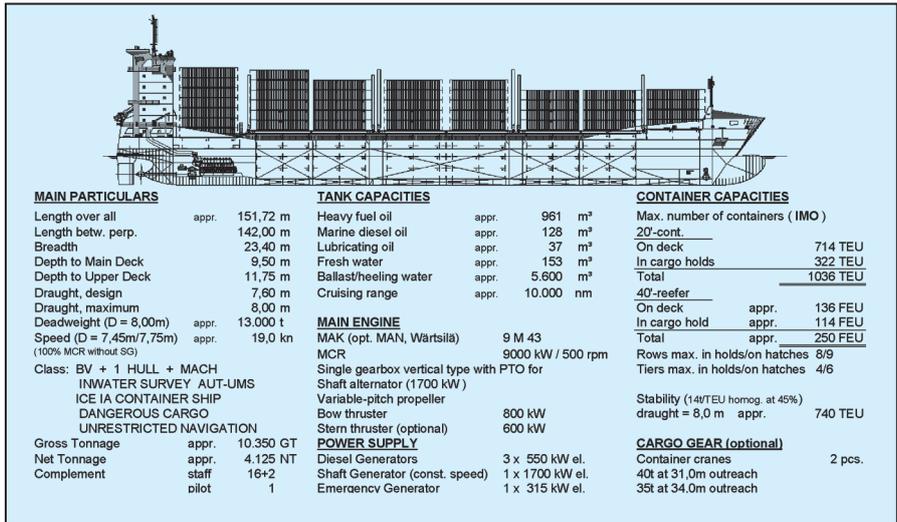
With a container capacity of 1036 TEU, *Anne Sibum* was built for Bernd Sibum in Haren Ems in Lower Saxony, Germany, which has so far ordered a total of three examples of the new SSW Super 100 design, with options for two more.

SSW describes the SSW Super 1000 as having a high loading capacity and loading flexibility, as well as a low fuel consumption. 'We have developed this type of ship with an eye on the extremely rapid growth in the amount of containers in feeder traffic, as well as on the constantly rising energy prices,' said shipyard director Karl-Heinz Jahncke, noting that it has been estimated that the total worldwide requirement for similar feeder ships in the years ahead will be around 1500 ships.

The design for *Anne Sibum* and her sister ships arose as a result of close cooperation between the shipyard, Bernd Sibum, and Vuyk Engineering of Groningen in The Netherlands. Based on the shipping company's experience and its requirements, SSW and Vuyk developed a design which, whilst having broadly similar dimensions to conventional feeder ships, can carry significantly more containers.

With a total capacity of up to 1036TEU if required, the SSW Super 1000 is able to transport around 740 20ft containers, each loaded with 14tonnes of cargo. The ship's performance is, claims SSW, significantly better than that of larger conventional feeder ships.

After making many hydrodynamic calculations and model tank tests, SSW and Vuyk have, in addition, succeeded in optimising the ship's lines such that in order to achieve a top speed of 19.3knots using a moulded draught, only a relatively small and economical 9000kW main engine is required. The design can take high



Profile drawing SSW Super 1000.

cube containers in all of its cargo holds, handle containers with hazardous materials, and is fitted with a single gearbox with PTO for a 1700kW shaft alternator, an 800kW bow thruster, and optional 600kW stern thruster.

Several versions of the basic SSW Super 100 design are available, with or without ice class, with or without cargo gear, and with pontoon hatch covers, if required. Potential areas in which it could operate include the North Sea and the Baltic, the Mediterranean, and the Caribbean.

SSW employs around 320 people, and together with the jobs at various suppliers, the SSW Super 1000 series is securing around 700 long-term jobs in the region. 'The significance of the project in

terms of labour market considerations and its importance to the economy of the region as a whole was also one of the reasons why NordLB bank became involved in it as a financial partner,' Mr Jahncke explained.

The SSW Super 1000 design has also begun to create ripples far beyond the Bremerhaven region. Because the shipyard is particularly busy, it is unable to fulfil all of the potential orders sought by shipowners, and SSW Super 1000 type vessels are also being built under licence in several other countries. In addition to the six ships under construction in Bremerhaven, 12 more are already being built around the world.

*Anne Sibum* under construction at SSW earlier this year.



TECHNICAL PARTICULARS SSW Super 1000 Feeder Vessel	
Length, oa	151.72m
Length, bp	142.00m
Breadth	23.40m
Depth to main deck	9.50m
Depth to upper deck	11.75m
Draught, design	7.60m
Max draught	8.00m
Deadweight	
(draught 8.00m)	13,000tonnes
Container capacity	1036TEU
Reefer capacity	250 40ft refrigerated containers in the cargo hold and on deck
Main engine	MaK 9 M 43 (9000kW)
Class	BV + 1 HULL + MACH, INWATER SURVEY AUT-MS, ICE 1A, Container Ship, Dangerous Cargo, Unrestricted Navigation



- more than 185 ships equipped with SEC's FATs
- more than 920.000 units in service (as per July 31, 2007)

**Your benefits from SEC's FAT-system:**

- reliable
- patented and certified
- reduce your initial investment
- reduce your costs for spare parts
- reduce your costs for maintenance
- reduce your costs for port handling
- save time during unloading
- become even more competitive

**Modern ships need ...  
innovative equipment**

# SEC

**Ship's Equipment Centre Bremen GmbH**

Speicherhof 5 . 28217 Bremen . Germany  
Phone: +49 (0) 421 39 69 10 . [www.sec-bremen.de](http://www.sec-bremen.de)

Whoever wants to manoeuvre on the seas **worldwide** needs reliable  
drive systems. Voith Turbo keeps your ships **on course**



[www.voithturbo.com/marine](http://www.voithturbo.com/marine)

Industry | Marine | Rail | Road

Precise manoeuvring is becoming ever more important in shipping. Voith Turbo Marine has been designing systems that are safe for man and environment for over 80 years: with tailor-made drives such as the Voith Schneider Propeller, the Voith Turbo Fin, the Voith Cycloidal Rudder and the world-wide proven ship's

concept of the Voith Water Tractor we are proving our far-reaching competence. Low-maintenance systems for safe operation, high availability and quality for a wide variety of ships. Your ships stay worldwide on course. **Please visit us at Europort Maritime, Rotterdam, Hall 1, booth 1319.**

**Voith Turbo**

**VOITH**  
*Engineered reliability.*

# GL forum addresses PSPC issues

COATINGS comprise a significant proportion of the cost of a new ship, and the quality of the coatings directly affects the structural integrity of a vessel, its environmental performance and, ultimately, the value of the asset.

Newly-enacted legislation in the form of the IMO's Performance Standard for Protective Coatings (PSPC) is intended to help delay the onset of corrosion in seawater ballast tanks and in the double-side skin spaces of bulk carriers. The PSPC has, among other things, introduced a common minimum standard for surface preparation for use by all yards on all ship types.

Perhaps the most significant impact of the new requirements enshrined in the PSPC is that it provides a common minimum standard for all owners and shipyards, and the requirements extend through the whole process from specification to application, detailing the role of each party involved. One of the most useful innovations of the PSPC is adoption of a coating technical file that records all the technical details

pertaining to coatings, which is compiled by the shipyard and reviewed for content by the class society.

Introduction of the new regulations has refocused attention, not just on assessors of coatings and the standard applied, but on the need for more technical awareness of coatings.

Classification societies have been quick to act to 'fill the gap' in understanding in some sectors of the industry about coatings, among them Germanischer Lloyd (GL), which recently organised an 'Exchange Forum' to discuss the new IMO Standard.

### Tighter rules

As GL noted, the rules for protective coatings are now much tighter, but the implementation of the PSPC rules have come as something of a challenge for industry. What will be the consequences for shipyards, paint manufacturers, application companies, classification societies, and owners of the PSPC, asked GL? Do application methods need to be adjusted? How much documentation is necessary?

These questions and others were discussed by more than 100 representatives of the maritime industry at the Exchange Forum organised by GL about the PSPC.

'For the shipping industry, it is high time to pay attention to the new regulation, which will enter into force on 1 July 2008,' said GL, noting that the new standard applies to dedicated seawater ballast tanks in all types of new ships in excess of 500GT, and double-side skin spaces arranged in bulk carriers of 150m in length and upwards, contracted on or after this date.

'Following the introduction of the PSPC, Regulation II-1/3.2 of the International Convention of the Safety of Life at Sea (SOLAS) was amended accordingly,' said GL, also noting that the ballast tanks of tankers and bulk carriers built under the Common Structural Rules that were contracted on or after 8 December 2006 are already covered by the rules.

The intention of the IMO standard was to provide a 'target' useful life for ballast tank coatings of 15 years, a laudable objective, but the decision initially caused mixed feelings

## First international client for GL ShipManager

GERMANISCHER Lloyd (GL) has obtained its first international clients for its GL ShipManager fleet management programme. The first clients for the programme are Finnish shipping company Oy Långshipp and Danish company Transmarine Management, which have both entrusted Ms Logistik Systeme, a Germanischer Lloyd Group company, with the implementation of GL ShipManager in their fleets.

Oy Långshipp, based in Piiikkiö, Finland, has equipped its two newbuildings, *Linda* and *Aila*, with the GL ShipManager, and will utilise the software tool for maintenance and order management. Three ships operated by Transmarine Management of Copenhagen, Denmark, will be equipped with the maintenance, administrator, and document modules.

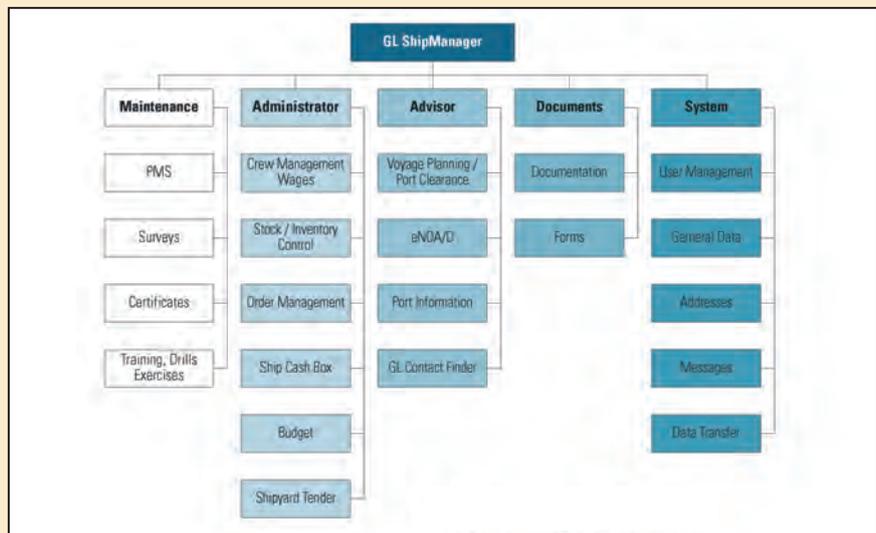
The office software for both will be installed on Ms Logistik Systeme's server, and each company will have access to their own data around the clock and receive special services with the automatic data exchange.

GL says GL ShipManager software simplifies operational planning processes for shipping companies, and covers the primary areas of Technical Management, Crew Management, and Ship Management with a total of 17 application programs (modules). The Port Clearance Module, for example, considerably reduces the time needed to prepare all of the necessary port documents.

'With the aid of GL ShipManager, shipowners and managers can increase the availability of their ships, reduce downtime and repairs, and also optimise the procurement and stocking of spare parts – thus reducing administrative effort and trimming the costs,' said GL, noting that the software tool is now in use on more than 250 ships world-wide.

Modules such as Crew Management, Technical Management, and Ship Management automate the administrative activities needed for day-to-day ship operations, and provide a secure method of data exchange using a range of communication channels, including the Internet, satellite communications, or telephone. The program compresses individual data packages as efficiently as possible, so that transmission costs are kept low. The software modules appear in a user-friendly office suite with web-based user interface. Any Internet-enabled PC can be used to work on the system, without the need to install additional software.

GL ShipManager structure.



among paint manufacturers, shipyards, and owners. 'Who will provide the guarantee for the condition of the coatings for such a long time-span? How much detail will need to be provided in the verified inspection report?' asked GL, noting that the generation of the required coating technical file will require additional work for yards, owners, and suppliers alike, and asking: 'To what extent will the new appliance and maintenance procedures increase shipbuilding costs and lengthen dock periods?'

The Exchange Forum was moderated by Daniel Engel, Germanischer Lloyd's head of competence centre materials and products. In his opening presentation he explained the class society's crucial role in the implementation of the new standard, noting that class is responsible for the certification of the coating system, qualification check, and monitoring of the Coating Inspector, as well as the review of reports and the Coating Technical File.

**Prolonging life**

The PSPC is mandatory within the scope of the Common Structural Rules of the International Association of Classification Societies (IACS), and in order to guarantee smooth implementation, IACS issued a Procedural Requirement (PR34). Maintenance and inspection remain the keys to prolong a ship's life – also in respect of coating conditions – and as Mr Engel

explained, the development of a similar standard for void spaces, as well as a standard for maintenance, will be required.

The practical challenges of the new standard will become clearer in the years to come, but yards have to gear up now, as Joachim Becher of Aker Shipyards made clear in his presentation, focussing on the challenges that the new standard poses for shipyards. His conclusion was that the new standard will help to prolong a ship's life, reducing maintenance and repair work as well as increasing ship safety, but yards will have to face a considerable amount of extra work.

**Coating takes time**

More time will have to be invested in coatings, and construction costs will rise. As Mr Becher also explained, shipyards will also need to think seriously about climatic conditions when applying coatings.

The way in which pre-qualification tests will have to be performed in the future and which requirements will have to be met were discussed by Dr Theo Reints Bok of Sigma Coatings, who also posed the question as to whether coating inspectors will have to obtain a certified qualification in future, whilst Dr Andreas Momber, representing surface protection specialist Muehlhan, discussed amendments to application and documentation procedures that will be required by the PSPC.

Thorsten Lohmann, a coatings expert at Germanischer Lloyd, gave an overview of the inspection requirements and class adjustments, noting that GL will offer owners a tool to generate the coating technical file. GL Pegasus, a programme developed to perform thickness measurement reports, will be used to file coating inspection reports in electronic form at the newbuilding stage and to provide for documentation of future maintenance activity, including images showing the condition of coatings and any corrosion that has been detected.

The tool developed by GL will thus help focus attention on possible corrosion 'hot spots' during the lifetime of a vessel. The programme is based on a 3D structural model supporting all parts of a ship, and provides interconnected tabular and graphical views.

GL also anticipates playing a key role in helping to train coatings inspectors, and has begun to organise a series of seminars to that effect. Given that type-tested products will be required by the industry, GL has established a testing laboratory for pre-qualification testing of coating systems, followed by a GL type approval.

Legislation such as PSPC is also explained in Germanischer Lloyd's 'IMO Pilot 2007', a comprehensive reference book, produced annually, that provides an overview of all major changes in technical and operational requirements since the year 2005.



## MACOR MARINE







- Hatch covers
- Embarkation / loading platforms
- Bow visors, bow and stern doors / ramps
- Mega yacht equipment
- RoRo car decks and ramps
- All types of shell doors
- Consultancy, design and engineering
- Installation, repair assistance

**MACOR Marine GmbH**

Hans-Böckler-Straße 50, D-28217 Bremen

Phone: +49 (0) 421-39030, Fax: +49 (0) 421-3903291

info@macor-marine.com, www.macor-marine.com

**Macor Marine China**

Room 1, 11th Floor, Tongsheng Mansion 458,

Fushan Road, Pudong, Shanghai, China, Post code: 200122

Tel. +86-21-58203737, Fax. +86-21-58203535

Visit us at these exhibitions:

	<b>Kormarine 2007</b> , Busan Exhibition & Convention Center, Busan, Korea, P 12, October 24th - 27th, 2007
	<b>Marintec 2007</b> , Shanghai New International Expo Centre, Shanghai, China, Halle W2, Booth - No.2 G11-2, November 27th - 30th, 2007

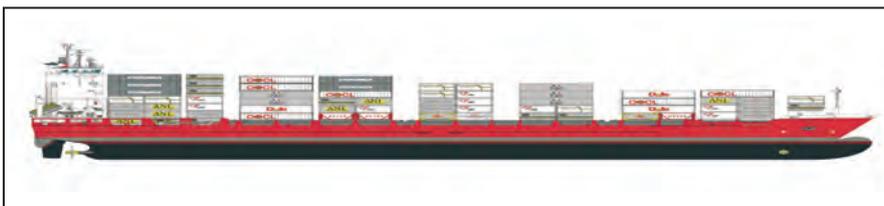
## Sietas delivers multi-purpose ice class

L ANGH Ship in Finland has taken delivery of two examples of a new class of ice-classed multi-purpose cargo vessels built by J J Sietas shipyard in Germany. Lanh Ship currently operates six multi-purpose cargo vessels with a total capacity of over 46,600dwt and container stowage space for 3586TEU.

The first vessel acquired by the company entered service in 1983. Then, in 1989, the company ordered three ships from J J Sietas, these being the first vessels in Europe with an integrated cleaning system in the cargo hold developed by Hans Lanh. This innovative system permitted the rapid cleaning of the holds after the unloading of raw materials such as coke, coal, kaolin, and salt. Within a very short space of time, the hold could be cleaned and made ready for the next cargo, and today, all of the ships in the Lanh fleet are equipped with this system, the inventive shipowner having also been responsible for designing specialised containers which make the transportation of certain types of cargo - such as steel coils - safer, and operating procedures faster and more cost-effective.

The new vessels are noteworthy for a very high ice class - E4 or Finnish/Swedish 1A Super - and are designed to operate in heavy ice conditions without assistance from an icebreaker, such as when trading to and from St Petersburg in Russia, where Lanh Ship notes, it is good not to be dependent on icebreaker assistance, because getting that assistance can take a very long time and the vessel may fall behind schedule.

The vessels also differ from ordinary container vessels in that they have a strengthened tank top. The distributed load on the tank top is 18tonnes per square metre, which enables the vessels to carry steel products in addition to boxes. 'We have very close contacts with the Finnish steel industry and transport a lot of steel with our older vessels,' said Lanh Ship. 'In the newbuilds, the tank top was strengthened in order to give us the possibility to carry steel products (mainly coils) with these vessels too.'



Profile drawing of J J Sietas shipyard's Type 174a design for Oy Lanh.

The new vessels are based on the German yard's Type 174a design, which means they are designed to transport bulk cargo and general cargo in addition to containers. 'The ship has reinforced tank top plating, and it is this that allows for the transportation of more than just container cargos,' technical manager Reino Veroasari confirmed.

Lanh Ship has a longstanding working relationship with Sietas, the German yard having built all of its vessels. 'The quality of the Sietas vessels is very good and in the long run they are absolutely worth the higher price,' said Lanh Ship. 'Sietas newbuilds tend to be more expensive than other shipyards, but the secondhand price of a Sietas vessel is normally very good,' said the company.

At the moment, the two newbuilds, *Linda* and *Aila*, are employed on different trades, trading between St Petersburg, Hamburg, and Rotterdam, the other between St Petersburg, Helsinki, Rotterdam, and a number of ports in the UK.

The 907TEU multi-purpose vessels have a length of 141m and a beam of 21.5m, and a deadweight of 11,300tonnes. They have a service speed of 17.7knots. Apart from a container capacity of 907TEU, *Linda* and *Aila* have 200 reefer plugs. The four cargo holds are fitted with cell-guides and hydraulically operated folding steel hatch-covers. Hatch No 1 is 12.60m x 13.05m; Hatch No 2 is 12.70m x 18.26m; Hatch

No 3 is 28.90m x 18.26m; and Hatch No 4 is 25.40m x 18.26m. The maximum permitted load on the tank top is 18t/m<sup>2</sup>; on the weather deck hatch covers it is 1.75t/m<sup>2</sup>; and on the 1st deck in front of the deckhouse it is 1.75t/m<sup>2</sup>.

The machinery takes the form of a Wärtsilä 8L46C delivering 8400kW, which is complemented by a 1500kW shaft generator. Manoeuvrability is enhanced by an 800kW bow thruster.

*Linda* and *Aila* are the first ships to have joined the Finnish Register for many years, and the company has expressed the hope that they may be the first of many more ships sailing under the Finnish flag. 'I hope that Finnish maritime policy will begin to more closely resemble European practices so that we can keep the ships under the Finnish flag in the future,' says the company's founder, Hans Lanh. The Finnish merchant fleet is currently very small, and Lanh would like to see the recently-elected Finnish parliament set up a working group, together with shipping companies and employee organisations. 'We have to think of practical ways of promoting newbuilding orders,' he said.

J J Sietas specialises in building containerships with capacities ranging from 700TEU to 1500TEU. In 2006 the yard completed 14 small containerships, and it currently has around 40 ships on order, having work until 2010. 

***Aila* and *Linda* are noteworthy for a very high ice class - E4 or Finnish/Swedish 1A Super - and are designed to operate in heavy ice conditions without assistance from an icebreaker.**



## Innovation and competence key says VSM

**T**HE German Shipbuilding and Ocean Industries Association (VSM) - which represents the interests of German shipyards and marine equipment suppliers - continues to be 'very satisfied' with the performance of the German maritime industry, said a spokesperson at the organisation's recent Annual General Meeting.

Sales of all shipbuilding companies (those building ocean-going ships, inland waterways vessels, and naval vessels, as well as those at boat and yacht builders, including yards handling repair/conversion projects) increased slightly in the most recent financial year to €6.2 billion, although the VSM noted that this result should not obscure the fact that the cost of building ships has surged due to enormous increase in expenditure on materials, components, energy, and labour. 'All in all, the shipbuilding industry still needs to achieve higher sales to enable it to finance necessary future investment,' said the VSM.

The improved order situation also led to a 2% increase in the size of the workforce directly employed at German shipyards, and thanks to the growth in the marine equipment and related sectors, the industry today employs more than 100,000 people.

In order to meet higher demand for trained personnel, the shipbuilding industry has significantly increased the number of industrial training places available and has stepped engineering training offered in conjunction with universities.

In 2006, said the VSM, German shipbuilding companies continued to benefit from the international boom in merchant shipbuilding, booking new orders for 88 vessels, worth €5.2 billion. German yards building ocean-going vessels delivered a total of 70 merchant ships, worth €2.9 billion. Orders on hand rose to 246 units, worth €13.4 billion, corresponding to full capacity utilisation for the next four years, and on a CGT basis, ferries, passenger vessels, and megayachts overtook containerships to claim the largest share (48%) of the product mix at German yards.

Naval shipyards achieved sales of approximately €2 billion in 2006 and thus still represent the second largest shipbuilding segment in Germany. Demand for submarines proved to be higher than for surface naval vessels, the latter area being negatively affected by the delay in order placement for the German Navy's new Class 125 frigate.

Shipyards engaged in repair and conversion reported sales circa €747 million, and according to joint surveys carried out by VSM and German Engineering Federation (VDMA), sales of German marine equipment suppliers came to approximately €10 billion in the same period. 'This good performance clearly reflects the high quality standards, reliability, and low maintenance requirement of German products,' said the VSM.

On a less optimistic note, the VSM said it views the development of shipbuilding in Asia 'with concern,' noting that the creation and expansion of shipyard capacity - in part with massive state support - is continuing unabated, particularly in China, Korea, India, Vietnam, and The Philippines, with a risk of overcapacity developing in the medium term, which given a slump in demand, would lead to a dramatic increase in global competition.

The chairman of the VSM, Jürgen Kennemann, said: 'German shipbuilding companies need to retain their technological lead. They can offer competitive products only if they use state-of-the-art production processes. The activities initiated in the context of the future-oriented strategy "LeaderSHIP Germany" thus have to be continued.'

In his address to the VSM's AGM, Mr Kennemann highlighted the need to remove existing distortions of competition, particularly as regards the promotion of R&D and innovations and the CIRR financing conforming to the OECD arrangement. He also recalled the Chancellor's promise that the shipbuilding industry would not be adversely affected by planned changes in the corporate tax regime, and said that the

competitiveness of shipbuilding companies could be adversely affected if this was not the case. 'The overall tax burden could threaten companies' survival, particularly with the so-called 'interest barrier' and the extension of the basis of assessment with the trade tax,' said Mr Kennemann.

Mr Kennemann concluded: 'We're on track thanks to "LeaderSHIP Germany" and the inclusion of maritime technologies in "The High Tech Strategy for Germany"'. Despite all the success achieved last year, however, there is a continued need for joint efforts on the part of politicians, trade unions, and industry to sharpen the competitive edge of the German maritime sector.' 

# SCHOTTEL for the Shipping World

## CP Propellers for Top Requirements

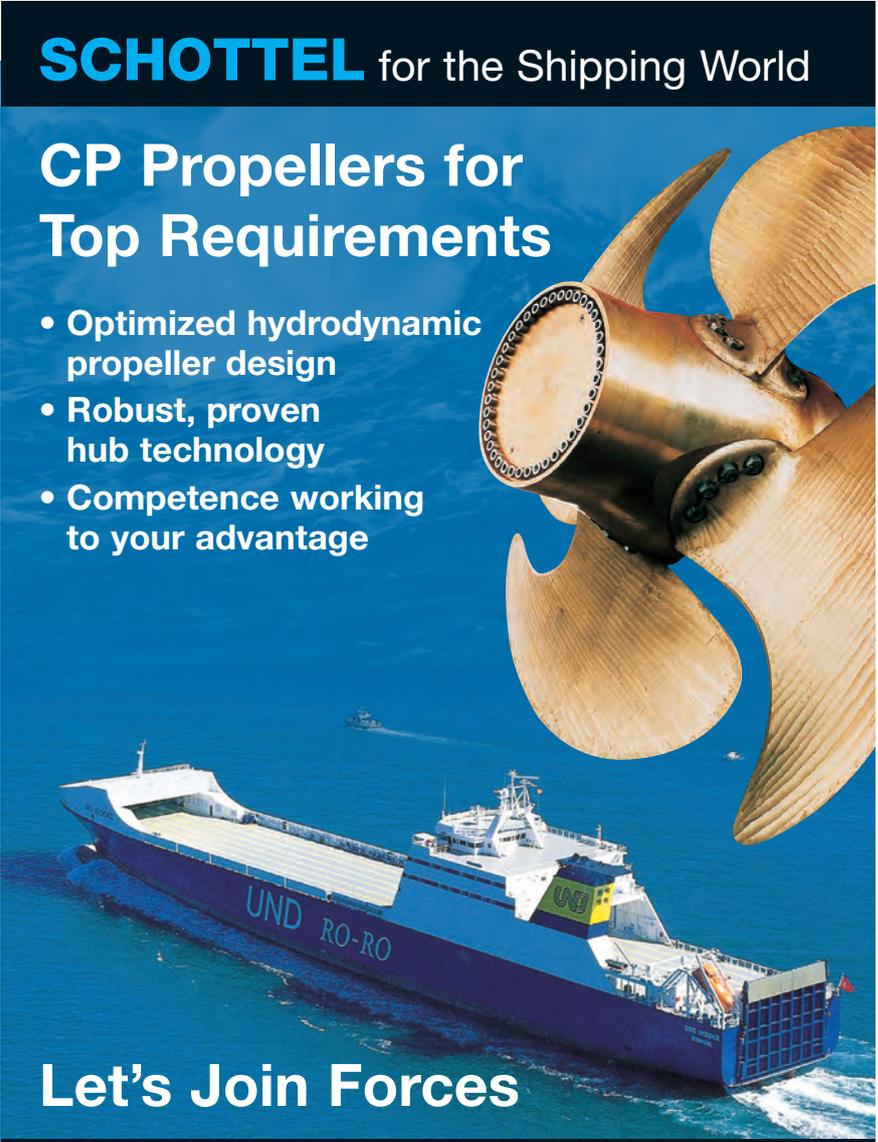
- Optimized hydrodynamic propeller design
- Robust, proven hub technology
- Competence working to your advantage

### Let's Join Forces

*Innovators in propulsion technology*

SCHOTTEL Schiffsmaschinen GmbH · Kanalstr. 18 · D-23970 Wismar  
Tel.: + 49 (0) 38 41 / 204-0 · Fax: + 49 (0) 38 41 / 204-333  
info-ssw@schottel.de · www.schottel.de





## SEC says confidence in FATs growing

IN the September 2006 issue of *The Naval Architect*, a number of concerns about Fully Automatic Twistlocks (FATs) were highlighted.

At the time, shipowners, charterers, classification societies, manufacturers, and P&I clubs were investigating a significant number of container losses which had occurred in early 2006, but by September of last year it became obvious that the container losses had all occurred on vessels using one specific type of FAT manufactured by one particular manufacturer.

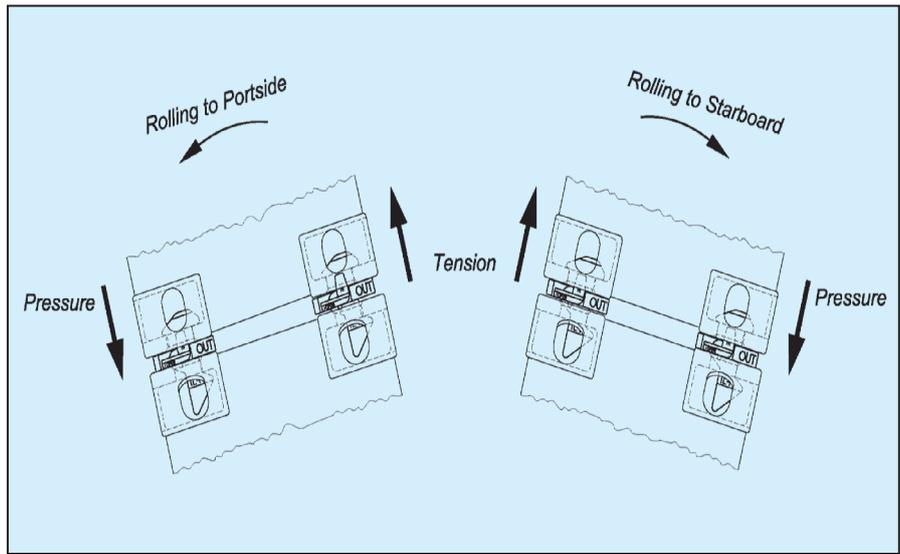
A year later, *The Naval Architect* has received an update on the situation from SEC-Bremen, whose FATs were not involved in any of the incidents. 'To date, the classification societies have not published any final report on the causes of the container losses, and have not re-approved any of the FATs in the market. Instead, the classification societies are not approving any new container-securing manuals if the FATs did not pass additional testing procedures,' said SEC-Bremen in a statement. 'Up to now, only the FATs designed and manufactured by SEC have passed these additional tests and are approved by all major classification societies.'

During the second half of year 2006, says SEC, two manufacturers withdrew their FATs and changed back to Semi-Automatic Twistlocks (SATs). 'According to one of them, MacGregor, this step has been taken as a reaction to the container losses for safety reasons. The other manufacturer, German Lashing, lost a court case for patent infringement [by SEC] but has decided to appeal,' said SEC-Bremen.

According to SEC, more than 185 ships have been equipped with FATs of its design, and more than 920,000 units were in service onboard of vessels by the end of July 2007. 'The feedback of SEC's customers is very positive, due to the advantages compared with SATs and the confidence in the safety of this product, which is growing steadily,' said SEC-Bremen. 'Other suppliers of lashing equipment have asked for licences or purchased FATs from SEC in order to integrate them with their lashing equipment. This shows that more and more shipowners and charterers are interested in using FATs on their vessels.'

FATs are inserted and removed on the quayside by stevedores in the same way as SATs but with the important difference that they do not have to be opened manually before containers can be unloaded. This, of course, saves a lot of time and cost in port.

Whilst the container is being lowered, it will rotate slightly around its vertical axis due to the shape of lower locking cone. No special movements have to be carried out by the crane and the FATs have been designed in such a way that they do not cause problems, even where rows of containers are very close or even touching. Whilst at sea, when the ship is underway, pressure forces will occur on one side of the stack while on the other side's lifting forces have to be absorbed by the twistlocks. The pressure forces block the transversal shifting of the containers, which enables the



FATs in seagoing conditions.



SEC-Bremen says confidence in FATs is growing again after problems with inferior FATs produced by other manufacturers.

FAT on opposite side of the stack to absorb lifting forces of up to 250kN. SEC-Bremen's FATs are tested and approved for a breaking load of 500kN by all major classification societies. 'During the unloading process, the container will be lifted by the crane at all four corners more or less simultaneously, transversal shifting is no longer blocked, and the container can rotate automatically around its vertical axis caused by the shape of lower cone. Even heel

angles up to 8° will not cause problems for the loading or unloading process, which has been tested extensively during development stage,' said a spokesperson for SEC-Bremen.

'Safe locking functions as well as smooth loading/unloading under difficult conditions have to be considered when developing a new FAT, and the exact shape and size of locking cone is extremely important,' noted the company. 

## Three bladed prop for reduced fuel consumption

New propeller developments can enhance performance.

WITH the price of fuel oil having almost doubled in the last three years, many shipowners have begun to reconsider technology that has the potential to enhance propulsive efficiency in order to reduce fuel consumption and save a significant amount of money over a ship's lifetime.

A very promising concept in this regard is a three-bladed propeller developed by Mecklenburger Metallguss GmbH (MMG) in Waren, Germany, together with a well-known European shipping group, and the Hamburg Ship Model Basin (HSVA), which have together investigated the applicability of the concept as a means to enhance propulsive efficiency of a very large crude oil carrier (VLCC).

### Calculated performance

As part of the ongoing research effort, MMG has calculated the performance of different three- and four-bladed propellers with varying diameters, and for each of the variants, the radial pitch and camber distribution was re-evaluated in order to achieve the best possible wake adaptation in each case, the latter being of great importance for full block ships. MMG's calculations seemed to promise a significant efficiency improvement with a three-bladed propeller.

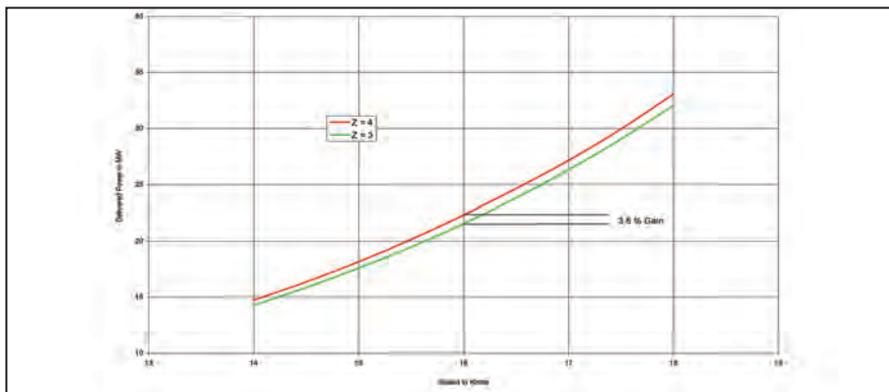
Comparative tests of the same hullform with a conventional four-bladed propeller and a three-bladed propeller in terms of power requirement versus ship speed, showed that the three-bladed propeller was up to 3.5% more efficient.

### Hull pressure pulses

As Christian Johannsen, a researcher at HSVA noted, it was anticipated that this efficiency increase would be accompanied by additional cavitation, resulting in large propeller-induced hull pressure pulses. To investigate this, the cavitation behaviour of the three-bladed and four-bladed propellers was tested in HSVA's large Hydrodynamics and Cavitation Tunnel HYKAT.

As Mr Johannsen explained, the cavitation on the three-bladed propeller was more extensive than on the conventional propeller, but its character was very similar to that of the conventional propeller; the cavitation being still smooth and non-erosive. The hull pressure pulses were higher as well, but did not exceed a level which would be regarded as acceptable for a VLCC.

As the HSVA pointed out, a three-bladed propeller would not be a suitable alternative for a highly-loaded propeller, such as on a fast container vessel, but for tankers or bulkers, the new propulsion concept has demonstrated very encouraging results. ☺



MMG and HSVA believe a three-bladed propeller could be well suited to applications on vessels such as tankers. A 3% gain is shown in speed using the three-bladed propeller.

# reliable

## BECKER PRODUCTS





**Often copied but never surpassed –** original Becker manoeuvring systems like our flap and twisted rudders and innovative new product lines such as our marine communication and material handling systems. Count on us to supply well-proven and thoroughly tested solutions that will and have become milestones of marine technology.





**becker marine systems**

Marintec 2007, Shanghai New International Expo Centre, Shanghai, China, November 27th-30th, 2007



WWW.BECKER-MARINE-SYSTEMS.COM

MANOEUVRING
MATERIAL HANDLING
COMMUNICATION

## SAM's research pays off

WITH subsidiary operations in China, Denmark, Germany, Greece, Japan, South Korea, The Netherlands, Norway, and the UK, SAM Electronics specialises in automation, electrical power, propulsion, navigation, and communication systems for ships of all types and sizes, and has recently extended its presence in China with the establishment of a new subsidiary in Taizhou, Jiangsu Province, SAM Taihang Electronics.

Supported by facilities in Shanghai, the Taizhou plant produces automation systems, low voltage switchboards, and consoles for bridge and engineroom control, with deliveries not only to domestic yards but also those in South Korea, Vietnam, and Europe.

Apart from commercial shipping, SAM is also a major supplier of systems to the cruiseship industry, with its NACOS series of integrated navigation command systems featuring radar-controlled trackpilots accounting for around 70% of current world INS requirements. Users include Aida, Carnival Cruises, Costa Crociere, Cunard, Holland America, MSC, NCL, P&O Princess Cruises, Star Cruises, and Radisson Seven Seas.

New orders for NACOS 65-5 systems have just been confirmed for a further 10 cruiseships under construction in French, Italian, and German yards for completion between 2008 and 2010. These include systems for Carnival's 112,000gt *Carnival Splendour*, which is building at Fincantieri's Genoa yard for delivery next May and its as yet un-named



SAM Electronics has secured a spate of orders for bridge equipment for cruiseships and is involved in a number of research and development projects.

130,000gt liner under construction at the Italian builder's Monfalcone yard for completion in 2009. Two further 113,000gt liners also building at the

Monfalcone yard for delivery to P&O Cruises and Princess Cruises next year are also being equipped with NACOS 65-5 systems.



# “Hi Marines”,

In France, similar NACOS units have been commissioned for MSC Cruises' *MSC Poesia*, *Fantasia*, and *Seranata*, now building at Aker Yards for delivery in 2008-9, while in Germany, Aida Cruises' three sister vessels of the recently launched Meyer Werft-built *AIDAdiva* are being similarly equipped with 65-5 assemblies; the ships are due for launching between 2008 and 2010.

Meanwhile, Cunard's much-publicised 90,000gt *Queen Victoria*, building at Fincantieri's Venice yard for delivery towards the end of this year, has also just been fitted with a NACOS 65-5 system. Cunard's *QE 2* has already been operating with an earlier variant for a number of years.

SAM has also become increasingly involved in outfitting megayachts, and is currently engaged in supply and installation of comprehensive electrical packages - including high-voltage diesel-electric propulsion systems - for two vessels being built by ThyssenKrupp Marine Systems (TKMS) while other major projects are being carried out in Australia, Dubai, The Netherlands, Singapore, and the US.

But SAM is also a Steering Committee member of the four-year SAFEDOR (Design, Operation and Regulation for Safety) project, which proposes an alternative, risk-based approach to maritime safety, where safety is regarded as a basic design objective rather than a constraint.

Launched in 2005 under the auspices of project coordinator Germanischer Lloyd, SAFEDOR is the single largest maritime safety venture to be funded by the EU, whose contribution to a

total budget of €20 million is €12 million, the remaining sum being met by a consortium of 53 partners drawn from all sectors of the European maritime industry.

Also aimed at enhancing innovation while strengthening the competitiveness of Europe's maritime industry, the project is presided over by a Steering Committee representing shipowners (Carnival Plc), yards (Navantia), classification societies (GL and DNV), flag states (Danish Maritime Authority), universities (Glasgow & Strathclyde), and marine systems suppliers (SAM Electronics).

SAM Electronics' role involves development of new safety-critical energy distribution networks as well as technical and ergonomic improvements to bridge layouts, based on its NACOS 5 series of integrated navigation command systems. The latter calls for replacement of all switches and LANs with a single Programmable Logic Controller (PLC) and touch-screen panel for direct control. It will reduce all cabling requirements while increasing overall system redundancy and reliability.

Navigation development work also covers development of a hand-held conning display, for which a prototype is already operational aboard Princess Cruises' new Italian-built 116,000gt liner, *Crown Princess*, as part of its NACOS 65-5 bridge assembly.

Other research projects in which the company is involved include ADOPT (Advanced Decision Support System for Ship Design, Operation, & Training), another EU-supported venture aimed at, among other things, improved

navigational decision-making in adverse sea conditions. Headed by FSG Shipbuilding, this has involved trials of various sensors linked to a NACOS 45-4 system aboard DFDS' ro-ro *Tor Magnolia*, on routes between Gothenburg and Ghent. The project is due to be completed next spring.

SAM is also coordinating ADANAV (Adaptive Navigational System for Precise Heading, Course, & Speed Control), a German research project part-funded by the Federal Ministry of Education & Research, which is aimed at developing a support system for innovative propulsion of ships.

Other project partners are Rheinmetall Defence Electronics' Simulation Division, the University of Rostock's Institute of Automation Technology, Wismar University's Department of Maritime Studies (which operates an amalgam of four ship-handling simulators), and Warnemunde Shipping Institute.

Due for completion next spring, work involves improving and extending the manoeuvring capabilities of SAM's Trackpilot integrated steering and control assembly, a core component of its NACOS series of integrated navigation command systems. The refinements include interfacing to podded drives, for which new controls are required.

A preliminary trial system has been developed for testing aboard Hapag-Lloyd's cruiseliner, *Europa*, while SAM is presently drafting a design for a user interface. Finalisation of all work will be carried out using a Wismar University ship-handling simulator. ☺

## Most probably ...the best in the world KME Products for Offshore and Shipbuilding



Do you still use heavy carbon steel pipes for seawater carrying systems, still use chlorination or painting to prevent marine growth?

*Why not use CuNi 90/10 tubes, KME trademark OSNA®-10? Save up to 50% weight of the piping system and any costly protection!*

Do you still use old fashioned singular tubes for hydraulic and pneumatic remote control systems?

*Why not use OSNALINE® tube bundles which are easily and quickly laid like an energy cable, supplied in very long units and tailor-made to customer's specifications?*



KME Germany AG \_ Osnabrück \_ Germany

Business Unit Marine Applications \_ Phone +49-541-321-30 11 \_ Fax +49-541-321-30 20  
info-maritime@kme.com \_ www.marine-applications.com

Business Unit OSNALINE® Tube Bundles \_ Phone +49-541-321-32 03 \_ Fax +49-541-321-34 49  
info-osnaline@kme.com \_ www.kme-tube-bundles.com

## The story of the hungry Caterpillar

**ENGINE builder Caterpillar Marine Power Systems continues to make inroads in the cruiseship market.**

**I**N recent months, Caterpillar Marine Power Systems has secured a significant volume of business, through Caterpillar Motoren, for engines for cruiseships.

As reported in *The Naval Architect* in May (pp16-18), one of the most significant references for German engine builder Caterpillar Motoren GmbH & Co KG in recent months is the new cruiseship *AIDAdiva*, which was formally christened in Hamburg in April.

The Meyer Werft newbuild was built for AIDA Cruises in Rostock and is fitted with a quartet of MaK 9 M 43 C marine engines, with a total output of 36,000kW.

The engines were manufactured by Caterpillar Motoren, which also had responsibility for project management, whilst Caterpillar dealer Zeppelin Power Systems was responsible for the sale, and for servicing the engines in future.

Caterpillar's Platform Manager for the project, Klaus Wirth, is also responsible for the ongoing development of the MaK engine programme, which currently consists of the M 20 C, M 25, M 32 C, and M 43 C series. Available in a range of cylinder variations, they cover a performance range of 1020kW to 1600kW.

On *AIDAdiva*, the ship's diesel engines are directly coupled to generators, which provide the energy needed for the propeller drive units and onboard electrical power. In the case of *AIDAdiva*, her four M 43 C engines produce a total of 36,000kW.

The engine was first introduced in 1998, since when, more than 650 of them have been sold. 'The MaK 43 C is technically speaking a long-stroke engine, in which the relationship between cylinder diameter and piston stroke is optimised to provide the highest possible reliability and maximum durability. Along with revolutions of only about 500/min, low compared to car engines, we can achieve good fuel consumption and low emission values – which pleases the shipping company, its passengers, and the people living in ports of call,' Mr Wirth explained.

As Mr Wirth also explained, Caterpillar Motoren has benefited significantly from co-operation within Caterpillar Inc in the field of emissions reduction. 'Caterpillar invests about US\$4 million a day in research and development, and ACERT Technology is one result of this,' Mr Wirth explained. 'It offers flexible, modular solutions for improving the effectiveness and emission behaviour of marine engines. One concrete application example of that is Flexible Camshaft Technology (FCT), which is used to reduce emissions on *AIDAdiva*.'

'Favourable fuel consumption and low emission values top the list of demands from shipping companies,' said Horst Prien, the account manager responsible for Meyer Werft at Zeppelin Power Systems. 'It's a big advantage if you can appreciate the technical demands of customers from your own experience at sea. Ship engines are, to a large extent, tailored to the specific needs of a particular vessel, but they also have to be reliable enough to fulfil the highest demands in the cruise shipping sector. As a result, one big plus during our talks with the shipyard and shipping company about the

AIDA project was that the M 43 engine was already a clear market leader and had also already demonstrated its all-round technical maturity in the propulsion of container feeders up to 1000TEU.'

Mr Prien also stressed the significance of many years of close cooperation with Meyer Werft, which has chosen MaK engines for decades. 'In shipbuilding, the most important factor is mutual trust. Even today, deals are clinched with a handshake, and a manager's word is his bond. In the case of the *AIDAdiva* engines, however, agreements with the yard are also in written form and there are now deals covering 16 engines for all four AIDA newbuilds.'

The demands placed on the engines for a cruiseship are of course considerably different to those of a cargo ship, where, typically, a single engine and direct drive propulsion is the preferred solution. 'In this case,' said Prien, 'we are supplying four engines per ship.'

*AIDAdiva* is, of course, a special project for Caterpillar, being the first time that the company has secured a contract for MaK engines of this type from the cruiseship sector, a deal which quickly led to further projects, such as those clinched recently with other cruiseship operators such as Holland America Line (HAL) and Costa Crociere.

Other contracts have been secured from the cruiseship sector recently, including a contract to supply the main engines on new cruiseships for US-based Norwegian Cruise Line (NCL).

NCL plans to introduce a new generation of 'Freestyle Cruising' vessels, underlining its goal to have the youngest fleet in the cruise industry by 2010. CMPS will supply 3 x MaK

On *AIDAdiva* the engines are in a diesel-electric arrangement. The four M 43 C engines onboard produce a total of 36,000kW.



# Rivertrace Engineering Ltd

RTE

Rivertrace Engineering is a market leader with over 30 years experience of Oil in Water Monitoring. RTE manufacture oil content monitors for the marine, offshore and industrial markets with up to date engineering solutions encompassing PFM technology. Our client list includes most of the worlds' separator OEMs, shipyards and vessel operators. We have IMO type approvals for both Bilge and Ballast monitors.

Our global network of agents ensures local service at most parts.



**Smart Cell**  
15ppm Bilge Alarm  
MEPC 107(49)

**Smart ODME**  
Oil Discharge  
Monitoring Equipment  
MEPC 108(49)



### INCREASED ASSURANCE DISCHARGE MONITORING SYSTEM

Demonstrate Marpol Compliance  
Cost Effective prevention of illegal discharge  
Capable of recording miscellaneous ship's data  
Compatible with all IMO resolutions  
Communications Package

powered by  
**purplefinder+**



SPECIALIST IN WATER QUALITY MONITORING

Rivertrace Engineering Ltd  
Unit P, Kingsfield Business Centre  
Philanthropic Road Redhill  
Surrey RH1 4DP England

Tel: +44 (0)870 770 2721  
Fax: +44 (0)870 770 2722  
email: sales@rivertrace.com  
www.rivertrace.com



**AIR PRODUCTS**

**D.I.G.G.**

## Air Products Dry Inert Gas Generator

- Novel drying, refrigeration and cooling techn. combined with Air Products combustion
- Fully automatic, energy efficient and compact
- 10 systems sold in 18 months

### Advantages

- 50% size and weight reduction
- 75% annular power reduction
- Fully automatic mode selection, operation and O2 control

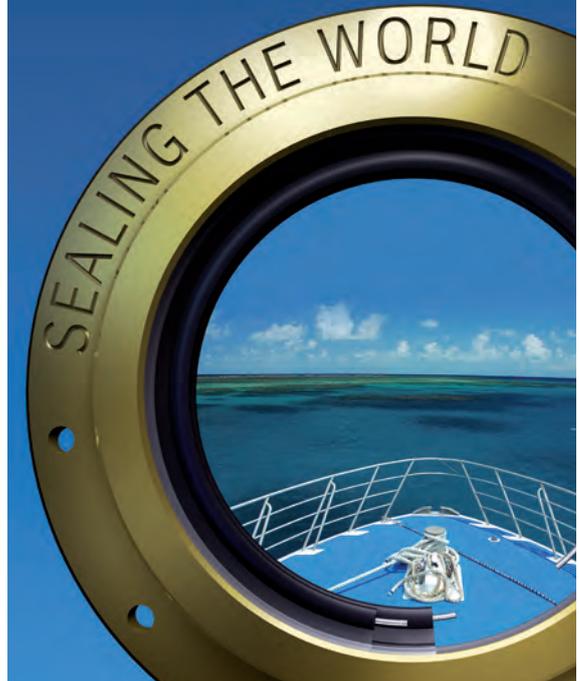
### Air Products AS

Tel: +47-38 03 99 00 • Fax: +47-38 01 11 13

[norway@airproducts.com](mailto:norway@airproducts.com) • [www.airproducts.com](http://www.airproducts.com)

Contact: Otto Johnsen, Business Director  
Steinar Andersen, Sales Manager

# Simplex-Compact®



## Simplex-Compact®

More than 50 years of know-how makes us one of the leaders in stern tube seals' technology. Safe and reliable, the right solution for your vessel. Go for it – contact us!



See us in  
Shanghai, November 27-30, 2007 • Booth No. 2F11-5

### Blohm + Voss Industries GmbH

Hermann-Blohm-Str. 5  
20457 Hamburg, Germany  
Phone: +49 40 3011 - 2639  
Fax: +49 40 3011 - 1950  
E-mail: [salesms.bvi@thyssenkrupp.com](mailto:salesms.bvi@thyssenkrupp.com)  
[www.simplex-turbulo.com](http://www.simplex-turbulo.com)

## ThyssenKrupp Marine Systems



**ThyssenKrupp**



The machinery room onboard *AIDAdiva*.

12 M 43 C and 3 x 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. Aker Yards SA 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. NCL has an option for a third vessel due for delivery in 2011.

The capacity of these ships will be some 6400 people. They will have 2100 cabins with 4200 lower passenger berths and 2200 crew. The post-Panamax vessels will be approximately 325m long, 40m wide, and have a gross tonnage of about 150,000. They will be designed for world-wide cruising, including the Caribbean and Europe. 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.

Environmental protection is among NCL's highest priorities for the new ships, and Caterpillar is helping by introducing advanced technology for the propulsion plant. A customer-specific engine rating will address all areas of concern: NOx emissions, CO<sub>2</sub> emissions, and smokeless operation.

The engines not only will meet DNV Clean Design requirements, reducing NOx emissions to 10.4g/kWh, but lower cylinder rating also reduces fuel oil consumption and thus also CO<sub>2</sub> emissions. Elements of Caterpillar's ACERT Technology and the unique Flexible Camshaft Technology (FCT) will 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.

Caterpillar's focus on engine reliability and emissions reduction fits in well with cruise lines' efforts to expand their operations in emission-sensitive areas while concentrating on environmental protection. In addition, the average size of cruise vessels is growing continuously, driving the demand for propulsion and onboard power supply to new heights. With their excellent power density, MaK 16 M 43 C V-type engines are a good match for the upcoming generation of cruise vessels, and smaller Caterpillar engines – such as the 4 x MaK 12 M 43 V-type engines on *Pont Aven*, a cruise ferry operated by French company Brittany Ferries in the North Sea – are already proving their worth.

As the company points out, NCL's new cruise vessels are designed for optimal cost efficiency per capacity day, as well as being highly attractive in terms of cabin revenue mix and onboard revenue generation, and with this in mind, Caterpillar and its global dealer network will contribute to cost efficiency by providing a competitive Total Cost of Ownership (TCO) package for the propulsion plant.

A Customer Service Agreement (CSA) has been prepared between NCL and Louisiana Machinery Co, Caterpillar's MaK dealer for Florida, the US Gulf Coast, and parts of the US Eastern Seaboard,

and the CSA will back NCL vessel operations with 24/7-service and optimum parts availability. In addition, the MaK DICARE engine monitoring system will permit engine operating data to be called up at any time, even from locations ashore.

Caterpillar notes that it has now established a good business relationship with Carnival and NCL - two of the leading players in the cruise sector - and with all three major yards involved in cruise vessel construction, and that, in addition to the contract with NCL/Aker for two vessels (12 x MaK M 43 C V-type engines totalling 159.6MW) plus one option, the company will provide four vessels under construction at German yard Meyer Werft for AIDA Cruises with a total of 16 x MaK M 43 C in-line engines, totalling 144.0MW.

Caterpillar is also due to deliver three shipsets of 4 x MaK M 43 C V-type and 2 x MaK M 43 C in-line engines totalling 64MW each, to Italian shipyard Fincantieri. These shipsets will supply propulsion and electrical power for three newbuilds for Carnival subsidiaries Holland America Line (HAL, one vessel) and Costa Crociere (two vessels), and there is an option for another shipset.

In recent weeks, Caterpillar has also announced that it is expanding its global marine engine production facilities. The company is already working on vessel projects for 2009 and beyond, and says there is 'virtually no sign of decline' in the markets served by Cat and MaK marine engines.

To accommodate the unprecedented demand for marine engines, Caterpillar has made a substantial

investment in improved engine and components manufacturing processes, and by implementing the Caterpillar Production System (CPS) hopes to transform its manufacturing systems to set new standards for quality, safety, and speed. 'Operations and supply chain management will be carried out utilising consistent processes throughout the entire value chain, and customers will benefit from expanded production capacity and reduced lead times,' said the company.

Today, Caterpillar operates more than 110 manufacturing locations all around the globe, 10 of which are involved in the production of marine engines. The US-based facilities in Mossville, Illinois; Lafayette, Indiana; Griffin, Georgia; and Greenville, North Carolina develop and manufacture Cat engines for propulsion, auxiliary, and generator-set use. Facilities in Gosselies, Belgium; Peterborough, UK (Perkins); and Wimborne, UK (Sabre) focus on smaller Cat high-speed marine engines and generator sets.

Caterpillar Motoren in Kiel in Germany is the 'centre of excellence' in the group for the development and production of medium-speed MaK engines for propulsion and generator-set applications, and the facility has now been serving marine customers for more than 80 years. MaK marine engines are also manufactured at Caterpillar Motoren sites in Rostock, Germany, and Guangdong in the People's Republic of China.

The CPS is designed to eliminate waste such as idle time, rework, and excess inventory, and enable each facility to handle customers' orders in the safest, most reliable, and fastest way possible. The Kiel engine centre is responsible for assembling the MaK M 20 C, M 25, and M 32 C in-line marine engines, and reorganisation of the centre using CPS methodologies has already streamlined the assembly process.

The Rostock engine centre, responsible for assembling the MaK M 43 C inline and V-type marine engines, benefited from improved operational flexibility in its engine test cells. Production capacity was extended by moving the assembly of MaK M 32 C V-type engines for propulsion and genset-applications from Kiel to Rostock.

The Guangdong engine centre also underwent a comprehensive upgrade of its assembly line, test beds, and quality control operations, and last year the facility secured ISO 9001:2000 certification, factory approval, works approval,



Caterpillar is supplying 3 x MaK 12 M 43 C (as shown here) and 3 x MaK 16 M 43 C marine engines for each of NCL's newbuilds.

and MaK M 25 type approval, and the addition of M 25 engine production in Guangdong not only increased total capacity but also brought manufacturing closer to the growing number of Asian shipyards. This has reduced delivery times and transport costs for domestic customers.

A substantial investment has also been made in Kiel on ultra-modern machining equipment for finishing cylinder crankcases, cylinder heads, and connecting rods, along with necessary operator training. 'Utilising progressive manufacturing technology will not only expand capacity but also further increase the reliability and durability of MaK marine engines,' said the company, noting that additional investment has been made at all three MaK manufacturing sites in order to enhance assembly, test, and paint processes. As the company also noted, using 6-Sigma and lean-manufacturing principles, Caterpillar has been able to create a safer work environment and reduce throughput time for engine assembly by 40%.

Improving manufacturing flexibility and providing additional production capacity is also the focus of several projects launched at

Caterpillar's facilities in Lafayette, Indiana, and Mossville, Illinois. In addition, Caterpillar is investing heavily in employee training globally, and every Caterpillar facility involved in marine engine production is also investing in regular audits by leading international classification societies.

MaK production hit an all-time record in 2005 with Caterpillar Motoren delivering over 300 engines to customers world-wide and, with all of the new machinery and production processes in place, an additional 25% increase in engine shipments from the plants in Kiel, Rostock, and Guangdong occurred in 2006.

In keeping with the company's focus on marine environmental protection, Caterpillar also recently announced that it has achieved DNV Clean Design notation for a number of high-speed marine engine families. These engines were jointly developed to meet both the DNV Clean Design, EU Stage III A Inland Waterway (EU 97/68/EC), and US EPA Tier 2 Commercial Marine (40 CFR 94) requirements.

Available with DNV Clean Design notation are Cat 3500C propulsion, C32 ACERT propulsion and auxiliary, C18 ACERT propulsion, C12 ACERT propulsion, and C9 ACERT propulsion and auxiliary. All these engine families exceed the requirements of DNV Clean Design, with a further NOx reduction of at least 15% on average. DNV Clean Design notation is also available for the latest generation of MaK medium-speed marine engines comprising M 20 C, M 32 C, M 43 C, and the new M 25 C.

Environmental Class is the common name for DNV's voluntary class notations Clean and Clean Design for ships which are designed, built, and operated to give additional protection to the environment. With respect to engine design, DNV Clean certification requires reduction of NOx emissions below current IMO Marpol limits.

Bob Hallengren, technical manager with Caterpillar Marine Power Systems, said: 'Many shipowners are anxious to have vessels that are as emission-friendly as possible; for these customers, DNV Clean Design notation is a must. Our marine engines utilise the latest emissions reduction technology, and we can provide DNV Clean Design notation with a full suite of products.'



**FRIENDSHIP SYSTEMS**

**FRIENDSHIP SYSTEMS GMBH**

BENZSTRASSE 2

D-14482 POTSDAM · GERMANY

TEL. +49(0)331 967 66 0

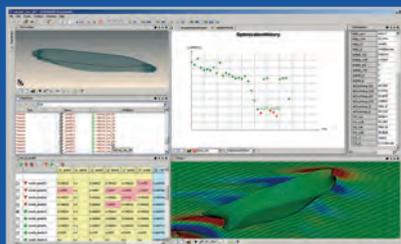
FAX +49(0)331 967 66 19

WWW.FRIENDSHIP-SYSTEMS.COM

INFO@FRIENDSHIP-SYSTEMS.COM

**SOFTWARE**

- CAD-CFD INTEGRATION
- CAD ENVIRONMENTS AND PARAMETRIC MODELING
- OPTIMIZATION TOOLS
- TAILOR-MADE SOLUTIONS



**CONSULTANCY**

- HYDRODYNAMIC OPTIMIZATION OF SHIPS
- CFD ANALYSIS
- PARAMETERIZATION OF FUNCTIONAL SURFACES
- RESEARCH AND DEVELOPMENT PROJECTS

Just released: **FRIENDSHIP-Framework 1.0**  
Download your free demo version from  
[www.FRIENDSHIP-SYSTEMS.com](http://www.FRIENDSHIP-SYSTEMS.com)





**SCHWEPPER**

## Lock & Hardware Concepts for Ship & Yachtbuilders



[www.schwepper.com](http://www.schwepper.com)



Foto: Dirk Hoffmann

P.B. 10 06 61 · 42571 Heiligenhaus · Germany · Phone + 49 - 20 56 - 58 55 - 0 · Fax + 49 - 20 56 - 58 55 - 41



STOPPING



TURNING



LOCKING



[www.dellner-brakes.com](http://www.dellner-brakes.com)

Dellner Brakes AB, Skyfallsvägen 2, SE-791 77 FALUN, SWEDEN

Phone: +46 23 78 30 50, Fax: +46 23 77 06 90

E-mail: [info@dellner-brakes.com](mailto:info@dellner-brakes.com)

## First choice for perfect pipe fabrication..



TUBOTRON · TUBOBEND · TUBOMAT · TUBOFORM · TUBOSCAN · PIPEFAB

- CNC tube bending machines
- 1-axis controlled and semi-automatic tube benders
- Assembly machines for hydraulic tubing
- Tube end forming machines
- Tube measuring systems
- System solution for template pipe production
- Piping software solutions



THE ONLY CHOICE FOR PERFECT PIPE INSTALLATIONS

**TRACTO-TECHNIK GmbH & Co. KG** · D-57368 Lennestadt

Tel: +49 (0) 2725 / 95 40-0 · Email: [tubomat@tracto-technik.de](mailto:tubomat@tracto-technik.de) · [www.tracto-technik.de](http://www.tracto-technik.de)

# THE NAVAL ARCHITECT

**ABC**

ABC audited circulation 11,312  
January - December 2006

**FACT, NOT FICTION**

IF YOUR **NEXT** ADVERTISING SCHEDULE

INCLUDES TITLES

THAT **AREN'T AUDITED** FOR  
CIRCULATION.....

ask.... WHY?

## Becker at leading edge of rudder technology

FOLLOWING the dramatic increase in the size of post-Panamax containerships, Becker Marine Systems has announced that it is increasing the size of its Twisted Leading Edge Rudders (TLKSR).

Having already delivered 67m<sup>2</sup> rudders, Becker has recently signed contracts and is designing rudders of 80.2m<sup>2</sup> for 10,000TEU vessels at DSME, which will be owned by NSB and CMA-CGM, as well as 85m<sup>2</sup> rudders for a series of eight vessels at Samsung Heavy Industries for MSC.

These full spade TLKSR rudders are designed to meet the needs of the new generation of large, high-speed container vessels and to avoid rudder-induced cavitation and provide economic advantages by saving up to 2% of propulsion energy. It is anticipated that the new, larger rudders will demonstrate the same level of performance during slow-speed manoeuvring as has been achieved with the 67m<sup>2</sup> rudders.

Among other recent contracts secured by the company, Becker Marine Systems is to deliver a high-performance flap rudder for one of the world's largest trailing suction hopper dredgers, recently ordered by Van Oord. The new trailing suction hopper dredger has a capacity of 32,000m<sup>3</sup> and will be built



Becker Marine Systems says demand for larger Twisted Leading Edge Rudders is growing (shown here is a twisted flap rudder).

equipped with Becker flap rudders but would require larger rudders on completion of the lengthening work.

When the first vessel arrived at the yard in January of this year - slightly delayed because of a hurricane - service engineers from the company were on hand to assist with the work on the rudders. Both rudders and the rudder stocks were removed in a very short time, and the rudder stocks, the upper and lower nut, as well as the link pistons were sent to Becker Marine Systems' workshop in Croatia to be adjusted to the new and bigger rudders. The rudders and the rudder stocks were re-delivered to the yard for the installation of the rudder system just four days later.

After the modification, *Stena Britannica* was the world's longest cruise ferry, capable of carrying 900 passengers and the equivalent of 4km of vehicles. Sea trials were successfully completed at the beginning of March, again with Becker Marine Systems' engineers in attendance. ☺

at IHC in The Netherlands. The vessel will be fitted with Becker Marine Systems' largest Heracles flap rudder, with a surface area of 27m<sup>2</sup>.

Other recent orders have seen Becker Marine Systems secure an order for the delivery of four rudders for two twin screw cruise ferries - *Stena Britannica* and *Stena Hollandica* - which are being lengthened by Lloyd Werft, the former by the addition of a new midship section of 29.25m and the latter by the addition of an even larger new section of some 52.00m. Both vessels were already

## More boxships from Nordseewerke

On 20 July, the keel of the eighth containership in a series of 2700TEU vessels being built by Nordseewerke, part of ThyssenKrupp Marine Systems, was laid down. Being built for GEBAB in Meerbusch, Germany, the vessel is due to be launched in December and is due to be delivered in March 2008.

Two days earlier, another vessel in the same series, which is also being built for GEBAB, was launched by Nordseewerke. This vessel is due to be delivered at the end of November.

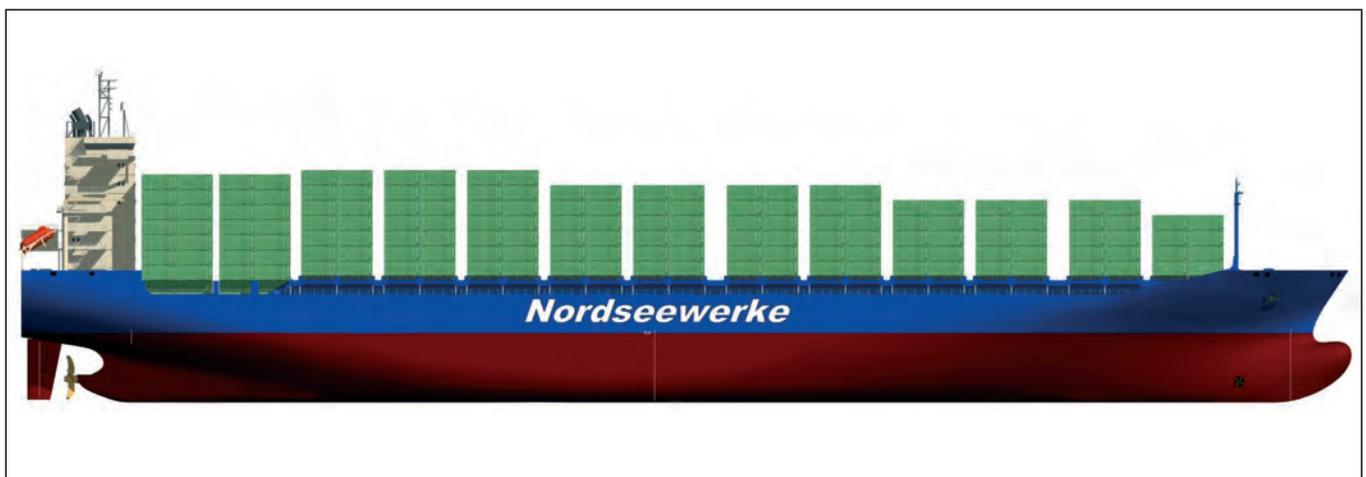
This autumn, the yard is also due to start building the first example of a new class of highly compact 3400TEU containerships, which, the yard claims, will carry around 700 more containers than vessels of similar - or larger dimensions.

The current series is 215.45m overall, with a length between perpendiculars of 205.28m, moulded breadth of 29.80m, moulded depth of 16.50m, loaded draught of 10.10m, deadweight of 37,900tonnes, and container capacity of 2702TEU.

The yard has orders for six of the new compact 3400TEU capacity ships which, at 228.5m

long and 32.2m across the beam, will only be marginally larger than its predecessor. The 33,000dwt Germanischer Lloyd-classed vessel design features a scantling draught of 12m. It will be able to accommodate 1384TEU on 11 rows and six tiers in its holds, with 2030TEU to be loaded on 13 row, in six tiers, on deck. Main engines will be of the MAN Diesel 8K 80-MC-C type, commanding 28,880kW of power. Each ship will feature two 2200kW diesel generators as auxiliaries, plus one 1720kW diesel generator. ☺

The new 3400TEU capacity containership from Nordseewerke - 700TEU more capacity than its predecessor, but only marginally bigger.



## Latest Safety Tanker Class 2010 delivered

LINDENAU Shipyard recently delivered the latest in a series of oil/product tankers based on the Lindenau Safety Tanker Class 2010. Newbuilding S 275, *Sea Marlin*, is a sister vessel to German Tanker Shipping's *Sea Trout*, *Sea Cod*, and *Sea Sprat*. The 40,600dwt/47,444m<sup>3</sup> double-hull tanker has Ice Class E3, and was delivered towards the end of July.

Lindenau Shipyard in Germany has a longstanding reputation as a designer and builder of oil/products carriers and chemical tankers, in addition to a wide range of other vessels, and the innovative double-hull products carriers that are among the largest and, the yard believes, safest, and most environmentally-friendly tanker designs built in Germany.

Demand for carriage of oil and oil products has grown significantly, and with the ongoing phase out of single-hull tankers, demand has arisen for a new class of tanker with double hulls surrounding the cargo area and fuel oil tanks.

The Safety Tanker Class 2010, on which the design of a quartet of newbuilds is based, is intended to transport oil and oil products up to a specific gravity of 1.1t/m<sup>3</sup>, with a high cargo volume (specific gravity homogenous loaded Tdes about 0.74t/m<sup>3</sup>, Tscs about 0.84t/m<sup>3</sup>), combined with the highest level of safety and environmental protection and operating economy.

With the cargo and oil storage tanks protected by a double hull, and volume cargo tank bulkheads, the newbuilds have a separate steering gear room, separate diesel generator room, and separate separator station, and fulfill Exxon Marine environmental and safety criteria for vessels in ExxonMobil affiliate service, Edition 2002, including strongly preferred items, and SOLAS 2002 (automatic identification system, voyage data recorder, FWBLAFFS). The Safety Tanker 2010 is also a particularly fuel-efficient design, the ship's lines having been optimised by the yard working closely with the owner, giving the vessel an optimised load/volume ratio at a maximum draught of 11m and Panamax breadth of 32.20m.

Extensive Computational Fluid Dynamics (CFD) studies were undertaken prior to model tank tests for resistance and propulsion, and sea-keeping and performance in ice, resulting in a design which the yard describes as having an



*Sea Marlin* – the latest in a series of innovative tankers from Lindenau.

extremely favourable speed/power ratio, resulting in low fuel consumption at relatively high speed. Particular attention has been paid to the design of the foreship, in respect of the Safety Tanker 2010's sea-keeping, both in relation to structural stresses and loss of speed in a seaway.

According to Lindenau, compared to many other, similar newbuildings, the Safety Tanker Class 2010 will experience many fewer 'deck wetness events' in adverse weather conditions, and the structural stresses on the foreship have been reduced by almost 40% compared to previous newbuildings. Another benefit of the optimised foreship design is the ability to operate at high speed in ice with good ice-breaking capability, a feature that is complemented by a high level of manoeuvrability thanks to a highly efficient full spade rudder profile, and a powerful bow thruster.

The newbuildings fulfill national and international rules for exchange of ballast water, and MARPOL Annex VI requirements for NOx and SOx emissions, and in keeping with earlier generations of tankers designed by Lindenau,

the vapour return system, and sewage treatment comply with requirements for minimal bilge water oil residues and use of non-ozone depleting coolants. The double-hull design, which provides the highest possible level of protection in the event of collision or grounding, qualifies for safety class COLL3, this being four times higher than the collision resistance of a typical single-hull tanker.

The cargo spaces onboard consist of 2 x 5 tanks as well as three slop tanks, which are separated from one another by volume longitudinal and volume transversal bulkheads. This has the beneficial effect of creating absolutely smooth tank surfaces, leading to short discharge times, minimal cargo residues, additional protection against cargo contamination, reduced tank cleaning time, and a high level of cargo flexibility if made possible by use of cargo tanks with different sizes, as well as the high cargo tank volume/deadweight ratio.

A newly-developed fixed emergency discharge system enables the entire cargo to be discharged under closed conditions in the event of a cargo pump failure. 

## LEMAG launches LUBEmag

THE latest product from LEMAG permanent measurement of cylinder oil consumption was unveiled at the CIMAC Congress in Vienna earlier this year.

The LEMAG LUBEmag displays specific cylinder oil consumption, daily cylinder oil consumption, and is touch-screen operated. It was designed to measure the specific cylinder oil consumption of two-stroke engines when used in combination with the LEMAG Shaftpower system. This can reduce wear of engine components caused by either under- or over-lubrication, and can also show potential cost savings by avoiding excessive consumption of cylinder liner lube oil.

One of the major design targets for the LUBEmag was to avoid any increase in pipe resistance. The LUBEmag is suitable for all gravity-driven lube oil supply systems, even those with low installation heights.

The system consists of two stainless steel tanks, which are filled and discharged automatically, alternating via two 2/3-way valves. Both tanks are aerated and protected against overfilling.

The time the system takes to discharge the measuring tanks is the basis for the calculation of the actual cylinder oil consumption. The level of the cylinder oil

inside the measuring tanks is controlled by level switches. Their signals are transferred to an electronic controller, which in turn communicates with the LEMAG Shaftpower system. The consumption values are then indicated on the Shaftpower touch-screen display.

In the event of a 'black out,' the 2/3 way valves will directly connect the cylinder oil pipe without any measuring cycle.

The LUBEmag is also equipped with a manual bypass pipe with an integrated two-way ball valve, fulfilling all classification society requirements. 

## Propulsion specialist Schottel reorganises

WITH a revised product range and a new corporate structure, Schottel has recently merged Schottel GmbH & Co KG in Spay, Rhine, and Schottel-Antriebstechnik GmbH in Wismar to form Schottel GmbH.

Schottel Schiffsmaschinen GmbH - which is also based at Wismar - will continue to develop and manufacture controllable pitch propeller systems as an independent company.

As of March of this year, 15% of the shares in the Schottel Group were acquired by Frydenbø Industri AS in Norway. Frydenbø Power AS, a subsidiary of Frydenbø Industri, is a long-standing sales partner of Schottel in Norway, and the remaining shares in the company are held by the founder's family.

The Schottel Group ended the 2006 business year with consolidated group sales of approximately €150 million.

'In the coming years we shall continue to grow on the strength of our capabilities,' said managing director Prof Dr Gerhard Jensen, noting that, during the course of this year, a new production shop is to be built in China, and a new warehouse in Wismar.

For the Frydenbø Group, the acquisition is part of an international strategy for Frydenbø Industri AS. 'The part ownership of Schottel group will strengthen our focus on production,' says Knut Herman Gjøvaag, chief executive and owner.

### FPSO orders keep Schottel busy

SCHOTTEL Group has recently secured a number of orders to supply demountable thrusters for Floating Production, Storage, and Offloading (FPSO) vessels. The thrusters in question are all type SRP 4040 LSUs, the first order being for the FPSO *Aoka Mizu*, a FPSO for Bluewater, a vessel that is being converted from an existing Aframax tanker with a length of 248.12m, breadth of 42m, and a draught of 14.9m. *Aoka Mizu* was built by Hitachi Zosen Corporation in Japan and is now the seventh vessel to be designed and converted by Bluewater.

At present, *Aoka Mizu* is being converted to a FPSO at Sembawang Shipyard in Singapore, and will be fitted with a new topsides and disconnectable turret mooring system.

For *Aoka Mizu*, Schottel is supplying a total of three underwater demountable SRP 4040 LSU rudder-propellers with an input power of 3800kW (5168hp) and a propeller diameter of 4000mm. Apart from maintaining the FPSO in position, the rudder-propellers will be used to propel *Aoka Mizu* on her maiden voyage from Singapore to the Ettrick field in the North Sea.

*Aoka Mizu* will probably remain moored in the Ettrick field for the rest of her operating life and will not be drydocked again, so underwater demountable rudder-propellers were the obvious choice, allowing the thrusters to be removed for repair or maintenance work whilst the FPSO is afloat and on-hire.

*Aoka Mizu* is due to start production in the first quarter of 2008. The two other FPSOs being fitted with Schottel thrusters are for the Norwegian company FPSOcean, which has acquired the shuttle tanker *Nordic Laurita* and the Aframax tanker *Semakau Spirit* for conversion into fully DP deepwater FPSO vessels.

Schottel is supplying *Nordic Laurita* with four and *Semakau Spirit* with five demountable rudder-propellers of the SRP 4040 LSU type, this being the same type selected for *Aoka Mizu*.

*Nordic Laurita*, to be renamed *DeeP Producer 1*, is scheduled for completion at Dubai Drydocks in the United Arab Emirates by the first quarter of 2008, and will be ready for first oil by the second quarter. *Semakau Spirit* will be renamed *DeeP Producer 2* and is likely to start conversion at Dubai Drydocks during the first half of 2008.



STATE OF THE ART TECHNOLOGY

**VETH  
MOTOREN  
SPEEDS  
YOUR  
PERFORMANCE**

**VETH-Z-DRIVE**

For more information  
about our products and  
services visit our website  
[www.veth-motoren.com](http://www.veth-motoren.com)

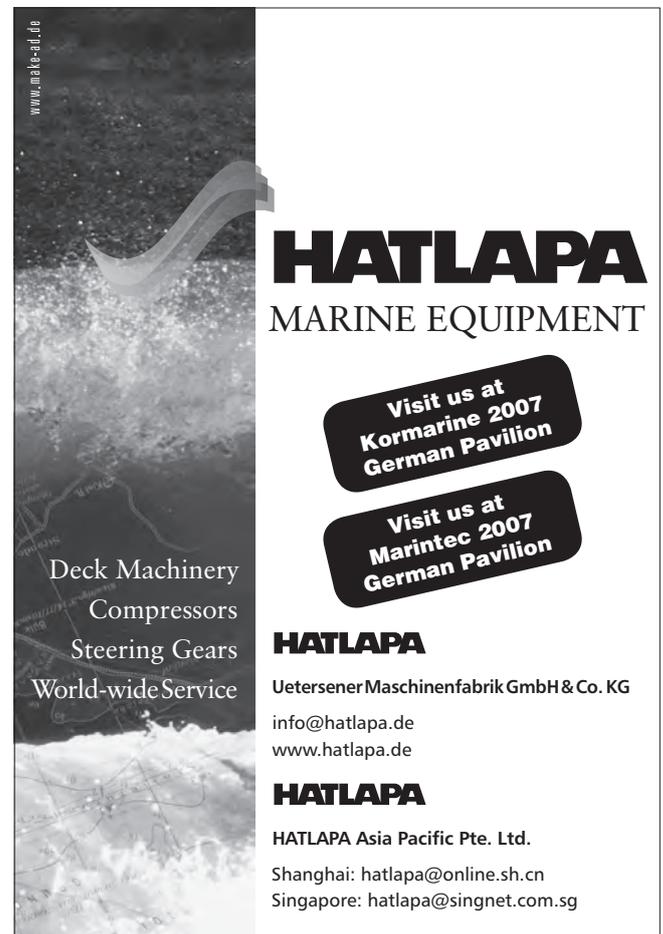
THE LEADER AMONG BOWTHRUSTERS

**VETH-JET**

**VETH  
MOTOREN BV**

P.O. BOX 53 - 3350 AB PAPENDRECHT - HOLLAND  
PHONE (+31) 78 615 22 66 - FAX (+31) 78 641 11 69

203230



[www.hatlapa.de](http://www.hatlapa.de)

**HATLAPA**  
MARINE EQUIPMENT

Visit us at  
Kormarine 2007  
German Pavilion

Visit us at  
Marintec 2007  
German Pavilion

Deck Machinery  
Compressors  
Steering Gears  
World-wide Service

**HATLAPA**  
Uetersener Maschinenfabrik GmbH & Co. KG  
[info@hatlapa.de](mailto:info@hatlapa.de)  
[www.hatlapa.de](http://www.hatlapa.de)

**HATLAPA**  
HATLAPA Asia Pacific Pte. Ltd.  
Shanghai: [hatlapa@online.sh.cn](mailto:hatlapa@online.sh.cn)  
Singapore: [hatlapa@singnet.com.sg](mailto:hatlapa@singnet.com.sg)

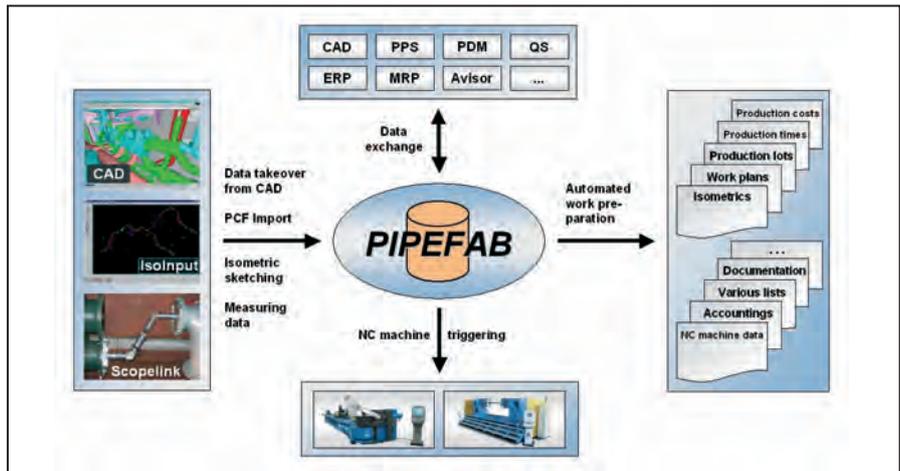
# Software tools for pipe production

TRACTO-TECHNIK, the well-known specialist manufacturer of pipe installation machines, recently formed a new company - TRACTO-TECHNIK SoftwareDevelopment (TT-SD) - which develops software products for pipe production and offers tailor-made IT services to its customers.

In addition to the development and fabrication of tube bending and processing machines up to Ø 170mm OD, Tracto-Technik is therefore now able to offer the industry software tools for pipe production management, and provide what it called 'complete system solutions for the piping industry'.

With its PIPEFAB software, Tracto-Technik offers a complete software solution for the planning and production of pipes and pipe systems for shipbuilding and offshore construction. The modular PIPEFAB software package combines the generation of isometric drawings, work preparation, and production control for pipe pre-production. It organises materials and time management and supplies all the required production dossiers for the pipe workshop.

PIPEFAB evaluates isometric drawings originating from different input channels. The data is made available by direct input into an integrated isometry tool, by transfer from 3D CAD systems or by transfer from pipe measuring systems. The software performs the complete calculation of the piping geometry and supplies the data required for the pipe production in the form of lists and files.



Functions and benefits of PIPEFAB.

In combination with ERP/MRP systems, PDM-systems, and standard accountancy systems, all data and isometrics necessary for carrying out a project and its control are produced, working packs are created, production times and costs are determined, additional material is calculated, and work schedules are set up. All results for project and data management, quality control, and NC machine triggering are available as automated, machine-readable files.

All of the modules and components in the PIPEFAB product family are compatible and form the basis for an integrated 'all-in' solution, the effectiveness of which is improved further by use of global connectivity via the Internet. 'Use of these flexible, user-friendly software tools results in a remarkable reduction of work and time, which will lead to considerable cost savings in the whole pipe production process,' said the company.

## OUR FLEXIBILITY IS YOURS...



[more than just flexible!]



## ...WHEREVER YOU ARE.



VULKAN KUPPLUNGS- UND GETRIEBEBAU GmbH & Co. KG

Head Office: Heerstrasse 66, 44653 Herne/Germany · Phone +49 2325 922-0 · Fax +49 2325 711 10

E-Mail [info.vkg@vulkan24.com](mailto:info.vkg@vulkan24.com) · Internet: [www.vulkan24.com](http://www.vulkan24.com)

## Schiffko now part of Wärtsilä

TOWARDS the end of last year, Schiffko, the well-known German design and consultancy company, was acquired by Wärtsilä. Privately owned until its acquisition by Wärtsilä, Schiffko has designs for more than 2500 vessels over the last 50 years, and has an annual turnover of approximately €4 million, with some 25 employees.

Schiffko's services range from initial design for a ship to the supply of complete design documents for fabrication. The company prepares full sets of technical and commercial tender documents and carries out independent design optimisation work on foreign designs to shipowners' requirements.

'We plan approval work, and conduct construction supervision, acceptance, and project management activities on behalf of shipowners. Vessel types range from highly-sophisticated research ships to heavy-lift/pipelay vessels and from offshore support vessels to containerships,' said Albrecht Delius, managing director, Schiffko. The company has designed 1100TEU container feeder vessels such as the SCHIFFKO CV 1100, which is now the most constructed container vessel in the world.

At the same time, Schiffko is also working on designs for new containerships ranging in size from 1300TEU to 7300TEU, and has been carrying out design studies for larger vessels of up to 12,000TEU.

'Wärtsilä has a substantial quantity of engineering capacity related to ship engines and machinery solutions. In ship design, we can now engage in a dialogue with customers on complete vessels, rather than just the machinery component. Schiffko container vessel designs have a long track record in the container business, one of shipping's fastest growing segments. Wärtsilä has always had a strong focus on containerships and views involvement in containership design as being of strategic importance. In adding ship design to the portfolio we believe that Wärtsilä is going to be a more valuable and resourceful partner to our customers in the containership segment,' said Magnus Miemois, vice president, ship power, Wärtsilä, speaking shortly after the acquisition was announced.

'Belonging to the Wärtsilä network means that our customers will see us as stronger ship designers in the future. As a part of a large multi-national organisation, we will have better resources for expanding our design and consultancy capacity, which will also benefit all parties,' said Delius.

Speaking in August of this year, Schiffko spokesperson Christian Marburg said that, at present, Schiffko is working on a diverse range of projects, including many consulting projects for shipowners, large container vessels of circa 6800TEU, various offshore support vessels, including anchor handling tug supply (AHTS) vessels, and other types of support vessels, and on new designs for pipelay vessels for Saipem and an unspecified customer in Dubai.



New generation containership designs from Schiffko.

## SPURS<sup>®</sup> PROTECTS YOUR FLEET

From net and line entanglements and resulting oil seal damage

### Awesome Cutting Action!



### The Cutting Edge Propeller Entanglement Solution

Spurs Cutter Systems are the world's most efficient and cost effective method of eliminating propeller entanglement and are trusted by U.S. Navy and commercial fleets world-wide. Spurs instantly cut lines and nets and prevent unscheduled dry-docking due to aft seal damage.

### Environmental Challenge

Don't take chance!!  
Avoid expensive fines and downtime from resulting oil leakage due to line and net intrusion into aft oil seals (as shown here).



All size cutters are in stock ready for immediate shipment and installation at your next dry docking.

For more information, or to request a free cd-rom,  
Phone (954) 463-2707, Fax (954) 525-0239  
Spurs Marine 201 SW 33rd Street FT. Lauderdale, FL 33315  
visit us at: [www.spursmarine.com](http://www.spursmarine.com), email: [spurs@spursmarine.com](mailto:spurs@spursmarine.com)



## Polish restructure gets underway

**STATE-RUN shipbuilders in Poland are finally being offered up to potential private ownership, but only two of three yards have agreed to cut capacity in line with EC demands.**

**P**OLAND'S largest shipyard has officially been put up for sale. The Polish Ministry of Treasury, the largest stakeholder of Shipyard Gdynia (33%), has announced that it will be in position to sell 80% in the company, just over a month after the company's general assembly of shareholders decided to increase company capital by Zlotys51million (US\$186 million), in order to clear the yard's public debt.

The new money will boost the stake held by the Treasury directly, privatisation body ARP (10%), and the Corporation of Polish Shipyards (KPS – 10%), from the current level of 53%, in order that potential investors can acquire a truly controlling stake in the Gdynia yard.

At time of writing, potential investors had until 7 September to file offers for shares in the Gdynia yard, with the plan being that the right investor is chosen before the year is out. A two to three month clearance period is expected to follow, before full privatisation is executed.

Hand in hand with privatisation will come a reduction in production capacity, following on from an agreement with the European Commission, ongoing since Polish accession to the European Union.

Shipyard Gdynia has agreed to shut the gates on the smaller of its two drydocks from the end of September 2009, as a compensatory move for the state aid, with the facility to be given over to steelworks related to bridge and industrial steelworks.

**Gdynia is due to shut one of its two drydocks by September 2009, as part of an agreement with the European Commission.**



Shipyard worker wages in Poland are still reckoned to be 25% of those available in Norway.

**Gdynia has made a speciality out of PCTC construction.**

The drydock features one 500tonne lift capacity main crane and four 150tonne capacity auxiliaries. With an area of 9600m<sup>2</sup>, and dimensions of 240m x 40m, plus depth from water surface of 8m, the smaller drydock is geared to assemble ships of up to 120,000dwt.

Closure of the facility will mean that work at the Gdynia yard will be concentrated around its larger drydock 'SD II', which has an area of 26,665m<sup>2</sup>; dimensions of 389m



x 70m; depth from water surface: 8m; and is capable of assembling ships of up to 400,000dwt.

The cut means that the yard will have capacity to turn out 12 ships per year, whereas it could currently turn out a maximum of 18 ships per year.

Arkadiusz Aszyk, management board member of Shipyard Gdynia, said: 'From the business standpoint, Gdynia has huge potential to flexibly adapt to needs of prospective investors.'

The strong Polish Zloty, escalating materials prices, and the movement of shipyard workers west in search of higher wages, have all weakened Polish shipbuilding of late, with financial results and renegotiated delivery times reflecting these factors.

However, Dr Aszyk cited labour costs reckoned to be 25% of those commanded in Norway as a continuing factor that would stimulate interest from European shipbuilders facing competition from Asia in the coming years. Shipyard Gdynia could also bring value to the companies planning optimisation of their production process.

Though affected by 'temporary' financial problems, Gdynia Shipyard had managed to secure tangible foundation for its future

growth. The forward orderbook of the company covered 21 vessels with the total value of approximately US\$1.1 billion, to be built by June 2009.

One strength thus lay in having slots available as early as second half 2009, at a time when yards all over the world were heavily booked.

'This, supported by a very positive forecast for the global shipbuilding market, makes us well positioned for further growth,' said Dr Aszyk.

It might be worth looking beyond past travails to note that the 2700TEU capacity containerhips Gdynia currently builds are attracting charter rates of around \$25,000 a day, whereas breaking even level for a ship ordered today is closer to \$20,000 a day.

In fact, the yard last signed a new contract one year ago. However, Shipyard Gdynia remains the biggest and most modern newbuilding yard in Poland, employing 200 designers and operating Poland's only design office capable of designing ships from beginning to end. The company specialises in construction of ro-ro car carriers, container vessels, and liquefied petroleum gas carriers. It has built 632 vessels of various profiles in its 85-year history, with total capacity exceeding 9m tonnes and aggregate tonnage close to 10m dwt.

Dr Aszyk emphasised that the capacity cut would not necessarily be reflected in comparable cuts in shop floor worker numbers among the yard's 6000-strong staff numbers. This was witnessed by the fact that, although the yard has haemorrhaged shipbuilding workers at a rate of 800 per year since accession to the EU, it took on 700 new workers last year, and this year will take on 600 more. Some of these workers have come from local sources, but a growing number (currently 100 workers) have been attracted from India, while Dr Aszyk said Shipyard Gdynia may later on

look to China for new recruits. Another yard source suggested: 'We need more welders and fewer clerks.'

Dr Aszyk conceded that newer recruits had not proved so efficient as the workers they were replacing, with the yard obliged to renegotiate deliveries of a number of ships. However, he stressed that the idea was to invest in modernisation, including automated welding processes, with up to Zlotys500m expected to come through a cash injection after the sale, in order that the yard's real output from one dock could match, or even exceed what it was today from two. The two docks currently turn out fewer than 10 ships per year.

In mid-August, Dr Aszyk said negotiations were continuing that could see the yard sign for new orders within weeks, with the most likely deals to involve further car carrier construction. Shipyard Gdynia has been concentrating on this area of production, not least because it has 11 x 6600 unit capacity pure car and truck carriers and three more 2130 unit capacity PCTCs due delivery to Israeli owner Rami Ungar's Ray Car Carriers between 2007 and 2008. A new contract is also reported to be in the pipeline from the same owner and it may be germane to note that Shipyard Gdynia has developed a 7000 plus car capacity ship that it is keen to bring to market.

Ray already owns a 16% stake in the yard and has frequently been identified as a potential main investor in Shipyard Gdynia. Dr Aszyk said that, although it was not yet clear which companies would appear on the shortlist of interested parties, due to be published in September, it would not surprise him if the car carrier specialist featured.

Dr Aszyk said that the Gdynia yard currently harboured plans to diversify its product offering over time, with the intention being to move into the offshore and ro-pax sectors.

However, while he did not say so, such plans would be contingent on who emerges as the eventual owner. If the new owner were indeed to be a shipowner like Ray, for example, it would have its own agenda, while such a scenario could also mean that the yard would be looking at on-sale once the shipowner's immediate build plans were fulfilled.

One potential buyer unlikely to join the fray in the immediate term is Aker Yards, Europe's largest shipbuilding group. Sources suggest that the group, with 18 yards under its control, has not found its recent acquisitions easy to digest.

Gdynia Shipyard becomes the frontrunner in the privatisation process. Interest in Polish shipbuilding has also come from Ukraine, where steel producer Donbas, through subsidiary ISD Polska, acquired a 4% stake in Gdansk Shipyard earlier this year.

Under instruction from the government, the Gdansk operation was brought under the management of its Gdynia counterpart five years ago, but the two facilities have subsequently been separated and Dr Aszyk said that current plans involved the sale of Gdynia's remaining 13% stake in the Gdansk yard. Production between the two yards was not linked, he said.

But the situation at Gdansk is not so clear cut, after the yard and the Polish government issued a document saying that two of three slipways would not be shut, in line with EC demands, because Gdansk would not be able to make money on this basis.

However, the announcement over Gdynia augurs well for its counterpart at Szczecin, where recent weeks have seen banks freezing lending at Stocznia Szczecinska Nowa, threatening to disrupt production at a yard that has 31 ships worth US\$1.6bn on order. SSN is 80% held by KPS and 20% held by ARP, and has agreed to close one of its three slipways under plans agreed with the EC. 



**SeaQuantum**  
Advanced TBT-free antifouling solutions

**SeaLion**  
Fouling Release Coating

No matter which direction you choose, both our technologies provide you with optimum hull performance

For detailed information: [www.jotun.com](http://www.jotun.com)

Jotun AS, P.O.Box 2021, 3248 Sandefjord, Norway

Tel:+47 334 570 00 Fax:+47 334 646 13

## CTO prepared to support change

WHILE builders of ships in Poland restructure in line with agreements made with the European Union, behind the scenes, new focus is being added to the work being undertaken by Centrum Techniki Okrętowej (Ship Design and Research Centre – CTO), which is looking to support opportunities for Poland's shipbuilding industry.

While the research bureau continues to offer the breadth of services that includes structural engineering, hydrodynamics, design, fire testing, software development, etc, it has also been making efforts to seek out specific targets in a changing market. For the last two years, for example, one strand of CTO's work has seen it concentrating on developing yacht design support tools, including CFD, with three projects already in train covering yachts of around 60m in length, and opportunities available for larger hulls of 60m-80m in length. While Poland is one of the largest export markets for yacht hulls in Europe, it has hitherto been a business characterised by family-run yards. There is a need to support a step up in capability.

The programme is aimed at providing reliable predictions of the hydrodynamic performance of yachts equipped with a mechanical propulsion system. The scope of work can be individually adjusted with respect to client's requirements, and can draw on a database of similar vessels, calculations using CTO-developed software, CFD analysis, and model testing. CTO points out that yacht designers rarely take advantage of experimental hydrodynamics, reserving model testing mainly to special requirements, such as when they want to build a megayacht. 'As a consequence [there is] the risk of failure in the design process, which usually leads to an increase in the building or operating cost,' the research and development body says.



**Finntrader** – a project which called on CTO's expertise in noise and vibration analysis.

In CTO's case, cost-effective model testing methodologies have been supplemented by its systematic statistical and numerical tools, in order to provide a comprehensive programme, which assures high quality predictions at an attractive price level.

According to CTO, the prime issue has been one of hull and propulsion system quality, CFD support, and model testing. CTO's next task will be to develop work on the comfort side specific to yachts, with a live project covering sea-keeping under development, and plans afoot to exploit CTO's considerable body of work in noise and vibration, and exhaust fume dispersal, in a yacht-building concept.

CTO's growing experience in the noise and vibration field was recently witnessed in its consultancy role in the conversion of the Finnlines combi-ro-ro vessels *Finntrader* (already completed) and *Finnpartner* (ongoing), at Poland's Remontowa Yard, where both passenger and cargo capacities were increased. The main conversion items on each ship have involved a new bulkhead on the lower

deck, a reshaping of the forward open car deck No 4, a new bow section including new forward bow visor, a new deck between decks 3 and 4 for new accommodation areas, the rearrangement of tanks for stability improvement, fitting a fixed ramp, hoistable tilting ramps and folding bow ramps, the installation of flood prevention doors on the main deck, new accommodation blocks consisting of 128 single and 32 double cabins per ship, and the rearrangement of public spaces.

Some of this work has been new territory for Remontowa, with CTO called in at the design stage to provide a strict noise analysis, which led to a modification in the eventual structure of deck 1, where structural changes were introduced to dampen vibration (the structure was partially cut to reduce the number of noise bridges) and, following analysis after the event, different insulation materials were used to those originally envisaged.

CTO reports that it is also working on new noise and vibration projects involving Remontowa for a fisheries vessel and a tender buoy vessel.

Elsewhere, CTO's more interesting projects include a new containership design from Stocznia Gdynia. This involves a new shaft alignment designed to optimise the building process within the shipyard, with CTO's research focusing on the hull bending moment effect on the shaft alignment due to wave action. Unfortunately, no further details were available at time of writing.

CTO said it was also working on other aspects of shaft design, where class rules were very general. For example, engine manufacturers offered very generalised data on shaft performance; where forces exerted at the start of the shaft were known, but forces acting within the engine itself were not necessarily known, and the relationship between the engine and the hull should be subject to further study. ⚙️

### Side launch analysis offer

CTO's visit to this year's Nor-Shipping highlighted a number of specialised service offerings, and one that caught the eye was its work on the safety analysis of the side launching of ships. For a given customer, work is based on a series of model tests whose principal purpose is to assess launching safety in the second and subsequent stages of side launching from a roller slipway from the hydrodynamic point of view. The following risks were assessed:

- the potential for the ship to capsize due to insufficient stability
- the potential for the vessel to strike the basin bottom

- the potential for the vessel to strike the slipway edge when the ship heels backwards.

Tests are conducted according to CTO internal standards, based on longstanding experience. The models are manufactured of wood and/or polyurethane foam, and fitted with the simplified model of the substructure. The slipway is modelled on the basis of information provided by the customer. The six depth of field motion of the model as a rigid body is registered in real time. Runs are recorded by contact-free, high-speed, and accurate Rodym DMM system, which is based on cameras mounted on lowering devices and a LED reference system located on the model. All tests are recorded via digital video camera.

Results of the model tests are analysed using custom-built software to recalculate the registered phenomenon at real scale, and to identify key parameters for launching safety (bottom clearance, minimum distance at the slipway edge, and maximum heeling angle). ⚙️



**Side-launching in practice.**

## Genfer Lloyd bridges the design gap

THE flipside of the turbulence afflicting Poland's shipbuilders has been the emergence of a new generation of independent Polish detailed engineering services companies, drawing on experience from the nation's shipyards themselves, but willing to take on complex work from home and overseas markets.

Typical has been ambitious Szczecin-based Genfer Lloyd, launched in 2005, which started with five designers, but now boasts a roster of 70, and hopes to increase that number to 100 before the year is out. Initially drawing on a pool of specialists from the Szczecin Shipyard, the company has subsequently opened a small office in Gdansk, with a staff of 20.

Marek Nowak, naval architect and Genfer Lloyd senior chief designer, came to the new concern with 35 years of experience behind him at the Szczecin Shipyard.

He explained that, backed by the experience gained in series shipbuilding in Szczecin, and with main offices situated just 800m from what is now the New Szczecin Shipyard, Genfer Lloyd had quickly geared up with modern software to deal with preliminary, basic, and workshop aspects of design. Its latest plan envisages the introduction of PDMS software covering oil rig platform production, although the company will wait for a firm project before acting on this intention.

### Nordic focus

After its formation, the mainstay of Genfer Lloyd's workload has come from Nordic offshore customers, specifically delivering engineering services on a subcontractual basis for designs developed by others, including detailed structural work and pipe arrangements. Work has spanned platform



Marin Teknisk's Jan Ove Kleppe and Genfer Lloyd's Justyna Trebaczkiewicz shake hands on a new contract, calling for Genfer Lloyd to deliver workshop documentation for piping and outfitting for a multi-purpose geotechnical and soil investigation vessel.

support vessels, seismic vessels, and drillships, having developed a subcontractor role with Norwegian design companies such as Skipsteknisk and Marin Teknisk.

Its latest contract with Marin Teknisk, for example, saw Genfer Lloyd engaged to deliver workshop documentation for piping and outfitting to Heroy, Norway, for the 'MT 6016L' project, a multi-purpose geotechnical and soil investigation vessel, for which Genfer Lloyd was previously awarded the contract for hull structure documentation.

With naval architects thin on the ground in traditional centres of excellence, Genfer Lloyd now sees opportunities to work with other clients on the same basis. Among them are Finland's Deltamarin, for whom it is preparing workshop documents covering construction of a car carrier, with prospective customers also in The Netherlands, where

Genfer Lloyd has been subcontracted to work on detailed aspects of a general cargo ship design. It also sees opportunities to work with German designers on a similar basis.

### Specialists stay home

Where Polish shipbuilding workers have gone abroad seeking wages up to four times those available at home, Genfer Lloyd is also priding itself on being able to pay the kind of salaries that will keep its specialists at home.

Another of the company's ambitions is to rekindle relations with Vietnamese shipbuilders, drawing on historical links between the Szczecin yard and Vietnamese state shipbuilder Vinashin. Before its demise, the state-run Polish shipbuilder was responsible for delivering an initial design covering two 1000TEU capacity containerships to Vinashin, a project it followed by selling a 600TEU capacity ship design, and then a 1700TEU capacity ship design. But links go deeper, with a significant number of Vietnamese naval architects actually educated in Poland and fluent in Polish.

Indeed, Mr Nowak said that it was something of an irony that Polish shipbuilders dealing with overseas customers had become accustomed to communicating technical terms in English.

Confronted by fluent Polish-speaking Vietnamese, it became necessary to readdress areas of technical vocabulary.

In the meantime, Genfer Lloyd is keen to participate in research projects emanating from the European Union, both as a means of stretching the naval architects it has in place, and as a way of working more closely with the academic institutions that will attract the naval architects of tomorrow. ☺



SeaQuantum

Advanced TBT-free antifouling solutions

SeaLion

Fouling Release Coating

No matter which direction you choose, both our technologies provide you with optimum hull performance

For detailed information: [www.jotun.com](http://www.jotun.com)

Jotun AS, P.O.Box 2021, 3248 Sandefjord, Norway

Tel: +47 334 570 00 Fax: +47 334 646 13

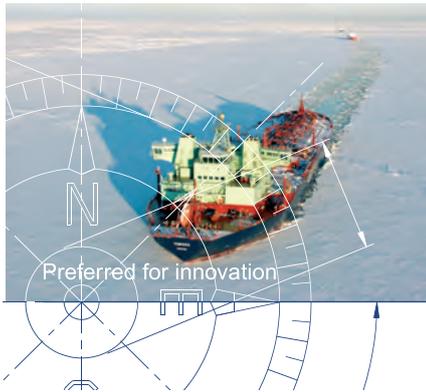
Aker Arctic operates now a new ice model testing facility in Helsinki, Finland.



# Aker Arctic



the full service  
ice technology partner



Aker Arctic offers full design and project support to ship-owners, shipyards and other operators.

A series of Arctic cargo ships is now under construction, including the world's first Arctic shuttle tankers for export of oil.

**Aker Arctic Technology Inc.** Tel.: +358 10 6700  
Merenkulkijankatu 6 Fax: +358 10 670 2527  
FI- 00980 HELSINKI, www.akerarctic.fi  
Finland info@akerarctic.fi



part of the Aker group





*Polski Rejestr Statków*

**PROVIDES:**

- Classification surveys,
- Statutory surveys,
- ISM code certification,
- ISPS code certification,
- Product type approval,
- Industrial surveys,
- Management systems certification: ISO 9001, ISO 14001, PN-N-18001, HACCP,
- Products certification for conformity with the European Union Directives.

**POLSKI REJESTR STATKÓW S.A.**  
Al. Gen. Józefa Hallera 126  
80-416 Gdańsk, Poland  
tel.: (+48 58) 346 17 00  
fax: (+48 58) 346 03 92  
e-mail: mailbox@prs.pl  
http://www.prs.pl






STRAIGHT LINE PANTOGRAPH

Photo: www.valderhaug.no

*Giving you a clear vision  
of the future.*

**HEPWORTH MARINE**  
INTERNATIONAL

T +44 (0)1527 61243 F +44 (0)1527 66836  
E info@b-hepworth.com W www.b-hepworth.com

## Baltic Design Centre joins in the fast lane

ONE of a number of interesting young Polish design houses emerging to challenge more established firms is Baltic Design Centre spz o o, established on 21 July 2006 as a common undertaking by FAST company and a group of naval architects and designers who formerly plied their trade at Gdynia Shipyard Design Office.

Shares in the company are split between FAST (50%), the board of BDC (30%), and employees (20%). The company is managed by its four person board. The president is Krzysztof Klocek (aged 34), who also holds the post of vice-president, FAST. Working alongside him is vice-president and managing director Rafal Krocicka (aged 34), who was formerly the executive director of Gdynia Shipyard Design Office. The two remaining members of the board are chief designers, Krzysztof Czernski (aged 35) and Konrad Cichocki (aged 34), both of whom are naval architects. In their former employment at Gdynia Shipyard they held the same positions, as chief designers.

At the end of July, Baltic Design Centre employed 11 persons on permanent contracts of employment, 10 of whom were designers. A further 10 designers were employed under 'performance' contracts (on a self-employed basis).



Diving support vessel concept, visualization by AYP, published courtesy of FMV AS.

Since the company was formed in the middle of fiscal year 2006, financial data will only be available by the end of 2007.

However, already, Baltic Design Centre is showing itself as being a forward-looking concern. Design software in use includes: AutoCAD Mechanical, AutoCAD, while plans are afoot to phase in Napa, NUPAS-CADMATIC, or equivalent (Aveva Tribon M3, for example).

Baltic Design Centre signed its first contract at the end of December 2006 and design work is nearing its completion. Work is progressing to complete a DSV (Diving Support Vessel) design, following an approach from Norwegian yard, Fitjar Mechaniske Verksted from Fitjar, near Bergen, in December 2006. The yard intends to build a DSV vessel to Aker Yards Projects design. This was meant to be a relatively simple job of adapting the design of a boat being built in Romania to the requirements of shipyard in the Ukraine that would construct the hull of the newbuilding. However, according to Baltic Design Centre: 'As is often the case, the owner's expectations and requirements changed in time and now we are nearing the completion of a design that turned out to be quite different from the original. Under separate contract we also prepared the 3D coordination model for the same vessel.'

'We are also taking part in other projects together with companies from Norway (among others, Glaesvert Ship Design – part of detailed documentation for seismic and fishing vessels) and Finland (detailed and lately, basic designs of hatch covers).

'In Poland we mainly deal with Remontowa. At present we cooperate with Remontowa (in a consulting capacity), approving classification documentation with Bureau Veritas for an LNG/LEG/LPG carrier of 7500m<sup>3</sup>. For the same yard we have also prepared the part of detailed documentation for a Fisheries Protection Vessel.'

Baltic Design Centre said it intended to develop steadily, 'at the pace of circa one new designer being accepted each month. However, our plans are not so much focused on building a company that is big in number, but one that is strong in expertise. We aim at the preliminary and basic design sector of the market, with a focus on car carriers, tankers, gas carriers, box ships, and ro-pax vessels. At the same time we are thinking of expanding our activities on land-based projects. For this we would, of course, need to acquire more skill in dedicated software systems, like PDMS (Aveva Plant) or SmartPlant 3D (Intergraph).'

### TECHNICAL PARTICULARS DSV06 PROJECT (AYP CLASS DESIGN)

LOA.....	107.0m
LBP.....	94.7m
Breadth.....	21.0m
Depth.....	8.5m
Draught max.....	6.6m
Deadweight ca.....	4000t
Complement.....	100 persons
Classification.....	DNV



SeaQuantum

Advanced TBT-free antifouling solutions

SeaLion

Fouling Release Coating

No matter which direction you choose, both our technologies provide you with optimum hull performance

For detailed information: [www.jotun.com](http://www.jotun.com)

Jotun AS, P.O.Box 2021, 3248 Sandefjord, Norway

Tel:+47 334 570 00 Fax:+47 334 646 13

# TRUSTED WORLD WIDE



**BRUNVOLL – the single source supplier of thruster systems**

Refined and proven concepts teamed up with supreme technical solutions ensures low life cycle costs

**BRUNVOLL – manufacturer of**

- Tunnel Thrusters
- Azimuth Thrusters
- Low-Noise Thrusters
- Thruster Control Systems



**Another successful story...**

The offshore supply vessel «Bourbon Mistral» – equipped with Brunvoll bow tunnel- and bow retractable thruster units. Built by Ulstein Verft AS for Bourbon Offshore Norway AS.



## BRUNVOLL

telephone + 47 71 21 96 00  
fax + 47 71 21 96 90  
e-mail: [office@brunvoll.no](mailto:office@brunvoll.no)  
[www.brunvoll.no](http://www.brunvoll.no)

## Sustainable use of the seas



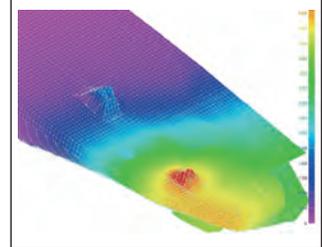
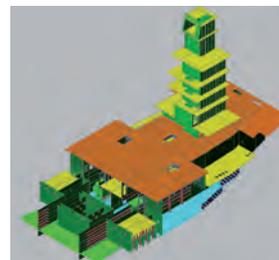
The School of Marine Science and Technology at Newcastle University is the broadest based in the UK. A degree in Naval

Architecture, Marine Engineering, Offshore Engineering, Small Craft or Marine Biology can lead to a career in one of the many aspects of the marine sector.

Undergraduate study can lead to a B.Eng or M.Eng degree. For those with experience, Masters degrees in a range of disciplines, including marine transport, pipeline engineering, renewable energy and coastal management are available. Study can be full time, or part time in some cases, and options are available for prospective students with different qualifications.

The global nature of the marine sector creates a huge range of career opportunities for graduates – in shipbuilding and repair, in ports and shipping operations, in classification and Government regulatory bodies. With emphasis on sustainable development and respecting the environment, there is a bright future.

**For further information contact the School of Marine Science and Technology at Newcastle University on Tel: +44 (0)191 222 6718, Fax: +44 (0)191 222 5491, e-mail: [marine@ncl.ac.uk](mailto:marine@ncl.ac.uk) or visit: [www.ncl.ac.uk/marine](http://www.ncl.ac.uk/marine)**



## BALTIC DESIGN CENTRE LTD Ship Design and Consulting Services

### Our areas of activity:

- initial design
- basic (class) design
- detailed engineering
- naval architectural calculations made in NAPA (damage stability, etc.)
- FEM calculations (Ansys, FEMAP, SEZAM)

### Our assets:

- young but highly experienced staff (majority with more than 10 years design experience)
- excellent relations with classification societies
- designers skilled in using major ship design systems such as AutoCAD, Tribon, NUPAS-CADMATIC
- exceptional consideration for attention and detail to Client's requirements/expectations



### Baltic Design Centre

15/8 Skwer Kosciuszki ST.  
81-370 Gdynia, Poland  
Tel: (+48) (0) 58 718 61 50  
[www.balticdesign.pl](http://www.balticdesign.pl)  
[marketing@balticdesign.pl](mailto:marketing@balticdesign.pl)

## StabPRS to aid ships' officers

THE Polish Register of Shipping (PRS) has developed StabPRS, an application tailored for individual vessels to aid ships' officers, enabling them to make fast and accurate assessments of their particular ship's loading condition and its resultant stability and strength. Given the pressures on seafarers, especially whilst in port, such a time-saving tool is expected to be welcome.

In addition to performing the usual calculations relating to stability, sheer forces, and bending moments, StabPRS enables the weight of cargo to be calculated from the vessel's draft marks and, in the case of general cargo and specialised heavy-lift vessels, predicts the degree of list anticipated when lifting heavy loads. This PRS application reduces

the time required for the assessment of the above to 10 minutes to 15 minutes, according to the class body. Furthermore, the system can also provide print-outs for attachment to the ship's log.

StabPRS also predicts the motion of the vessel in irregular sea states and displays the ship's motion simulation, showing exactly what the ship is likely to experience.

Should the vessel be involved in an incident, StabPRS is also capable of routinely calculating the stability and hull stresses when one or more compartments are flooded, showing in graphic form the state of the ship under such conditions in calm water.

Before rolling out StabPRS globally in 2008, PRS is working with a number of Polish

shipowners who are providing valuable feedback on such details as the merit of certain features and overall user friendliness. Ships' officers are also making suggestions as to additional features they would like incorporated into the programme.

Five owners are participating in the project and seven vessels have either been provided with StabPRS software or are about to have it installed. Two further vessels are scheduled to be fitted with StabPRS very soon.

The satisfaction of one owner, which initially started using StabPRS on a small bulk carrier, has encouraged a second owner to request the application onboard a ro-pax vessel trading between Poland and Sweden. 

## PRS opens for business in Shanghai

MORE than 20 newbuildings recently ordered in China are to be classed by the Polish Register of Shipping.

Responding to the development, PRS has opened a representative office in Shanghai and is establishing site offices manned by Polish surveyors in the shipyards where the vessels are being built.

PRS said it was also developing its relationship with the China Classification Society (CCS), having earlier this year signed a cooperation agreement in China for implementing a Chinese-Polish Joint Stock Shipping Company (Chipolbrot) newbuilding project, and hosting a CCS delegation in Gdansk.

Chipolbrot's order with the Cosco Dalian Shipyard for six multi-purpose/heavy-lift vessels is a key factor in the cooperation between PRS and CCS. Reflecting the fact that Chipolbrot is owned 50:50 by the China

Ministry of Communications and Poland's Ministry of Economics, three of these vessels are being built to PRS class, while the other three will be built to CCS class. They are due for delivery between 2009 and 2010.

### Polsteam goes for 18

Other work for PRS is coming from the Szczecin-based Polish Steamship Company (Polsteam), which has ordered 18 bulk carriers in China. Four 80,000dwt Panamax vessels contracted with New Times Shipbuilding Co in Jing Jiang for delivery in 2010-2011 will be classed by PRS, together with Lloyd's Register, as will eight 37,000dwt handy-size bulkers ordered from Xingang Tianjin Shipyard for delivery in 2008-2010. Six 30,000dwt bulk carriers, termed Lakers as they are designed for operation on the Great Lakes, are also being built for Polsteam in China to PRS and Det Norske Veritas class – four by Yangzhou

Guoyu Shipyard for delivery in 2008-2009, and two by Nantong Mingde Shipyard for delivery in 2009.

According to Darek Rudzinski, PRS commercial director, this revival in newbuilding classification work for Polish owners has also stimulated interest from owners based in other countries: 'We are able to use these opportunities to demonstrate what we can do, using Polish surveyors and Polish management, both in China and in our head office,' he said. 'For some owners, especially in Europe, this can be especially important.'

'The Chipolbrot contract is especially challenging as the three ships are quite sophisticated. They have extremely large hatch openings, closed by hatchcovers designed to support heavy lift cargo carried on deck. Each vessel is equipped with four large cranes, two of which each have a capacity to lift 320tonnes or a combined 640tonnes.' 



**CTO S.A.**

**CENTRUM TECHNIKI OKRĘTOWEJ S.A.**  
Ship Design and Research Centre

[www.cto.gda.pl](http://www.cto.gda.pl)

tests

designs

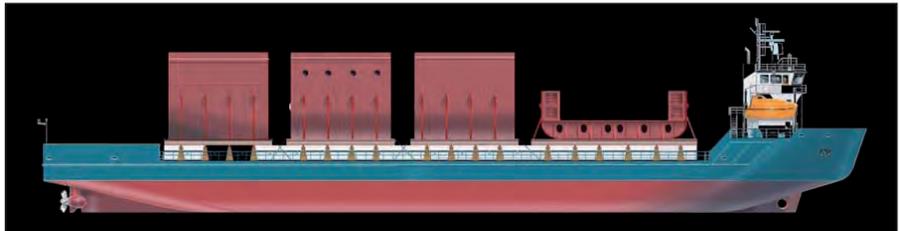
measurements

# Aura for a new heavylift era

**F**INNISH chartering and operations company Meriaura Oy will add a new type of multi-purpose deck cargo vessel into its fleet over the summer, with a ship designed to offer year-round project cargo transportation services around the Baltic Sea, especially around the icy Finnish coast, for the first time.

Ordered from Polish shipyard, Remontowa, the vessel, *Aura*, has cost around €14m, and is designed for especially heavy project cargos on deck, and will be built according to the Finnish-Swedish ice class IA.

Meriaura, whose core business includes sea transportation of raw materials, processed goods, and various project cargoes, operates six dry-cargo vessels, mainly in the Baltic Sea.



**Aura: a new ice-strengthened project cargo vessel whose first deployment will see her moving ship blocks for Aker.**

The company said the development of the new concept would bring a considerable increase to the possibilities of transporting all manner of specialised project cargoes around the Baltic Sea.

Aker Yards and Meriaura Oy have already signed a long-term transportation contract covering the ship's activities, with plans to deploy her to carry ship blocks between different Aker Yards.

Indeed, concept development was undertaken in cooperation with Aker Yards and with a network of Finnish maritime designers and suppliers including, among others, Länsivivain Oy, Foreship Oy, Wärtsilä Diesel, Rolls-Royce, Aquamaster, and Bureau Veritas.

The project has obtained R&D support from TEKES (the Finnish Funding Agency for Technology and Innovation).

Design of the vessel enables a very flexible platform for different types of project cargoes, as well as conventional deck cargoes, eg timber or rock minerals. The deck of the vessel is strengthened for heavy cargoes. The concept also offers a version for oil recovery operations.

In the design of the vessel concept, special attention has been paid to the overall safety and efficiency of the cargo transportation, the sea-keeping performance, and ice-going capabilities of the vessel.

At 101m long, the vessel features a beam of 18.8m, height 6.55m, and deadweight of 4600tonnes. Her operating speed is about 13knots.

The owner said that the capacity and flexibility of the new vessel concept would be much higher than was the case using conventional barge transportations, and at the same time the transportation would be more economical. 'The sea fastening and securing of the

ship blocks onto the deck will be carried out with specially designed equipment,' the company said. 'The vessel concept includes several innovative and patented solutions.'

The order holds a possibility of several additional vessels. 

## TECHNICAL PARTICULARS *AURA*

Owner: .....	Meriaura Oy
Delivery: .....	Summer 2007
Builder: ...	Gdanska Stocznia Remontowa S A, Poland
Classification: .....	Bureau Veritas, Finnish-Swedish Ice Class IA
Length: .....	101.3m
Breadth: .....	18.8m
Draught (max): .....	4.6m
Draught (ballast): .....	3.5m
Speed: .....	13knots
DWT: .....	4600tonnes
Cargo deck area: .....	1500m <sup>2</sup>
Ballast capacity: .....	3900m <sup>3</sup>
Main engines: .....	2 x 2220kW; Wärtsilä Vasa 6R32 LND
Propulsion: .....	Two Azimuthing Propulsion Units; Rolls-Royce Aquamaster
Bow thruster: .....	450kW
Cargo: .....	Steel sections, other steel structures 240TEU 20ft containers (a 13.5t) Timber, logs, heavy cargoes

**Aura is launched at Remontowa.**



Five renowned specialists have combined their experience, knowledge and expertise in security, fire resistance, insulation and climate control. Want to know more about the attractive return on investment it offers?



### MARINE APPLICATIONS

Jülicher Straße 495, D-52070 Aachen  
Tel. +49 (0) 241 9667400  
Fax +49 (0) 241 9667320  
E-mail: [marine@saint-gobain.com](mailto:marine@saint-gobain.com)  
Web: [www.saint-gobain-marine.com](http://www.saint-gobain-marine.com)

# Clorius

## Controls A/S

- ensures reliable control of heating, cooling and ventilation systems

### Clorius Controls ensures reliable control in ships

### More than 100 years of experience

Clorius Controls A/S is specialized in the development and production of equipment for monitoring, controlling and regulating heating, cooling and ventilation. Relying on our expertise of this area, we offer complete series of valves, self-acting thermostats, electronic controllers and electric valve motors. These can be used for engine jacket cooling water systems, lubricating oil coolers, hot water tank heating, heating systems for fresh water generators and heating systems for air conditioning plants etc.

Our long-standing service and our reliable products with high quality have established our well-known brand.

Today, we deliver up-to-date equipment to various industries all over the world, particularly to the maritime industry.

Our professional engineer team can offer 24 hours service.

Our vision is to ensure the most reliable and economic control systems for our customers.

### Clorius Controls A/S is your best choice and ensures your ship running all years!

Clorius Controls A/S  
Tempovej 27  
DK-2750 Ballerup  
Denmark

Phone.: +45 77 32 31 30  
Fax: +45 77 32 31 31  
E-mail: mail@cloriuscontrols.com  
Web site: www.cloriuscontrols.com



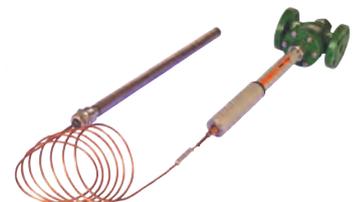
Electronic controllers



Control valves



Electric valve motors



Self-acting thermostats



Now 3-way valves up to DN 500

# Protect Assets. Save Lives. **FyreWrap**<sup>®</sup>



## Introducing Our Complete Family of FyreWrap<sup>®</sup> Fire Protection Materials

- Light weight, easy to fabricate
- Provide protection in excess of 1250°C
- Meet international and local fire standards and code requirements

FyreWrap materials are ideal for a variety of passive fire protection applications including:

- Marine bulkhead and deck insulation
- Firestopping and penetration seals
- Building movement joints
- Fire doors and seals
- Cable tray protection systems
- Grease and HVAC ducts
- Window system tapes



0062

For more information, contact Unifrax Corporation, European Sales & Marketing +44 1744 88 76 00; Corporate Headquarters USA 716-278-3800.

**UNIFRAX**

[www.unifrax.com](http://www.unifrax.com)



# New concepts for ferry propulsion

**WORK by Wärtsilä\* comparing total costs for ferry propulsion come out in favour of the podded CRP concept.**

**T**HE demands for lower bunkering costs and reduced greenhouse emissions have become two of the main drivers in the field of ferry design.

In the last couple of years, the shipping industry has witnessed a significant increase in fuel prices. Prices have fluctuated, but in general around much higher levels than was the case in the past. Fuel costs have thus become an ever more significant part of the total operating costs of a ferry.

At the same time, the public is focusing more and more on the climate change, and the pressure on the industry to reduce the greenhouse emissions is becoming ever more evident. The EU has set a target to reduce CO<sub>2</sub> emissions by 20%. The shipping industry must step up to this challenge.

Both these facts mean that fuel efficiency is becoming more important.

Two or four medium-speed diesel engines driving twin propellers via two reduction gears is the most common machinery solution in large displacement ferries. This is a simple and well-proven solution with low first costs.

There are, however, some shortcomings with the typical twin shaft line propulsion setup. The long shaft lines below the hull and the other needed appendages give rise to high resistance. The appendage resistance of a ferry can be as high as 10%-15% of the total resistance.

Furthermore, the risk for pressure side cavitation at low-speed operation is always eminent with CP propellers, which are needed in this type of mechanical propulsion.

The engines are also run at low load while manoeuvring and during slow-speed operation. This is not desired from the engine performance



Figure 1: New ferry design with CRP propulsion.



Figure 2: Conventional propulsion setup for ferries with twin shaft lines.



Figure 3: CRP propulsion with electric Azipod.



Figure 4: Japanese ferry *Hamanasu* with CRP propulsion.

## TECHNICAL PARTICULARS PROPOSED FERRIES

Twin CRP.....	shaft 2-stroke 16V46
Length, oa .....	186.0m, 191.9m, 186.6m
Length, bp .....	170.0m, 175.1m, 170.0m
Breadth .....	27.7m, 27.7m, 27.7m
Draught, design .....	7.0m, 7.0m, 7.0m
Depth .....	10.0m, 10.0m, 10.0m
Gross tonnage .....	28,500gt, 28,500gt, 29,000gt
Deadweight .....	6700tonnes, 6600tonnes, 6600tonnes
Payload.....	5150tonnes, 5150tonnes, 5150tonnes
LWT.....	12,000tonnes, 12,300tonnes, 11,900tonnes
Displacement .....	18,700tonnes, 18,900tonnes, 18,500tonnes
Lane metres .....	2410m, 2420m, 2410m

point of view. Ferries need good manoeuvring characteristics since they have frequent port calls and need a short turnaround in port.

Twin shaft lines with twin rudders offer quite good manoeuvring performance, but some ferries need more side thrust still than can be generated with rudders alone, so additional tunnel thrusters are installed in the stern. Single screw arrangements are quite rare in modern ferry tonnage.

A range of new propulsion concepts for ferries have been presented by Wärtsilä in recent years, such as podded CRP, wing pods, and wing thrusters [2, 3, 4, 5]. They have one important feature in common. They have moved away from the traditional twin shaft line setup and instead use a propeller mounted on the centreline skeg, combined with either one or two azimuthing propulsors.

The Podded CRP concept features a contra-rotating propeller on an electric pod located directly behind the main propeller in the centreline skeg. The podded propeller is of the fixed pitch (FP) type, while the main propeller is of the controllable pitch (CP) type. The podded CRP configuration offers better hydrodynamic efficiency compared to a conventional vessel with twin screws, mainly due to the following reasons:

- The aft propeller takes advantage of the rotational energy left in the slipstream of the forward propeller when it rotates in the opposite direction
- The skeg offers a more favourable wake than a shaft line, resulting in better hull efficiency (hH).

The improvement in propulsion efficiency is clear, but the quantity depends on the vessel in question. The reduction in power demand at the propeller measured in model tests has usually been in the range between 10%-17% compared to twin screw vessels. Even higher values have also been reported.

- The resistance of the single skeg hullform with a single pod is lower than that of a twin screw hull with two shaft lines

\* Adapted from a presentation given by Oskar Levander, general manager, Wärtsilä Corp, Finland, to RINA's Design and Operation of Passenger Ships, as part of the Cruise + Ferry conference and exhibition, May 2007.



Figure 5: New ferry with mechanical thruster CRP propulsion.

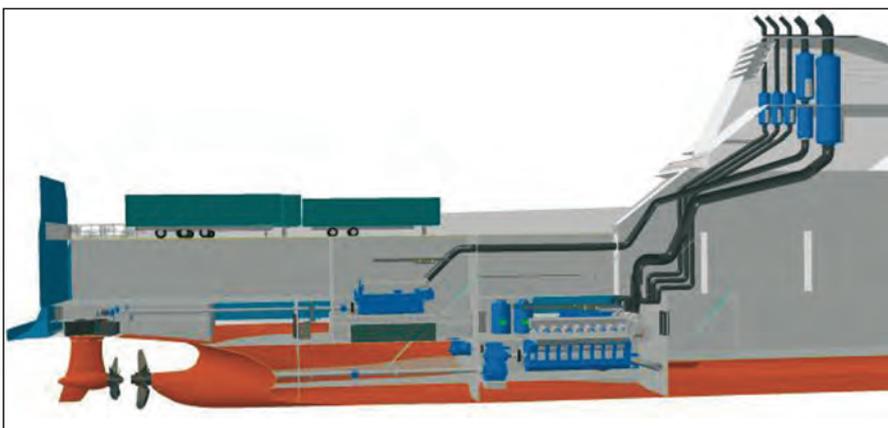


Figure 6: CRP propulsion with new engine location.

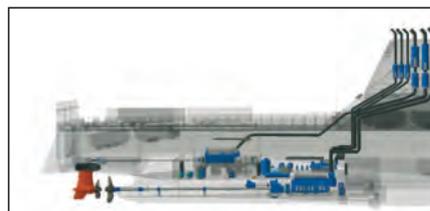


Figure 7: Transparent view of vessel showing new engine locations.

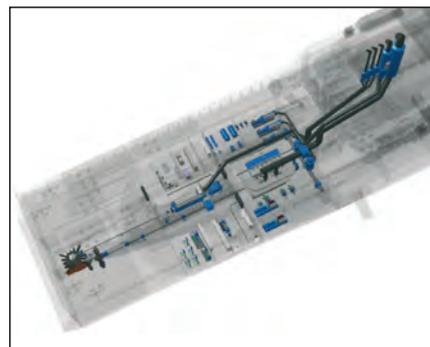


Figure 8: Transparent view of vessel showing the new concept with a large main engine.

The podded CRP concept has actually been applied in two fast Japanese ferries and the beneficial features of the concept have been showcased in real life.

The first ferries featuring Podded CRP propulsion, *Hamanasu* and *Akashia*, entered into service in Japan in 2004. These two ferries are operated by Shin Nihonkai Ferry and were built by Mitsubishi Heavy Industries. They have a service speed of 30.5knots and a top speed of 32knots. They feature a CODED (Combined Diesel-Electric and Diesel-mechanical) machinery with two 12V46C medium-speed engines driving a CP propeller, two similar 12V46 engines driving the generators, and one smaller genset for use in port. The total installed propulsion power is 42.8MW, with 17.6MW on the pod, and 25.2MW on the forward propeller.

A comparison with conventional ships in Shin Nihonkai Ferry's fleet shows that a 20% reduction in fuel consumption is easily reached. This does not take into account the fact that the new ships are one knot faster and take 15% more cargo.

The Podded CRP concept has thus proved itself in two full scale applications and delivered better fuel savings than estimated. However, to date there has not been any surge in new orders. At the same time, there have been plenty of orders for conventional ferry concepts.

Why, then, do ferry owners not appear to want to make significant savings on their fuel bills?

There is probably not one conclusive answer to this question, but one can speculate over some of the contributing reasons. One fact is that the CRP is still quite a new concept, despite the almost three year operational track record. Again, since most ferries are ordered in Europe, owners do not have concrete

feedback over the performance of the Japanese vessels. Ferries on order have also been designed for lower speeds than the two existing CRP vessels.

The question for owners is, of course, how big the saving will be for a slower vessel, given that the cost of a CRP ferry is higher than a conventional twin shaft ferry. The electric pod is especially expensive. While it is easy to show that the CRP will pay itself back in a reasonable timeframe, a higher initial price can be a critical factor for the owners trying to finance the ship in the first place.

Another aspect to the cost issue is the sister ship effect. It is always more expensive for a shipyard to build a prototype vessel rather than a repeat vessel. Even though many of the ferries on order today seem to be new designs, they are often actually based on a previous ship with many similar characteristics. This makes it increasingly difficult for the introduction of any new designs.

Wärtsilä has developed a new concept that is relying on the good features of CRP propulsion, but that is also trying to overcome some of the current shortcomings. It features a pair of Contra Rotating Propellers with the forward propeller mounted on the centre line skeg, and the aft propeller on a steerable mechanical thruster of the pulling type, located directly aft of the forward propeller. When looking from the outside, this setup looks very similar to the existing CRP arrangement with an electric pod. It also acts in the same way hydrodynamically.

However, the difference is inside the thruster. Here, the electric motor is replaced by a mechanical drive system with two 90° bevel gears. The most evident benefit of this is that it allows for fully diesel-mechanical machinery and significantly lower investment costs.

The novelty of the new propulsion concept is in the machinery arrangement that makes it both feasible for a ferry and economically superior to all other machinery alternatives on the market today. The aft thruster is driven mechanically by a medium-speed diesel engine located in the centre of the vessel above the shaft line of the forward propeller. This means that the engine is higher up than where engines are normally placed in ferries. The engine compartment penetrates the main deck. The forward propeller is driven in a traditional manner by one or two engines. The engines are located in the centre of the vessel at the tank top level.

The machinery forms a very compact package that is higher than normal, but much narrower. The machinery can also be pulled more aft-ward than in a twin shaft vessel, since the single skeg hullform allows the reduction gear to be located further aft. The thruster engine is also very far aft - made possible by its high location.

The new machinery arrangement also provides some new options when it comes to engine selection. The narrow and high machinery is well suited for a large main engine that is higher than normal. The main engines could be a two-stroke engine or the very largest medium-speed engine on the market, the Wärtsilä 64.

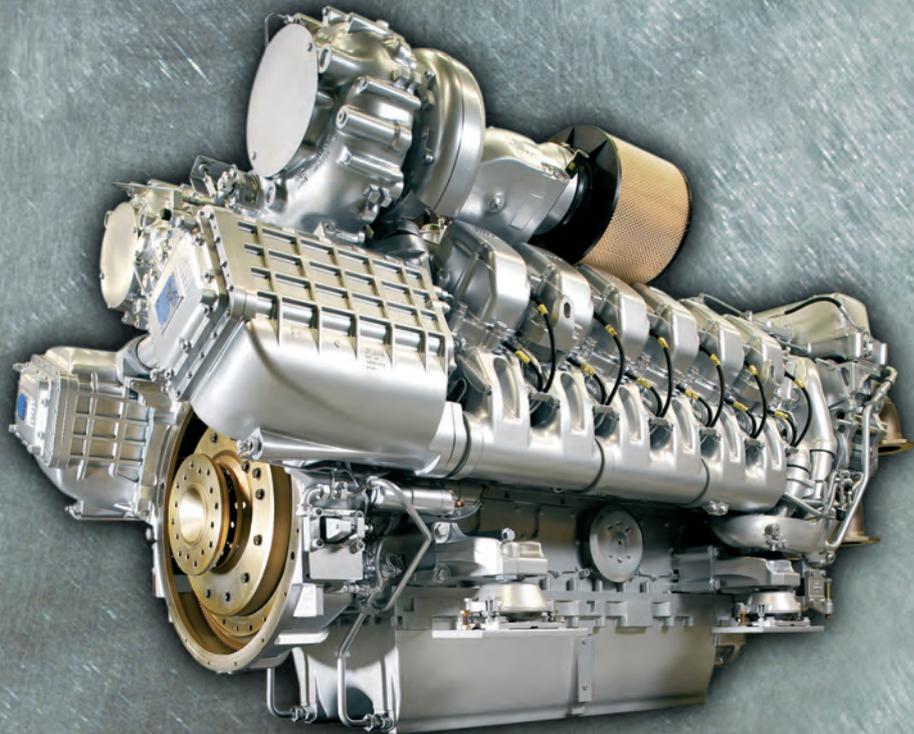
The new arrangement efficiently overcomes some of the problems associated with high engines in ferries. With a conventional propulsion solution, two large engines would block the entire beam of the main deck. Since the engines in the new proposal are mounted one after another, two engines will not take up more than two lanes on the main deck. This is only one more than what is anyway occupied by the normal engine casing. This means that only very few lane metres are lost on the main deck. In addition, the shorter engineroom allows for a longer, lower cargo hold, which compensates for the lost lane metres.

A novel cargo deck arrangement goes hand in hand with the new machinery concept. A wide ramp

MTU - A Tognum Brand

# IRON MEN

ROBUST. RELIABLE. PROFITABLE.



MTU SERIES 4000 WORKBOAT EDITION

[www.mtu-online.com](http://www.mtu-online.com)



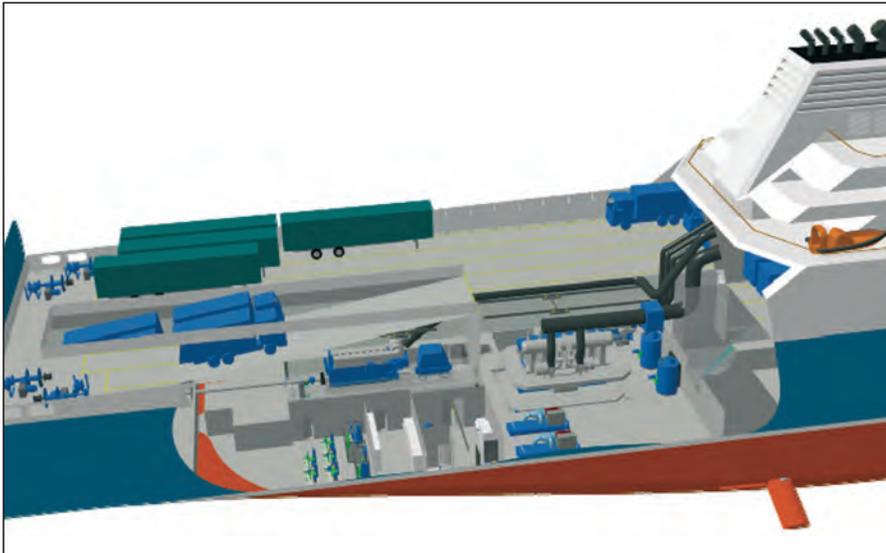


Figure 9: Arrangement with ramp to upper deck on top of machinery.

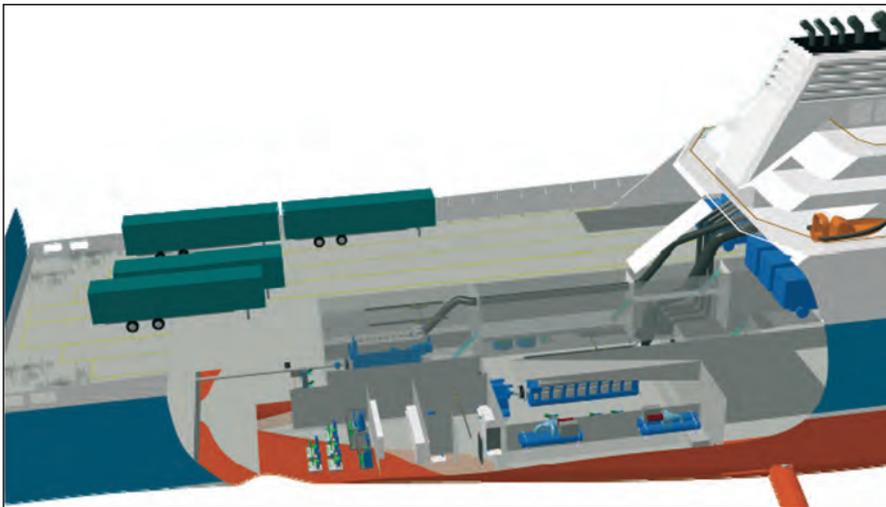


Figure 10: Arrangement without ramp to upper deck.

from the stern of the vessel up to the upper cargo deck can be located on top of the machinery. The fixed two lane ramp on top of the engines will utilise the space on the main deck efficiently, that would otherwise be lost to the machinery compartments. This way, the entire beam of the vessel can be used for loading. The two centre lanes lead directly to the upper cargo deck without any influence on the loading operation of the main deck.

A few new ferry designs have been made with different machinery solutions. One design is of a ferry with conventional twin screw machinery, while all the others have a CRP propulsion arrangement but with different main engines. The five machinery alternatives studied are:

- Twin shaft, 4 x Wärtsilä 9L38
- CRP, 7RT-flex60 + W8L38
- CRP, W16V46 + W8L38
- CRP, 2 x W8L46 + W8L38
- CRP, W8L64 + W8L38.

The vessels are designed to offer the same capacity and performance:

- Lane metre 2400m
- Payload 5150tonne
- Speed 24knots (15% SM, 85% MCR).

The ship design is kept similar, but the main dimensions vary to offer the optimal solution. This will provide the ideal means to compare different machinery alternatives.

The ferry arrived at represents a contemporary ro-pax vessel with 2400 lane metres for cargo, and day facilities for a limited number of passengers.

The CRP ferry with a main engine below the main deck can have the same dimensions as the conventional twin shaft ferry and still offer the same cargo capacity. There is some reduction in lane metres in way of the thruster engine compartment. However, this is compensated for by a larger lower cargo hold, made possible by the shorter engine room.

The CRP machinery option with a high main engine going through the main deck and with the ramp on top of the machinery cannot offer the same cargo capacity, unless the length of the ship is increased.

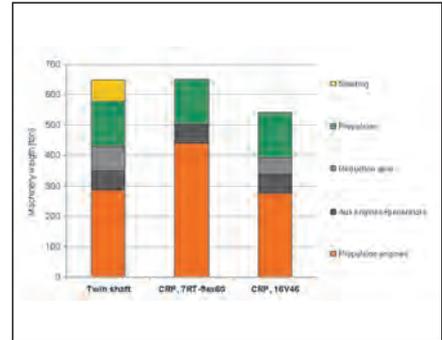


Figure 11: Machinery equipment weight.

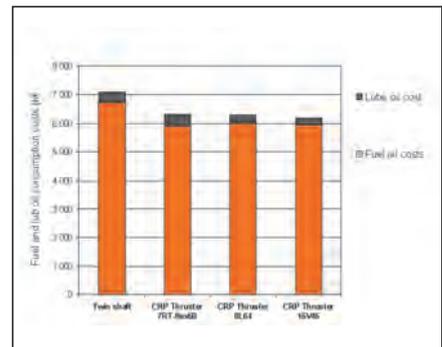


Figure 12: Annual fuel and lube oil costs (HFO = £230/tonne).

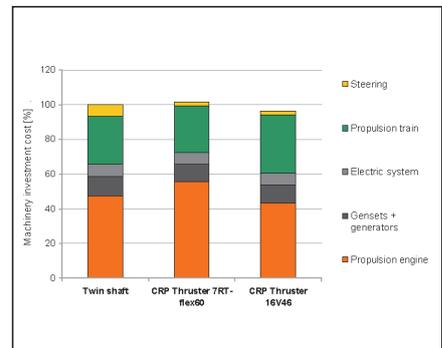


Figure 13: Relative machinery equipment investment costs.

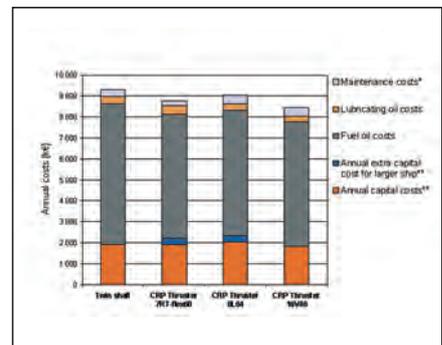


Figure 14: Annual machinery related costs.

The CRP machinery option shows an advantage when it comes to weight. Even the weight of the option with the low-speed engine is at the same



Figure 15: New ferry design with clear economic advantages.

level as the conventional twin shaft machinery.

The power demand of the vessel has been calculated and compared with results from previous CRP model tests that Wärtsilä has been involved in. The delivered power demand of the CRP propulsion is about 9.5%-11% lower than that of the twin screw option. The larger saving is achieved with the option having the lower W46 medium-speed engines, as their weight is 400tonnes lower, owing to the lighter machinery and the small ship.

However, fuel consumption also depends on transmission losses and the specific fuel oil consumption in each operating mode. The mechanical thruster has higher transmission losses than a conventional shaft line, owing to the two bevel gears. On the other hand, this represents only 25% of the total power. The main engine in the CRP option is of a larger type than in the twin shaft vessels. This gives lower specific fuel oil consumption. The total annual fuel consumption in the CRP option (16V46) offers the lowest fuel and lube oil costs. Indeed, the annual fuel and lube oil cost saving with CRP is about 11%-12.5%.

The investment cost of each machinery alternative has been estimated based on equipment offers, and it can be seen that the CRP machinery with the smaller medium-speed main engine offers the lowest machinery equipment investment costs.

In addition to the machinery, other building costs need to be assessed as well. This has been done with a system model of each vessel. The CRP alternative with the low-speed engine is about €2 million more expensive than the other options, since its hull is about 500gt larger.

Annual operating costs are, meanwhile, calculated based on an assumed operating profile. The investment costs are turned into annual payments with an assumed 12 year period and 6% interest. All CRP options show a clear saving compared to the conventional twin shaft vessel. The CRP option with the 16V46 medium-speed engine offers the best economics with an annual saving of about €850,000.

The nice feature of the CRP concept, then, is that it does not need to be more expensive than a conventional solution, despite its superior performance. The investment costs can actually be cheaper depending on main engine selection. A novel arrangement also allows for an efficient cargo handling, despite a small penalty in lost lane metres on the main deck. This can, however, be compensated for by increased ship size. This fact is taken into account in the comprehensive

economic comparison performed, showing that all CRP options show clearly superior total performance.

In conclusion, the lowest total cost level is for the CRP concept with the 16V46 main engine. All in all, the new concept offers a very competitive solution that is a step in the right direction towards a cleaner ferry business. ⚓

#### References

1. Anderson L - Wärtsilä Corp, 'Hybrid CRP pods for large Japanese ferries', *Marine News - Wärtsilä Customer Magazine* nr 1 - 2005, March 2005, www.wartsila.com
2. Levander O, Sipilä H, Pakaste R, 'ENVIROPAX ferries make promising progress', *Marine News - Wärtsilä Customer Magazine* nr 1 - 2005, March 2005, www.wartsila.com

3. Levander O - Wärtsilä Corp, 'Combined Diesel-Electric and Diesel Mechanical Propulsion for a RoPax Vessel', *Marine News - Wärtsilä Customer Magazine* nr 3 - 2001, December 2001, www.wartsila.com

4. Levander O - Wärtsilä Corp, 'Wing Thrusters propelling the next generation of ferries', *The Scandinavian Shipping Gazette*, 23 September 2005

5. Levander O - Wärtsilä Corp, 'Novel propulsion machinery solutions for ferries', World Maritime Technology Conference, London, 6-10 March 2006

6. Praefke E, Richards J and Engelskirchen J - HSVA and Blohm+Voss, 'Counter rotating propellers without complex shafting for a fast monohull ferry', Presentation at FAST 2001, Southampton UK, September 2001

## THE HAMMAR ELECTRONIC REMOTE RELEASE SYSTEM - A LIFESAVING SYSTEM AT ARM'S REACH



BETTER SOLUTIONS FOR SAFETY AT SEA

**HAMMAR**®

Seamless and solid deck covering  
with the look of real teak.



## Bolideck® Future Teak

• durable • flexible • UV-resistant  
• non-skid • safe • exterior and interior  
• impermeable to fluids • sound-insulating  
• salt water resistant

Seatrade Europe Hamburg, Stand 234.

**bolidt**  
N O L I M I T S

<http://cruise.bolidt.com>

# *Plying the Seven Seas*



Avda. Beiramar, 2 • 36208 Vigo, Spain  
Tel: +34 986 213 297 • Fax: +34 986 204 415  
[astillero@hjbarreras.es](mailto:astillero@hjbarreras.es) • [www.hjbarreras.es](http://www.hjbarreras.es)

**Shipyard**  
**BARRERAS**

VIGO - SPAIN

## Color arrives at Superspeed

THE year's end should satisfy those thirsting for the new, as the first of Color Line's innovative 'Superspeed' ferries is due delivery into services connecting Norway and Denmark.

With a second vessel due to follow in 2008, the owner characterises these ships as representing 'completely new and forward-looking transport solutions'.

'With the Superspeed concept, Color Line enters a new era in the traditional seaborne traffic between Norway and Denmark. These new ships will both increase accessibility and will shorten the distance to the rest of Europe. Superspeed are ships of the future which will carry a large number of passengers, cars, and freight quickly and efficiently to and from the Continent,' the shipowner says.

Built by Aker Yards, at Rauma, the new ships will be put into operation on the Kristiansand – Hirtshals service in December 2007 and on the Larvik – Hirtshals service in April 2008. They will have a length of 211m and will be able to accept a 2km-long line of trailers in addition to 1800 passengers.

By virtue of a 27knot service speed, the crossing between Kristiansand and Hirtshals will take three hours and fifteen minutes. Between Larvik and Hirtshals the crossing will take three hours and forty five minutes.

With a length of 211m, freight capacity of approximately 2000 lane metres, and space for around 1800 passengers, the new ships will increase Color Line's capacity considerably on these services.

Color Line's latest commitments, *Color Fantasy*, the world's largest cruiseship with car deck, and its sistership, the newbuilding *Color Magic*, are primarily aimed at the cruise, entertainment, and enjoyment sector. The Superspeed ships represent a different approach to wooing passenger, car, and freight business to and from the Continent.

The background for the company's engagement in the Color Line Superspeed concept is the



Color Superspeed design: a 'completely new and forward-looking transport solution'.

increasing demand for fast and efficient transport between Norway and the Continent. Color Line has registered an increase in freight volume of 10% per year in recent years.

There will be no passenger cabins onboard the Superspeed ships (although there will be 54 cabins for drivers) and they are therefore

being marketed for major growth potential for the land-based tourist industries in Norway and Denmark. For example, accessibility to winter destinations in Norway and tourist attractions on Jutland will be greatly improved and will be regarded more as local facilities by tourists from both countries.



# RENK INSIDE.

RENK marine gears type RSV

### TECHNICAL PARTICULARS 'COLOR SUPERSPEED' VESSELS

Gross tonnage:	33,500tonnes
Length:	211.3m
Beam:	25.8m (29.6m between bridge wings)
Draught (design):	6.55m
Height:	42.7m
Max speed:	27knots
Engine:	diesel
Main engine:	4 x 9000kW
Auxiliary engine:	4 x 3000kW
No of decks:	11
Cabins for drivers:	54
Passenger complement:	1928
Total freight capacity:	Trailers: 2034 lane metres, passenger cars: 3890 lane metres
Class:	DNV +1A1 ICE 1B, Car ferry A, MCDK, PWDK, TMON, Comf – V(2), VIBR, NAUT- OC, CLEAN, F-M or equal notation of another classification society

Vehicle Transmissions  
Industrial Gears  
Marine Gears  
Slide Bearings  
Couplings  
Test Systems

**> RENK Power Transmission Engineering for container-feeder ships** is the key to success in global container traffic. The new RENK RSV/RSH gearbox series meets the most challenging demands: The gear units of 17 different sizes cover a power range of 1,500 to 22,000 kW, their compact volume and low weight makes them especially economical – and just as reliable as the predecessor series HSU/HSN which has been proven outstandingly successful in countless applications.



RENK, a member  
of MAN Group

RENK Aktiengesellschaft  
Rheine plant  
Rodder Damm 170  
48432 Rheine, Germany  
Phone +49.5971.790.317  
Fax +49.5971.790.208  
info.rheine@renk.biz  
www.renk.eu

RENK Aktiengesellschaft  
Hannover plant  
Weltausstellungsallee 21  
30539 Hannover, Germany  
Phone +49.511.8601.298  
Fax +49.511.8601.288  
info.hannover@renk.biz

POWER FOR MARINE PROFESSIONALS

# A REVOLUTION FOR PATROL BOATS



Unmatched in speed, acceleration and fuel economy, the Volvo Penta IPS is a revolution in the marine world.

The new choice for fast patrol boats.

- D4/D6 common rail marine diesels deliver improved performance and fuel economy – over the whole speed range.
- Integrated exhausts positioned under the boat greatly reduce smoke and noise.
- Active pods give unsurpassed manoeuvrability – further enhanced with the optional joystick function.
- Stainless steel and bronze throughout for long service life in tough seawater conditions.

Engine:	<b>IPS350, D4</b>	<b>IPS400, D6</b>
Crankshaft power, hp:	260	310

**VOLVO  
PENTA**

[www.volvopenta.com](http://www.volvopenta.com)



**Harland and Wolff  
Heavy Industries Ltd**

**FORGING THE FUTURE SINCE 1861**

## **SHIP & OFFSHORE UNIT REPAIR AND CONVERSION**

### **Docking Facilities**

• 556m x 93m	2 x 840T Gantry
	2 x 60T
	2 x 9T
• 335m x 50.29m	2 x 40T
	1 x 80T

### **Quayside Facilities**

• 400m x 8.6m DRAFT	2 x 40T
• 300m x 8.5m DRAFT	1 x 5T

Licensed TBT Paint Removal System

Licensed Open Grit Blasting

1500m<sup>3</sup> Slops Facility

Full Design Engineering Facility

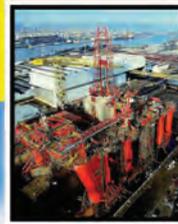
Harland and Wolff Heavy Industries Ltd  
Queen's Island, Belfast, BT3 9DU, NIRELAND, UK

TEL: 00 44 2890 458 456

FAX: 00 44 2890 458 515

Email: [billymc@harland-wolff.com](mailto:billymc@harland-wolff.com)

**[www.Harland-Wolff.com](http://www.Harland-Wolff.com)**



## Landmark wave piercer makes its debut

**THE first of Incat's landmark 112m-long wave piercing catamarans, *Natchan Rera*, has been delivered to Japanese company Higashi Nihon Ferry.**

**O**RDERED in May last year, the largest vessel ever produced by Hobart's Incat will operate across Japan's Tsugaru Strait between the islands of Honshu and Hokkaido, approximately halving the time currently taken for voyages between Aomori and Hakodate by existing ships. In service, the wave piercer offers a crossing time of one hour and 45 minutes on the 61nm passage.

The largest catamaran ever built in Australia, the new ferry will provide greater sea-keeping qualities and passenger comfort, even over Incat 98m class, on this often turbulent crossing.

The largest diesel-powered high-speed catamaran in the world, *Natchan Rera* (Incat Hull 064), was designed in a partnership between Stuart Friezer Marine and Revolutions Design, building on ideas first kicked about six years ago.

The result is a ship that sails at loaded speeds of approximately 40knots and has the capacity to carry 355 cars, or 450 lane metres of trucks and 193 cars. While Incat's 112m design can accommodate up to 1500 persons, *Natchan Rera's* accommodation has been custom designed and laid out to cater for 800 persons.

Higashi Nihon Ferry is fulfilling the first part of its plan to expand the prospect of its ferry business by changing from the existing cargo-centred strategy to the creation of a hospitality business with a high added value, targeted at the customer. The next stage of the company's plan will see the delivery of a sister, Incat Hull 065, in mid-2008.

*Natchan Rera's* interior design has come about through Incat's partnership with MEC Design International, of Japan.

The passenger spaces onboard *Natchan Rera* are located on two decks, Tiers 4 and 3. The latter is the main passenger deck, boasting three lounges, and is accessed from the vehicle decks, Tiers 2 and 1, by stairways forward and aft and, in a claimed first for high-speed catamarans, also by Kone escalators port and starboard.

Passengers entering the accommodation via the escalators, or via shoreside gangways, arrive into the heart of the craft, the Entrance Lounge. The lounge is 30% open to the adjacent lobby space, fabricated in aluminium with wood laminate finish.

Located around the centrepiece staircase and atrium is café style seating where up to 60 passengers can sit around tables on Beurteaux Ocean Outdoor chairs. Here, for passenger entertainment, four large LCD screens are installed.

For the flooring of the busy walkways around the café and shop, Amtico tiles finished in marine florentine blues, wild cherry, and marine white maple, have been used. Axminster carpets have been made by Brintons Carpets.

Interiors throughout *Natchan Rera* are finished with lightweight Ayrlyte laminated



*Natchan Rera*, the shipbuilder's largest ever catamaran.



Form featuring long bows.

composite panels. These panels assist in the all important reduction of vessel weight, which in turn helps towards increasing speed, reducing fuel consumption, increasing range and payload, and lowering the vessel's centre of gravity, according to Incat.

The wheelhouse onboard *Natchan Rera* provides 360° visibility for the officers over the top of the aerodynamic superstructure, while an aft-facing docking console and CCTV

monitors negate the need for bridge wings with their associated windage and weight. However, berthing stations have been provided for the customer, below on Tier 3. The bridge is fitted with electronic, navigation, and communication equipment to comply with the High Speed Craft Code. There are three forward facing adjustable seats around the centre line, the Captain sitting in the centre, with the First Officer to starboard and the Chief Engineer to port.

There is space for 45m of freight at 3.1m wide and 4.35m clear height plus 193 cars at 4.5m length x 2.3m wide. If the vessel was to be filled entirely with cars then up to 355 vehicles may be shipped.

Hobart-based company Colbeck & Gunton supplied the lightweight structural fire protection system aboard *Natchan Rera*, including fire doors and dampers. To protect all moderate and high-risk spaces the 'rapid access' (deckhead) and 'lightweight' (bulkhead) fire protection system meets all the demands for lighter weight and faster installation/removal for this type of craft. An addressable fire detection system, CCTV cameras, zoned fire sprinkler systems, and hydrants protect vehicle decks and also passenger areas and engine rooms.

*Natchan Rera* is powered by four MAN 20V 28/33D diesel engines, each rated 9000kW at 1000rev/min and delivering a low weight when compared to other engines in its class. It is reckoned to burn less kg per cargo tonne per hour than any other high-speed catamaran.

The latest combustion chamber technology with electronically-controlled pump pipe injection system and optimised cylinder pressures, reduces specific fuel consumption to less than 190g/kWh. At almost a 7% reduction per kWh over the previous generation of medium-speed diesel engines, this represents a saving on annual fuel bills. The vessel is also environmentally compliant with low NOx of less than 10g/kWh.

## MAN takes engine contract

MAN Diesel won the contract for eight engines to power Incat's record-breaking catamarans. It also involves the first orders received for the 28/33 D diesel since the engine's transfer from MAN Diesel's UK facilities to its engine works in Augsburg, Germany.

In detail, the contract covers eight of the largest, 20 cylinder versions of MAN Diesel's four-stroke, 52° vee configuration 28/33 D engines, each rated 9000kW at 1000rev/min. Two of the 20 cylinder engines are installed in each of the twin aluminium hulls where they drive high capacity reversible waterjets via reduction gears with horizontal offset input and output shafts. The total installed power of 36MW gives the catamarans a loaded speed of 40knots, Incat states.

28/33 - the first delivery from Germany, after MAN shut down its UK works.



**RFD BEAUFORT**

*at the forefront of survival technology*

RFD Beaufort is internationally recognised as the world leader in the design, development and manufacture of high quality safety and survival equipment for the commercial marine industry. Part of the Survitec Group, with more than 80 years experience, flexibility of a global servicing network plus quality assurance, RFD Beaufort has the capability, facilities and technological resources to meet the most stringent market or customer demands.



Survitec Group Limited, Head Office, Kingsway, Dunmurry, Belfast BT17 9AF, N.Ireland, UK

+44 (0) 28 90301531  
+44 (0) 28 90621765

info@survitecgroup.com  
www.survitecgroup.com

**survitecgroup**  
Part of the SURVITEC group of companies

### TECHNICAL PARTICULARS NATCHAN RERA, HULL 064

Design:	Two slender, aluminium hulls connected by a bridging section with centre bow structure at fwd end. Each hull is divided into nine vented, watertight compartments divided by transverse bulkheads. Two compartments in each hull prepared as short range fuel tanks and one as a long-range fuel tank
Designer:	Revolution Design Pty Ltd
Builder:	Incat Tasmania Pty Ltd
Class Society:	Det Norske Veritas
Certification:	DNV +1A1 HSLC R1 Car Ferry "B" EO
Length overall:	112.60m
Length waterline:	105.60m
Beam of hulls:	5.80m
Beam (moulded):	30.50m
Draught:	approximately 3.93m
Speed:	40knots
Tonnage:	10,841tonnes gross 6264tonnes net Up to 1380tonnes deadweight
Total persons:	800 persons
Vehicle deck:	450 truck-lane metres plus 193 cars or a total of 355 cars
Capacities, passengers:	800 persons (including crew)
Vehicles:	450 truck lane metres at 3.1m wide and 4.35m clear height plus 193 cars at 4.5m length x 2.3m wide or 355 cars only
Axle loads:	Tier 1 – 12tonnes per axle Tier 2 – up to 9tonnes per axle
Tankage:	Fuel Oil – 900,000litres Fresh Water – 10,000litres Sewage – 5000litres Lube Oil – 2 x 1000litres ER Oily Water – 4 x 150litres Genset Fuel Oil – 2 x 1238litres
Evacuation:	Escape is via four Marine Evacuation Stations, two port and two starboard. The two forward MES serve a total of 200 persons each and the two aft MES can serve up to a total a total of 300 persons each A total of nine 100-person rafts are fitted 2 x SOLAS inflatable dinghy with 30hp motor and approved launch/recovery method

#### Machinery Installations

Main Engines:	4 x resiliently mounted MAN 28/33D marine diesel engines, each rated at 9000kW
Fuel consumption:	SFC of <190g/kWh
Emissions:	<10g/kWh
Waterjets:	4 x Wartsila LJX 1500 waterjets configured for steering and reverse
Transmission:	4 x ZF60000 NR2H gearboxes, approved by the engine manufacturer, with reduction ratio suited for optimum jet shaft speed
Ride Control:	A 'Maritime Dynamics' active ride control system is fitted to maximise passenger comfort This system combines active trim tabs aft and fold-down T-foil located at aft end of centre bow fitted with active fins

#### Electrical Installations

Alternators:	4 x MAN D 2876 LE 301/HCM 534 C 360kW (nominal) marine, brushless, self-excited alternators
Distribution:	415V, 60 Hz. 3 phase. 4 wire distribution with neutral earth allowing 240volt supply using one phase and one neutral. Distribution via distribution boards adjacent to or within the space they serve



The largest diesel-powered high-speed catamaran in the world.

The ferry is fitted with four of the largest transmissions from ZF Marine GmbH, the ZF 60000 NR2H, each with maximum rated power of 12387kW. Special technical solutions were required to satisfy the engineroom layout and the demand for the highest reliability. The transmission had to be matched to the interface provided and the ZF solution was an excellent compromise with low weight and small dimensions.

Engine power is converted to propulsion thrust through a new design of waterjet from Wärtsilä. The new LJX waterjet is claimed to offer, in comparison with other waterjets available today, a 25% reduction in mounting flange diameter, a 10% overall weight reduction, and a 35% increase in cavitation margin. It comes with a 1500mm diameter impeller and an inboard layout for steering and reversing hydraulics.

A substantial weight saving is also claimed to have been achieved through the use of Centa carbon-fibre shafts. Some 70% of weight is said to have been saved compared to that in the use of conventional steel shafts.

Power generation onboard has been secured via four MAN D2876 LE301/HCM 534C 360kW alternators.

Sea trials for *Natchan Rera* were completed in three days with all systems meeting expectations. During the course of trials while running at 100% MCR (maximum continuous rating), speeds of up to 45.4knots were averaged with 250tonnes deadweight onboard. Loaded with 600tonnes deadweight, an average speed of 41.9knots was achieved at 100% MCR, almost 3knots above contract requirement.

The wave piercing catamaran's sea-keeping qualities are characterised by its Maritime Dynamics/Incat Ride Control System, consisting of transom-mounted trim tabs and a retractable T-foil. These, combined with Incat's unique hullform featuring long outer bows, fuller mid-ship sections, stern skeglets, and centre bow clearances, means motion sickness incidence has been reduced in higher sea states by reducing pitch, roll, and heave, the major contributors to passenger discomfort.

*Natchan Rera* is equipped with four Liferaft Systems Australia Marine Evacuation Stations, two port and two starboard. The two forward MES serve a total of 200 persons each. The two aft MES serve up to a total of 200 persons each. A total of nine 100-person rafts are fitted. Two SOLAS Narwhal inflatable rescue boats, each with 25hp motors, are provided for launch and recovery operations. 

# New standards for catamaran sea-keeping

WHEREAS speed and deadweight has traditionally been the subject of passionate discussion in the High Speed Craft (HSC) industry, sea-keeping is the new hot topic among operators and observers alike. Here are the thoughts of Gary Davidson and Tim Roberts of Tasmania's Revolution Design.

A SPEED and deadweight target for high-speed craft has long been 40knots with 1000tonnes deadweight. This has been the virtual Holy Grail for HSC. RevD/Incat set out to achieve this target and the current 112m wave piercing catamaran design is the result. A speed of 40knots and 1000dwt is possible, depending on the hull and cabin arrangement.

Industry discussion wrongly suggests that catamarans are not suitable for good sea-keeping. The comparisons have generally compared a 26% greater waterline length (LWL) and 14% greater beam vessel against the 96m WPC. Other comparisons have been published but with insufficient information on the catamaran vessel to understand why there is such a difference. Generally, most of this discussion suggests that catamaran motions are similar to monohull and monohull type vessels in head seas, but poor in beam seas. In service experience shows improvements in sea-sickness rates of the 96m/98m WPCs over smaller vessels. This is a good result for the 112m WPC. Being a much longer, wider, and heavier vessel, the sea-keeping will be similarly improved but with greater efficiency than any competitor.

## Speed and efficiency

To increase the speed of a vessel, the length to breadth (L/B) ratio must be increased to reduce the wave making resistance, Dubrovsky, (2001). For a monohull this means a very long vessel or the stability of the vessel will be reduced too far. The Pentamaran, Dudson, (2001) and the Austal Trimaran, Armstrong, (2003) have been designed to overcome this limitation by providing outriggers to a monohull to provide the necessary stability, while reducing L/B to an appropriate figure. The L/B of each hull of the catamaran is restricted only by the size of the waterjet. On a catamaran it is easier to achieve a high L/B for each hull as only two waterjets are in each hull, whereas the stabilised monohull would have to fit three or four. An un-stabilised monohull would not be able to achieve the same L/B ratio unless it was very long. The disadvantage of length in this respect is that the vessel lightship weight could become unreasonable and the vessel may not be practical for some of the ports' HSC use.

In general, a high-speed catamaran has shorter length than an equivalent monohull or stabilised monohull. Equivalence here means similar speed and carrying capacity. For commercial operations in today's economic climate, the efficiency of the vessel is very important. It can be seen that at equivalent payload and power, the vessel that can go faster should be the most efficient, as to gain speed, the hulls must

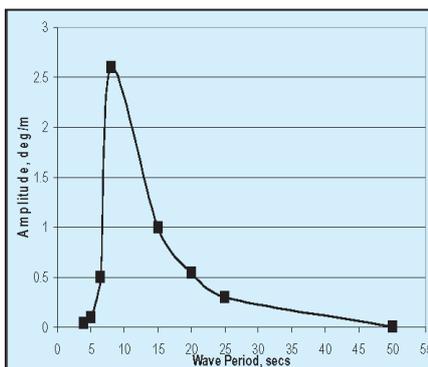


Figure 1: Typical RAO, pitching motions, no ride control.

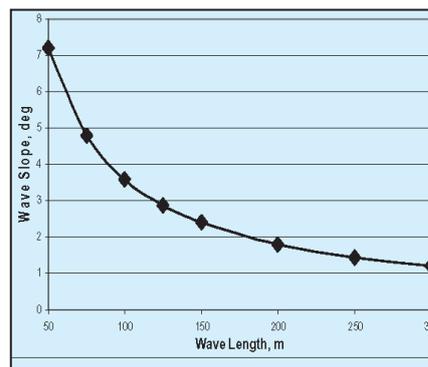


Figure 2: Wave slope per metre amplitude.

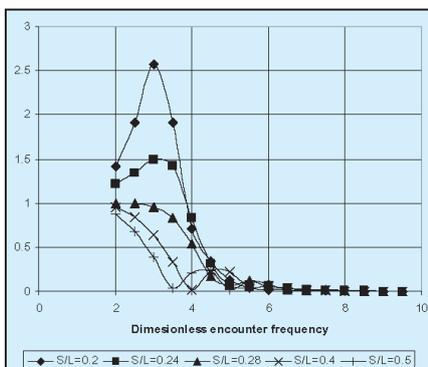


Figure 3: Roll RAO in beam seas at 40kt: NPL hullform catamaran (2500tonnes, 102m length) (Computed by BEAMSEA including sway motion), S = hull spacing, l = waterline length.

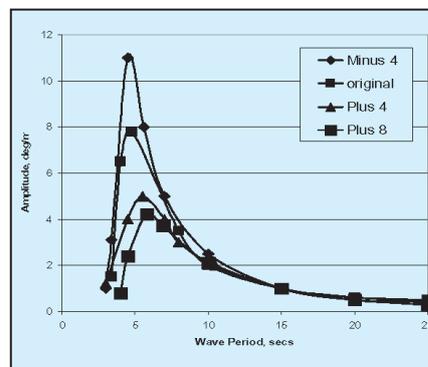


Figure 4: Comparison of results for variation in hull separation, no ride control.

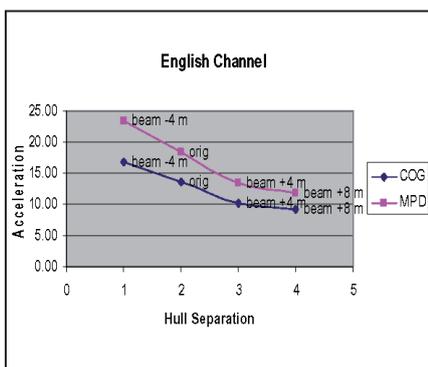


Figure 5: Comparative accelerations at varying hull separation, no ride control, COG is Centre of Gravity, and MPD is Main Passenger Deck.

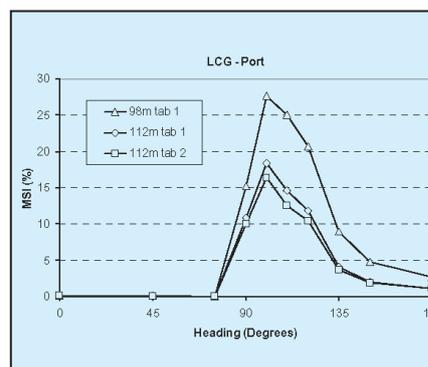


Figure 6: Simulation Comparison of INCAT Tasmania 98m and 112m catamarans, Jonswap Spectrum 7s 3m, 39knots, fully laden. Tab RCS, Motion Sickness Incidence (MSI) along port side, 2 hour exposure.

be efficient. Catamarans and especially WPC designs have superior speed and efficiency. For example, the 98m can carry 500tonnes deadweight at 40knots with 28MW of power. The 112m can carry double that deadweight at 40knots with only a 20% increase in power.

The predominant motions for most ships are generally pitch, heave, and roll. The others do not contribute in a significant way and so will not be discussed here. Pitch is a rotation around a transverse axis and results in the bow going up as the transom is going down and vice versa.

Heave is the whole vessel going up or down evenly. Roll is the rotation around a longitudinal axis with the port side going down while the starboard goes up or vice versa.

A typical Response Amplitude Operator (RAO) is shown in figure 1 and it can be seen that the amplitude tends to peak at a certain encounter period. In beam seas the encounter period is equivalent to the wave period. In head seas the encounter period decreases as



# You're not alone.

**We're always there to support our clients in whatever location or situation they find themselves.**

The world is where we work. Whether it's the Mid-Atlantic or the South Pacific, our local expertise means we can deliver what you need and what we promise.

Hamworthy people create this global presence through a network of local offices and manufacturing facilities. It allows us to be fast, more direct and better informed.

Hamworthy Middle East is the latest edition to our global support network. Hamworthy now has over 750 employees supporting ship owners and shipyards throughout Europe, the Middle and Far East and North America.

To find out more visit [www.hamworthy.com](http://www.hamworthy.com)

the vessel goes faster, since the vessel sees more waves the faster it goes. At zero vessel speed the encounter period would match the wave period but as the vessel gains speed the encounter period decreases. In following seas vessel speed increases the encounter period or less waves are seen.

It can be seen from the RAO in figure 1 that the motion increases significantly at a certain wave period seen by a large peak. The wave period associated with the peak should be avoided in operation. A change of heading and/or speed can change that encounter period. The wave encounter period is more important than the wave height. A resonance is set up when the vessel natural period matches that of the encounter period.

As waves get longer the wave slope reduces, this is intuitive, and a wave of 1m height at 40m length has to be steeper than a wave of the same height at 100m length. Figure 2 plots the wave slope/metre amplitude versus wave length. It can be seen clearly that a ship that is in resonance with a 50m wave is meeting a wave much steeper than a vessel in resonance with a 100m wave.

**Roll with it**

It has been suggested that the sea-keeping of a catamaran is reliant on its transverse metacentric height (GM). This is a measure of a vessel's stability; the higher the value the greater the stability. In monohull theory it can also be used as a measure of vessel motions. Catamarans can have GM ranging from 20m – 40m depending on size, whereas a monohull GM can be as low as 4m.

Further, it has been suggested that catamarans have high accelerations in beam seas due to their short roll period when compared to the longer roll period of a monohull.

That is not the experience with Wave Piercing Catamarans; in fact it has always been felt that catamarans roll much less than a similar size monohull. Dubrovsky, (2001) considers a well designed catamaran to have two to three times less roll amplitude than an equivalent monohull with equal accelerations. Experience with monitoring of WPC has indicated that the accelerations and motions in beam seas are more than acceptable and are well within HSC code limits.

Exploring the concept of high GM, catamarans by their nature have much higher GM values; hence their stability is correspondingly higher. Added roll inertia is assumed to be 25% of actual inertia for a monohull vessel. Lloyd (1998) recommends a natural roll period of between 10 seconds to 20 seconds to ensure acceptable roll motions. To increase the roll period to within these recommended values, fluid metacentric height (GMF) can be reduced or roll moment of inertia (Ixx) increased. Reducing GMF is possible in a monohull by raising the vertical centre of gravity. This is at the expense of stability though so is not always possible. It is more difficult in smaller vessels as these vessels usually have high GM for their length, Martin, (1994).

Catamarans do have high centre of gravity but due to their hull separation also have high GM which is a function of transverse second moment of waterplane area, so increasing hull

separation will generally increase this value. The benefit of this is increased stability. If the monohull theory is followed it would seem to indicate a shorter roll period and hence higher accelerations. What the monohull theory does not account for is that the added roll inertia also increases.

The formula does not account for damping forces which increase with hull separation.

Dubrovsky, (2001) states that the wider the overall beam of a multihull the smaller the motions, and that a catamaran does not roll like a monohull but that each hull heaves up and down. For catamarans he considers the added roll inertia to be equivalent to the heave value as opposed to the roll value usually used for a monohull. For monohulls in heave, the added inertia is generally equivalent to the actual inertia, whereas for roll it is 25%.

The natural roll period increases with increasing overall beam, which would provide a subsequent decrease in acceleration levels. Accelerations are proportional to the inverse of the period squared, Martin, (1994).

Fancescutto, (2000) tested models in beam seas and found that an increase in hull separation decreased motions. He found that only at small values of hull separation did the response exhibit peak like behaviour, similar to a monohull. Wahab, (1971) tested models and found that roll response decreased with increasing hull separation. He also found that roll response was lower at forward speed than at zero speed. Davis (2006) has found a decrease in roll motion with increasing hull separation, figure 3 shows the peak like behaviour disappearing at higher separation.

Studies were undertaken during the design of the 112m where the overall beam or hull separation was decreased by 4m, increased by 4m and 8m compared to the original. The original was equivalent to the hull separation on the 98m vessel. Referring to figures 4 and 5, some of the results of this study can be seen where the motions and accelerations reduce significantly with wider hull separation and increase significantly with decreased separation. From the original hull separation, (same as 98m) to the plus 4m separation, (same as 112m) the accelerations reduced by 25%, DNV, (2000). In figure 4 it can be seen the period at which the peak response occurs has also shifted, a higher period for the increased hull separation.

Dubrovsky (2001) has also found that increasing hull beam to draught ratio reduces roll motions. On the 112m, the hull beam to draught ratio has increased approximately 15%. The side effect of this is a reduction in resistance.

Active ride control and viscous damping, Faltinsen, (1993), is neglected in figures 4 and 5, the effect being that motions would be expected to be even less in reality at speed.

MDI (2001) have found significant reductions in motions and accelerations in beam seas for the 112m over the 98m. This would seem to be from the increased hull separation and the greater effectiveness of the ride control. The trim tab has a greater aspect ratio on the 112m due to the wider hulls and also greater lever arm due to increased hull separation. Greater aspect ratio equals greater lift. The MDI results

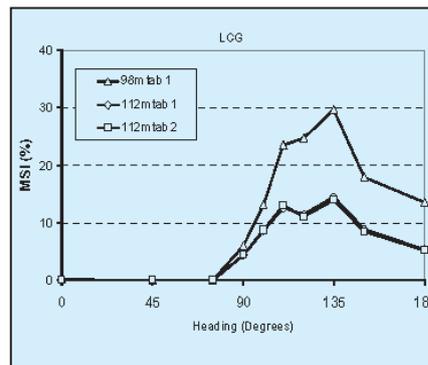


Figure 7: Simulation Comparison of INCAT Tasmania 98m and 112m catamarans. Jonswap Spectrum 8s 4m, 38knots, fully laden. Tab RCS, Motion Sickness Incidence (MSI) along Centreline, 2 hour exposure.

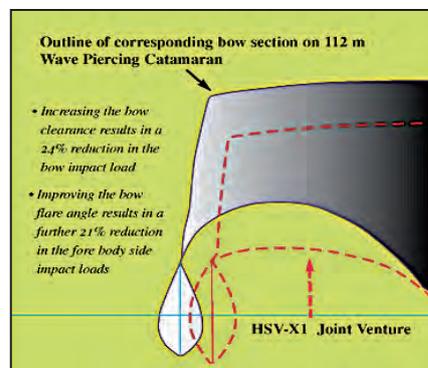


Figure 8: Comparison of tunnel clearance between 96m and 112m vessels, HSV-X1 is a 96m vessel.

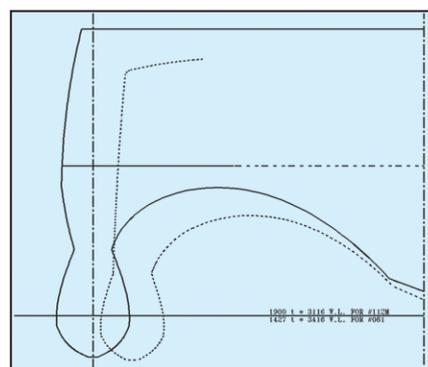


Figure 9: Comparison of tunnel clearance between 98m and 112m vessels.

vary depending on wave height and period but reductions in roll angle and MSI are generally in the region 25% to 35%, but can be up to 50% depending on wave period and height. Referring to figures 6 and 7, tab 1 for the 112m refers to a tab similar to the 98m in aspect ratio. Tab 2 refers to a higher aspect ratio tab as fitted to the 112m in the final design.

**Natural roll period**

In monohull theory, it is always thought that a higher natural roll period gives the lower

# More and more shipyards

## are discovering our contracting & components packages

**Dredging equipment specialist VOSTA LMG for dredging installations including design, key components supply and assisted assembly at your shipyard**

Working with many shipyards during numerous projects enabled us to supply dredge systems precisely tuned to your requirements. Apart from delivering our in-house designed and under our supervision produced range of top quality key components to shipyards worldwide, we also assist in dredge upgrades, refits, repairs and new building at local shipyards.

Combining our thorough knowledge on dredge systems design with your shipbuilding capabilities will lead to even more cost-effective dredges...

**Features:**

- Years of experience with shipyards worldwide
- Supply of dredge design and detailed drawings
- Effective communication with shipyard staff
- On-site guidance for fast and efficient assembly of dredge systems



<b>The Netherlands:</b>	Klaprozenweg 75e • 1033 NN Amsterdam • The Netherlands • Phone: +31 20 4936666 • Fax: +31 20 4936670
<b>Germany:</b>	Konrad-Adenauer-Str. 4 • 23558 Lübeck, Germany • Phone: +49-451-8085-100 • Fax: +49-451-8085-121
<b>China:</b>	1908A Jingtai Tower • 24 Jianguomenwai Street • 1000222 Beijing • China • Phone: +86 10 6515 6640 • Fax: +86 10 6515 6641
<b>China:</b>	Rm 416-417, 4/F, Private Enterprises Mansion, No.10 Technology 1st Rd. • Zhuhai, Guangdong, 519085, P.R. China • Phone: +86 (0756) 339 5188.339 5288
<b>USA:</b>	998 Gold Ridge Rd. • Sebastopol, California 95472 • United States of America • Phone: +1 707 823 8503

E-mail: [info@vostalmg.com](mailto:info@vostalmg.com) • [www.vostalmg.com](http://www.vostalmg.com) • [www.vostalmg.cn](http://www.vostalmg.cn)

# Maritime technology

FORCE Technology offers maritime expertise within design studies, towing tank tests, wind tunnel tests and port studies.

We offer our value-creating solutions to leading international consultants, ship-owners, and shipping companies. Our expertise covers all kinds of ships and offshore platforms.

FORCE Technology's solutions include loading computers, decision-support tools, and simulators. Further, we assist in training of ship-owners, operators, and maritime training organisations.

FORCE Technology is an international technological consultancy and service provider.

Our customer base consists of e.g. the energy and process industry, the oil and gas industry, the pharmaceutical and food industry, the maritime industry and the public sector.

We have companies in Denmark, Sweden, Norway, Russia and USA.

FORCE Technology  
Hjortekærvej 99  
2800 Kgs. Lyngby  
Tel. 72 15 77 00  
[force@force.dk](mailto:force@force.dk)  
[www.forcetechnology.com](http://www.forcetechnology.com)



motions. When looking at figure 2, which plots the wave slope versus wave length, it can be seen why this may be the case. A vessel will react worst to the wave period it is in resonance with, the greater that period, (and wave length) then the less is the slope of the wave. Generally it is assumed that the vessel will roll no more than the angle of the wave, Lloyd (1998), so the higher the natural period the longer the wave that the vessel reacts to, so the lower the roll angle. The other advantage is that longer waves are statistically less likely to occur, hence the resonance will occur less frequently. So for catamarans and other multihulls it would be important to increase the natural period in roll, this can be done by increasing the hull separation, Dubrovsky, (2001), Francescutto, (2000).

Tunnel height or clearance is thought to be the most important factor to reduce slamming that arises from pitching motions; others are longitudinal stability, ship length versus wave length, block and prismatic coefficients, and foils. An increase in tunnel height twofold can reduce accelerations by four to five times, Dubrovsky (2001).

Davis, (2006) created drop test experiments with varying shapes of centre bow and found that the shape of the centre bow is critical to impact pressures. A shape more similar to the 112m shape reduced impact pressures by 50% compared to the 96m shape. This is expected to translate into significant reductions in accelerations during slamming events.

Although desirable to increase the tunnel clearance to reduce slamming loads, practically it may not be so, eg, raising the tunnel clearance means increasing the freeboard, making it much more difficult (cost and weight) to construct ramps down to low wharves or pontoons. Safety in following seas may be compromised if the tunnel clearance is excessive. The increase in tunnel clearance may also unnecessarily increase structural weight.

A compromise reached with the 112m design was to increase the tunnel height forward only; the shoulder area of the centre bow was lifted significantly, as shown in figures 8 and 9, while the centreline area was left relatively close to the water to ensure early immersion and subsequent damping and motion control. Part of the flat cross structure aft of the centre bow was also raised in the process. Shaping of the centre bow shoulder area was also done to eliminate flat surfaces, which can produce very high accelerations and pressures. The 96m series of vessels have very low tunnel clearance and very flat surfaces. The 98m being the 'Evolution' has been totally reshaped in that area to reduce flat surfaces and increase tunnel clearance in the shoulder area.

Compared to the 98m, MDI (2001) found that in head or bow quartering seas, MSI for the 112m reduced between 10% and 20% depending on the wave period and sea state. Refer to figures 6 and 7.

Most text suggests that a longer vessel will reduce motions. A vessel of infinite length will never respond to a wave, every wave will be shorter than it is, and a wave of infinite length would have infinitely small or zero steepness. But an infinitely small length ship will respond to every wave it meets as every wave is longer than itself. A very small length wave is very

steep so the infinitely small ship will simply follow the very steep wave profile with most case motions. As the vessel and equivalent wave length is increased the wave steepness is reducing. It can be seen from figure 2, the wave steepness reduces more rapidly for the shorter lengths hence the high reduction in motions for vessels in that length. Steep long waves are less likely to occur statistically, and practically at a certain steepness, the wave will break, limiting its maximum steepness.

It can be seen that length (size) has a significant effect on motions, especially in the smaller to medium size range between 500tonnes and 2000tonnes, refer to figure 10. This is similar to what Lloyd (1998) found where accelerations reduce rapidly with length increase in the smaller vessels and reduce less rapidly at greater lengths. For example, from LWL 86m to 115m, rms accelerations reduced 40%, whereas from LWL 250m to 300m, rms acceleration only reduces 10%, Lloyd, (1998). The 86m LWL is significant in that it represents a 96m WPC and the 115m LWL represents a larger competitor.

**Ride control**

Ride control is very effective at reducing motions of high-speed craft, especially when the vessel is operating at or near its resonance period. When at resonance, the waves do not need a lot of energy to create vessel motion, so the ride control is most effective as less energy is required to control that motion. Dubrovsky (2001) found that pitching motions can reduce significantly with a bow foil with accelerations reduced by up to 30% with the correct location and area of foils.

Sclavounos, (2003) has found that ride control can be very effective in eliminating resonant peaks in heave and reducing resonant peaks significantly in pitch. Higher speed and higher aspect ratio of ride control surfaces increase the effectiveness of ride control significantly.

The 112m simulations from MDI (2001) predict improvements with the higher aspect ratio trim tabs fitted due to the wider hull beam, and improvements from the new higher aspect T-foil similarly.

By way of conclusion, then, sea-keeping is heavily dependant on the size of the vessel; length, beam, and weight are crucial parameters. A wider, longer vessel will generally have improved sea-keeping compared to the shorter, narrower vessel. The improvement in sea-keeping, given the right sea-state, could be significant, in fact, in the right conditions, motions could reduce to insignificance if the vessel operates in wave periods outside of its own natural periods. Ride control is very effective in reducing the peak motions, especially in resonant conditions. Motions can be reduced generally by 20% with active ride control but up to 50% depending on sea state.

The 112m WPC, when compared to the 96m and 98m WPC, can offer improvements of at least 25%, but up to 50% depending on sea state.

The wider hull separation, although increasing GM (and stability), does not lead to an increase in motions but in fact reduces motions, and quite significantly, in the right conditions.

The WPC platform allows for optimisation of the demihull shape for maximum efficiency. The

112m WPC can carry 500tonnes of deadweight at 40knots at only 85% MCR. The vessel can also carry 1000tonnes at 40knots depending on hull and superstructure configuration; this is well in excess of any of our competitors. 1500tonnes of deadweight in slow speed condition is also possible. Achieving these parameters means very high efficiency with low resistance and significantly reduced operating costs.

With its increased size and many design innovations, the 112m WPC will set new standards for catamaran sea-keeping. The selection of a High Speed Craft with a required capacity of 1000tonnes deadweight now needs to focus back onto efficiency and operating costs.

**References**

Armstrong, T, Holden, K, A New generation of large Fast Ferry – from Concept to Contract, FAST 2003.  
 Davis, M R, Whelan, J R, Modelling of Wet Deck Bow Slamming of WPC, *International Journal of Maritime Engineering*, Vol 148, RINA, 2006.  
 Davis, M R, Computation of Motion Sickness and Global Bending Motions for Intermediate and Fast Ships, ICCAS, UK, 2007.  
 DNV, 'Beam & Wet Deck variation study', Report No 00-0346, 13-9-2000.  
 Dubrovsky, V, Lyakhovitsky, A, *Multi-Hull Ships*, Backbone Publishing Company, USA, 2001.  
 Dudson, E, Gee, N, Optimisation of the Sea-keeping and Performance of a 40knot Pentamaran Container Vessel, FAST 2001.  
 Faltinsen, O M, Sea-keeping of Conventional and High-Speed Vessels, *Journal of Ship Research*, Vol 37, June 1993.  
 Francescutto, A, Mathematical Modelling of Roll Motion of a Catamaran in Intact and Damage Condition in Beam Waves, Proceedings ISOPE' 2000.  
 Lloyd, A R J M, Sea-keeping, Ship Behaviour in Rough weather, A R J M Lloyd, UK, 1998.  
 Maritime Dynamics Report MDR-707802, 'Comparative study of the ride quality of an Incat 98m and 112m catamarans' 2001.  
 Martin, J P, Roll Stabilisation of Ships, *Marine Technology*, Vol 31, Oct 1994.  
 Slavounos, P D, Purvin, S, Ulusoy, T, Kim, S, Simulation Based Resistance and Sea-keeping of High-Speed Vessels Equipped with Motion Control Lifting Appendages, FAST 2003.  
 Wahab, R, Pritchett, C, On the behaviour of the ASR Catamaran in Waves, *Marine Technology*, July, 1971.

**NOMENCLATURE**

WPC.....	Wave Piercing Catamaran
RAO.....	Response Amplitude Operator
MSI.....	Motion Sickness Index
GM.....	Metacentric Height
MW.....	Megawatt
dwt .....	Deadweight
LWL(L).....	Length Waterline
B.....	Hull beam
T.....	Draught
RCS.....	Ride Control Surfaces

# Leave fouling behind.

PPG Protective & Marine Coatings has the proven antifouling and fouling release technology to serve your marine needs:

ABC 3 is a five-year TBT-free, self-polishing antifouling recommended for long-life fouling protection under the most severe service conditions.

ABC Release is a biocide-free silicone elastomer fouling release system that creates a slick coating surface that makes it difficult for fouling to attach. But when it does attach, the vessel's movement can easily remove the fouling because of the low-friction coating system.



**PPG Protective & Marine Coatings**

[www.ppgpmc.com](http://www.ppgpmc.com)

## Common rail engine installed on Baltic Sea ferry

At the end of June, *The Naval Architect* was invited to a presentation and viewing of a newly-installed common rail (CR) engine aboard a ferry traversing the waters between Germany and Denmark. Scandlines' M/F *Prinsesse Benedikte* had MAN Diesel's L32/44CR engine fitted earlier this year.

The 142m-long *Prinsesse Benedikte* takes 45 minutes to cross the Baltic Sea, between the ports of Puttgarden and Rødby. It has four engines, three for normal operation with the fourth used in high season; in 2003 it was refitted to increase its capacity, having entered service in 1997.

Then in March 2006, major damage occurred to auxiliary engine no 3, with cylinder no 8, the engine frame, and the camshafts of cylinders 7 and 8 all damaged beyond repair. The oilpan, crankshaft journal no 8, and the turbo-charger were also damaged, but would have been repairable.

Scandlines then had to decide whether it was most viable to replace or repair the engine. Despite longer delivery time, more extensive installation work, and a complicated connection to the existing alarm and control system, the decision was made to opt for the new MAN Diesel L32/44CR engine. This was due to lower costs involved, a guarantee on the new engine and generator, claimed lower fuel oil consumption and emissions, and fewer components, which are hoped to save on maintenance costs in the future.

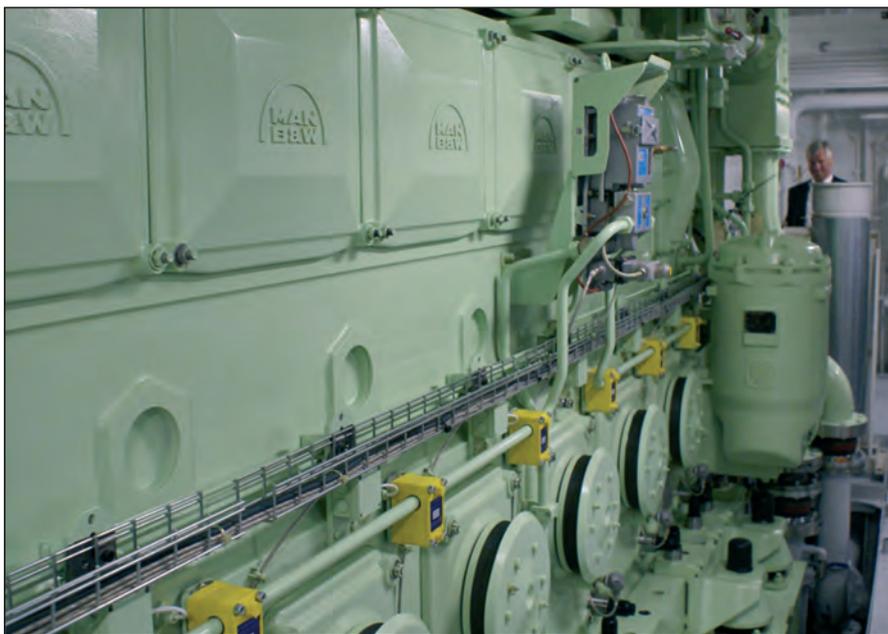
Lars Jordt, chief superintendent, Scandlines, said that Caterpillar MaK was also approached for the engine contract, but it quoted a longer delivery time than MAN, and *Prinsesse Benedikte* needed to be operational by summer 2007, its peak season.

Drydocking took place between April and May this year, with Stahlbau Grebin lifting out the damaged engine, and Voss International and Fredericia Værft overseeing the installation of the new one. The fitting took around two to three weeks.

### Engine development

MAN Diesel developed the L32/44CR with future engine requirements in mind, especially with regards to emissions and fuel consumption. MAN started CR development in 1999 and the design is based upon its predecessor, the 32/40, said to be noted for its robustness and reliability. The company gained feedback from initial field tests before the final stages of development took place.

The L32/44CR has a power output of 560kW per cylinder, with 320mm bore, 440mm stroke, and a maximum firing pressure of 230bar. LR approved the engine, and at 100% load, the specific fuel oil consumption was 177g/kWh, reducing to 175g/kWh at 85% load. Exhaust gas is thought to be invisible in the entire load range.



The L32/44CR engine onboard *Prinsesse Benedikte*.



Scandlines' Baltic Sea ferry, *Prinsesse Benedikte*.

The engine is claimed to have a higher compression ratio, optimised valve timing, flexible intelligent CR-injection, and efficient turbocharging. The optimisation of the air inlet system was achieved by computational fluid dynamics (CFD), and experimental verification on the test rig.

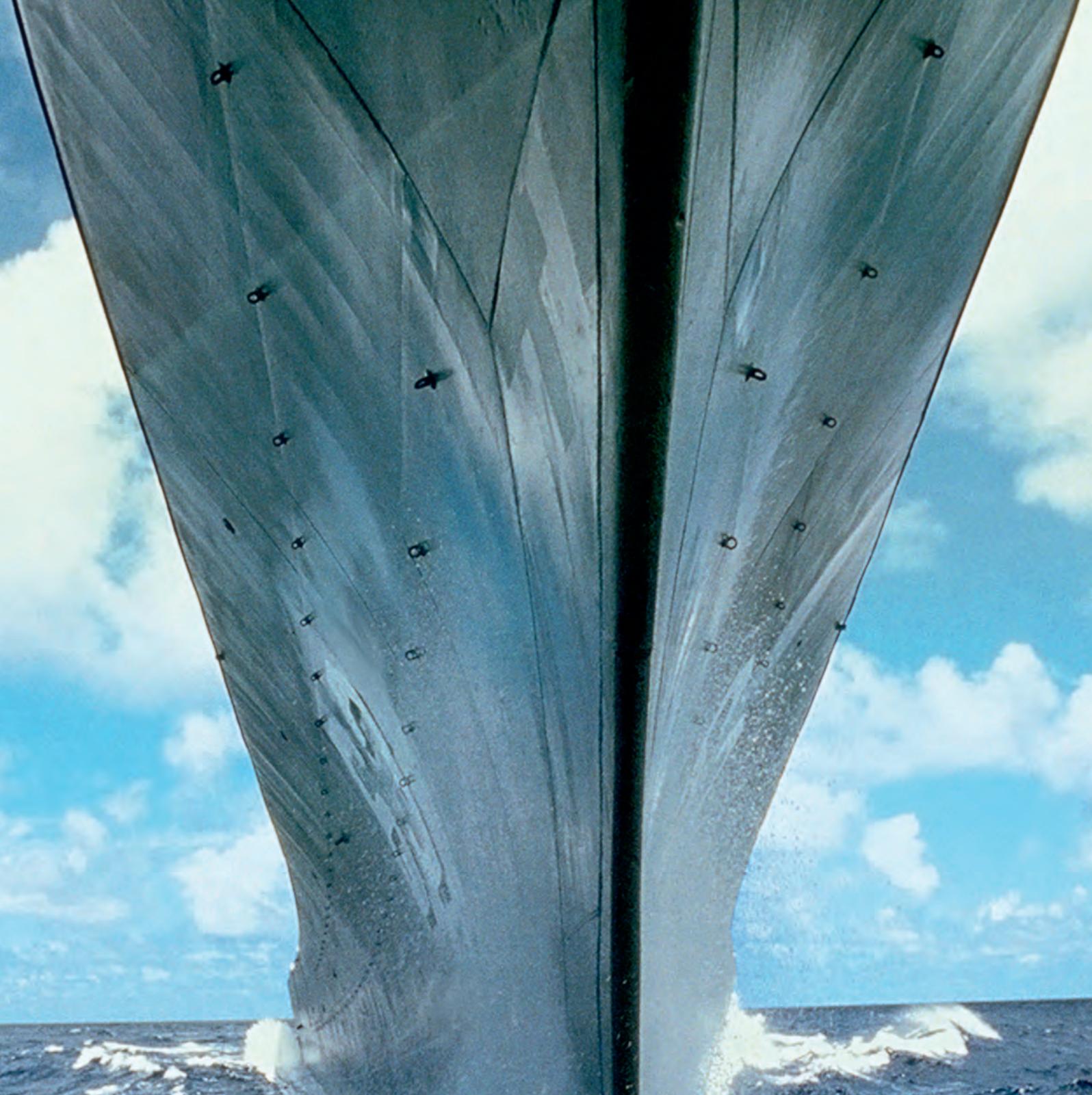
The turbocharger is also said to have been improved using CFD, especially the compressor and the turbine wheel. It is jet assisted, and the whispering silencer noise emission is less than 105dB(A).

Common rail is said to be more advantageous than a conventional injection system because the pressure generation and the fuel injection are separated, and there is

electronic control of the rail pressure and injection. An environmental advantage is that smoke emission is reduced, especially at low loads and during starting.

The flexibility of the CR system results in improvement of the NOx/specific fuel oil consumption trade off. MAN's new engine designs take into account expected future emissions legislation, and offers various technologies to reduce emissions beyond the required limits.

With this installation, both Scandlines and MAN Diesel are hoping that the L32/44CR will be an engine of the future, due to its claimed efficiency and lower smoke emissions. 



**Inmarsat FleetBroadband.**  
Bringing high-speed data to the high seas.

Offering global coverage,\* constant simultaneous access to voice and data and keeping you connected whatever the weather conditions, FleetBroadband is the next generation service you have been waiting for. Delivered via a compact, easy to install terminal, it brings more cost-effective access to high-speed data that will revolutionise crew communications and produce the operational efficiencies you need. With predictable pricing and flexible tariffs, it's everything you expect from Inmarsat and more.

\*Polar restrictions apply. Global coverage after successful launch of third I-4 satellite.





# ZODIAC

INCORPORATED

Zodiac, mastering the elements



## Evac water treatment solutions save the environment

We have become the leading supplier in our field by offering water saving, environmentally friendly total solutions for management and control of the waste water process. Use of Evac vacuum system leads to huge savings over the lifetime of a vessel. Our technology saves space, materials, installation time, money, water and the environment.



**EVAC**

Environmental Solutions Marine Sector  
Part of Zodiac Group

Tel. +358 20 763 0200, fax +358 20 763 0222

[evac.marine@evac.zodiac.com](mailto:evac.marine@evac.zodiac.com) - [www.evac.com](http://www.evac.com) - [www.zodiac.com](http://www.zodiac.com)

## RANSE codes challenge podded advantage

**DESIGNERS** from Fincantieri\* argue that a new conventional propulsion system can achieve hydrodynamic performances equivalent to or even better than ships featuring pods.

**P**ASSENGER ships equipped with podded propulsors are well known for their good performance in terms of hydrodynamic efficiency and high comfort onboard. Compared to conventional passenger vessels equipped with rudders, shaft line, and stern thrusters, these vessels have significantly improved fuel consumption, noise, and vibration.

Taking experience from the design of conventional high-speed passenger ferries where pods are seldom installed, a new concept has been developed to design new generation passenger vessels with conventional propulsion systems getting hydrodynamic performances equivalent to or even better than compared to ships featuring pods. Tank tests have proved that this new generation of conventional vessels has the chance to compete in terms of fuel consumption and comfort with the best podded ships.

In a conventional arrangement, each propeller is mounted on the aft end of the shaft supported by the struts, and the ship is steered by rudders. In the podded propulsion arrangement, the propeller is fitted at the fore end of azimuthing propulsion unit (that can rotate by 360°) located just in front of the ship's stern, with the motor located inside the shell of the unit.

Compared to conventional vessels fitted with shafts and rudders, tank testing and sea trials measurements performed on many podded vessels proved their very good hydrodynamic performance regarding propulsion efficiency, manoeuvring, vibration, propeller cavitation, and comfort onboard. The better propulsive performances are related to the improvements and simplifications of the hull geometry, as rudders, shaft lines, brackets, and other appendages have been removed and substituted by the pod, reducing resistance and flow turbulences.

In addition, the propeller rotates in an undisturbed flow, providing optimum cavitation behaviour with low pressure fluctuation, and yielding lower hydrodynamic loads and vibration.

The only technical problems with pods relate to repairing in case of damage and the cost of the device itself.

Over the last decade, incredible improvements have been made in developing CFD codes. Fincantieri has been steadily applying such new tools in the design of the passenger ships it builds. During the latter part of this period, the development of an improved conventional propulsion solution

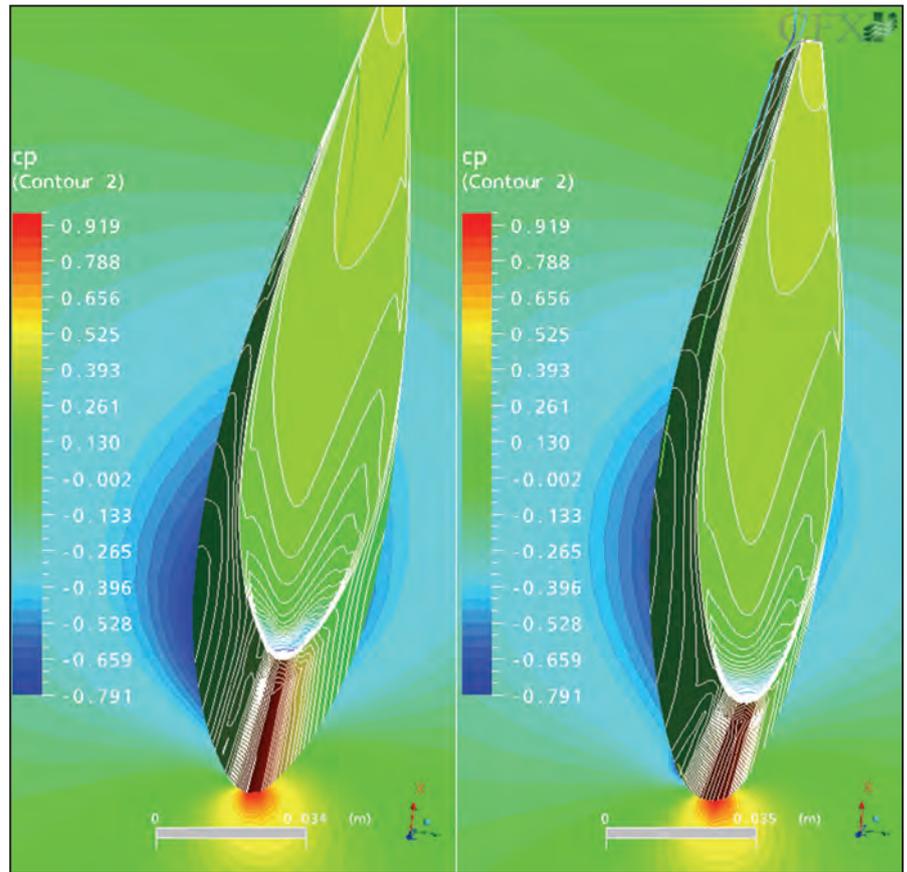


Figure 1: Pressure comparison on two different rudder profiles.

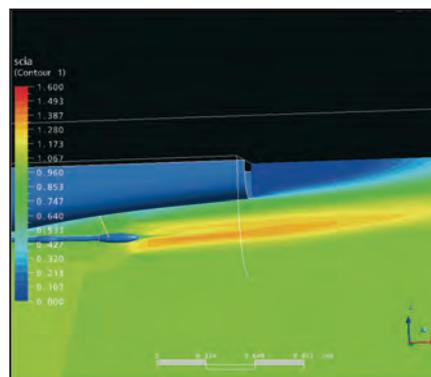


Figure 2: Induced velocities by using the actuator disc.

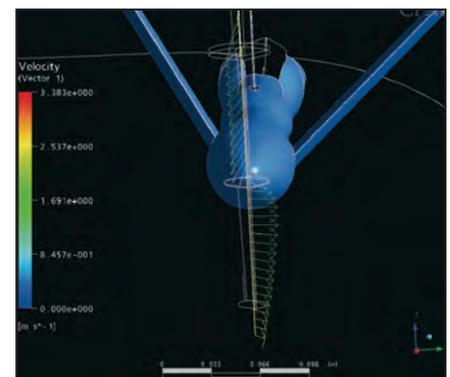


Figure 3: Twisted velocity vector caused by the propeller rotation.

has been requested in order to cope with the cost of pod installation and with the power limitations of azimuthing propulsion.

During the design process, each single hull and the appendage details that generate hydrodynamic drag have been optimised using RANSE CFD techniques. The greatest care was given to optimising brackets, bossing shaft lines, rudders, and stern frames in order to achieve, as the final target, performances comparable to a ship featuring pods.

It has been noted that the fitting of pods drives can have a significant impact on the hydrodynamic design of the stern frames, as new and different hull

shapes can be used to improve the ship propulsion performance and reduce production costs. It has been noticed that, when fitting pods, it is convenient to adopt 'pram-type' hull shapes, both to reduce hull resistance and steel manufacturing costs. Fincantieri selected these hull geometry configurations on recently delivered ships that were equipped with azimuthing propulsion units.

However, in recent years, Fincantieri has carried out extensive experimental and research work on a large number of twin screw passenger vessels and ferries, collecting and comparing data from tank tests and from sea trials with those achieved by

\* Footnote: Adapted from a paper presented by G. Lavini and L. Pedone to RINA's Design and Operation of Passenger Ship, as part of the Cruise + Ferry conference and exhibition, May 2007.

Giampiero Lavini is senior naval architect at Fincantieri. He is responsible of hull and propeller design, tank tests and speed test during sea trials. Lorenzo Pedone holds the current position of naval architect at Fincantieri. He is responsible of both potential and viscous CFD.



# Faster and further with Ecospeed

**E**cospeed is an extremely durable hull coating that will save on fuel costs and give increased speeds. It is expected to last for up to 25 years and is guaranteed for 10.

Amongst recent applications are a 275 metre, 5000 TEU container ship, several ice-class cargo vessels and a major cruise liner—with more of each category planned for the near future.

The Belgian Navy have been using Ecospeed on a number of their vessels since 2004 and have committed to applying it on the remainder of their fleet as the time comes for repainting.

The growing appeal of Ecospeed comes down to a number of key factors.

The final hull surface has very low roughness levels. This, together with its corrugated surface, gives fuel savings through reduced consumption and increased speed.

The strength and impermeability of the coating provides a very high degree of protection against mechanical impact and corrosion. The endless cycle of hull repainting every two to five years can therefore be dispensed with. Even after being tested under extreme Baltic winter and ice conditions it has proven to

be an effective protection against mechanical impact.

In addition, the coating has no adverse effect on the environment as it is entirely toxic-free.

Ecospeed can be used on most ships, offshore vessels and structures. It has proven to be ideally suited for fast moving container and cargo ships, cruise vessels and ice-going ships. Its use can remove major headaches for ship superintendents. With no repainting necessary, yet protecting the hull surface against corrosion, there will be many additional advantages such as significant savings on repair and maintenance costs.

podded ships. By testing different aft body designs on the same vessels, it has been noticed that the pram-type shape performance with flat stern and square shaped skeg can be improved, mainly in the case of full hullforms and low length to beam ratio. This goal can be reached by adopting an alternative solution which, developed by the extensive use of CFD tools, was seen to achieve a substantially better performances.

The solution is not only an interceptor or a trim wedge and spoiler, but a different concept in the frame design in the whole area of the aft body.

The flat surfaces of the pram shape are kept as far apart as possible, while the square shaped skeg is replaced by a well-rounded configuration. The shape of this 'central rounded skeg' is faired according the flow lines calculated by RANSE codes. The effect of this shape is to reduce the wetted surface compared to the pram type (a rounded section has less extension compared to a square shape), reducing drag considerably. Tank tests on different ships demonstrated an improvement of about 8%-10% while keeping the same hull volume, the same stability, and the same appendages.

In case of ferries provided with this geometry, sea trial results showed that the standard statistical correlation factors adopted for a twin screw vessel were also improved. For instance it is well known that, in case of high-speed ferries, the correlation factors are better, compared to a slow speed vessel, whatever hull shape is adopted. Similar behaviour has also been detected on ships fitted with this alternative aft body shape.

The pram-type vessels generally confirmed during sea trials the sea-allowance correlation factor derived from the standard coefficients, but these new kind of

geometries can also further improve the correlation coefficients. It seems as an average that the correction factor can be improved by about 4-5%.

It could be argued that these kinds of hull lines could also be adopted also for ships featuring pods. However, even if the bare hull resistance of a rounded skeg hull is better than the pram type, this advantage is counteracted by a decrease in propulsive efficiency.

This could be due to the fact that the podded propeller is normally located far aft in an undisturbed flow, while on a conventional ship adopting a traditional bracket configuration, the propeller can be located close to the centre line, benefiting from the wake increase yield by the skeg, which improves the total hull efficiency.

It can be concluded that the selection of a rounded skeg configuration can significantly improve the performance of a conventional ship, making up ground in efficiency terms on a ship featuring pods.

### Appendage improvements

Rudders are generally designed with one aim - creating a momentum strong enough to make the ship manoeuvre in accordance with rules requirements.

For a conventional passenger ship, a twin balanced horn rudder with NACA 00 profile has normally been adopted. In newer applications, flap rudders have been introduced, which allow significant improvements in terms of efficiency and manoeuvrability.

For some vessels, where the tangential velocity component induced by the propeller is quite significant, Fincantieri decided to install a twisted rudder, in order to reduce drag and the risk of cavitation erosion.

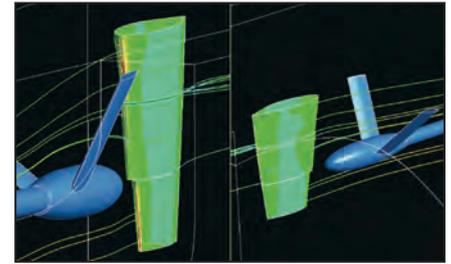


Figure 4: Pressure and streamlines on a twist rudder.

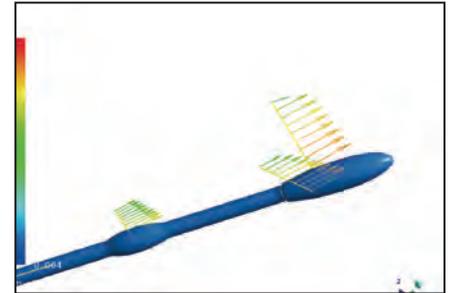


Figure 5: Virtual Pitot tubes test on the brackets.

Of course, the main challenge revolved around the choice of the rudder's geometry. Thanks to CFD calculations, it has been possible to evaluate the most efficient solution and choose the shape that would yield only minor hydrodynamic resistance (Fig 1).

This work has been performed by first taking into account a very accurate calculation of the inflow velocities created by the propeller and the ship's wake, to select the most suitable profile and leading edge twist, and thus to achieve the best pressure and velocity distribution on the surface.

In this way it has also been possible to identify the optimum clearance between propeller and rudder, and to determine the neutral rudder angle. The twist distribution can be seen in Fig 3 and 4 using the actuator theory to simulate the propeller behaviour (Fig 2).

In addition, any risk of cavitation and erosion of the rudder surface is significantly reduced in all sailing conditions. Modified NACA 66 sections with proper twisting proved to be the most promising.

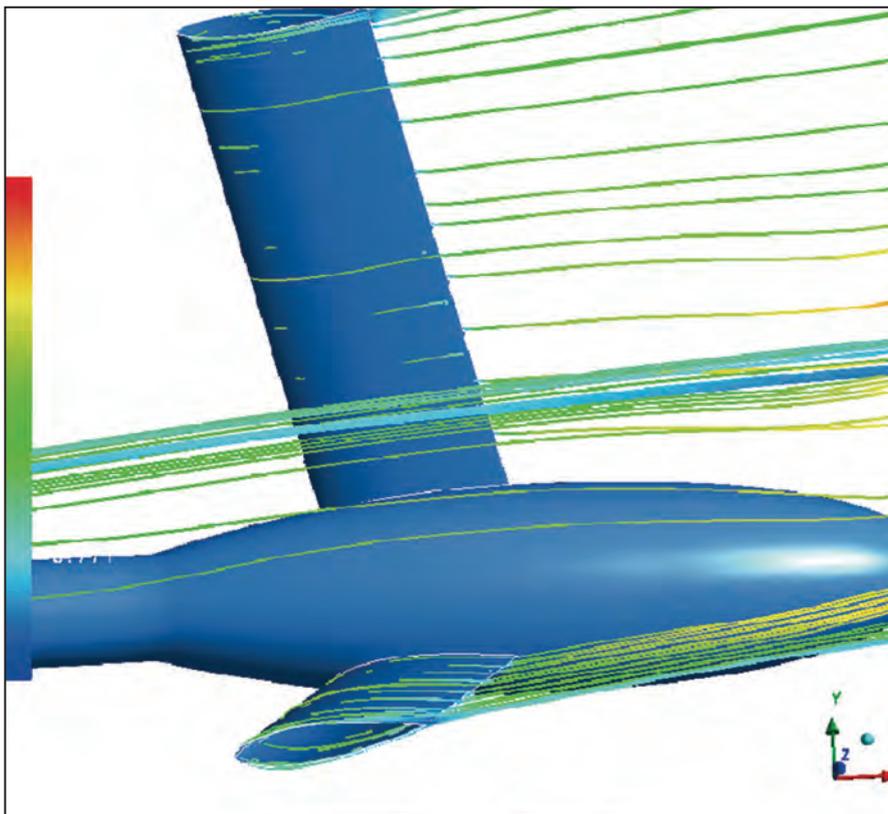
Propulsion tank tests have shown that an improvement of more than 2% can be achieved with these kind of rudders, as studied with CFD techniques.

Manoeuvring simulations with flapped rudders have produced excellent performance both in harbour conditions and at sea.

The brackets were usually orientated minimising the absorbed power by the use of a self-propulsion test. However, from the well-known relation  $\eta_H = 1 - t/1 - w$ , the increase in propulsive efficiency could be caused by an increase in the mean wake, with a consequent possibility of cavitations on the propeller blades. For this reason it proved better to find the final orientation by Pitot tubes during the propulsion test.

Thanks to CFD calculations, it is possible to find out the correct inflow angle on each position of the bracket axis at an early design stage, making it possible to investigate different solutions in a very

Figure 6: Streamlines on the brackets.



# CONFERENCE REGISTRATION NOW OPEN

THE 23RD INTERNATIONAL CONFERENCE & EXHIBITION FOR THE LNG, LPG AND NATURAL GAS INDUSTRIES

# GASTECH 2008

10 - 13 MARCH 2008

BANGKOK INTERNATIONAL TRADE & EXHIBITION CENTRE • THAILAND

**Early bird fee now in operation**

**Register today at**

**[www.gastech.co.uk/na](http://www.gastech.co.uk/na)**

HOSTED BY



ORGANISED BY



SPONSORED BY



**e-on** | Ruhrgas



**ExxonMobil**



WHERE THE COMMERCIAL AND TECHNICAL GAS WORLDS MEET

## SIGNIFICANT SHIPS OF 2006

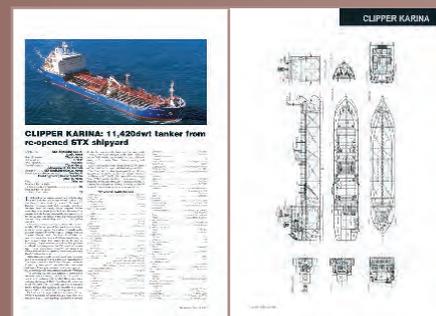
AVAILABLE IN PRINTED OR CD-ROM FORMAT

A publication of  
The Royal Institution of Naval Architects

The Royal Institution of Naval Architects published the 17th edition of its annual *Significant Ships* series in February 2007. Produced in our usual technically-orientated style, *Significant Ships of 2006* presents approximately 50 of the most innovative and important commercial designs delivered during the year by shipyards worldwide. Emphasis is placed on newbuildings over 100m in length, although some significant smaller cargo ships, fast ferries and offshore vessels have been considered, including a cross-section of ship types, with each vessel being either representative of its type or singularly significant. Each ship presentation comprises of a concise technical description, extensive tabular principal particulars including major equipment suppliers, detailed general arrangement plans and a colour ship photograph.

Non-member £46 (RINA member £40)  
Or Order a set:  
One copy of Significant Ships 2006  
& one copy of Significant Small Ships 2006  
price £61.00 (RINA member £52)

OUT NOW



Newbuildings include:

*Norilskiy Nickel, Pauline, Freedom of the Seas, FS Charlotte, TIMCA, Clipper Karina, Emma Maersk, Finnstar, Eton, Crystal Diamond, Gotlandia II, plus many more*

When ordering please advise if printed or CD ROM format is required, contact :

The Marketing Department,  
RINA, 10 Upper Belgrave Street, London, SW1X 8BQ, UK. Tel: +44 (0)20 7235 4622 Fax +44 (0)20 7259 5912  
E-mail: [publications@rina.org.uk](mailto:publications@rina.org.uk) Website: [www.rina.org.uk](http://www.rina.org.uk)

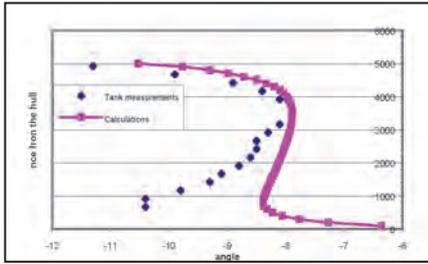


Figure 7: Flow angle distribution on the external bracket.

short time. This can lead to a very accurate solution and, furthermore, a twisted geometry could be easily determined if necessary (Fig 5, 6, and 7).

Also evaluated has been the best solution for the relation between 'L' and 'V' brackets (Fig 8), and it has been noticed that, in all CFD simulations carried out to optimise the bracket angle, the 'L' brackets are the ones which cause the lowest wake shadow on the propeller plane. Tank tests have proved that, by adopting 'L' brackets oriented with CFD optimisation, propulsion results are indeed good. In conjunction with an inward propeller rotation, this configuration is also optimal for cavitation and induced pressure pulses.

Traditionally the shaft line is oil lubricated, and located inside the tube case with a diameter larger than the shaft itself. An alternative solution is represented by water lubrication, which offers some consequent benefits. First of all, the inflow water meets a smaller diameter and so the wake peaks on the propeller plane are reduced. Furthermore, the water through frictional effect is trailed in rotation towards the propeller with a significant benefit for propulsion efficiency (about 2 %). The water lubricated shaft line is also practically maintenance free and represents a 'green' solution as the risk of oil leakage is avoided.

Meanwhile, traditional bossing is quite voluminous, creating a very high drag because it has to be large enough to contain the SKF connection and long enough to keep a proper distance between the propeller and intermediate bearings. CFD calculations, confirmed by subsequent model tests, showed that a large bossing can cause vortex and instability in the flow, even if it is far from the propeller disk (Fig 9).

By adopting an intermediate bracket, the bossing can be much reduced and the SKF connection can be moved forward completely inside the hull. CFD calculations allow the best shaft orientation

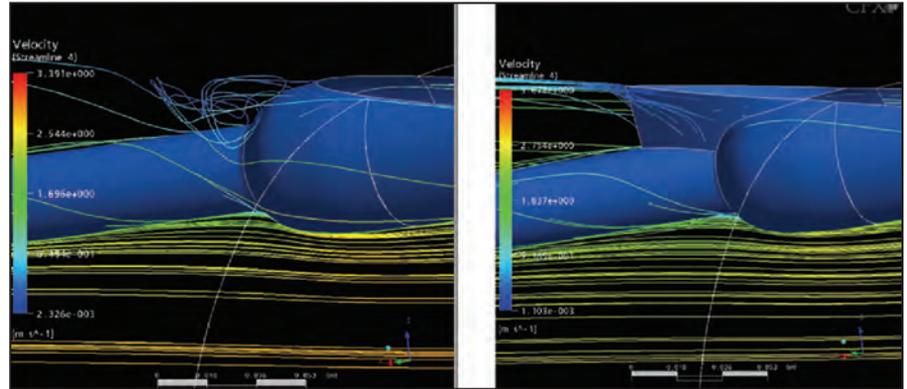


Figure 9: Vortex at the bossing – original and improved.

to be identified at an early design stage in both longitudinal and horizontal planes, in order to create the best wake distribution on the propeller disk.

The intermediate bracket, even if it can seem a small detail, represents the most important innovation of the whole shaft line. The high flexibility of a long shaft line could lead to high loads and consequently to high temperatures at the main brackets bearing, mainly during the turning manoeuvre at high speed. The intermediate bracket strongly reduces this phenomenon because of the increasing of its hyper static degree. From the hydrodynamic point of view the intermediate bracket is very ticklish: the propeller-induced pressures are very sensitive to its orientation. However, CFD calculation can strongly help in selecting its correct position and orientation, but a final confirmation in the towing tank due to the significant viscous effect involved is always requested.

The careful design process of the shaft line details yield the conclusion that the total resistance of the hull with all the shaft line appendages is lower than the value experienced in the past, which was 12%-14% of bare hull resistance.

This shows the dramatic improvement that can be achieved through a proper use of a combination of extensive CFD calculations and tank testing.

Adopting a FPP propeller the diameter of the hub bossing can also be considerably reduced compared to a CPP. In fact the hub diameter of FPP can be close to 0.2R versus 0.3R-0.35R of a CPP propeller. This, of course, has a significant benefit on the bossing drag and propeller efficiency. CFD tools can help in optimising the flow attached to the bossing surface and the attached propeller hub. Propeller hub and bossing shape have, in fact, to be studied together, considering the induced rotational speed components

created by the propeller. A careful analysis in this area can also cancel the danger of hub root cavitation, which can sometimes occur when bossing shape and size are not properly examined.

RANS calculations have shown that 'drop' profiles provide the best pressure distribution both on the bossing and on the following propeller hub.

The careful design activity performed in the hull and appendages definition of the improved conventional propulsion system has produced, as a consequence, a very homogeneous wake on the propeller disk. As indicated in figure 8, a wake distribution comparable to a podded vessel has been achieved.

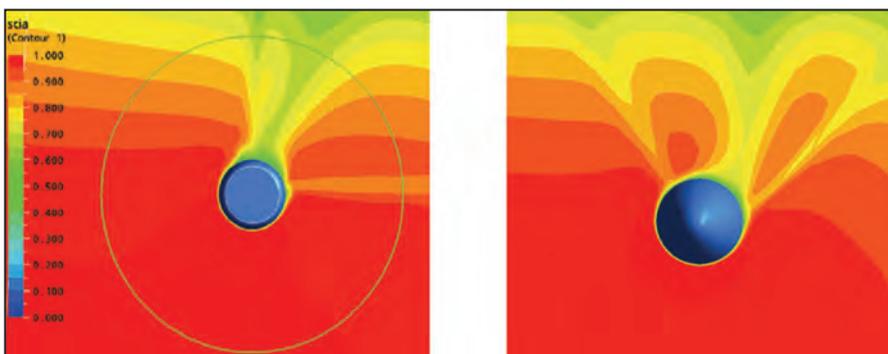
The propeller design, developed with a new technique, takes advantage of the flow visualisation on the blades through CFD computations, with the blade shapes allowed to fair in the most proper way, adjusting the combination of skew, rake, camber, chord, and pitch in order to get the most suitable pressure and speed distribution without any knuckle and discontinuity on the blade surface.

As a result of the application of this design procedure to a ship with 2x22.000MW installed power and a speed of 23knots, a six blade FPP has been chosen, in order to reduce noise and vibration onboard, and maximum pressure pulses of 0.8kpa in trial conditions and 0.5kpa in service conditions were recorded during model tests, without any type of face cavitation. At the same time, the efficiency of this propeller is 0.68, as shown by model tests. As a comparison, a four blade FPP podded ship delivered some years ago by Fincantieri showed a maximum pressure pulse of 1.1kpa with an identical efficiency of 0.68.

It can be concluded that designing a conventional passenger ship provided with a rounded skeg hull shape, twin six blade FPP, water lubricated shaft line and appendages optimised by CFD techniques, the performances, in terms of total propulsive efficiency, cavitation, and pressure pulses, are quite comparable to a ship featuring pods. A vessel fitted with such propulsive configuration provides at the same time a high reliability as far as the mechanical aspects are concerned. Oil leakage from the shaft line is avoided and the intermediate bracket provides a stiff shaft configuration that reduces bearing mechanical and thermal stresses, especially during manoeuvring or crash stops.

In a scenario requiring low fuel consumption, high comfort onboard, low environmental impact, and reliability of the propulsive system, the proposed configuration provides a very appealing and economical choice compared to the podded solution.

Figure 8: Axial wake with L brackets and V brackets.



SHIP SECTIONS TRANSPORTERS

# INDUSTRIE COMETTO

## easy handling



PARTNERS CN - NA 01/04



INDUSTRIE COMETTO S.p.A.  
VIA CUNEO, 20 - 12011 BORGIO S. DALMAZZO - CN - ITALY  
TEL. +39.0171.263300 - TELEFAX +39.0171.266335  
<http://www.comettoind.com> E-mail: [cometto@comettoind.com](mailto:cometto@comettoind.com)

YOUR PARTNER FOR THE FUTURE



REINTJES GmbH produces marine gears in the output range of 250-20,000 kW for every type of vessel, from fishing trawler to high-performance catamaran, with its staff of 380 at its plant in Hamelin, Germany.

Serving customers as an independent partner, REINTJES has designed and manufactured only marine gears for 75 years. It has subsidiaries in

Singapore, Madrid, Dubai and Antwerp, as well as sales and service partners all over the world.

REINTJES puts service first, guaranteeing its customers global support around the clock. Its corporate philosophy "Your Partner for the Future" is based on its customer- and growth-oriented strategy.



REINTJES GmbH  
Eugen-Reintjes-Straße 7  
D-31785 Hameln  
Tel. + 49 51 51/104-0  
Fax + 49 51 51/104-300  
[www.reintjes-gears.de](http://www.reintjes-gears.de)

## Largest freighter for the Channel

THE end of September will see delivery of Brittany Ferries' newest freight ferry, in the shape of the £50m *Cotentin*.

On delivery, the Aker Yards Helsinki-built ship will be the largest, fastest freight ship on the Channel. She will operate between Poole and Cherbourg during the week and between Poole and Santander in northern Spain every weekend.

Classed by Bureau Veritas, the 165m-long by 26.8m-wide ship will offer a cruising speed of 23knots, and have 120 en suite cabins for drivers, as well as being able to accommodate 120 freight units along 2200 lane metres. This is two and a half times the capacity of the current freighter used out of Poole.

Brittany Ferries currently has two ships on order with the Aker shipyard. The other is the passenger ship *Armorique*, due for delivery at the end of 2008, which will be identical to the 6200dwt *Cotentin* from the keel to deck five. The £81m *Armorique* is due to take over the Plymouth-Roscoff route in autumn 2008. The 1500-passenger, 470-car/65-lorry capacity vessel will be built in Helsinki.

Both ferries will also be propelled by 2x MaK 12 M 43 C engines, and there is still an option for a third vessel with a different MaK engine configuration.

Since 2003, Brittany Ferries has successfully operated the superferry *Pont Aven*, built at the German yard Meyer Werft in Papenburg. *Pont Aven* is equipped with 4x

**MaK 43 engines will be installed onboard both of Brittany Ferries' latest newbuildings.**



*Cotentin*, under construction at Aker Yards.



Design drawing, *Cotentin*.

MaK 12 M 43 engines, actually the first VM 43 engines sold into the market. Brittany Ferries thus becomes the first customer to MaK VM 43 engines on a repeat basis. Together with the recent orders of VM 43 engines from German yard Flensburger

Schiffbau-Gesellschaft (FSG) to propel ro-ro freight ferries contracted with Belgian shipping company Cobelfret Ferries, the Aker orders are considered by the supplier as the 'final breakthrough of the MaK VM 43 C marine engine'. 

Design drawing, *Armorique*.



Naval Architects  
Mechanical Engineers  
Basic Design  
Detailed Engineering  
Survey of Construction

# MarineEngineeringServices

Specialists in High Technology Ships, such as Gas Carriers,  
Chemical Carriers, Bitumen Carriers, etc.

Designer of M / V SARACENA

Our **PURPOSE** is to give

the **BEST QUALITY PRODUCT**

and **SERVICE**



[www.mes.it](http://www.mes.it) - [info@mes.it](mailto:info@mes.it)

Via San Maurizio 2/D 34129 - Trieste ( Italy )  
Ph. +39-040-3728668 - Fax +39-040-3728669



## Enraf Tanksystem

### HERMetic UTImeter Gtex

Portable closed/gas tight  
Electronic gauge for:

- Cargo inspection, inventory control
- Custody transfer
- Topping off
- Free water detection
- Verification of automatic gauges
- Back-up system

#### Benefits

- No calibration required
- Temperature accuracy  $\pm 0.1^\circ \text{C}$
- Continuous temperature reading
- Tape accuracy  $\pm 1.5 \text{ mm} / 30 \text{ m}$
- Weight with 15 m tape: 4.4 kg
- 2 years guarantee

Enraf



For safety and precision

For more information: [www.tanksystem.com](http://www.tanksystem.com)

## Super C-class to set sail

**BC Ferries awaits the arrival of the first of a new series of passenger ferries due to revolutionise its service offering.**

At time of writing, less one month remained before the first of BC Ferries three new Super C-class ferries was due to set sail from Germany's Flensburger Schiffbau - Gesellschaft, en route to British Columbia. The shipowner reported that all three new vessels are on schedule and under their total build budget of C\$542m.

The first of the new vessels, *Coastal Renaissance*, was due to depart Flensburg on 21 September.

Each of the three Super Cs will be outfitted with customised graphics promoting the 2010 Winter Olympic and Paralympic Games. Upon leaving the shipyard, the ships will make stops in London, Los Angeles, San Francisco, and Seattle.

A fourth ferry - the C\$133-million northern vessel, to be known as *Northern Expedition* - is in the design phase. Due to enter service in 2009, the design for this ship has already gone through basic testing on computers and a scale model has been developed at a laboratory in Copenhagen.

*Coastal Renaissance* will arrive in British Columbia in mid-November and is scheduled to be in service in early 2008. The second vessel, *Coastal Inspiration*, will arrive three months later and is expected to be in service in the spring. The third, *Coastal Celebration*, will arrive in summer 2008 and is expected to be in service by summer 2008 as well.

The double-ended passenger ferries have been specifically designed for operation in the waters between the lower mainland and Vancouver Island. BC Ferries has finalised deployment plans for the new vessels. *Coastal Renaissance* will reside at Departure Bay in Nanaimo and will serve the Departure Bay - Horseshoe Bay

route. *Coastal Inspiration* will reside at Duke Point in Nanaimo and serve the Duke Point - Tsawwassen run and *Coastal Celebration* will reside at Swartz Bay, and serve the Swartz Bay - Tsawwassen run.

'The Super Cs are the largest double-ended passenger ferries and the most advanced ferries of their kind in the world,' said David L Hahn, BC Ferries' president. 'Their arrival ushers in a bold new era for BC Ferries and for coastal transportation in British Columbia. This is the beginning of a very exciting period in our history.'

The three 160m-long, 21,980gt vessels are being built from 88 large steel sections at FSG. Prefabricated modules are being joined together in the slipway, starting with the engine rooms, at the centre of the vessel, and moving up and out. The heavier, more compact modules are at the bottom, with lighter ones at the top.

The contract with FSG is a design-build contract that transfers the risk of the project away from BC Ferries and provides substantial guarantees in terms of delivery dates, performance criteria, cost certainty, and quality construction. FSG is responsible for delivering the vessels to BC Ferries in Vancouver, where title transfer will occur. The yard has hired the Dutch company Redwise Maritime Services to deliver them.

FSG is also responsible for building vessels that comply with all Transport Canada regulations, as well as classification and environmental regulations.

Each ship will carry 1650 passengers on two passenger decks and 470 vehicles on two vehicle decks, with a service speed of 21knots.

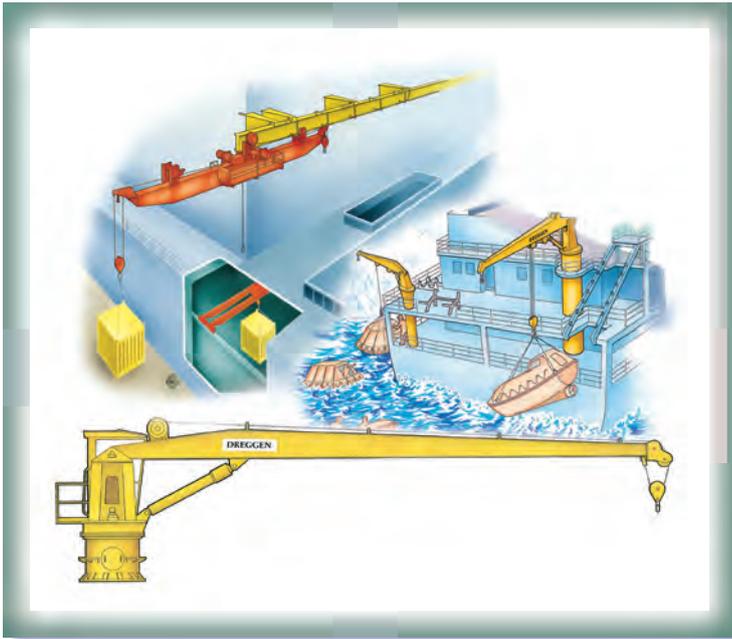
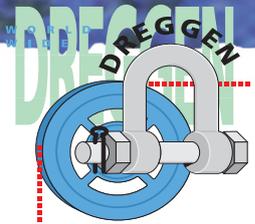
The ships will feature a diesel-electric propulsion system/power station that is claimed to be one of the largest and most economical of its kind in the world. ⚓

***Coastal Renaissance*, the first of the Super C-Class ferries for BC Ferries is put through her paces.**



### TECHNICAL PARTICULARS SUPER C-CLASS FERRIES

Length o a .....	160.00m
Length bp .....	154.00m
Breadth moulded .....	27.80m
Breadth o a .....	28.20m
Depth to main deck .....	8.25m-8.75m
Design draught (moulded) .....	5.75m
Deadweight at design draught .....	1770t
Growth margin in addition	
to deadweight .....	500t
Day Passenger Capacity .....	1500
Max Passenger Capacity .....	1650
Gross Tonnage .....	22,100gt
* AEQ.....	Automobile Equivalent,
	means a vehicle of
	standardised dimensions
	of 5.34m length,
	2.60m width
* Tractor Trailer .....	a vehicle of
	standardised stowage
	dimension of
	19.80m length,
	3.20m width
Vehicle Capacity	
Main Deck Upper	
Deck Total Lane width .....	8 x 2.60m or
	6 x 3.20m
	8 x 2.60m
AEQ* Lanes .....	1010lm 1010lm
	2020lm
AEQs .....	186 186 372
Tractor Trailers* .....	32 - 32
Free Height .....	4.75m 2.90m
Classification.....	ABS +A1,
	Vehicle Passenger Ferry,
	Strait of Georgia Service,
	+AMS, COMF+,
	HAB, ES, (E)
Diesel-electric Propulsion/Power Station	
Concept.....	Four prime movers,
	supplying electric power
	for two 11,650kW electric
	drive motors running at
	constant speed, auxiliary
	systems and public spaces.
	A speed of 20knots can be
	maintained with one engine
	off-line for servicing, and 18knots
	speed will be reached
	with two prime movers off-line.
Prime Mover Engines.....	Four (4) prime
	mover diesel engines
	MCR 3840kW each, 600rev/min
Fuel .....	MGO (Marine Gas Oil) or
	MDO-DMB (Marine Diesel Oil)
	according to ISO 8217
Service Speed: .....	21.0kn (at design
	draught of 5.75m, 85% MCR
	(13,056kW), fouling margin of
	5% of PD, 2400kW electrical load for
	auxiliary systems and public spaces)
Fuel consumption: .....	55.5t/day



## MARINE CRANES AND LIFTING EQUIPMENT

A main priority of Dreggen is to provide our clients with the benefit of cost effective solutions. Companies in a wide range of engineering sectors have selected Dreggen to be their supplier of solutions concerning material handling and crane technology

**We are able to supply:**

1. Monorail provision crane.
2. Engine room crane.
3. Combined lifesaving and provision crane.
4. Hose handling crane.
5. Cargo handling crane
6. Gantry travelling slewing crane
7. Grab handling crane
8. Provision crane
9. service crane
10. Offshore crane

[www.dreggen.com](http://www.dreggen.com)

DREGGEN CRANE A.S., P. O. Box 3434, N-5815 Bergen - Norway Phone.: +47 55 33 36 50 Fax: +47 55 33 36 51 E-mail: mailbox@dreggen.no



## Marine



Cargo



Military



Passenger



Yacht



**RINA**

Cargo ships, military vessels, passenger ships, mega yachts. Safety and protection of the environment also depend on RINA's ability to team up with clients who share the values which characterize its Marine Division: professionalism, competency and an aptitude for innovation.

[info@rina.org](mailto:info@rina.org)

Together for Excellence

[www.rina.org](http://www.rina.org)

## On to the next Galaxy

**F**URTHER development is due for Tallink's 'Galaxy' class of cruise ferry, built by Aker Yards, with the third ship in the series marked out by higher speed and adjustments to aspects of the interior design.

Currently designated 'Cruise 5', the €180m ship is due to be delivered by Aker Yards Rauma in spring 2009.

*Galaxy*, the first ship in the series, was partly built at Aker's French yard in St Nazaire, but completed in Helsinki, and has been operating since spring 2006. A second ship is under construction at Aker's Helsinki yard and is due to be delivered in spring 2008.

At 212m long and 29m wide, 'Cruise 5' will be one of the biggest and fastest cruise ferries in the Baltic Sea, having capacity for 2800 passengers and offering a speed of 24.5knots. This will be achieved by virtue of the fact that, whereas *Galaxy* features four 6560kW main engines, achieving 22knots, *Cruise 5* will feature four 8000kW engines.

According to Aker, the guiding principle in designing the vessel has been paying attention to the comfort and luxury of passengers.

Over 900 cabins, several restaurants, and places to entertain of various style and class, as well as a conference centre featuring over 450 seats will make the new ship a 'multi-functional sea-based hotel'.

The ship will feature what Tallink is terming 'the maximum usage of high-tech solutions' with respect to safety and the environment.

The ship's interior design has been developed by Finnish company Aprocos and Estonian designer Pille Lausmäe. Both participated in designing Tallink's previous new vessels.

Tallink said that the conference area aboard *Cruise 5* would be in line with that on *Galaxy*, while the sauna and disco would remain in the same place. However, other public areas are liable to change. The shipowner said that customer satisfaction with the design of *Galaxy* meant that no major changes were envisaged for the interior design/facilities of the vessel. However, *Cruise 5* will feature one large central bar area, where the installation aboard *Galaxy* saw this area split between a wine bar and a whisky bar.

Passengers, meanwhile, will be able to avail themselves of wifi connectivity as part of a package of communication offerings. ⚓

### Standard cabin onboard Galaxy-class of ferries.



Cruise 5 – the next stage in Tallink's developing newbuild programme.



Irish Pub interior.

### Gourmet Ravintola interior.





*Cruise Roma* is launched, in June.

## Grimaldi wheels on the orders

SHIPBUILDER Fincantieri and shipowner Grimaldi are looking beyond current orders towards a cooperation aimed at developing new designs, within the framework of which, Fincantieri is set to become Grimaldi Group's 'preferred' shipyard.

Since 1987, Grimaldi has ordered 23 vessels from Fincantieri for wheeled cargo, thus contributing to ensuring continuity of workload and employment to various Fincantieri shipyards, in particular in the South of Italy. When Finnlines ships are included, the number rises to 28.

The companies are now considering 'setting up joint programmes to enable Grimaldi to maximise its operating and strategic targets and to enable Fincantieri - also by adopting new technologies and including new suppliers and products - to reach design and process economies', a joint statement suggested.

The collaboration has been blossoming since Grimaldi ordered two cruise ferries from Fincantieri, in the shape of *Cruise Barcelona* and *Cruise Roma*, to operate the existing daily freight and passenger service between Rome (Civitavecchia) and Barcelona.

These vessels will be designed to handle new cars, as well as road trailers and passenger car traffic. Grimaldi has already ordered two ro-pax ships from the Italian shipbuilder, due to enter intra-Mediterranean services next year, while there is an option for two more, looking to a 2009 delivery.

*Cruise Roma* was launched over the summer and is due delivery to the shipowner by the end of the year.

At 55,000gt, *Cruise Roma* will be the largest cruise ferry operating in the Mediterranean and will also be suitable for short cruises. At 225m long and 30.40m wide, the ferry will have 3000 lane metres available for trailers and 478 cabins, and will be able to transport 2300 passengers and 215 vehicles at a maximum speed of 27knots. Easy boarding will be ensured thanks to two large stern hatches and interior ramps, while once onboard, ease of manoeuvring is ensured by extensive garage areas.

In line with the latest trends in short sea shipping, the ferry will be fitted out to the same high standards as cruiseships, both in terms of cabin furnishings and the wide range of entertainment onboard: extensive areas for wellness and fitness, a solarium, a swimming pool and hydro massage pool, as well as self-service and à la carte restaurants.

The design is the result of close cooperation between Grimaldi Group Naples and Fincantieri's technical and design staff. They will achieve a maximum speed of 28knots.

The 7500dwt ro-pax vessels will be 180m long, offering capacity for 1000 passengers, feature 100 cabins, as well as 2700 lane metres of wheeled capacity. They will achieve maximum speed of 25knots.

The overall value of the orders, excluding options, is approximately €360 million. Through these orders, Fincantieri has further strengthened its position as the world's leading ferry builder with ten ships on order and a market share of over 50%.

Grimaldi is set to draw on the maintenance and repair services of Fincantieri's shipyard at Palermo and of other shipyards, in Italy or abroad, which are able to work in synergy with the yard in Sicily.

Away from the passenger sector, however, Grimaldi has shown that it is willing to look further afield. Where it has formerly built a series of car carriers in Croatia, its latest order for the ship type has gone to South Korea, with Hyundai Mipo snapping up a US\$430m deal for five multi-purpose ro-ro car carriers. The first ship is scheduled to be delivered on 30 April 2010, with the last of the ships due exactly one year later.

While HMD emphasised that the car carriers were to its own design, it was Grimaldi itself which said that they would 'be almost identical sisters of another five ships contracted with Uljanik Yard of Croatia', slated for delivery in 2008 and 2009.

In line with the Grimaldi Group strategy, the new ships will be highly flexible in terms of cargo mix. At 24,400dwt, the new ships will achieve a service speed of 21knots, by virtue of their MAN Diesel 8S60MC-C main engines. Each of the 210m-long by 32.26m-wide vessels will be able to take onboard up to 2000 lane metres of ro-ro cargo, 2000 cars, and up to 800TEU of containers. The ships will also be fitted with a pair of 40tonne cranes to handle containers, project and oversized cargo, while the stern ramp has been designed to allow the loading of pieces of cargo of up to 250tonnes of weight. Ⓢ

# Diagnosis: seasickness.

123 456 789  
123 456 789



Passengers can get the injection. What do you do if the ship suffers?

With all medical problems, you need to know the causes before you treat the symptoms. In this case, seawater, rain, snow, ice, salt and even sand are the culprits infecting your ship via the air intakes and are at risk of spreading through the whole ship via the ventilation ducts. The engine rooms, the crew spaces, the passenger spaces and staterooms are no longer pristine but potential breeding grounds for moulds and bacteria.

Not only the soft furnishings are at risk; slowly but surely, every piece of sensitive equipment is degraded by this invasion. It even affects the crew and passenger health.

Munters have the answer; top class air intake systems developed over years of research and development, now available for the harshest marine environment.

Munters' droplet separators and mist elimination systems are tailor-made and ready to install, where and when you want them.

Don't call the doctor, call Munters! Get the antidote from our website: [www.munters.com](http://www.munters.com).

We offer you the top  
of the class air-intake  
systems.

*DFH snow and droplet  
separator for air intakes.*



*Munters offer the full spectrum of mist eliminators and droplet separators – from moderate, to high and very high protection levels – via single-stage, two-stage, or three-stage systems.*



Munters Euroform GmbH, Aachen, Germany,

Phone +49 241 89 00 0, Fax +49 241 89 00 5199, [munters@muntersac.de](mailto:munters@muntersac.de)

Munters Corporation, Fort Myers, USA,

Phone +1 239 936 1555, Fax +1 239 936 8858, [moreinfo\\_me@americas.munters.com](mailto:moreinfo_me@americas.munters.com)

## UNIQUE IONOMER TECHNOLOGY

Tin and Copper Free Self  
Polishing Anti-Fouling Paint

**SEA GRANDPRIX**

**CF-10**  
**SERIES**

- CF-10 for 5-years anti-fouling performance
- CF Mk II for 3- to 4-years anti-fouling performance

[www.chugokupaints.com](http://www.chugokupaints.com)

E-mail: [sales@chugoku.nl](mailto:sales@chugoku.nl)



Industry



Wheelmark  
and  
U.S. Coast Guard  
approved



## SikaFloor® Marine

Your global supplier of

- Customized high performance acoustic flooring solutions
- Easy to install primary deck coverings
- A comprehensive range of structural sealants and adhesives



[www.sika.dk](http://www.sika.dk)



## Safe-Line Marine After Sales



RoRo



Hatch Covers



Winches



Elevators



Cranes



Spare Parts



Davits



Industrial

Tel: +44 (0) 191 423 43 43  
Fax: +44 (0) 191 423 43 46  
[www.safe-line.co.uk](http://www.safe-line.co.uk)



Engineering Ltd

## High Pressure Fuel Lines

Common Rail & Pump and Line Formats

Jacketed and Standard Types

Pressure Ratings to 2500 Bar

Class Approved



Visit Our Stand At



Talisman Business Centre, Duncan Rd,  
Park Gate, Southampton, SO31 7GA, UK  
Tel: +44 (0)1489 885288 • Fax: +44 (0)1489 885199  
Email: [giro@giroeng.com](mailto:giro@giroeng.com) • [www.giroeng.com](http://www.giroeng.com)

## SODENA ECDIS eases into harbour

WITH 2,700,000 passengers carried each year, and harbour entrances that are often difficult to negotiate, Brittany Ferries set out to find a particularly safe navigation solution. The company has equipped its full fleet with a personalised version of the SODENA GECDIS navigation system.

'Harbour entrances involve difficult manoeuvres: in some places, the channel is 90m wide,' said Captain Yves Le Reun of Brittany Ferries. 'For ships 180m long that cruise at 18knots, we had to find a solution showing us exactly where the ship is, in real time, because there can be considerable drift in strong currents.'

To make channel navigation easier, SODENA added a specific element to its GECDIS navigation solution for Brittany Ferries: the software provides a dynamic zoom depending on the ship's position. The narrower the channel, the closer the zoom: 'We thus always have the most suitable view to manoeuvre the ship, without having to adjust the scale during difficult moments,' said Capt Le Ruen.

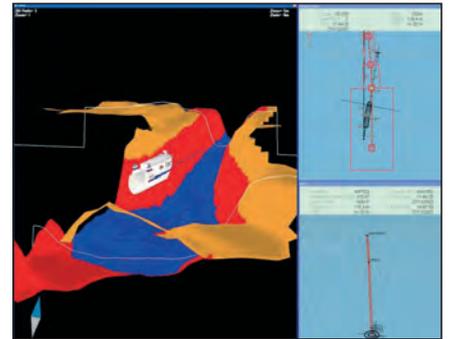
GECDIS also offers a second dedicated window showing the ship, its route, and its environment, taking into account the tides and the ship's draught.



GECDIS offers a second dedicated window showing the ship, its route, and its environment, taking into account the tides and the ship's draught.

The maritime areas used by Brittany Ferries are among the busiest in the world; the sea lanes off Brittany account for about 25% of world-wide maritime traffic.

The GECDIS solution is an ECDIS navigation system that provides all of the functionalities expected (anti-collision, AIS, RADAR, etc), plus SODENA's expertise.



The narrower the channel, the greater the zoom capability.

It is now possible for Brittany Ferries to use bigger ships and manoeuvre even in foggy weather. Beforehand, it was necessary to wait. The SODENA solutions thus save time and enhance efficiency for bigger ships, without compromising on safety.

SODENA launched development of GECDIS in 1997. The first merchant navy ship was equipped in 2000. It now has more than 6000 ships equipped. 

Brittany Ferries has selected GECDIS from SODENA for fleet-wide application.



## Solasafe puts the rest in the shade

THE ro-pax vessel *Nissos Chios* - the second long lost sister in design to *Blue Star Paros* and *Blue Star Naxos* - is finally due to appear this summer from Elefsis Shipyards, Greece, in Hellenic Seaways colours, after years as a rusting hull awaiting completion.

The route of *Nissos Chios* has yet to be advertised, but a service to Chios is likely (possibly with *Nissos Mykonos* moving elsewhere). This will be a boat to look out for, as she promises to be another high quality mid-speed ferry offering a more comfortable trip than most. Hellenic Seaways claims to have the largest marine fleet in Greece with 32 vessels in total (13 conventional and 19 high-speed), of which 14 were constructed within the last 10 years.

What is known is that the vessel will sail with 30 Solasafe screens, painted to a bespoke RAL specification, installed on the bridge.

Coastal ferry operator Hellenic Seaways' ro-pax *Nissos Mykonos*, which was constructed in 2005 at Skaramanga Shipyards in Greece, also benefits from Solasafe screens.

For supplier Solasolv, this is the latest endorsement of a product which has become a mainstay of the market over the last 20 years. For most seafarers, sunshine is a welcome natural occurrence, in moderation. In excess it can become a nuisance or a nightmare. On the navigation bridge of a ferry, the solar glare, as well as the infra red and ultra violet



Solasolv's sunscreens in action.

radiation from the sun, needs to be controlled, to enable staff and crew to carry out their duties in a more comfortable and work-friendly environment.

Solasafe screens have proved to be so beneficial and effective for crew fatigue management that they are now recognised in much of the legislation that exists on navigation visibility. They are featured in the International Code of Safety for High-Speed Craft, IMO Resolution MSC.31 on Navigation Bridge Visibility, Merchant Shipping (Navigation Bridge Visibility) Regulation 1998, U S C G Title 46, ISO8468:1995, and Chapter 9 of the Navigational Arrangements for Periodic One Man Watch.

Although Type Approval for these products is not necessary, Solasafe screens have been approved by Lloyd's Register ABS and Det Norske Veritas.

Solasafe screens reject 93% of the sun's glare coming through the window, as well as 87% of the solar heat, and 99% of its UV light when they are in use. When not required, the screens roll up out of the way and eliminate the need for fairly significant storage areas in the days when solid plastic screens were used and had to be stowed at night and in dull weather.

*Superflex Alpha*, the first of 14 ferries built by Sunderland shipbuilders for Danish owners in 1987, was one of the very first ferries to have anti-glare roller screens installed. The other 13 superflex ferries were also delivered with Solasafe screens fitted to the navigation bridge windows.

Then *Stena Normandy* and Brittany Ferries' *Bretagne* were introduced, both in 1989, and the first fast cat of significance from Incat, *Hoverspeed Great Britain*, in 1990. This was followed by a series of Incat vessels thereafter including the special vessels built for transporting military personnel and equipment.

Many ferries that have been built and delivered since 1990 have been equipped with Solasafe screens. Recent vessels include Minoan Lines' passenger/vehicle ferry *Festos Palace*, the ro-pax vessel *Stena Leader* which operates on the Fleetwood to Larne route, and Norfolkline's ro-pax *Mersey Viking*, purpose-built in Italy in 2005 and currently operating on a dedicated route between Belfast and Liverpool. 

# SUNFLAME

Are you satisfied with Waste Oil disposal?  
Our clients say  
**"Yes"**



**BELT-LESS Rotary Cup Burner**  
for Aux' Marine Boiler

<SDR Series>  
 -Capacity: 45-250kg/hr  
 -Complete combustion for low quality & high viscosity fuel oil.  
 -No choking (as it is tipless) and nor wear through low quality fuel oil.  
 -No maintenance work to replace the belt and no trouble due to belt break.  
**[Beltless-Motor direct driven]**



**Incinerator**

IMO Type Approval  
  
 EC Type-Examination  


- Capacity for combustion : 240-1500kW
- for waste oil : 26-161kg/hr
- for solid waste: 20-125kg/hr
- Rotary cup burner is installed for all model.

## SUNFLAME CO., LTD.

1-30 Nishinohata Okubo-cho Uji Kyoto 611-0033 Japan  
 TEL: +81-774-41-3310 FAX: +81-774-41-3311  
 E-MAIL: [info@sunflame.net](mailto:info@sunflame.net)

## Traveller completes Stena's step up

**H**AVING just entered service, the latest freight ferry for Stena Line is already having an impact on the company's Killingholme to Hoek van Holland route.

The arrival of *Stena Traveller* completes a massive £170m investment programme which, over the past two years, has seen the introduction of *Stena Trader* on the same route in August 2006, and the lengthening of the two ro-pax vessels *Stena Hollandica* and *Stena Britannica* on the Harwich to Hoek van Holland route.

The 'Seabridger', 26,660gt Stena ro-ro newbuilds have been classed by Lloyd's Register to Swedish/Finnish Ice 1A standards.

Built by FMV Fosen in Norway, they are 212.5m long, 26.7m across the beam, and draw a draught of 6.3m.

Frank Nieuwenhuys, Stena Line, freight commercial manager, UK and Republic of Ireland, said: 'We have now virtually doubled our capacity on the route, with both *Stena Traveller* and *Stena Trader* each providing 3100 lane metres.'

Deck 1 offers 415 lane metres of capacity, with deck 3 offering 1275 lane metres and deck 5 offering 1410 lane metres. All three of these decks offer a free height of 5m.

Cargo access is given via a 17m-long stem ramp, or via a 50m-long hoistable ramp to deck 5, or through a 50m-long fixed/hoistable ramp to deck 1.

Until now, freight transport on the Hoek van Holland to Killingholme route has consisted of 40% trucks with a driver and 60% trailer only. On the new *Stena Traveller* and *Stena Trader* ferries, the shipping line expects the attractions for drivers to skew the share in favour of accompanied trucks to around 60%.

The ships have capacity for 300 passengers, and feature 100 'deluxe' cabins with a total of 204 beds. As well as a buffet-style restaurant, each ship features a bar/lounge area, a shop, and its own cinema.

Main engine power draws on two 10,800kW 9L 48/60 units from MAN Diesel. Auxiliary power is provided by two 1590kW S 16R-MPTA engines from Mitsubishi Heavy Industries. The ships also feature twin 1600kW bow thrusters and twin controllable pitch propellers, in each case from Lips. Two flat-type rudders from Barkemeyer are



(L – R) Frank Nieuwenhuys, Stena Line freight commercial manager, UK and Republic of Ireland, Captain Peter van de Wardt, and Pim de Lange, area director North Sea for Stena Line.

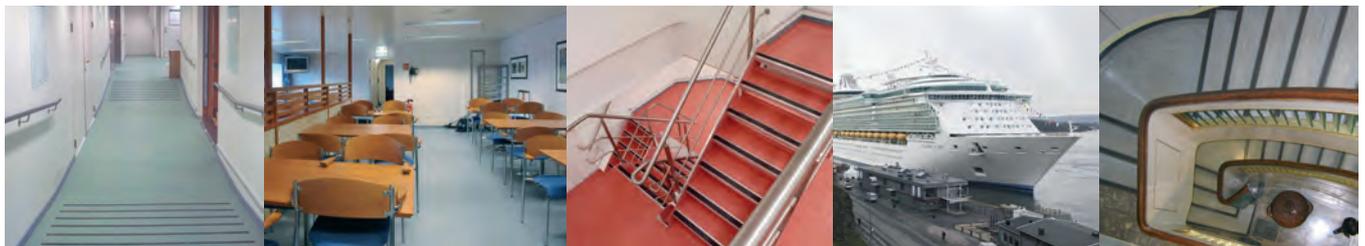


*Stena Traveller*, after entering service in July.

also included, while the twin 10.76m<sup>2</sup> fin stabilisers on each ship are of the Rolls-Royce Brown Brothers Neptune series.

Meanwhile, on the two lengthened vessels sailing on the Hoek van Holland to Harwich route, freight

capacity has risen from 180 units to 260 units. The number of cabins has doubled to 400 and the maximum passenger capacity to 900, while the total number of passenger cars that can be accommodated has risen from 60 to 170. 🌐



### ...marine flooring solutions

Specially developed for the marine sector by commercial flooring specialists Polyflor Ltd - Voyager flooring is certified by Bureau Veritas as fully meeting Marine Equipment Directive 96/98 EC, indicating compliance with all required regulations and standards for the marine environment. Providing a balanced and co-ordinated colour

palette, the collection is suitable for all crew areas from offices, cabins, stairs and corridors to the cafeteria and hospital facilities. Voyager studded rubber tiles are also available in four shades and provide outstanding durability, cigarette burn resistance, natural elasticity for enhanced impact sound resistance and are soft underfoot for improved ergonomics.

**VOYAGER**  
POLYFLOR  
TRANSPORT FLOORING

POLYFLOR LTD. - TRANSPORT FLOORING DIVISION  
PO BOX 3 RADCLIFFE NEW ROAD WHITEFIELD MANCHESTER M45 7NR UK  
TEL: +44 (0)161 767 1111 FAX: +44 (0)161 767 2515  
EMAIL: TRANSPORT@POLYFLOR.COM WWW.VOYAGER.POLYFLOR.COM

Thrustful solutions



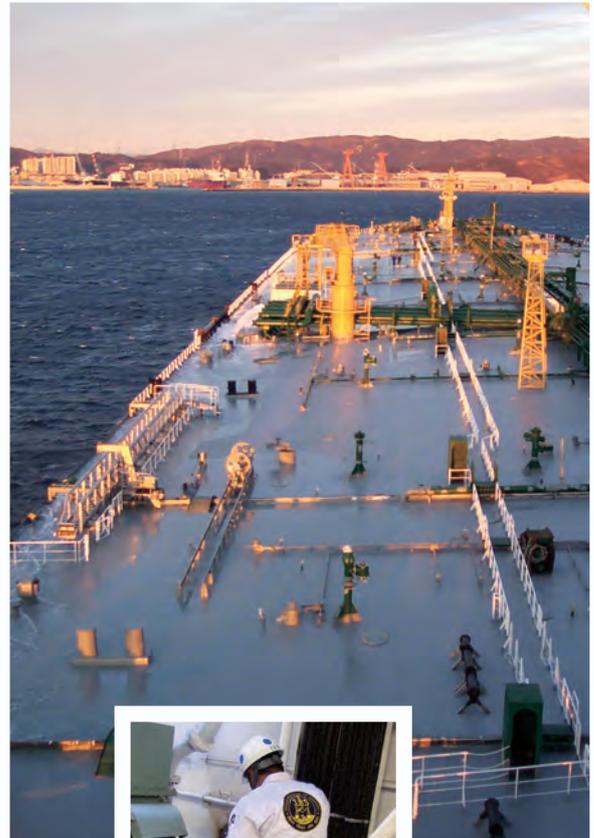
HRP develops cutting-edge technology for reliable steerable thruster systems up to 2400 kW while working in close co-operation with you as a client to best serve your individual needs.

HRP Thruster Systems b.v.  
P.O. Box 2020  
2930 AA Krimpen aan de Lek  
The Netherlands



T : +31 (0)180 33 10 00  
F : +31 (0)180 33 10 99  
E : info@HRP.nl  
I : www.HRP.nl

**Expertise** combined with  
**experience,**  
**understanding**  
and a **zeal to excel**



Discover More With

**IRCLASS**  
Indian Register of Shipping

Visit us at Marintec China, Stall 3B16

52 A, Adi Shankaracharya Marg, Mumbai 400 072, INDIA.  
T: 91 22 3051 9400, F: 91 22 2570 3611, ho@irclass.org

## CFD possibilities and practice

**SIGNIFICANT developments in computational methods covering fluid flows in and around ships are explored by Volker Bertram (Dept Mech Eng, Univ Stellenbosch) and Patrick Couser (Sunnypowers Ltd).**

**C**OMPUTATIONAL Fluid Dynamics (CFD) are here interpreted as a numerical, computer-based simulation of a fluid flow, modelled by solving a set of field equations describing the dynamics of the fluid flow.

In this context, the field equations are (in increasing order of simplification):

- Navier-Stokes equations. For practical problems, the Navier-Stokes equations can only be solved by making certain simplifications leading to the...
- Reynolds averaged Navier-Stokes equations (RANSE). These can be used to solve viscous fluid flows. Removal of the viscous components of the model yields the...
- Euler equations, which are often used in aerodynamic problems where compressibility is important. For ship-flow simulation they are less widely used. Removal of the compressibility terms gives the...
- Laplace and Bernoulli equations (potential flow). Because the effects of viscosity are often limited to a small boundary layer (for streamlined bodies with no separation), potential flow models are very useful, particularly for free surface flows.

Depending on the field equations being solved, different numerical representations of the fluid domain are may be employed. These can be summarised as follows:

- Field methods – where the whole fluid domain is discretised, namely Finite Element Methods (FEM), Finite Difference Methods (FDM), Finite Volume Methods (FVM)
- Boundary element methods (BEM) – where only the fluid boundary needs to be discretised, also called panel methods
- Spectral methods.

Volker Bertram is an authority on CFD and computational methods and author of the standard textbook *Practical Ship Hydrodynamics*. He is an extraordinary professor at the Department of Mechanical Engineering of the University of Stellenbosch, South Africa, and Lecturer at ENSIETA, Brest, France. Volker also organises the Computer and IT Applications in the Maritime Industries (COMPIT) and the Numerical Towing Tank Symposium (NuTTS) conferences.

Patrick Couser: Before becoming an independent consulting naval architect in 2004, Patrick worked for Formation Design Systems, BMT Seatech, and several universities using and developing a wide range of design and analysis software. Amongst other projects, he still continues to be involved in the development of Formation Design Systems' Maxsurf suite.

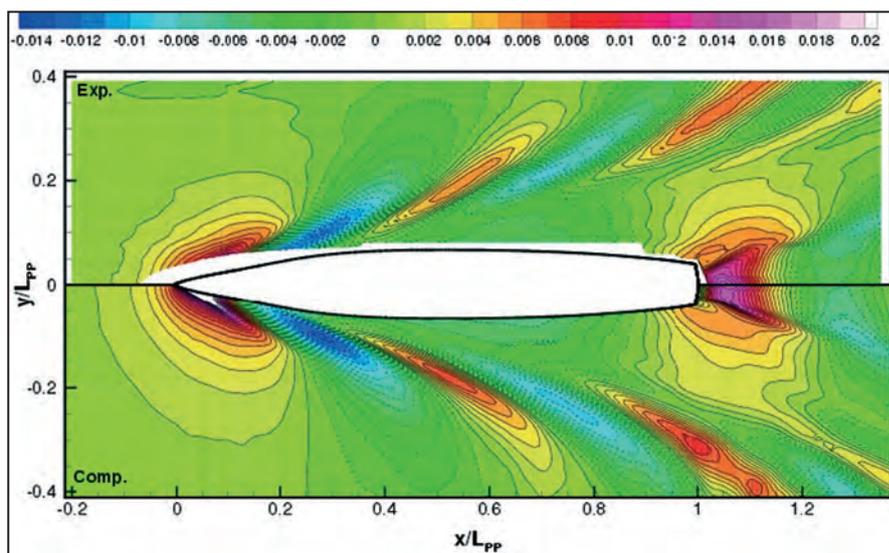
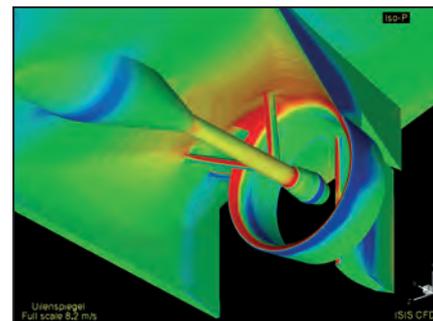


Figure 1: Comparison of CFD model (bottom) and measured (top) wave pattern, courtesy of NUMECA.



Figure 2: RANSE modelling of vessel stern and appendages, courtesy of NUMECA.



While in principle there could be many combinations of field equations and numerical techniques, in practice these are predominantly RANSE solvers based on FVM for solving viscous flows and Laplace/Bernoulli solvers using BEM for inviscid, potential flow.

Before discussing the tools and trends in more detail, it is necessary to answer the most frequently asked question concerning CFD: can CFD be used as a substitute for towing tank model tests to predict ship power?

The answer is that, despite all the progress, and despite some marketing claims, CFD codes are not able to consistently predict the power requirements of a ship with the same accuracy as model tests performed in professional model basins; CFD provides versatile design tools, but they are not (yet) able to predict ship resistance or power.

However, as computational power increases and cost decreases, and as CFD codes become more sophisticated and better integrated into CAD and optimisers, it is inevitable that the use of CFD in ship design will become increasingly important and widespread.

There is a broad range of problems where CFD techniques are applicable; some of the

key areas of interest to the naval architect are described below. Due to differences in scale, fluid, geometry etc, different CFD techniques are better suited to some problems than others. There is currently no single CFD technique that can be applied to all problems; for this reason, it is generally necessary to have a range of software tools to hand.

- Hull design, especially fore-body design
- Design of appendages (alignment and form details of shafts, brackets, etc)
- Propulsor design (efficiency, avoidance of excessive vibrations and cavitation)
- Mooring
- Unsteady ship motions: manoeuvring, sea-keeping
- Aerodynamics
- Fire modelling and HVAC flows
- Internal pipe flows
- Flooding – fluid inflows and outflows
- Slamming and sloshing (especially in LNG tanks).

Although the following types of analysis are also very useful, since they generally provide results with a reasonable degree of certainty for

# NUPAS

## CADMATIC

### 3D Ship Design Software

Picture courtesy of Ulstein Verft. AS Norway

Nupas-Cadmatic V5.2 is the ultimate 3D ship design software solution for ship designers and shipbuilders. Nupas-Cadmatic is a concurrent engineering software tool for ship hull-, machinery-, piping-, HVAC-and outfitting engineering. It genuinely saves time and money. The open software is database-driven and utilizes advanced 3D modelling technology, providing the necessary information for accurate pre-outfitting and production.

The informative and easy-to-use 3D modelling capabilities can be used for early and basic design, detailed engineering, and the production of workshop drawings and generation of ready-to-use production data for production machinery.

With Nupas-Cadmatic you can successfully carry out the entire ship design project, right from the early start, up to the deck outfitting and final production phase. It improves engineering quality and shortens construction times. Nupas-Cadmatic seamlessly distributes engineering projects globally between different sites while ensuring effective communication between project partners. With the Nupas-cadmatic eBrowser all parties involved can view and check the 3D ship model and other design information via the Internet. The eBrowser adds value to the entire ship project, easing communication and providing everybody with continuous access to updated and relevant information.



**NEW  
VERSION  
V5.2  
RELEASED**

#### Design and engineering of:

- GA and MA
- Classification drawings
- Hull structures
- Piping and other diagrams
- Machinery & piping, HVAC
- Accommodation & interior
- Outfitting
- Virtual 3D models
- On-line Walk Around
- Windows AVI Video files

#### Comprehensive information for:

- Plate and profile cutting
- Plate and profile bending
- Pipe spools and isometrics
- Pipe cutting and bending
- Other material lists
- Weights
- Centers of gravity
- Logistic data
- Data for production robots
- Interfacing other systems

S O F T W A R E D E V E L O P E D B Y :

**NC** NUMERIEK CENTRUM  
GRONINGEN

Numeriek Centrum Groningen B.V.  
Osloweg 110, 9723 BX Groningen, The Netherlands  
Tel +31-50-57 53 980, fax +31-50-57 53 981  
www.ncg.nl, e-mail sales@ncg.nl

**CAD**MATIC

Cadmatic Oy  
Itäinen Rantakatu 72, 20810 Turku, Finland  
Tel +358-2-412 411, fax +358-2-412 444  
www.cadmatic.com, e-mail sales@cadmatic.com

[www.nupas-cadmatic.com](http://www.nupas-cadmatic.com)

*We improve your shipbuilding*

a wide range of ship types and geometries, they will not be described in detail in this article since they are not normally classed as CFD.

- Slender body theories for resistance (only applicable for slender hulls, for instance catamaran demihulls)
- Strip theory for the prediction of ship motions.
- Manoeuvring using empirical coefficients.

### Current trends in CFD

The majority of commercially available CFD codes are either RANSE/FVM for viscous flows and Laplace/BEM for inviscid potential flow.

By ignoring viscosity, the equations governing the fluid flow are greatly simplified. These methods are ideally suited to the calculation of wave resistance where the solution speed of these methods allows rapid design exploration. The solution speed is primarily due to the fact that only the fluid boundary, rather than the entire fluid volume needs to be modelled. This normally leads to at least an order-of-magnitude reduction in the number of elements required to model the vessel. Typically, panels are placed on the submerged part of the ship's hull and the free surface. If the vessel is operating in a confined waterway, the bottom and sides of the channel can also be modelled by including additional panels on these boundaries or by using mirror images of the panels.

State-of-the-art fully non-linear wave resistance codes had become standard ship hull design tools by the mid-1990s, whilst panel codes for propeller design had reached design maturity even earlier, mainly pushed by developments for the aerospace industry.

First-generation wave resistance codes used only source elements to model displacement; propeller codes from the same era used only vortex or dipole elements to model lift. Later developments added lifting surfaces to wave resistance codes (to handle, for example, the keel of a sailing boat) and source elements to propeller codes (to handle thicker blades and the propeller hub). When lifting surfaces are included, it is also necessary to model the trailing vortex wake left downstream. Considerable effort has been made to model the shape and tip roll-up of this wake accurately, as this has a significant impact on the accuracy of the induced drag calculation and interaction with downstream bodies.

The Navier-Stokes and the continuity equations are generally considered to be sufficient, in principle, to describe all real fluid physics for ships, but impossible to solve for ship flows. They must be simplified in some way so as to be useful for modelling these flows. The most common method of simplification is the Reynolds-averaged Navier-Stokes equations (RANSE), ie time-averaged Navier-Stokes equations, combined with a semi-empirical turbulence model.

An alternative is the Large-eddy simulation (LES). LES is positioned between RANSE and the Navier-Stokes equations, solving directly in space and time for the large turbulence structures and modelling the small turbulence structures with a semi-empirical turbulence model. Some researchers see LES as the only

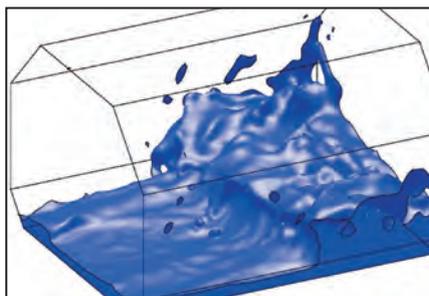


Figure 3: Multi-phase flow model of sloshing in a tank, courtesy of Germanischer Lloyd.

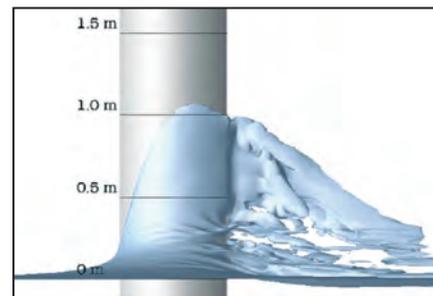


Figure 4: Wave breaking on a strut, courtesy of HSVA.

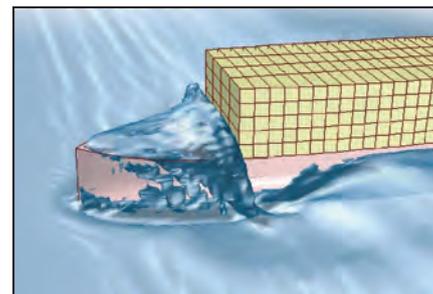
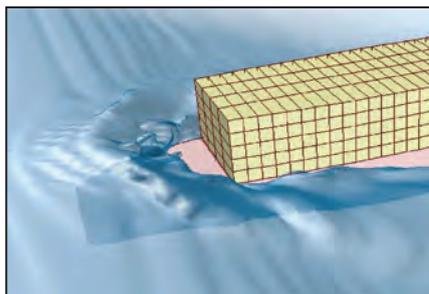


Figure 5: RANSE simulation of ship motions with green water on deck, courtesy of Kyushu University.

long-term solution to the current problems with turbulence modelling required in RANSE solvers, but LES will not be practical for ship flows at full-scale Reynolds numbers for at least one, possibly several decades.

For many design applications, RANSE solvers with appropriate turbulence models are sufficient to model a wide variety of ship flows with sufficient accuracy and confidence to be practically useful. The past decade has seen a general trend towards more sophisticated turbulence models, with Reynolds stress models (RSM) and  $k-\epsilon$  models now being widely favoured over the older  $k-\epsilon$  models.

Most RANSE solvers are also able to represent complex free surfaces including breaking waves and air entrainment using volume of fluid (VOF) or, perhaps more commonly, multi-phase flow solutions. RANSE solvers have gained in importance for the analysis of flows around the whole ship hull – an area which until relatively recently used to be the undisputed domain of potential flow solvers – because they can handle the complex geometries of the ship and free surface, including wave breaking.

CFD is applied to a vast range of analyses: from injection moulding to combustion within an engine to global weather system modelling. In this section we will look at some of the main areas where CFD can be usefully applied in the ship design process.

### Resistance and propulsion

CFD generally gives correct ranking of sufficiently different designs, although absolute values of resistance are normally not accurate enough to exclude the need for towing tank tests. The strength of CFD analysis is that it allows a wider range of alternative hull designs to be tested than would be possible by tank testing alone. It is ideally used for selection of

promising candidate designs for further testing in the model basin. CFD also gives insight into where and how to modify a design, showing, for example, the detailed pressure distribution over the hull.

It is often possible to calibrate a CFD code for a particular design with a 'catch all' correlation factor included with the experiment results; the correlation factor can be assumed constant for small changes in hull geometry and speed, thus allowing further examination of design alternatives using CFD.

The industry workhorse for calculating wave resistance – steady free surface flows – is still the inviscid panel method. The first-generation codes followed Dawson's double-body approach and neither fulfilled the non-linear boundary condition on the free surface nor automatically adjusted the ship to a position of equilibrium. By the end of the 1980s, these drawbacks were overcome with second-generation codes, so-called fully non-linear codes. Amongst the best known of these codes are SHALLO (HSVA), RAPID (MARIN) and Shipflow-XPAN (Flowtech). These codes are regularly used to support design decisions. They have been successfully applied to a large variety of ship types, including tankers, dredgers, submarines (in snorkelling condition), catamarans (including foil-supported catamarans), frigates, etc. However, they are not suitable for planing hulls.

Over the past decade, these codes have become a standard design tool, increasingly deployed directly at the shipyard by designers rather than dedicated CFD specialists. These codes are particularly useful for the design of the bulbous bow and the forward shoulder of the ship when trying to minimise wave resistance.

Although the pressure distribution over the majority of the ship (with the exception of the

Maximising technology for a safer world.



GRC Ltd is a Software and Naval Architecture consultancy specialising in bespoke software solutions and IT services, as an independent business within the QinetiQ Group. We have supported the UK MoD over the last 15 years both onshore and at sea, whilst working with commercial organisations.

Accessing QinetiQ's vast research and knowledge base broadens the GRC range of advanced marine technology software products, which allows us to deliver innovative solutions worldwide.

To find out how we can make a difference for you, call us on +44 (0) 2392 334 003 or visit [www.grc-ltd.co.uk](http://www.grc-ltd.co.uk)



*New Version*

**FORAN**

Today's Best Shipbuilding **CAD/CAM**

**We are ready to cooperate in your business success**

Our vision is to be at the fore front in ship design and production technologies and to provide a first class support service which creates strong synergies with our customers.

Image Courtesy of Navantia

[www.foran.es](http://www.foran.es)

[www.sener.es](http://www.sener.es)

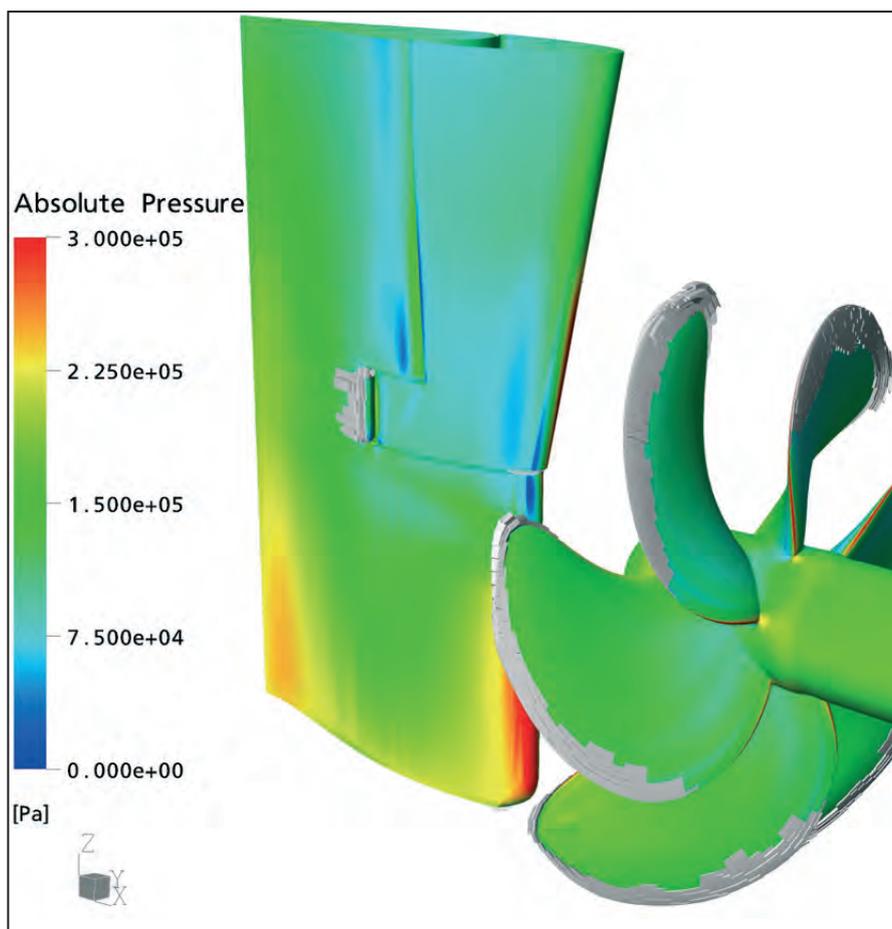


Figure 6: CFD modelling of interaction between propeller and rudder with cavitation, courtesy of Germanischer Lloyd.

aft-body) is believed to be quite accurate and wave cuts computed by state-of-the-art codes usually agree well with experiments, the computed wave resistance for real ships may still differ considerably from measured residual resistance or even wave resistance estimated using form factor methods. Ships with large transom sterns are particularly problematic. There are claims that so-called patch method codes overcome these shortcomings by providing better resistance prognoses. These codes employ new techniques to improve accuracy, examples are the KELVIN code of SVA Potsdam and the V-SHALLO code of HSVA, but very little has been published on these codes. However, there seems to be some general improvement in transom stern treatments that allows the typical rooster-tails, found behind fast ships, to be captured. For low to medium speeds, large transom sterns still pose a problem for these inviscid codes. In these situations, a free surface RANSE simulation is recommended.

Usually only the flow fields in the near-field or even in contact with the ship are of interest to the designer aiming to minimise power requirements. However, in recent years, wave resistance codes have also been used in various projects to develop low-wash ships. This application of panel codes is still in development: design criteria are still to be determined by national and international authorities, and the simulations shown so far are usually limited to steady flow conditions neglecting local river topologies and critical unsteady situations such as the deceleration of fast

ferries approaching quays. Hybrid methods could be developed matching near-field simulations of the wave generation around the ship (using fully non-linear wave resistance codes or free surface RANSE) and matching the solution to codes used in coastal engineering that simulate the propagation of the wave field in arbitrary shallow-water topology. However, such simulations are rather specific to a particular river or estuary topology. For more general design purposes, a comparison of the near-field wave pattern using a wave resistance code, usually suffices in practice: if, for a given speed, the waves generated in the vicinity of the ship are reduced, then the wash will also be reduced.

The handling of breaking waves remains a major problem for panel methods, be it for wave resistance or sea-keeping. One approach to attempt to overcome these limitations lies in methods which discretise the fluid volume rather than the vessel and free surface boundaries. Such methods can simulate flows with complicated free surface geometries (notably breaking waves) allowing the analyses of problems beyond the realm of applications of panel methods. However, maturity, short computational time, ease of grid generation and robustness of the codes explains why panel methods will continue to be the preferred tools for design engineers.

Flow phenomena, such as separation, vortex generation, and non-uniformity of the wake field, are dominated by viscous effects requiring more sophisticated CFD approaches. In practice,

RANSE simulations are normally used where these viscous phenomena are significant, and for most design applications, only steady flow is considered.

Appendages such as brackets, rudder, fins, etc usually lie in regions where viscosity cannot be neglected, but where the free surface can be ignored. In these situations, CFD allows the simulation at full-scale Reynolds numbers and thus offers a clear advantage over model tests. The CFD simulation can reveal, for example, how to align propeller shaft brackets so as to minimise resistance and adverse flow patterns in way of the propeller (which cause vibrations). Similar applications appear for openings in the ship hull such as bow thruster tubes, waterjet inlets etc. Such computations, modelling the flow around appendages, account for a considerable share of viscous flow calculations carried out during design. Although these types of analyses are among the simplest ship applications of RANSE solvers, it is still industry practice to outsource the analysis to experts. This is because the quality of the results is very sensitive to meshing and other analysis parameters which require considerable user experience.

RANSE computations that include the effect of propellers – propulsion test – usually model the propeller by applying body forces, ie the propeller geometry is not captured by the grid, instead, each cell in the propeller region is associated with a force representing a contribution to the lateral and rotational acceleration of the water imparted by the propeller. The body forces are often prescribed based on experience or experimental results. Alternatively, panel methods may be employed to predict the thrust and rotation distribution of the propeller. These simulations still appear to be limited to research applications and are not widely used in design. The body force model of the propeller is, however, frequently employed if the effect of the propeller on appendages in the aft-body is of interest, eg for rudders.

The simultaneous consideration of viscosity and wave making has progressed considerably over the past decade. A number of methods try to capture wave making with various degrees of success. The methods for computing flows with a free surface can be classified into two major groups:

Interface-tracking methods define the free surface as a sharp interface whose motion is followed. They use moving grids fitted to the free surface and compute the flow of the liquid under the free surface only. Problems are encountered when the free surface starts folding or self-intersecting or when the grid has to be moved along walls with complicated shapes (for instance, the geometry of a real ship hull).

Interface-capturing methods do not define a sharp boundary between liquid and gas and use grids which cover both liquid and gas filled regions. The free surface is then determined by either Marker-and-Cell (MAC), Volume-of-Fluid (VOF), level-set or similar schemes.

The trend is clearly towards interface-capturing methods as implemented, for example, in all major commercial RANSE codes. These are the preferred choice whenever wave breaking is of significant importance, eg for surface piercing struts, blunt fore-bodies (barges), sloshing in tanks, etc.



# State-of-the-art simulation for the marine industry

Flow, thermal and stress simulation is routinely used to enable naval architects and engineers to master the complex demands of today's marine industry. CD-adapco's cutting-edge technology (STAR-CD & STAR-CCM+), allows our customers to tackle the most demanding problems the industry has to offer, such as:

**Hydrodynamics, wave slamming, wind loads, 6 DOF pitch and roll, propeller and rudder cavitation, sloshing, green-water, fluid-structure interaction (FSI), as well as engine design and passenger comfort.**

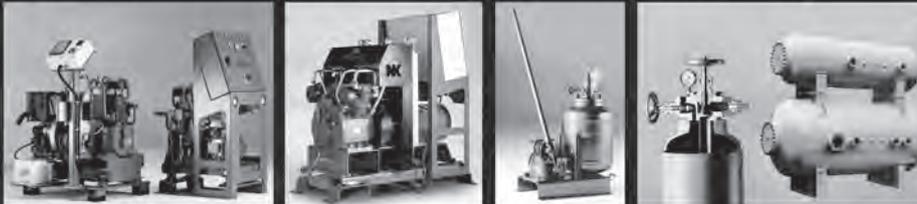
CD-adapco has a 25-year history of providing state-of-the-art flow, thermal and stress simulation to the marine industry, and our solutions are the most widely used by the America's Cup teams. Contact us to find out why CD-adapco is the marine industry's CAE partner for success.

For more information contact us: [info@uk.cd-adapco.com](mailto:info@uk.cd-adapco.com)

Your CAE Partner for Success  
[www.cd-adapco.com](http://www.cd-adapco.com)



## Solutions for shipbuilding and industry

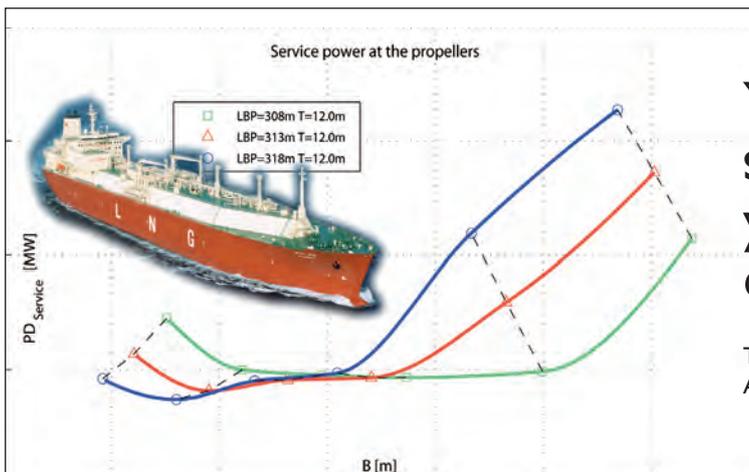


- Compressed - Air Receivers
- TDI-Engine Air Starters
- Gastight Bulkhead Penetrations

- Compressors
  - starting air
  - control air
  - working air



Neuenhauser Kompressorenbau GmbH  
 Ladestrasse 5 · D-49828 Neuenhaus  
 Germany  
 Phone +49 (0) 59 41/604-252  
 Fax +49 (0) 59 41/604-202  
 e-mail: [nk@neuenhauser.de](mailto:nk@neuenhauser.de)  
[www.neuenhauser.de](http://www.neuenhauser.de)



## You win! SSPA reduces your energy consumption

The picture shows:  
 A hull parameter optimisation



SSPA Sweden is an independent consulting company providing services in the areas of ship design and maritime operations. We focus on developing efficient, safe, and environmentally friendly maritime solutions. [www.sspa.se](http://www.sspa.se)

Most schemes reproduce the wave profile on the hull accurately, but some problems persist with numerical damping of the propagating ship wave. It is debatable if an accurate prediction of the wave pattern is necessary for practical applications, but certainly everyone would prefer to see this problem overcome. This may require considerably finer resolution and higher-order differencing, ie much higher computational times and storage capacities. For global wave system creation, the much cheaper wave resistance codes seem sufficiently accurate and are the recommended tool of choice.

Inviscid flow methods (panel methods and vortex lattice methods) have long been used in propeller design as a standard tool yielding information comparable to experiments. Today, RANSE methods also yield good results for 'nice' propeller geometries. However, both panel methods and RANSE deteriorate for extreme propeller geometries due to grid problems. Also, certain types of cavitation still are not satisfactorily reproduced by the computations.

Most publications for propeller flows focus on open-water simulations. In practice, the propeller should be designed for the effective wake field of the full-scale ship, considering hull-propeller and propeller-rudder interactions. Complete RANSE simulations appear to be unnecessarily expensive and so far yield results no better than hybrid approaches that combine potential flow computations and RANSE.

These hybrid approaches typically calculate the propeller inflow using a RANSE simulation. Then the propeller in the modified inflow is modelled by a potential flow computation. The propagation of the propeller wake uses a RANSE simulation between a plane just downstream of the propeller and a plane just upstream of the rudder (thus using a very simple grid) and then the flow around the rudder can again be solved using a potential flow simulation. Such a procedure appears complex due to the different codes involved, but is fast enough for design and of similar accuracy to a full RANSE simulation.

Recently, podded drives and other special propulsors such as waterjets have attracted attention. Due to limited experience with these unconventional propulsors, designers are more inclined to resort to CFD analyses, particularly to find designs that avoid or minimise cavitation. For podded drives, CFD applications appear to be at a similar level of maturity to those for conventional propeller-rudder arrangements.

Although the underlying physical models are generally considered crude, strip methods are able to calculate most sea-keeping properties of practical relevance accurately enough for a wide range of vessel types, including most cargo vessels. Strip methods are generally employed for displacement monohulls for the prediction of long-term sea-keeping statistics. They form the basis for predicting: fatigue loads; added resistance; ship motion statistics; motion sickness occurrence; and ship routing. Strip methods have fundamental problems in predicting local pressures at the ends of the ship. They are also frequently less accurate for surge motions and for all motions at low encounter frequencies. Strip methods are applicable up to Froude numbers of 0.4, and with some

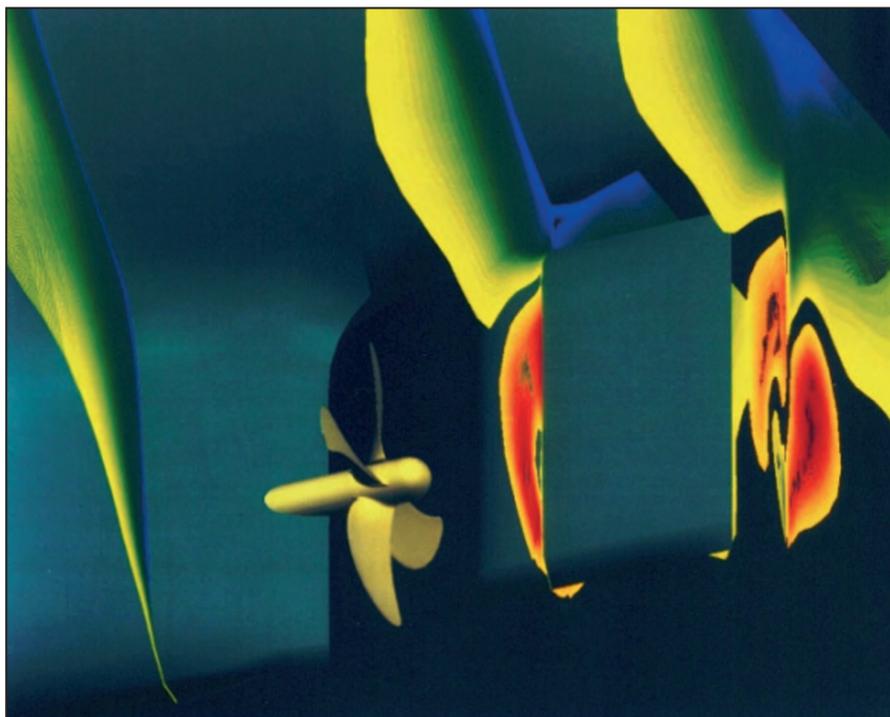


Figure 7: CFD modelling of interaction between hull, propeller and rudder, courtesy of Mitsubishi HI.

corrections, this range can be extended up to Froude numbers of 0.6. For displacement hulls at Froude numbers above 0.4, 2D+t methods – also called high-speed strip methods – are quick to solve and yield good results. Codes based on Green function methods (GFM) like WAMIT and DIODORE are standard tools in offshore industry for evaluating the sea-keeping performance of stationary or moored vessels. However, GFM codes perform poorly for ships with considerable forward speed and transom sterns.

The International Maritime Organization introduced new requirements for damaged ro-ro passenger vessels after the *Estonia* disaster. These requirements (Stockholm Agreement) applying to ships operating in Northern Europe, have also become a widely accepted standard for ships operating in other regions of the world. This development has stimulated much research: classical strip method approaches have been extended to non-linear strip methods modelling damaged ships and associated internal flows (water entering the ship). Several such codes exist, eg SIMBEL at Germanischer Lloyd or ROLLS at HSV, but the analysis remains in the hands of a few dedicated experts.

Some pioneering applications of RANSE computations for ships in regular waves have appeared. Computing power is now the main limiting factor: even when powerful computer clusters are employed, simulations are limited to a few seconds. It is questionable whether there is any commercial value to be obtained by using these methods for small motions or small incident waves, as strip methods with empirical corrections for viscous damping perform very well. Where RANSE simulations make sense is for strongly non-linear cases involving green water on deck and/or coupling with sloshing inside the ship. In such simulations a hybrid

approach is typically employed: standard strip methods are used to determine critical combinations of frequency, wave direction, load case, etc. Then an expensive RANSE simulation is used for one or a few of these critical cases.

Sea-keeping of planing hulls is one area where RANSE simulations would be our recommended choice. Rolla Research in Switzerland and MTG in Germany have presented convincing applications for real planing hull geometries. The RANSE code employed (COMET in both cases) was reported, in personal communication, to give 'good results in nine out of 10 cases', but such an analysis requires considerable experience with RANSE codes and significant hardware resources, forcing designers to outsource the services to a few select experts.

Slamming problems, even in two dimensions, are very challenging. This is because in situations where slamming occurs, the following may have to be considered: rapidly changing local hull loads in both space and time; hydro-elastic effects; interaction between trapped air pockets and the surrounding water; compressibility of water in localised regions, leading to the formation of shock waves; and complex water surface shapes due to the formation of jets. Traditional approaches work well for two-dimensional flows around wedges of suitable deadrise angle, but usually ship cross-sections do not have suitable deadrise angles and the phenomena are three-dimensional. There is wide consensus that only CFD will allow substantial progress in simulating slamming loads. However, such simulations currently remain limited to research problems.

None of the methods developed so far incorporate all relevant phenomena and adaptive grid techniques appear mandatory to allow realistic computations in an acceptable

# Demanding applications? We've seen them all.

With a drive system from Hägglunds, you get compact, durable power - without foundations or gearbox. A full range of rugged motor types and with a rich range of accessories we can offer complete solutions and give you total assurance, even in the most demanding applications. Let us know your demands. **Let us know your demands.**

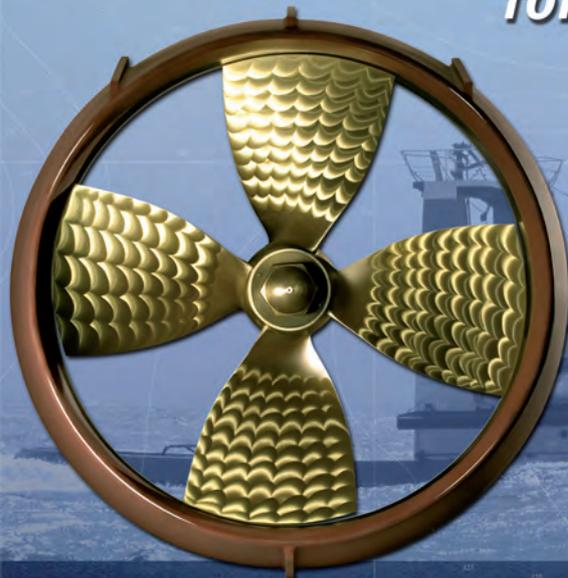
Hägglunds Drives AB, SE-890 42 Mellansel, Sweden.  
Tel: +46 (0)660-870 00. E-mail Business Area Manager:  
lars-goran.soderlund@se.hagglunds.com  
www.hagglunds.com

Our drive is your performance.

**HÄGGLUNDS**

## ***ELICHE RADICE***

*Propellers, nozzles and complete shaft lines  
for all professional uses*



 **ELICHE RADICE SPA**

 **www.elicheradice.com**

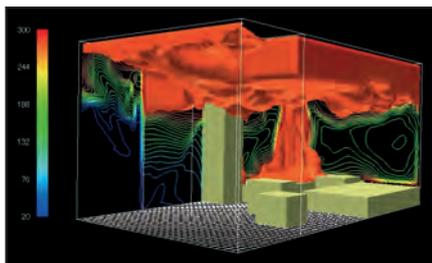


Figure 8: Simulation of a fire in a cabin, courtesy of Kyushu University.

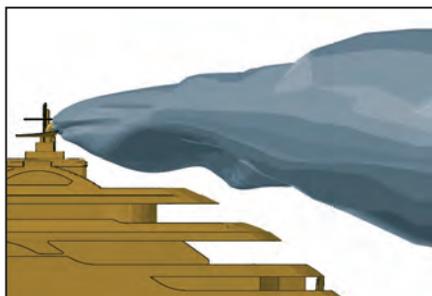


Figure 9: Modelling smoke propagation, courtesy of Germanischer Lloyd.

time. Designers will continue to use the recommendations made by classification societies, which are in turn developed using a mix of full-scale experience, model tests, and advanced simulations.

Sloshing can be seen as a form of slamming on internal structures. Due to the highly non-linear free surface deformation, sloshing analyses use free surface RANSE simulations. These simulations are now well validated even for complex three-dimensional geometries. Local pressures are well reproduced by the numerical simulations. Recent developments now focus on coupling global ship motions and internal sloshing analysis. Such a direct coupling requires considerable computational resources, but prototype applications have appeared in 2007. In principle, these simulations are now feasible, but need to be outsourced to experts.

In practice, the ship designer will probably use strip methods for most problems. RANSE methods or non-linear strip methods may be employed by experts for a few specific, highly non-linear problems.

A number of high-profile incidents involving tankers and ferries have emphasised the importance of the manoeuvring performance of ships. IMO regulations concerning the (documented) manoeuvrability of ships have increased the demand for CFD methods in this field. However, CFD simulations of ship manoeuvring remain limited to advanced research applications. For practical applications, the preferred choice is a force-coefficient method that employs various coefficients to approximate the forces acting on the ship (hull, rudder, propeller, thruster, etc). Some of these coefficients can be predicted accurately by CFD, but usually empirical estimates or computations based on slender-body theory suffice.

However, CFD has gained rapid acceptance for rudder design. For many applications, potential flow models enhanced by empirical corrections are sufficient, but for large rudder angles (where the onset of separation is approached) and partially cavitating flows, RANSE simulation is the tool of choice. The designer strives to avoid rudder cavitation for rudder angles up to  $\pm 5^\circ$ . This is the usual operating range for rudders during normal ship course keeping. Cavitation is almost unavoidable for highly loaded rudders at large rudder angles and in these situations it is normal practice to accept it. Modern RANSE codes with cavitation models have been reported to predict location and extent of cavitation on rudders at full scale very well. Germanischer Lloyd has presented several publications showing excellent correlation between paint erosion on rudders and predicted cavitation areas using the RANSE code Comet.

SOLAS regulation II-2 Chapter 17, in force since July 2002, allows designers alternative methods of compliance with regard to fire safety. This applies to systems, arrangements, and complete designs. The requirement is to prove that the safety level of the design is at least equal to that of a design based on the prescriptive rules. The equivalent safety level is to be proven by engineering analysis. In principle this could mean fire experiments, but these are too costly and time consuming to support ship design, leaving computer simulations as the most suitable option.

At present, zone models and CFD tools are used for fire simulations in ships. Zone models are suitable for examining more complex, time-dependent scenarios involving multiple compartments and levels, but numerical stability of the computer models can be problematic for multi-level scenarios; scenarios with Heating, Ventilation, and Air Conditioning (HVAC) systems and for post-flashover conditions. CFD models can yield detailed information about temperatures, heat fluxes, and gas concentrations. However, the time penalty of this approach currently makes CFD unfeasible for long periods of real time and/or large computational domains.

For fire simulation, it is necessary for the CFD simulations to solve additional equations that describe the energy aspects and the combustion (chemical reaction). Multi-purpose RANSE solvers (Comet, CFX, Fluent) are not suited to this task, nor is the experience of hydrodynamic or aerodynamic flows directly transferable to fire simulations. In short, fire simulations should be left to experts, preferably those with experience in modelling such scenarios onboard ships.

#### Aerodynamics

Only a few CFD applications are available for the computation of the airflow around the upper hull and superstructure of ships and offshore platforms. Topics of interest are wind resistance (especially of fast ships), wind-over-the-deck conditions for helicopter landing, wind loads, and tracing of funnel smoke.

The differences between CFD and model-test results are not generally larger than between full-scale and model-scale results. However, due to the time involved in generating the

computational mesh and in computing the flow patterns, CFD is usually not economically competitive when compared with routine wind tunnel model tests. For wind forces, empirical estimates usually work well enough for conventional ships. With decreasing time and cost of grid generation around complex ship super-structures, we may see more CFD applications for ship aerodynamics, but so far such simulations are only applied in research or in combination with other features, for example fire and ventilation flow simulations. Our tool of choice thus remains a wind tunnel in most design applications.

In spite of considerable progress made during the last decade both in hardware and software development, the accurate prediction of turbulent flow around appended hull remains a challenging task. In addition to an appropriate turbulence model, the success of a numerical simulation depends on the quality of the body-fitted grid employed for the computation.

Many of the software vendors provide consulting services, and there are specialist consultants who will perform CFD analysis. Many towing tanks will also offer CFD analysis to supplement the physical model testing. So there are many options available depending on available budget, the frequency with which CFD projects occur, and the expertise available in-house.

In the end, the quality of the results produced is generally more dependent on the skill of the operator than on the CFD tool used. Sufficient experience with the software, particularly the grid generation, is the decisive factor for the cost and quality of the analysis.

As a simple rule of thumb, it becomes cost-effective to do the analyses in-house if you perform more than ten analyses per year and you are able to stay sufficiently up-to-date with the software and technology. If you only perform CFD analyses infrequently, it is advisable to outsource the analysis when the need arises.

To be able to use advanced CFD applications in-house requires:

- Specialist CFD staff, typically requiring several months training to become proficient in the use of an analysis package
- Software licences for grid generators, flow solvers, and post-processing tools (and possibly further codes)
- Significant computer resources, typically distributed PC clusters.

This type of investment only pays off if CFD analyses are performed on a regular basis. Vendors frequently downplay the cost of initial training and, at present, for design offices and independent shipyards there is little sense in using RANSE codes due to their complexity and the level of knowledge required to produce correct results; it will normally be more cost-effective to outsource these analyses to specialists. However, inviscid, potential flow, wave resistance codes can be recommended for in-house use if there are ten or more projects per year. Similarly, strip methods (or high-speed strip method for fast ships) for sea-keeping analyses makes sense because the codes can



# ZODIAC

Mastering the elements.

MES ESS  
ORIL 100 / 151

MES SIS  
TO 50 / 150

MES SIS  
TOSR 50 / 150

TAKE ADVANTAGE OF INNOVATION

## SLIDES EVACUATION SYSTEMS

for low free-board passenger vessels, ferries and high speed crafts  
with evacuation deck heights up to 2.2m, 2.7m and 3.2m

MES SIS  
ORIL 50 / 100 / 151

MES ESS  
Slimline container

ZODIAC INTERNATIONAL - 2, rue Maurice Mallet - 92130 Issy-les-Moulineaux - France - Tel: +33 1 41 23 23 23 - Fax: +33 1 41 23 23 98  
e-mail: solassales@zodiac.com - www.zodiacsolas.com - www.zodiacrescueboats.com

© ZODIAC 04-2006

NIIGATA POWER SYSTEMS CO. LTD. was founded on the basis of NIIGATA's own technology that developed the first Japanese industrial diesel engine and has become stronger under the extensive basic technology of Ishikawajima-Harima Heavy Industries Co. Ltd. (IHI)



# NIIGATA



**Niigata Power Systems Co.,Ltd.**  
Marketing & Sales Center  
International Operations / Marine  
9-7, Yaesu 2-Chome,  
Chuo-ku, Tokyo, 104-0028, JAPAN  
TEL: +81-3-6214-2826  
FAX: +81-3-6214-2839  
E-mail: info1@niigata-power.com

### Local Office & Subsidiary

-Shanghai Office  
TEL: +86-21-6278-7680 FAX: +86-21-6278-7682  
-Niigata Power Systems (Singapore) Pte.Ltd.  
TEL: +65-6899-1500 FAX: +65-6899-1600  
-Niigata Power Systems (Europe) B.V.  
TEL: +31-10-405-3085 FAX: +31-10-405-5067

be run on standard PCs, and generation of the input data is fast and relatively simple. In any case, generation of input data and interpretation of the result requires an understanding of the fundamental theory behind the code and its assumptions and limitations.

Progress in commercial RANSE codes over the last decade has included the development of better turbulence models, the inclusion of cavitation models and free surface capabilities, usually in the form of two-phase flow treatment allowing breaking waves and detaching droplets to be modelled. In addition, the codes are now able to handle arbitrary grids, allowing faster grid generation. There are different approaches to achieve this geometrical flexibility, including overlapping grids (Chimera grids), non-structured grids, and arbitrary polyhedral cell shapes.

At present, adaptive grid techniques for RANSE codes appear to be not yet sufficiently mature for application to three-dimensional ship flows in an industrial context. However, various research applications indicate that adaptive grid techniques may become viable over the next decade or so.

There is also a trend for the major commercial RANSE codes to interface with a variety of other codes. The main RANSE solver can thus interface with a variety of commercial and perhaps in-house grid generators, as well as a range of post-processing tools. Interfaces with finite-element programs for structural analysis open the door for advanced hydro-elastic analyses. Fluent is interfaced to Abaqus, Comet and Star-CD to Ansys, for example.

Commercial codes have the advantage of large user community pools of experience. This usually reduces the (re)occurrence of mistakes. This is not a general law, but a frequently observed fact. Also, commercial codes are usually better validated and documented. The larger user community supports continuous development and enhancement of the software, in terms of both features and ease of use. From a business point of view, commercial codes often make more sense than one-off products fresh from universities or in-house researchers.

Until recently, wave resistance codes had been used to 'optimise' ship hulls manually by comparing flow details for various ship hull options, selecting the best of a handful

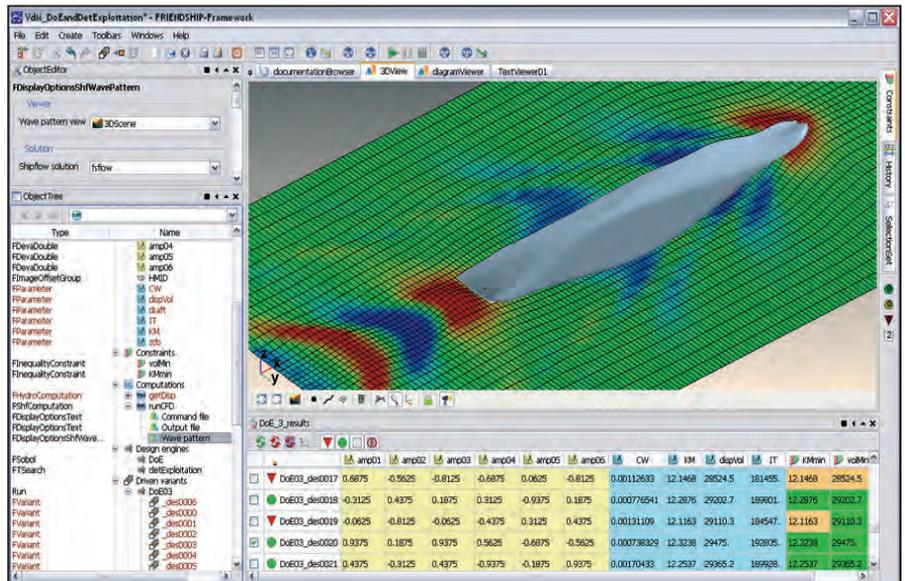


Figure 10: Automated optimisation of hullforms for minimum resistance within the FRIENDSHIP-Framework, courtesy of FRIENDSHIP SYSTEMS.

of alternatives or deriving recommendations on how to change the hull. A formal optimisation seemed to be out of reach as the necessary number of evaluated hulls and the CPU times for each hull evaluation lead to staggering total computational times. Improved hardware and approaches focusing on local perturbations of a parent form opened the door to formal optimisation at least using inviscid codes. Convincing prototype applications combining wave resistance codes and formal optimisation were presented by the year 2000.

Optimisation frameworks such as FRIENDSHIP-Framework and modeFRONTIER provide flexible environments for performing such optimisations.

**Resources**

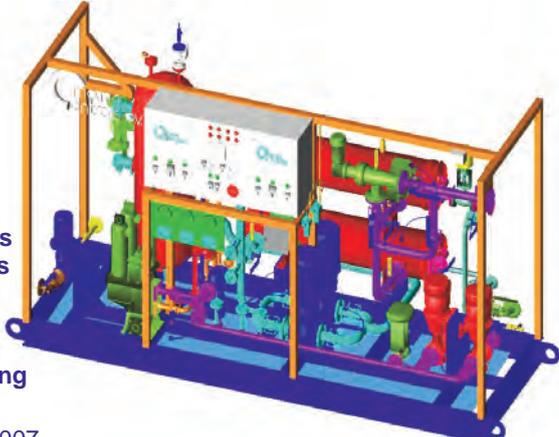
- Software and software vendors
- Analytical Methods Inc: [www.am-inc.com](http://www.am-inc.com)
- AQUA: [www.ansys.com/products/aqwa.asp](http://www.ansys.com/products/aqwa.asp)
- CFX: [www.ansys.com/products/cfx.asp](http://www.ansys.com/products/cfx.asp)

- FLUENT, FIDAP: [www.fluent.com](http://www.fluent.com)
- FRIENDSHIP-Framework: [www.friendship-systems.com](http://www.friendship-systems.com)
- HSVA: [www.hsva.de](http://www.hsva.de)
- MARIN: [www.marin.nl](http://www.marin.nl)
- MARINTEK: [www.sintef.no](http://www.sintef.no)
- ModeFRONTIER: [www.esteco.com](http://www.esteco.com)
- NUMECA: [www.numeca.com](http://www.numeca.com)
- ShipFLOW: [www.flowtech.se](http://www.flowtech.se)
- Star CD: [www.cd-adapco.com/products/STAR-CD/index.html](http://www.cd-adapco.com/products/STAR-CD/index.html)
- WL | Delft Hydraulics: [www.wldelft.nl](http://www.wldelft.nl)
- Online resources
- CFD Online: [www.cfd-online.com](http://www.cfd-online.com)
- MARNET-CFD: <https://pronet.wsatkins.co.uk/marnet/>



- Fuel Supply Modules
- Viscosity Control Systems
- Pressure Control Systems
- Preheating Modules
- Temperature Control Systems
- Fuel Consumption metering systems

See us at Marintec China 2007



**MAR-IN CONTROLS NANTONG Co. Ltd.**  
 Huancheng North Road, Lvsi Town,  
 Qidong City, Jiangsu Province  
 China  
 Tel.: +(86) 513 83417098  
 Fax.: +(86) 513 83437097  
[qqfansung@163.com](mailto:qqfansung@163.com)  
[www.mar-in-controls.com](http://www.mar-in-controls.com)

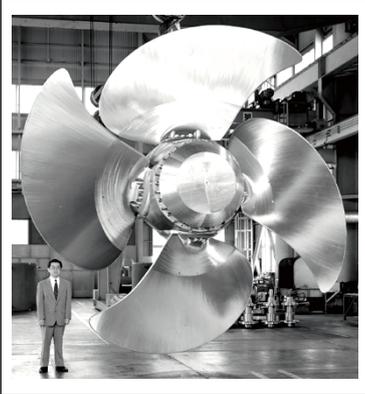
**Advantages of our Fuel Supply Modules**

- Energy consumption minimized by proper selection of control functions
- High standard control instrumentation
- All parts installed are accessible
- Low cost to maintain
- Excellent after sales service
- Tailor made solutions

# KAMOME

**“5,000 CPP”** installations have been provided for worldwide customers  
through our **80 years experience.**

We guarantee **“Superb Performance and Long life Reliability”**.  
Visit our web-site immediately. ([www.kamome-propeller.co.jp](http://www.kamome-propeller.co.jp))



## Products:

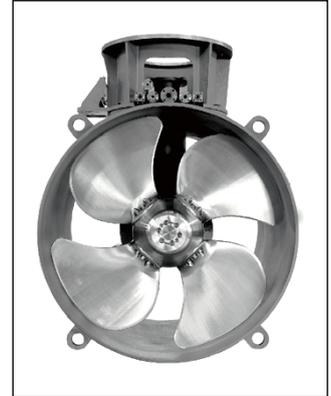
Controllable Pitch Propellers  
Fixed Pitch Propellers  
Side Thrusters  
Shafting Instruments  
MACS-KM (Joystic Control System)  
K-7 Rudder (High-Lift flap Rudder)

Established in 1924

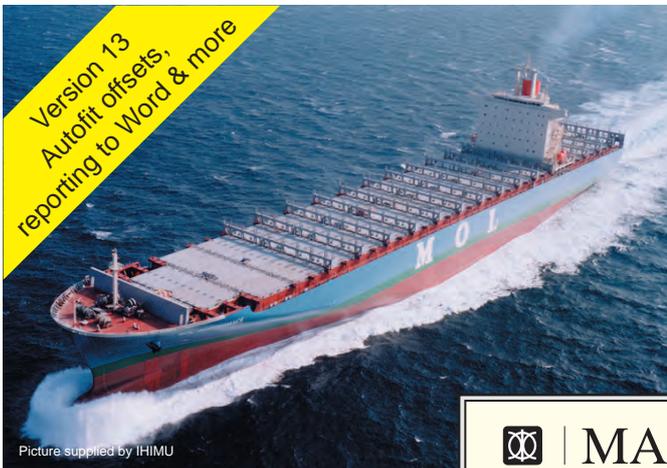


**KAMOME PROPELLER CO., LTD.**

690, Kamiyabe-cho, Totsuka-ku, Yokohama 245-8542 Japan  
Phone : +81-(0)45-811-2461 Fax: +81-(0)45-811-9444  
U R L : [www.kamome-propeller.co.jp](http://www.kamome-propeller.co.jp)  
E-mail: [info@kamome-propeller.co.jp](mailto:info@kamome-propeller.co.jp)



Version 13  
AutoFit offsets,  
reporting to Word & more



Picture supplied by IHIMU

## Integrated Naval Architecture & Ship Construction Software

Maxsurf is a completely integrated suite of design, analysis and construction software suitable for all types of vessels. All modules feature a consistent, graphical Windows interface, work from a common database, and provide data exchange with AutoCAD, Microsoft Office and ShipConstructor. Contact us for a demo CD or download from -

[www.formsys.com](http://www.formsys.com)

International: Formation Design Systems  
Email: [info@formsys.com](mailto:info@formsys.com)  
Tel: +61 8 9335 1522 Fax: +61 8 9335 1526  
UK: Island Computer Systems  
Email: [peter@islandcomputers.co.uk](mailto:peter@islandcomputers.co.uk)  
Tel : +44 1983 82 7100 Fax +44 1983 52 1608



**MAXSURF**

Integrated Naval Architecture & Ship Construction Software

### HULL MODELLING

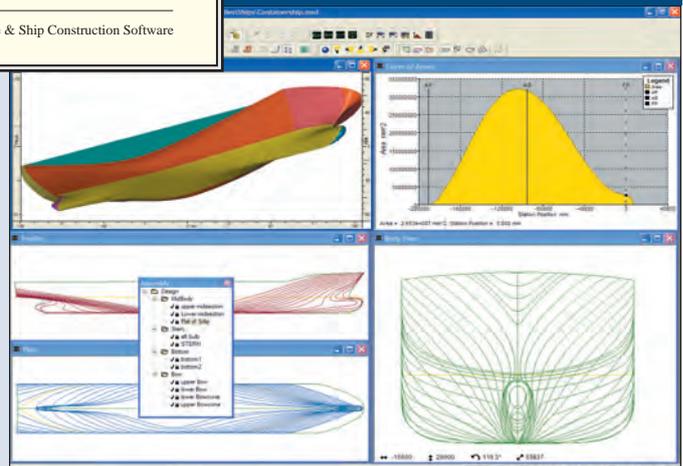
Trimmed NURB surfaces, fairness indicators, developable surfaces, parametric variation & high accuracy

### STABILITY, STRENGTH & PERFORMANCE

Hydrostatics, longitudinal strength, intact & damaged stability, custom stability criteria, resistance prediction & seakeeping

### PRELIMINARY STRUCTURE

Stiffener paths, frame generation, deck generation, plate forming, plate development, parts database & export to ShipConstructor



# Simulating safe shipping of LNG

CD-adapco's STAR-software helps LNG tanker architects and operators ensure safety.

THE International Energy Agency (IEA) estimates that by 2030 there will be a six-fold increase in the number of LNG tanker ships in operation world-wide. With these new commissions is an increasing emphasis on safety, particularly around the sloshing of LNG in heavy seas, which can cause serious damage to the tank walls and affect the vessel's stability; at worst, when resonance effects occur this can even result in capsizing. This is leading to the use of innovative technologies in the design and optimisation of LNG tankers. One such technology is Computational Fluid Dynamics (CFD) and this article reviews how Germanischer Lloyd, Daewoo Shipbuilding, and CD-adapco are using CFD to simulate sloshing in LNG tanks and tankers to optimise their performance, stability, and structural integrity.

## The big picture

Of the various methods proposed by the world's governments to reduce man's carbon footprint, one of the easiest and therefore most appealing, is to switch to less polluting fuels. As natural gas has a high energy density while producing less CO<sub>2</sub> than diesel, petrol, or coal, it has strong credentials; between 1990 and 2003 greenhouse gas emissions from the UK's electricity, gas, and water supply companies fell by 11.9% as electricity generators increased their use of natural gas over coal.

The rub is that the world's natural gas reserves are not well distributed, with 60% of the proven reserves residing in just three countries – Russia, Qatar, and Iran – making the key challenge in bringing natural gas to market just that, getting it from source to consumer. Where possible, it is carried through long pipelines – such as those that snake from Russia across Europe – but this is unfeasible if gas is being exported from Qatar to Europe, or Asia or the US: enter Liquefied Natural Gas (LNG) tankers.

When chilled to around -160°C, natural gas condenses into a colourless, odourless, non-carcinogenic liquid that occupies 1/600th of its gaseous volume. This liquid can then be shipped across the world to the consumer in specially designed tankers. One of the key challenges in shipping large quantities of LNG is what happens in rough seas, as the motion of the ship causes the dense liquid to slosh around, potentially damaging the tank and affecting the vessel's stability. The interaction between the ship's motion and the in-tank sloshing is highly non-linear and cannot be studied by simple superimposition of individual effects, which makes it difficult to study either numerically or experimentally.

## Virtual testing

CFD is a computer modelling method that provides a detailed 3D representation of the flow in and around ships. As successful exponents of CFD for a number of other marine

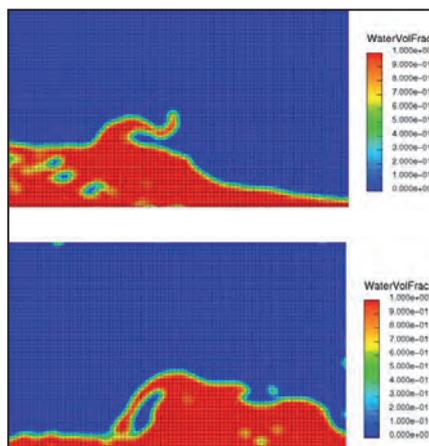


Fig 1: Distribution of water volume fraction after 100.5 (upper) and 101 (lower) periods of oscillation, computed on the coarse 2D grid extracted from 3D grid of Fig 1.

applications – eg hull hydrodynamics, cavitation around propellers and rudders – Germanischer Lloyd and Daewoo Shipping decided to use it to gain deeper insight into this scenario, with a view to improving ship and tank designs. As the technology leading supplier of CFD technology to the marine industry, CD-adapco is ideally placed to help with this challenging application.

The objective of the work was to demonstrate the feasibility of running this complex analysis. The key challenges for this application are threefold. First, is to capture accurately the forces on the tank without requiring an excessively large computational resource. Second, is the ability to model the fragmented liquid as it is sloshing in the tank over a long period of time. Finally, the vessel must be free to move in the water, even to the extent of capsizing.

The analysis process was to start with a simple case – sloshing of LNG in a 2D tank, to gain confidence in the methods used – then progress to a 3D tank, and finally ran the full coupled simulation of the ship with two tanks inside. This allowed us to build confidence and understanding of the methods used.

## 2D and pitching motion

The aims of 2D simulations are:

- Test the resolution of free surface under the conditions of severe deformation and fragmentation
- Test the suitability of the solution method for long-lasting simulations, which are needed when studying motion in irregular sea.

The length of the tank is 43.7m (x-direction), the width is 37.5m (y-direction), and the height is 26.7m (z-direction). The simulations are first performed for pitching motion: the tank rotates around y-axis positioned 18.6m away from left tank wall (in negative x-direction) and 12m

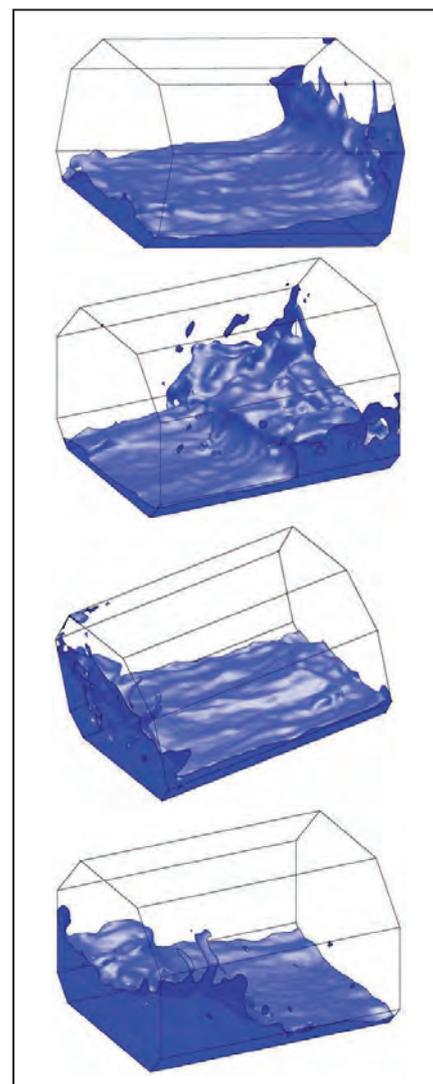


Fig 2: Predicted 3D shape of free surface at  $\frac{1}{4}$ ,  $\frac{1}{2}$ , and  $\frac{3}{4}$  of an oscillation period (8th and 9th period of oscillation after start).

above tank bottom (in z-direction). The motion is sinusoidal with an amplitude of 11degs and a period of 12.2s. The filling level of 20% was considered.

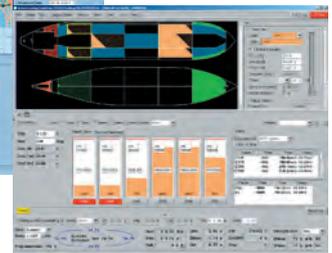
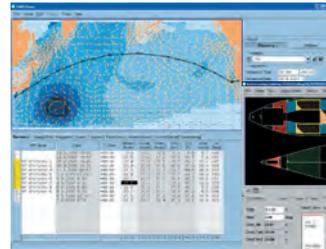
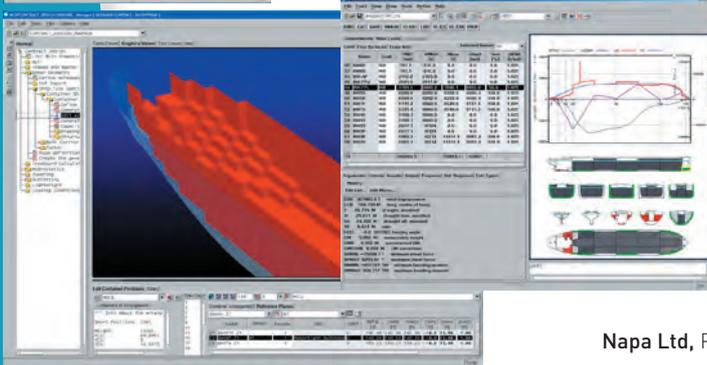
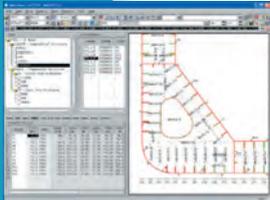
Figure 1 shows the grid and the distribution of water volume fraction in the tank at two time instants when the tank is horizontal (half and full period) in the 101st period of oscillation, computed on the 2D grid. One can see that the thickness of the interface (transition from liquid – red – to gas – blue) is approximately equal to the width of one cell, except in regions where small bubbles or drops cannot be fully resolved on the given mesh. However, even those unresolved bubbles and drops move through the solution domain towards interface without further smearing, so the limiting volume fraction values (1.0 and 0.0) remain valid throughout simulation. This shows that the solution method provides the highest possible resolution of the interface (one cell wide) and that it is suitable for long-lasting simulations.



## A Single 3D Model for the Entire Lifetime of a Ship

NAPA software applications for the design and operation of ships:

- NAPA for initial and basic ship design and naval architectural analysis
- NAPA Steel for ship structural design at the early design stages
- Onboard-NAPA for load planning, damage stability analysis and decision support on board ships
- NAPA SPS for ship performance optimization



Napa Ltd, PO Box 322, FI-00151 Helsinki, Finland • Phone +358 9 22 813 1  
E-mail sales@napa.fi • Internet www.napa.fi

## WAVE MONITORING

### WAVEX - THE DIRECTIONAL WAVE MONITORING SYSTEM USING A MARINE NAVIGATION RADAR

- For use on high speed crafts, fast ferries, shore installations for ports and coastal waters, traditional vessels, naval vessels and research and service vessels.
- Providing real time and historic wave data.
- For optimized vessel speed and course, improved regularity and reduced heavy weather damages.



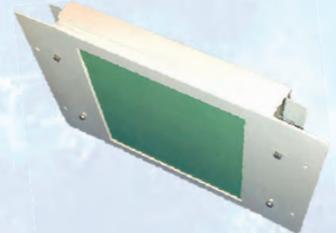
Type Approved Product



- measuring the ocean surface

## WAVE PROFILES / RIDE CONTROL

### MIROS RANGE FINDER - THE PERFECT AIR GAP SENSOR FOR RIDE CONTROL SYSTEMS



- Designed for very accurate measurements of wave profiles and air gap from high speed vessels.
- In use on commercial and military vessels of single hull, catamaran, SES and SWATH type as input to various types of ride control systems.
- Analogue or digital output 1-50 Hz with 1 mm resolution.
- The SM-048/2 Microwave sensor is not affected by rain, sea spray, mist or fog.
- A reliable, robust, well proven and very accurate sensor.



Solbråveien 32, P.O. Box 364, NO-1372 Asker, Norway  
Tel: (+47) 66 98 75 00, Fax: (+47) 66 90 41 70,  
E-mail: office@miros.no, Web site: www.miros.no

These results were encouraging for two reasons. First, we were able to resolve the fragmented fluid motion with a reasonable grid density, making the full simulation possible with today's computing resources. Second, many Volume Of Fluid (VOF) techniques, such as that used here, suffer from the problem that over long simulation times, the interface between the liquid and the gas becomes smeared, due to numerical effects: ie the solution quality deteriorates with time. The fact that the interface remains resolved by one cell, indicates that this is not happening here.

### 3D and pitching motion

The aim of this simulation was to study 3D-effects and compare predicted pressure distributions with those from 2D simulations. The inclined side walls cause the splashing flow to develop 3D features as soon as free-surface breaking starts in the second period. While in 2D simulations bubbles and drops are actually endless cylinders and their impact on the flow is very strong, in the case of 3D simulation, bubbles and drops tend to obtain rounded 3D shapes.

Figure 2 shows free surface at four instants of an oscillation period. The top picture in Fig 2 is taken when the tank has reached the lowest position. In this situation, liquid is running up the front wall and is hitting inclined side walls, where increased pressure in the corners can be expected. This is indeed the case, as can be seen from pressure distributions shown in Fig 3. Some water blobs also hit the tank ceiling; in Fig 3 one can observe several spots with high pressure on the ceiling, which result from such short-lived events.

As the tank moves upward, water starts sliding down the front wall and then running back towards the opposite wall. A steep wave is created, which then overturns, as can be seen in the second plot in Fig 2. Some liquid may again hit the ceiling, but this is less pronounced at this tank side since it is closer to the rotation axis and accelerations are smaller.

Once the tank has reached its uppermost position and starts moving down, liquid runs down the wall and towards the opposite side, overturning again (the last plot in Fig 2). The motion of liquid is periodic, but due to the stochastic nature of splashing and 3D-effects, each cycle is slightly different.

Pressure distributions shown in Fig 3 also indicate the three-dimensionality of both the liquid flow and free-surface elevation. The three plots, which show the states only 0.244s apart, indicate that some events (impact of water blobs onto tank ceiling) are short-lived. Indeed, for a full-size LNG-tank with dimensions of the order of 40m, the computational mesh cannot be reduced below say 100mm (which would mean a total of about 50-100million of cells per tank); in the current mesh, cells are 500mm wide. This means that blobs of water smaller than mesh size cannot be resolved and their impact will therefore not be adequately accounted for.

### Floating vessels

In order to demonstrate the applicability of the numerical simulation to the full complexity of vessel motion in waves, we performed a

simulation in which two partially-filled tanks identical to the one shown in Fig 2 are mounted on a typical tanker ship, which is set in motion in a sea with high-amplitude waves. The ship is 266m long ( $L_{pp}$ ) and 44m wide, with a draught of 11m. The head waves have a wavelength of 260m and amplitude of 7.5m, and the ship speed is 6knots. The solution domain extended about one ship length to the front, side, above, and below free surface, while in the wake it was about three ship lengths long.

The overlapping grid approach is used. The background grid is Cartesian, adapted to free surface and waves (ie locally refined in vertical direction around free surface to resolve wave height), while the overlapping grid is attached to the vessel and refined locally around the hull to better predict forces on the vessel.

This kind of simulation can be used to study the effect of partial filling of tanks of a multi-tank vessel on the vessel stability, since in the worst case, resonance effects can cause either structural damage or capsizing. Although the grid used here is not fine enough to produce an accurate resolution of ship-induced waves, it is considered adequate for the purpose of simulating ship motion.

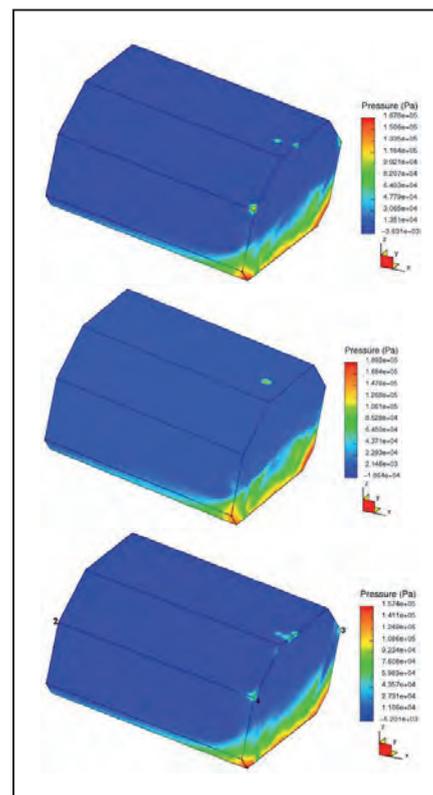
Results are presented below for the vessel motion with two degrees of freedom (heave and pitch); work is ongoing that includes results for different wave directions and additional degrees of freedom (sway and roll). The big advantage of overlapping grid technology is that the grid does not have to be regenerated – one only needs to reposition the vessel with its grid.

Figure 4 shows the vessel in two different positions – riding on a wave crest and dipping with the bow into the next wave. In Fig 5, the vessel position and the free surface shape in symmetry plane are shown for four time instants. Sloshing in tanks is not violent yet – it takes few wave encounters before splashing starts.

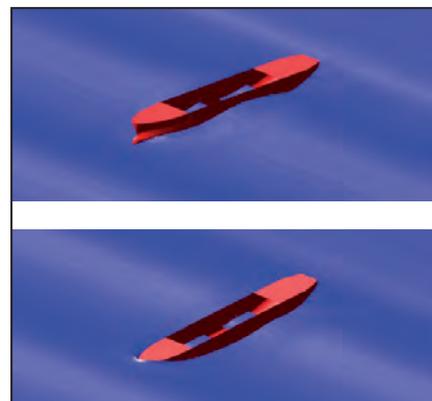
It has been demonstrated that the numerical solution method employed in this study (STAR-software of CD-adapco) can be used to predict loads on tank walls due to sloshing over long periods, both in 3D and 2D simulations. This kind of analysis can be performed in the design and optimisation stage, in order to determine critical parameter ranges and conditions which can adversely affect either performance, stability, or structural integrity of tanks and floating vessels.

It has also been demonstrated that a coupled simulation of flow around the floating vessel and in the tanks, and the vessel motion, is now possible, and promises to provide simulation capabilities under realistic conditions that can capture all the interaction between sea waves, sloshing in tanks, wind loads on the superstructure, and vessel motion, due to all the forces acting on it. In the near future it will be also possible to compute the structural deformation of the vessel and tank walls, but even when the structure is considered rigid, many non-linear factors can now be better taken into account than when individual problems are studied separately.

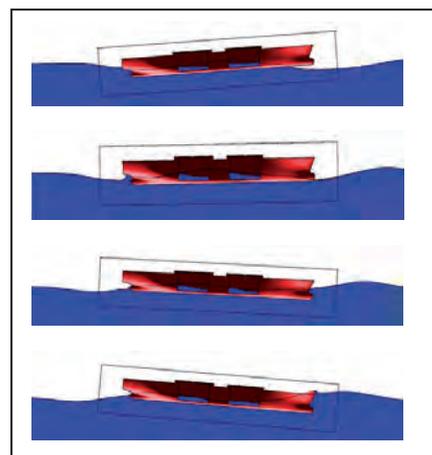
**Fig 5: A view of the vessel and free surface shape in symmetry plane at four instants of time, during the second wave encounter.**



**Fig 3: Pressure distribution at front tank wall (furthest away from rotation axes) at three time instants 20 time steps apart, around the time when the tank has reached its lowest position (% of period).**



**Fig 4: Free surface around vessel and in tanks, at two instants of time.**





# INTERFERRY

## 32nd ANNUAL CONFERENCE

### NEW VISIONS FOR A NEW ERA

28-30 SEPTEMBER, 2007 • THE GRAND HOTEL • STOCKHOLM, SWEDEN



#### SESSIONS

**Energy & Environment: an Overview • Energy & Environment: Innovations and Solutions • Baltic Operations  
Student Session • The Future of Shipbuilding • Swedish Domestic Operations • Public Tendering • Interferry AGM • Wrap Up**

#### CURRENT SPEAKERS AND MODERATORS

**Bertil Arwidsson** – Swedish Shipowners Association  
**Alf Baird** – Napier University, Scotland  
**Mark Barra** – Global Financial Consulting, USA  
**Jean-Loup Bertret** – SNCM, France  
**Klas Brogren** – ShipPax Information, Sweden  
**Martin Crilly** – BC Ferry Commission, Canada  
**Kommer Damen** – Damen Shipyards, Netherlands  
**Robert Dane** – Solar Sailor, Australia  
**Tom Docherty** – Red Funnel, UK  
**Håkan Enlund** – Aker Yards, Finland  
**Sten-Crister Forsberg** – Destination Gotland, Sweden  
**Signhild Arnegård Hansen** – Confederation of Swedish Enterprise, Sweden  
**Len Holder** – Videotel Marine International, UK  
**Peter Johansson** – Vagverket Farjerederiet, Sweden  
**Hallgeir Kleppe** – Fjord1, Norway  
**Mads Kofod** – Bornholmstrafikken, Denmark

**Yiota Krassakopoulou** – Superfast Ferries, Greece  
**Oskar Levander** – Wärtsilä, Finland  
**Tony Long** – World Wide Fund for Nature, Belgium  
**Jan-Eric Nilsson** – Rederi AB Gotland, Sweden  
**Andy Osbourne** – Krystallon/BP Marine, UK  
**Erik Østergaard** – Danish Transport & Logistics, Denmark  
**Richard Regan** – Austal, Australia  
**Len Roueche** – Interferry, Canada  
**John Steen-Mikkelsen** – Scandlines, Denmark  
**Ewa Stenberg** – Waxholmsbolaget, Sweden  
**Captain Trafford Taylor** – BC Ferries, Canada  
**Andreas Ullrich** – Germanischer Lloyd, Germany  
**Jen-ning Wang** – ShunTak -TurboJet, Hong Kong  
**Roberta Weisbrod** – Partnership for Sustainable Ports, USA  
**Gerd-Michael Würsig** – Germanscher Lloyd, Germany  
*and more to come...*



[www.interferry.com](http://www.interferry.com)  
 Check the website often for updates.

For information contact: Len Roueche, CEO - Interferry  
 1-250-592-9612 • [len.roueche@interferry.com](mailto:len.roueche@interferry.com)

## Arriving at a schematic model

**SCHEMATIC models and shipbuilding.** From a paper to be delivered at ICCAS 2007, by Henrik Hultin, Per-Olof Nilsson, and Per-Ola Åkesson, of AVEVA AB.

SHIP and offshore designs are becoming ever more advanced and thereby incorporating an increasing number and complexity of systems. This fact, in combination with an often flexible approach to the project implementation, such as the usage of subcontractors and system suppliers, gives a requirement for management and consolidation of data from different sources.

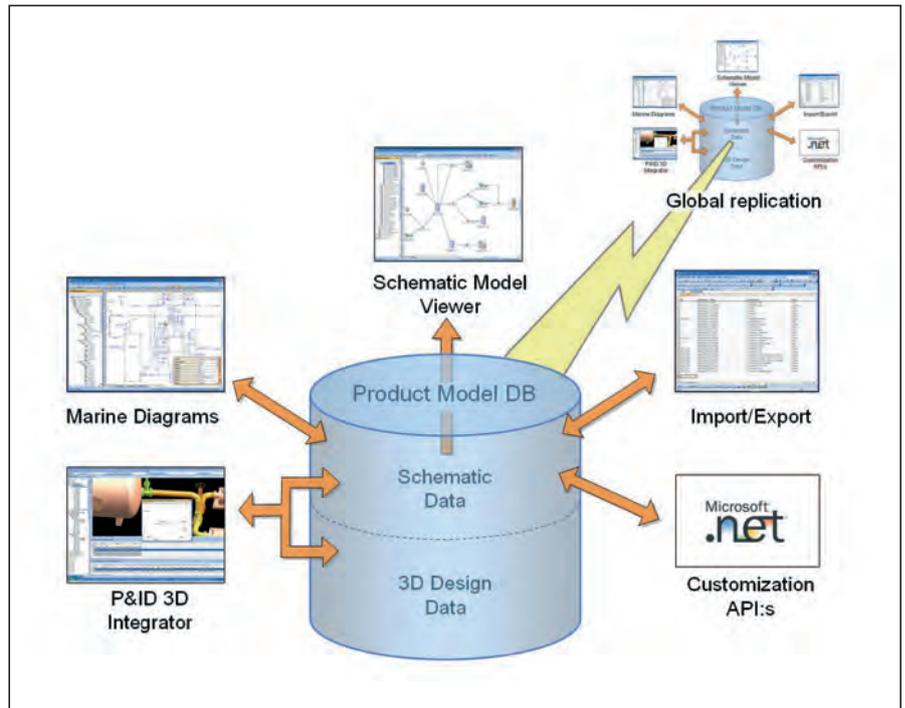
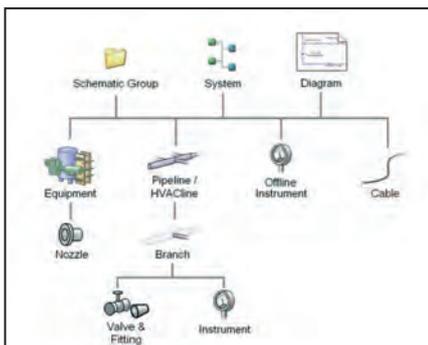
Apart from the more complicated system design in itself there is also the issue of a more collaborative environment for the design and elaboration of these systems. Many shipyards have globally distributed and collaborating design departments; they are making more use of design agents and subcontractors for the system design, as well as specialty system suppliers that provide turn-key and integration system solutions. Due to time constraints and compressed schedules, this work is also often carried out concurrently. For the shipyard, there is a challenge to coordinate and handle the system design data in an efficient way. Data from several sources must be consolidated, and design changes must be properly managed.

### Schematic versus 3D

In the shipbuilding world of today, the usage of a 3D product model provides an accepted way of working. In many cases a common product model for hull and outfitting is used, and in some cases separate models are still created and the data is transferred across in various ways. The 3D product model offers many advantages such as space management with collision checks, collaboration between different disciplines such as hole management, and also a common and distinct source for various derived data such as production information.

In contrast to the 3D product model, which is a commonly used and accepted concept, it is not usual to engage a similar concept for schematic data. The concept in this case refers to having a common database usable by all schematic designers and disciplines with the purpose of creating a continuous, consolidated, and complete schematic model, closely integrated with the 3D

**Figure 1: Simplified overview of Schematic Model DB schema.**



**Figure 2: The schematic model as part of the complete product model DB, together with related functions.**

model. In the same way as a common 3D design product model provides many benefits, such a schematic model could offer advantages of similar importance in the system design area, and better support some of the system design challenges described above. AVEVA has been researching and developing this concept and subsequently created a Schematic Model Database with related functions.

The general approach was to add the schematic data to the existing 3D product model database, thereby extending the scope of the product model to not only include the 3D spatial representation, but also the functional schematic representation. However, as the organisation is different (system oriented rather than space oriented), it was found that the database schema would need to be structured accordingly. For some items, such as pipelines, it was clear from the beginning that a separate representation was needed, due to the structural difference against corresponding 3D items. In cases where there is a one-to-one relationship between the schematic and 3D side, eg equipment items and cables, it was considered whether the existing 3D objects could be used and extended for the purpose of supporting both the 3D as well as schematic design.

This was a tempting approach, since it would reduce the redundancy of having separate objects. However, after careful evaluation, the methodology of having separate objects for the schematic and 3D instances proved to have superior advantages in form of possibilities for concurrent working, change handling, workflow, and data management.

Leading on from this design consideration, it was found that the related management tools would need

to provide a high level of functionality and offer powerful features for the handling of the relations between schematic and 3D manifestations.

The AVEVA Marine product model can by this extension be considered to include a schematic part as well as a 3D model part in a single repository. The design of the database schema for the schematic part was also adapted to use as much of the concept and design philosophy from the existing 3D model database as possible, thereby contributing to the possibilities for managing the data.

Furthermore, efforts were taken to make sure that the supporting data sources in form of catalogs and specifications could be referenced from the schematic data as well as from the 3D design data. This also ensures data consistency and enables a flexible work process whereby catalog selection can be done at the schematic stage and re-used on the 3D side, or directly added on the 3D side if so preferred.

The schematic model database is organised using two main hierarchies (figure 1). These are the schematic group hierarchy and the system hierarchy. The schematic group hierarchy can be considered a user-defined folder structure into which the schematic items can be categorised and organised in an arbitrary way. In parallel to this, there is a System hierarchy which represents the design systems that the schematic items are members of. The database also includes references between schematic items and the drawings on which they are represented, and this can be thought of and used as a third hierarchy.

The database can store and represent a number of base object types (figure 1) as are listed below:

**The simple fact is:**

**Continuous innovative developments within the shipbuilding industry are the responsibility of global suppliers.**

**The simple question is:**

***But what is the right time and place to get the whole picture?***

**This is the world's leading trade fair for advanced maritime technology. We put the shipbuilding industry in a global perspective.**

***Find the answer at:***

**EUROPORT  
MARITIME**

***Register on-line now!  
It is simple and easy at  
[www.europortmaritime.com](http://www.europortmaritime.com)***

**THIS is the future...  
Welcome aboard**

**6 - 9 November 2007 Ahoy Rotterdam  
[www.europortmaritime.com](http://www.europortmaritime.com)**

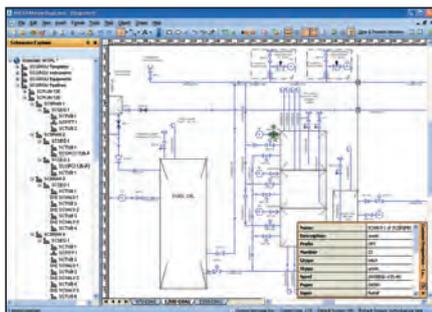


Figure 3: The Marine Diagrams application, with the schematic database explorer to the left and MS Visio drawing canvas including the Custom Properties (attributes) window to the right.

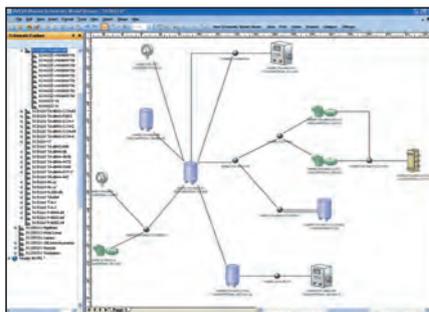


Figure 4: The schematic Model Viewer showing a selected equipment item (the tank in the centre) with all connected systems.

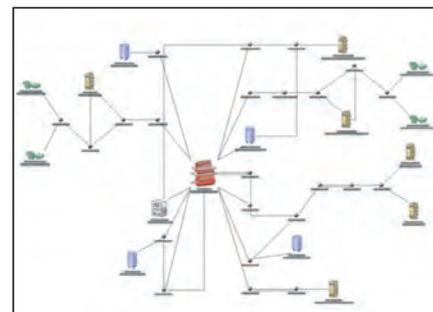


Figure 5: The initial view created for a main engine with three connected systems.

- Equipment items having Subequipment, Nozzles (pipe connection pieces), and Electrical connections
- Pipelines with branches, valves, and fittings
- Inline and offline instruments
- HVAC lines with branches and HVAC fittings
- Cables
- Diagram drawings, drawing templates and symbol libraries
- Etc.

The diagrams are represented by proxy objects, which enable the database to manage the corresponding diagram documents and their relation to the schematic items which appear on them.

In addition to the base objects, users can extend the data model with user defined hierarchies, object types, and attributes. Such user defined items are still fully recognised, displayed, and handled by the standard application functions.

Topological information such as connections from pipelines/HVAC lines/Cables to equipment items, as well as offline instrument connections to various fittings, is captured and represented in the data model. The offline instruments can also provide a link between a main process system and a related control system.

In order to fulfill the data management requirements related with the intended collaboration support for the schematic model database, an in-house developed data management platform has been utilised. This platform provides support for distributed databases, transactions, versioning, traceability etc. Such features can be made use of to globally distribute the schematic model database between different collaborating parties and subcontractors. Systems can be designed using the tightly integrated diagram authoring tool with direct access to the database, even if the design teams are working in different geographical locations. This working method can be successfully applied to subcontractors and other entities that are closely collaborating with the main shipyard.

#### Open model

In case the design of some systems is done by parties using applications that are not connected on-line to the Schematic Model DB, a set of functions for importing and exporting

data are provided. Line lists, equipment lists, valve lists etc can be imported using ordinary spreadsheet files, or more advanced XML formats such as ISO15926 being used in the offshore business. Drawings can be imported in different formats, but in case conversion to the XML-based SVG format can be achieved, this will provide a higher level of functionality, such as identification and highlighting of the related schematic items. As a complement to the import functions, corresponding export functions are also available.

In addition to the import and export interfaces, the Schematic Model Database provides a set of public .NET API:s which enables custom developed software to interface against the Schematic Model DB for on-line reading and writing of data. This can, for instance, be used for extending existing applications, for custom development of closely integrated schematic authoring applications, analysis tools, or for ERP-type system integration.

Using the .NET API:s alternatively, the import/export functions, information about major items, as well as estimates for pipe lengths and types/numbers of fittings can be obtained. This information can be useful for early ordering and material planning.

One of the options provided to populate the Schematic Model Database is a closely integrated authoring tool by the name of Marine Diagrams (figure 3). This application covers the creation of diagrams and related data in the piping and instrumentation, HVAC, and electrical disciplines. It supports all the standard features that can be expected of a diagram drafting tool such as dimensioning of Pipe/HVAC, specification/catalog search, including re-size/re-spec, annotation, off-page connectors, spreadsheet style editing of valve and fitting lists etc. An integrated MS Office Visio drawing control provides an intuitive and feature-rich drafting environment for the user.

#### Event driven

The Visio drawing control provides an event-handling API, such as when a symbol is added to the diagram. In the implementation connected to this event, we have included a routine that updates the database accordingly. For instance, if an equipment symbol is dropped on the drawing, a corresponding item will automatically be created in the database. Some items that must exist in a context, such as inline piping parts, are

instead created when connected to a branch. This is handled by subscribing to another event. When attribute values are changed, a third event is being used to capture this data and update the database. This architecture enables the user to work in a seamless way in the Visio environment, while all actions are being captured and immediately updated in the database.

When the user is working with the Marine Diagrams application, both the drawing as well as the database are being updated. These two sources of information must therefore be kept in synch. The application includes a number of features to assure that this is the case. When a drawing is saved, the database session is also committed as part of the same operation. Correspondingly, if a drawing is not saved, a database rollback is performed. Should the sources become out-of-synch anyway (which could happen if the database is updated outside of the application control), a set of powerful consistency check functions are included. These functions can detect any inconsistencies and bring the situation back to a consistent state. For the convenience of the user, this function can also be run in batch for several drawings at one time, for instance in connection with a design approval of a system spanning multiple diagrams.

#### Schematic model viewer

Given the schematic model database and its capability to represent a continuous schematic model for the whole ship design, the question was raised whether it would be possible to view and visualise the contents of the database in an intuitive and easily understandable way. As this data can originate from a number of different P&ID:s and other diagrams, as well as imported from various sources, there is no single drawing that illustrates the complete schematic model. Although the connectivity can be seen in the various P&ID:s and other diagrams, these documents are most often organised in a way that a single diagram only shows a single system or even part of a single system, and does therefore not provide a complete overview of interconnected systems. In ship design there are many cases of equipment items that are related with more than one system. The most obvious example is perhaps the main engine which is connected to a number of supporting systems, such as a cooling water system, a fuel oil system, a lubricating oil system etc (figure 5).

# The worlds leading shipbuilding fair

**23 - 26 sept. 2008**



**shipbuilding · machinery &  
marine technology**

**international trade fair · hamburg**

 **Hamburg Messe**

Phone: +49 40 3569-0 · [info@smm2008.com](mailto:info@smm2008.com)

**[www.smm2008.com](http://www.smm2008.com)**

A set of main goals for a visualisation tool were defined as follows:

- It should illustrate the connectivity of items in the database in a neutral way not related with the subdivision and layout of individual P&ID:s
- It should provide a consolidated view of multiple systems
- It should provide a navigable view and not a static picture
- It should be possible to start with a limited view in scope as well as detail, and then expand and 'drill-down' on request
- It should be easy and intuitive to use.

Based on these goals, research was done in the area. We quickly found that a traditional treeview (explorer) control is suitable for showing predefined hierarchies but can not illustrate the full connectivity of the model. It must be considered that the topology of the piping network includes such features as loops.

After examining different alternatives, we decided to look more closely at the so called 'mindmap' style of diagram, a variant of this is also known as a 'wheel' diagram. When investigating existing applications of this style of diagram, we found that inspiration could be taken from computer network administration applications, which in many cases exhibit features similar to what we wanted to accomplish.

We decided that the navigation should start with an equipment item selected by the user. From this item, the system would automatically find all connections in the database and display each connection as a graphical subtree. Each subtree would then be traversed through all branches until other equipment items or branch ends were encountered. Branching points (such as Tee:s, Olet:s, or 3-way valves) were represented by a generic branching point symbol. For the equipment items, a set of customer definable rules have been created. By using these rules, the application can select and display an appropriate graphical symbol for each equipment item. As the schematic Model Viewer is a dynamic viewer tool and is not displaying a static P&ID layout, we decided not to use the traditional P&ID style symbols, and instead go for a more illustrative style.

During the traversal of the pipeline network, circular layouts can be encountered. To handle this, we introduced an algorithm by which the connected items were placed in a primary subtree, and the looping connection was illustrated by a diagonal line to a member of another subtree, or at another location in the same subtree. In case the layout generated by this mechanism is not what the user would prefer in this particular situation, there is a possibility to easily reverse the link so that the item in question will move and become a member of the other subtree or the other part of the same subtree.

The process described above results in an initial view, with the selected equipment item in the middle and connected equipment items around it, as well as the branching topology visible in the interconnecting lines and branch points (figure 4).

From the initial view it is possible to interactively navigate along the connection network, expanding and collapsing subtrees

and re-centring on other equipment items. By this process, the user can proceed from system to system and explore the complete schematic model.

In the initially generated overview layout, only equipment items and generic branching points are shown. In case the user wants to go into more detail and also see inline parts such as valves, reducers, and other fittings, this can be accomplished by the press of a button. Alternatively, the user can right click on an item in the schematic model viewer and list the diagram drawing(s) on which this item exists, and the selected drawing(s) can be opened and viewed. This provides another form of drill-down.

The schematic Model Viewer also provides standard features such as viewing of database attributes for the selected item, possibility to manually re-arrange the auto-generated layout by drag-and-drop etc.

Given the Schematic Model data and the 3D model data, it was clear that a set of management functions had to be developed. These functions would include the creation of 3D data based on the schematic model, comparison functions including reporting, as well as functions for managed updates to existing data following design changes. An important aspect to this would be to support parallel working and not restrict it to a predefined sequence of events. For these purposes, the P&ID 3D Integrator application was developed (figure 6). As these functions in many cases are part of a workflow that is handled by existing design applications, an important design decision was to implement this application as an Add-In, which can be integrated into existing design applications. This means, for instance, that a 3D piping engineer does not have to leave the 3D piping design application to compare the current 3D design with the corresponding schematic design.

The consolidated data in the schematic model database can be used as a base for the 3D layout design of the related systems. The Integrator allows the schematic model data to be exploited as a base for automatic creation of 3D design data. A customer configurable rule-based implementation enables the creation to be performed in a flexible way according to customer preference and design rules, including automatic pipe routing. The automatically created data can then be further elaborated and modified by the 3D piping engineer to accomplish a final 3D design. By applying this procedure, the 3D design can be elaborated quicker and with less effort, and the logical correctness of the 3D model can be increased.

The user can find missing and unmatched items on both sides, as well as differences in attribute values and topology and connectivity, for instance an incorrect branching model or incorrect sequence of fittings in a branch. Using the Integrator, the user can view the diagram as well as the related 3D data. If a schematic item is selected, the corresponding 3D item is also selected and highlighted, and vice versa. This makes it easy for the user to see the relation between corresponding items and understand any anomalies. It is also important to point out that the comparison can be done even if the 3D data has not been created from schematic data using the Integrator. In many cases the strict sequential



Figure 6, the P&ID 3D Integrator showing a 3D model machinery arrangement together with the corresponding diagram, as well as tables of related data.

working procedure between schematic design and 3D design cannot be applied, and it must still be possible to compare the models.

### Managed updates

In case any inconsistencies or anomalies are found as a result of comparison between the schematic model and the 3D model, there is a possibility to update one from the other in a controlled way. This forms the base for the management of design changes and making sure that they are properly applied to the schematic as well as the 3D design model.

The schematic model database provides a good platform for compiling all relevant schematic data for a project. This can be accomplished by tight on-line working against the database, where items are created automatically as they are drafted on the diagram, or in a off-line fashion where data can be imported from other authoring tools. This flexibility can support a distributed way of working with partners, subcontractors, and system suppliers.

The resulting set of data in the schematic model database can be verified and consolidated by using the Schematic Model Viewer, as well as editing possibilities of Marine Diagrams, miscellaneous reports, and other tools. This provides a possibility to make sure that all related data is complete and consistent.

The schematic model database also provides a base for the following 3D model where schematic data can be re-used on the 3D side. However, in many cases a more concurrent working mode has to be used because of time constraints. In this case the schematic model can be of use anyway, to retrospectively check that the 3D model fulfills the system design intent.

In case the schematic model database is kept up-to-date with all changes introduced, it can also provide a schematic as-built documentation of the project, which can easily be navigated using the schematic model viewer. This includes the possibility for in-service and onboard applications.

Looking further, we believe that there is much more potential to be taken from the current developments in this area. This concept can be extended and enhanced in many different ways, of which just a few have been implemented already. ☺

# Bulk Savings

## Now available in China



**SPS**  
Overlay

### Reasons to choose SPS Overlay for major steel renewals:

1. Price competitive with crop and replace world-wide.
2. Up to four times faster than conventional steel repairs with substantially less labour required.
3. Fast and predictable schedules minimise loss of earnings.
4. A permanently flat high impact resistant repair which increases operational efficiencies.

“ SMT have taken a licence for SPS Overlay and our trained staff are using it to extend the life and operational efficiency across our bulk carrier fleet.  
Ton Voorham, Managing Director, SMT Ltd.

Smooth SPS tank tops on our two ATBs save us an hour and a half per hold in final cleaning mode.  
Richard Paris, Manager Major Maintenance, TECO Ocean Shipping.

It is hard to find a single dent on our two vessels after a year and a half of operation - 40-45 grab discharge operations.

Sverre Grønn, Technical Manager, Torvald Klaveness Group. ”

**Intelligent Engineering Ltd**

UK Office | Tel: +44 1753 890 575 | enquiries@ie-sps.com | www.ie-sps.com

**SPS Overlay Asia Pte Ltd**

Singapore Office | Tel: +44 8707 107 184 | enquiries@ie-sps.com | www.ie-sps.com

## Rule-based ship design

**THE ability to drive a ship design with automated rules is critical to the future of computer-aided ship modelling. From a paper by Kristin Cochran, support consultant at Integraph Corp, given at ICCAS 2007.**

As shipyards work to maintain their competitive advantage in the global marketplace, technology differentiators become a key to success. Today's shipyards demand more work from a reduced set of design experts. Because of this demand on the knowledge-base, the ability to drive a design with rules is not just a luxury; it becomes a necessity. If those rules are customisable for any shipyard, processes and knowledge can be built directly into the system, and rule-based decision-making can be used in every stage of the design process.

The goal of rule-based design is not necessarily to replace the users making the decisions, but to allow those users to accomplish more work with greater accuracy in a shorter period of time. The result is an improved process, reflected in improved business results. This paper will highlight the key advantages to rule-based ship design, and will outline the process architecture that SmartMarine 3D has implemented to bring rules customisation to the user.

Since shipyards are not high-volume assembly lines like car manufacturers, it is difficult to find processes that can be repeated over and over, thousands of times. For every different ship design, and for every variation to an owner's specifications, there are different scenarios that have to be considered during design and construction. However, most shipyards have clear best practices and pre-defined workflows that can be applied to every design. Capturing this information and turning it into rules can provide many advantages to a shipbuilder, throughout the design process, and from one ship to the next.

If a shipyard can easily customise its design software to capture its decision-making process, it will benefit in five key ways:

- Increased ability to embed standard shipyard practices
- Increased automation of routine procedures
- Reduction in user experience requirements
- Improved design consistency and reduced risk
- Ease of model modification.

The collective knowledge of a shipyard is proven-in-practice, and constitutes part of an individual company's unique know-how and capabilities. This knowledge is often contained in manuals, or passed from worker to worker. In some cases it is never passed on, and has to be re-discovered by each new generation of employees. In addition to user knowledge, design requirements come from the ever-evolving classification rules. At the next stage of the model design, production requirements define how the model should be built. All of these information sources

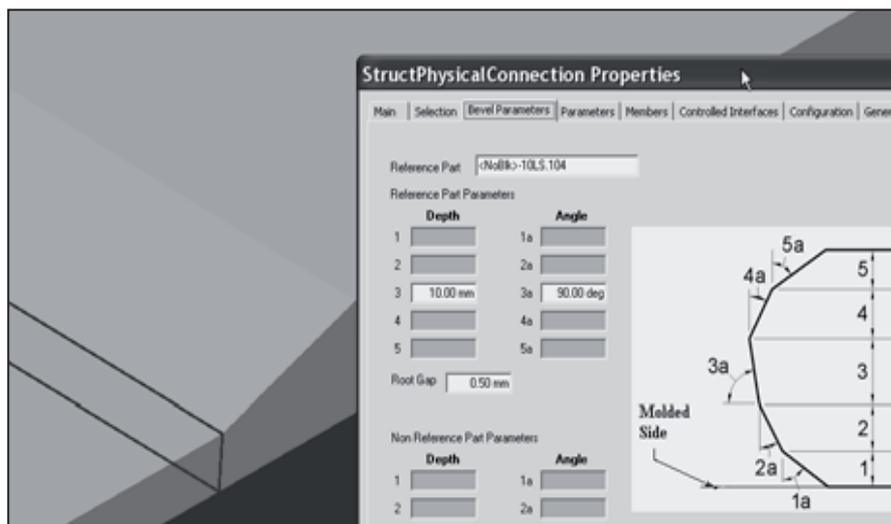


Figure 1: Result of automatic weld selection.



Figure 2: Non-tight vs tight collar selection.

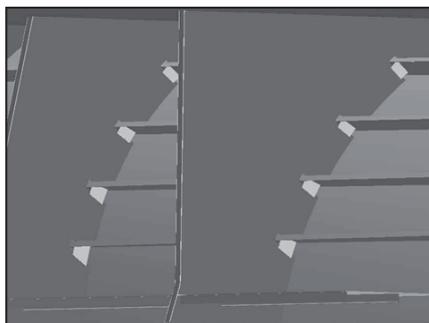


Figure 3: Shell profiles penetrating a bulkhead.



Figure 4: Slots opening to different angles.

may have input in the final design, but they don't necessarily work together to get the design right the first time.

One of the key advantages of rule-based design is the ability to capture knowledge from various sources and combine it to drive the design. Gathering and standardising the shipyard's

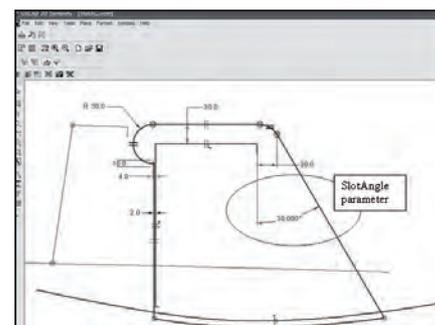


Figure 5: 2D slot symbol.

knowledge results in the ability to see patterns in decision-making. In return, embedding these repetitive patterns can help to automate the design process.

To embed the standard practices, data is built up into a catalog that can be shared across designs, or customised for each design. This is not limited to features that are placed from ship to ship; it also includes rules that can be applied as each feature is placed.

An example of this embedded knowledge is weld data. Weld decisions can be captured in a set of rules that drives the selection of every bevel in the ship. In the most basic form, the weld assignment could be made by the experienced user as part of a manual design process. Once the user has chosen a bevel, the bevel data can be populated based on the thickness of the two parts. Using the manual approach, the user must manually modify the weld to account for any design changes.

A better alternative is for a rule to automate this placement, taking into account the attributes of the two objects being welded together. The rules can use properties like material, thickness, orientation, and location in the ship to make decisions about the type of weld that is needed. Figure 1 shows a plate to plate connection with a thickness difference between the two

# Kawasaki

is the top brand of steering gears and deck machinery — manufactured in the world's major shipbuilding countries.

For manufacturing Kawasaki-brand steering gears and deck machinery, we have production centers in Japan, Korea and China, three countries that together account for more than 80% of the new ships built in the world today. Local production in countries where new ships are regularly manufactured is, we believe, the key to both reliability and economy.

● **UK / Kawasaki Precision Machinery (UK) Ltd.**

**Korea / Flutek, Ltd.**

**Japan / Kawasaki Precision Machinery Ltd.**

**China / CSIC/Wuhan Marine Machinery Plant Co., Ltd.**

90 years of experience in hydraulic technology  
— guarantee safe, economical operation.

High-pressure, compact, easy to install and maintain, Kawasaki steering are proud of long history and rank No. 1 in the world in terms of quantity delivered: over 16,000 ships have been equipped with them. As quiet, high-pressure systems, our deck machinery has also earned a superior reputation, and in this field, too, we have achieved world-class results, equipping over 5,500 ships.

**KPM**  
Kawasaki Precision Machinery

<http://www.khi.co.jp/kpm/>

**Head Office / Main Plant**

234, Matsumoto, Hasetani-cho, Nishi-ku, Kobe 651-2239, Japan  
Phone: 81-78-991-1133 Fax: 81-78-991-3186

**Kawasaki Precision Machinery (UK) Ltd.**

Ernesettle Lane, Ernesettle, Plymouth, Devon PL5 2SA, United Kingdom  
Phone: 44-1752-364394 Fax: 44-1752-364816

parts. The rule has computed the difference and automatically applied a chamfer in addition to the bevel. If a modification is made to the geometry or properties of these objects, the rules automatically verify that the selected weld is still valid. If it is not, the rules pick a different weld.

In the best-case scenario, the rule also checks the location where the two parts will be assembled, and assigns a bevel based on the equipment available in that workshop. Additional production planning inputs can be used to drive the bevel selection and orientation, including the workcentre where the two parts will be welded together, and the upside of the two parts as they are welded.

The best-case scenario illustrates that by embedding the user's knowledge, the type and geometry of the parts, and the production specifications, the weld selection can be completely rule-driven. This same concept can be applied to other types of detailed features, resulting in over 90% of some types of features being placed automatically.

**Automated routine**

Once the shipyard knowledge has been embedded into the software, rules can be used to make decisions about routine procedures. Instead of manually applying design details throughout the ship model, rules can be run to place known features automatically.

An example of this automation is the creation of the connection between a profile and a plate. When a stiffener ends at a bulkhead, it will be welded to the bulkhead. When the stiffener penetrates through a bulkhead, a standard slot opening for that cross section type will be cut in the plate, and welds may be applied to connect the plate to the stiffener. Additional structural reinforcement may be needed in the form of a clip. Because these are standard practices for a shipyard, there is no need for any user interaction in this process. A rule-based decision can be made, and all necessary features can be placed automatically.

If the penetrated plate is made watertight, the clip will also need to be watertight. The user does not have to detect this and do something about it; the rule will fire again and make a new decision. Case 1 of Figure 2 shows the profile penetrating through a non-tight plate.

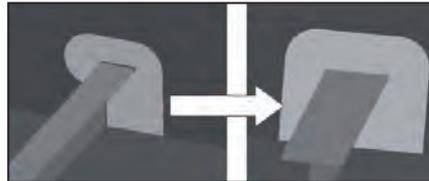


Figure 6: Collar selection based on cross section.

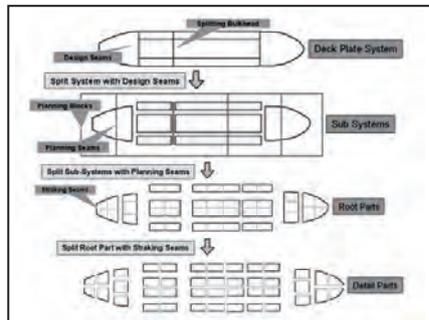


Figure 7: Connection definition.

Case 2 of Figure 2 shows the same automated connection after the penetrated plate has been made watertight.

As design standards are embedded into the customised software, the rules can make more and more of the decisions. This takes the burden away from the user, and it reduces the user's required level of design experience. The individual user no longer has to be an expert, and the real design experts can focus on the more complicated design issues.

Figure 3 illustrates how a rule-based decision can alleviate the burden on the user. In this case, shell profiles are penetrating through a transverse bulkhead, and slots will be applied.

What the design user may not know is how these parts will be assembled. In this case, the production planning user has already determined that the assembly will be oriented based on the shell plates. The shell profiles will be welded to the hull plates first, and then the transverse bulkhead plates will be dropped vertically onto the profiles and the hull plates. The transverse

bulkhead plates must fit over the profiles as they are dropped vertically, and so the slots should be opened to provide the necessary clearance. Because each shell profile has a different orientation relative to the assembly's shop floor orientation, each slot must open to a slightly different clearance angle, as shown in Figure 4.

To place the slot features manually, the user would first need to know the assembly orientation and the order of construction. To know the angle for each slot, the user would also have to know the assembly orientation angle, and the angle of each profile relative to the assembly orientation. Finally, the user would have to make the calculation and input the angle value into the slot feature. In the meantime, the production planner may change the orientation of the assembly by a few degrees, and the manually calculated slots will no longer fit over the profiles when the bulkhead plates are dropped.

The solution is to drive this decision process with a rule. A parametric slot symbol is created in 2D, and it allows the slot to be opened to some angle. The 2D symbol is shown in Figure 5.

As the slot symbol is placed, a rule runs to find the assembly where the transverse bulkheads plates will meet the shell profiles. If the rule finds that the plates will slide onto the profiles, there will be no need to open the slot, and the angle value will not be calculated. If the rule finds that the plates will be dropped onto the profiles, the rule will calculate the assembly orientation angle.

In the next step of the process, the rule will compare this assembly angle to the angle of the shell profile, and determine how far the slot should open to allow the plate to be dropped. The calculated angle will be applied to the 2D symbol, which will be used to cut the 3D plate part.

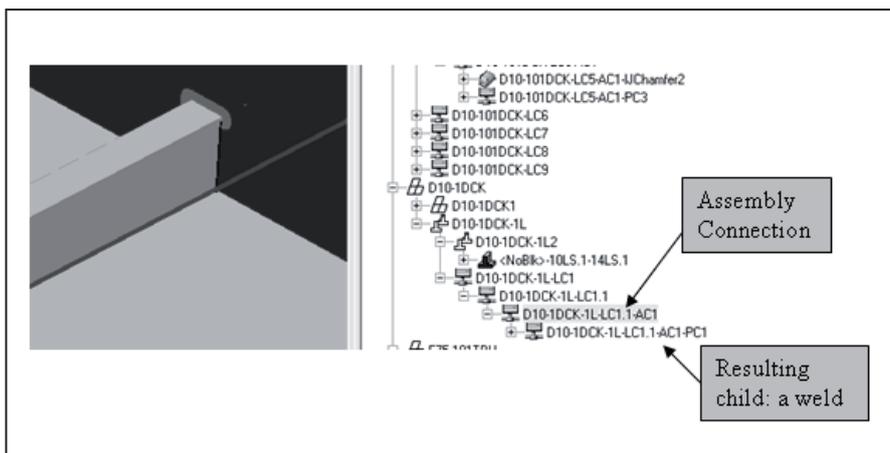
This type of rule can be defined by experienced users, limiting the amount of knowledge required for the typical designer.

The fourth key benefit to rule-based design is the consistency that comes from having a single source making the decisions. When the decisions are made by the rules, it is not necessary to validate every output from the model; the data can be trusted. In areas where manual selection is still required, additional checking rules can be written to verify that the choice made by the user is valid. This improved accuracy results in time savings, as well as reductions in scrap and rework. Most importantly, the increase in reliability means a reduction in risk.

An example of rule-based checking is SmartMarine 3D's Check Manufacturability tool. SmartMarine 3D provides a set of user-definable checking rules, written in Visual Basic code, that validate the combination of the detailing data and the production data. A series of checks can be run against the design in various disciplines, and in different design stages. For example, a check can be run against detailed structural weld data to ensure that an assembly can be constructed in the selected workcentre. Another check can be run against pipe bending to ensure that the design data is valid for the assigned pipe bending machine requirements.

As it becomes more and more necessary to sub-contract work to other shipyards, rule-based design is even more valuable to ensure design consistency. The primary shipyard can

Figure 8: Assembly connection object.



# The Royal Institution of Naval Architects

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

3rd-5th October 2007

Dr Kenneth W FISHER, FRINA

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

### Topics to be covered:

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

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

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

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

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

To register, simply complete all sections of this form and return it with your payment to:  
**THE CONFERENCE DEPT, RINA, 10 UPPER BELGRAVE STREET, LONDON SW1X 8BQ.**  
Tel: +44 (0)20 7201 2401 Fax: +44 (0)20 7259 5912 email: [conference@rina.org.uk](mailto:conference@rina.org.uk)

Name: \_\_\_\_\_ Position: \_\_\_\_\_  
Company: \_\_\_\_\_  
Address: \_\_\_\_\_  
\_\_\_\_\_  
Postcode: \_\_\_\_\_  
Telephone: \_\_\_\_\_ Fax: \_\_\_\_\_  
Email: \_\_\_\_\_ RINA Membership No (if applicable): \_\_\_\_\_

Please indicate your preferred method of payment:

I enclose a cheque/Eurocheque for: £ \_\_\_\_\_  
Please send me an invoice for: £ \_\_\_\_\_  
Bank Transfer details enclosed for: £ \_\_\_\_\_  
Please debit my credit card: £ \_\_\_\_\_

Card Number: \_\_\_\_\_

Expiry date: \_\_\_\_\_

Signature: \_\_\_\_\_

Payment must be made in pounds sterling by Eurocheques, cheque drawn on a bank with a UK branch address, credit card (VISA/AMEX/Mastercard) or bank transfer. Please note RINA requires payment *before* the conference date.

**Account Name:** The Royal Institution of Naval Architects

**Account Number:** 10042127 **Account code:** 160016

**Bank address:** Royal Bank of Scotland PLC, Belgravia Branch, 24 Grosvenor Place, London SW1 7HP, UK.

The following charges will be made in the event of a cancellation: £250 if received before 5th September 2007. Cancellations made anytime after that date will not be refunded. Delegates may be substituted in writing subject to the consent of the Conference Organiser.

**Registration fee:** RINA Members: £1020+VAT (Total £1198.50) Non Members: £1100+VAT (£1292.50) Group Fee (3 delegates or more): £1000+VAT (£1175.00)

develop the rules that should be used throughout the design, and then distribute the rules to sub-contractors.

If a design is rule-based and driven by the relationships between objects, modification becomes very easy. There is no need for the user to react to design changes; the rules will automatically propagate the effects of modifications. The benefit of automatic updates is less work for the user.

In the case of a watertight slot, a matching watertight collar is selected automatically based on the cross section type. As shown in Figure 6, if the cross section type changes, the rules cause the slot to automatically recompute, and a different collar is selected.

### SmartMarine 3D

The SmartMarine 3D design process follows a path from early-stage design to manufacturing output, but the path is not restricted by data being thrown over the wall at the conclusion of each stage. SmartMarine 3D builds in seamless interaction between the design stages. Data that is assigned to a SmartMarine 3D object follows that object throughout its life cycle, and this concept facilitates modification. Modifications made in each stage are reflected immediately to the other stages. This concept also contributes to a system of rules that can be run at various levels of the design.

The first stage in the design process is the early design stage. The tasks in this stage include definition of surfaces, called systems, which will later be used to drive detailing and manufacturing data. At this stage, plate and profile systems are connected together and split, and properties are assigned. Rules are used in the first design stage to drive the placement of objects such as tripping brackets and stiffeners, and to run services, such as symmetry assignment, that automatically set properties for the plates and stiffeners.

Tripping brackets and stiffeners can be rule-based and parametric. Based on the number of objects selected as boundaries for the tripping bracket, the rule will automatically select the correct type of bracket. The rule is also used to ensure that the parametric tripping bracket will also be sized correctly to the objects that are bounding it. Rules for tripping stiffeners can be customised to define the connection angle, and they can control what type of connection will be applied to the end of the stiffener. For example, the rules decide if the end of the tripping stiffener should be lapped to its boundary, or connected to the flange with a tee weld.

It is difficult to drive the placement of major systems through rule-based automation, and so the user is most involved at the early design level. But, everything they do will contribute to the design automation in later stages.

As the surfaces of the model are being defined, production planning begins. The hull model can be split into blocks, and parts that result from splitting large systems can be assigned to assemblies at this level.

The final component of the early design stage is drawing extraction. The early stage drawings are driven by the systems that have been defined at this level.

As portions of the early design model are completed, they pass to the detailed design stage. At this point, the first set of completely

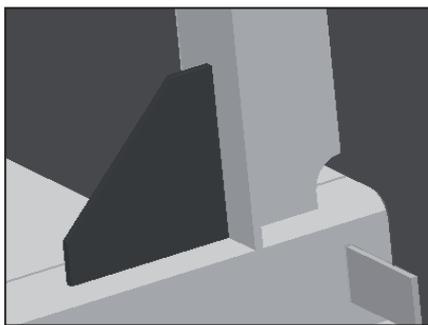


Figure 9: Assembly connection children.



Figure 10: Automated end cut selection.

automated rules is run. These rules rely on the geometry and properties defined in the earlier stage, along with data gathered from planning.

In addition to thickening and trimming the detailed parts, features are placed during detailed design. A feature is any detail that is applied either manually or automatically to the plate or profile parts. Features either drive the final geometry of the part, or hold properties that will be used to drive manufacturing output data. Rule-based features include:

- Slots
- Collars
- Web cuts
- Flange cuts
- Welds
- Corner features
- Edge features
- Brackets.

In this stage, less work is required from the user, and more of the work can be done by the rules. Each shipyard can control how much they want to automate. If the shipyard chooses to embed their knowledge and limit manual modification, it is possible to derive 90% or more of the detailed output directly from the rules. In particular, slots and welds can be highly automated.

As the detailed design progresses, data defined in the early design stage may be changing. Because the detailed design re-uses the same model objects, the objects and their relationships to other objects update automatically. At the same time, the rules are re-fired to make any necessary changes to the feature selection.

Production planning continues at this stage as assemblies are defined further. When planning data drives the rules, features are updated automatically to account for changes to the planning data.

Drawing extraction is also continuing throughout the detailed design stage, and the output drawings from this stage will show the detailed parts and their features.

The final stage in the process is the production design stage. At the beginning of this stage, the data defined in the detailed design stage passes through another set of rules to define the manufacturing output. The manufacturing rules rely on the model geometry and the properties defined at the detailing level, in addition to user settings.

The user-defined manufacturing rules control how the output will be processed and marked, and in what format the output will be delivered. Like the detailing rules, the rules in this stage provide the user with a set of options. The options have default selections, but the user may override them by choosing from a pre-defined set of answers. Rule-based manufacturing data includes:

- Margin
- Shrinkage
- Templates
- Pin jigs
- Plate processing and marking
- Profile processing and marking.

Like the detailed design stage, this stage relies less on the user. Most decisions can be driven by the rules. As changes are made in the earlier design stages, the manufacturing rules can automatically update the output data.

The rule-driven drawings produced in this stage are the plate manufacturing drawing, template and pin jig drawings, and the profile sketches.

### The rules process

SmartMarine 3D offers rule-based decision-making at every step of the design process. Customers can choose to utilise the delivered default rules, or they can customise the rules at any level to meet their needs. Customisation can be done over time, allowing each shipyard to prioritise its own high-value automation. Where decisions can't be driven by rules, manual placement can still be used; but to achieve the real productivity potential of the system, automation should be used wherever possible.

SmartMarine 3D rule-based automation is driven by a concept of connections, or relationships, between objects. As objects are modelled, relationships are established and connections automatically created in any case where a boundary or penetration is created. These connections are used to drive the rules, and to control updates when modifications are made.

To drive the rule-based design, SmartMarine 3D relies on the relationships and connections between objects. Relationships are created at different stages of the design process. Figure 7 shows the progression of connections from early stage design through detailed design.

In the early design process, the user creates plate and profile systems to define thickened surfaces in the Molded Forms environment. The next step in the process is to break up the systems by placing design seams to define splits, or by splitting automatically at intersecting systems. Throughout this early design process, production planning can be ongoing, and the major block splits can be established. Additional seams can be defined automatically where the structure crosses block boundaries.

# Journals on cd rom

The ideal reference to have in the library or when travelling!

In January every year since 1999, RINA has produced the following journals on CD ROM:

*The Naval Architect* and *Ship & Boat International*, plus *Shiprepair & Conversion Technology* and *Warship Technology* since 2001 and from 2005 *Offshore Marine Technology*.

The institutions journals are a source of valuable reference and provide a wealth of information. A title and key word search facility is available to help you find a specific article or issue.

*The Naval Architect 2006* and *Ship & Boat International 2006* on CD ROM price each: £40 (RINA Member £35 each)

*Shiprepair & Conversion Technology 2006*, *Warship Technology 2006* and *Offshore Marine Technology 2006* on CD ROM. Price each: £32 (RINA Member £27 each)

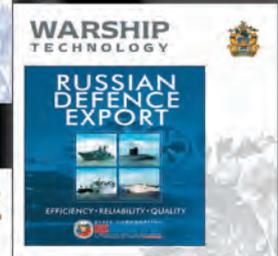
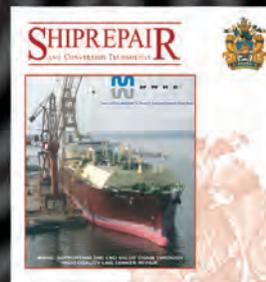
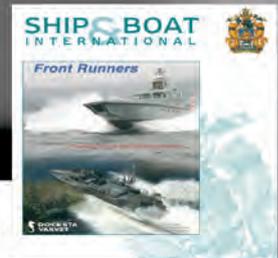
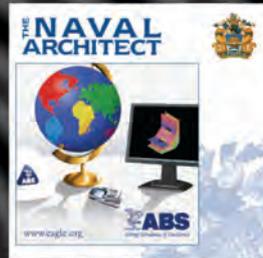
Please send your order, or contact:

The Marketing Department, RINA,

10 Upper Belgrave Street, London SW1X 8BQ, UK.

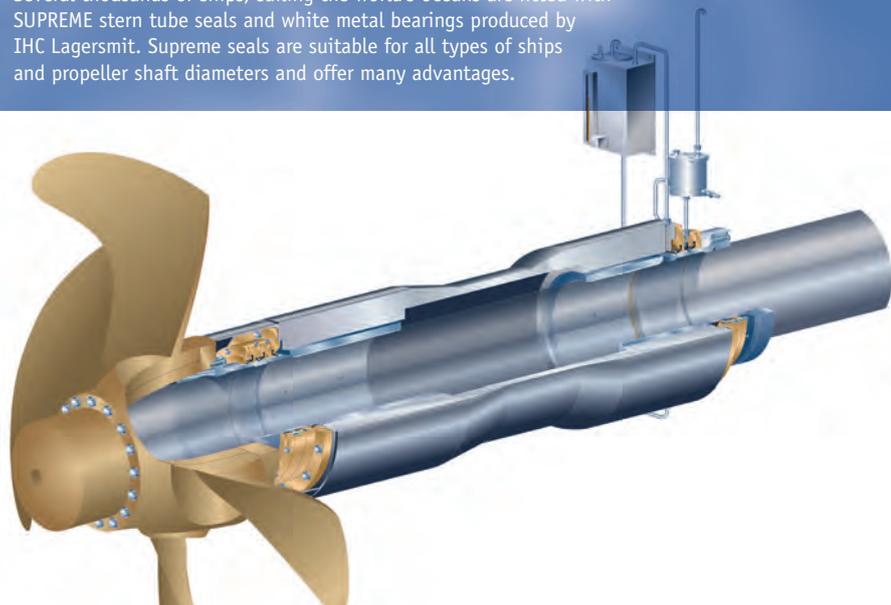
Tel: +44 (0) 20 7235 4622 Fax: +44 (0) 20 7259 5912

E-mail: [publications@rina.org.uk](mailto:publications@rina.org.uk) Website: [www.rina.org.uk](http://www.rina.org.uk)



## SUPREME<sup>®</sup> Stern tube, seals and bearings

Several thousands of ships, sailing the world's oceans are fitted with SUPREME stern tube seals and white metal bearings produced by IHC Lagersmit. Supreme seals are suitable for all types of ships and propeller shaft diameters and offer many advantages.



IHC Lagersmit BV

[www.ihclagersmit.com](http://www.ihclagersmit.com)

Tel.: +31 (0)78 6910472 Fax: +31 (0)78 6910477

Member of the IHC Holland Merwede Group

Rules and automation are also used to drive the decisions made at the planning level. Parts are automatically assigned to blocks based on user-definable rules. Parts can be combined to form assemblies, and this process can be driven automatically, based on rules defined by the user.

The result of the early stage design is a series of systems that are connected through relationships called logical connections. Logical connections are created as objects in the database. They maintain relationships throughout the design process, and when modifications occur, they trigger updates to the rules.

The detailed design begins when the early-stage design goes through the detailing process. The detailing process trims the parts to their final 3D shape, and creates one or more assembly connections for every logical connection. The process started in Figure 8 is continued throughout the detailed design. Further relationships can be established at the detailing stage by splitting the parts with straking splits. In case of a straking split, a new assembly connection is created.

The key to this part of the process is the creation of the assembly connection. Assembly connections are the brains of the entire rule-based modelling process. They analyse the type of relationship between two detailed objects (bounded or penetrating), and start additional rules to decide what child features are needed in each case. Those child features may place additional children of their own.

In the case shown in Figure 8, the logical connection is defining the relationship between the profile and the plate. When the two parts are detailed, the assembly connection is created and its rules determine that the profile should be welded to the plate. The result of this decision is a child, which is the weld.

The decisions made by the rules are not limited to geometry and property settings.

Information can also be gathered directly from the user, in the form of Questions. A Question is a customisable property that can have multiple solutions, depending on the case. These properties provide input to drive the selection that is made by the rule. The Question property always has a default answer, and that answer can be calculated based on model properties such that it never needs to be over-ridden. But in some cases, the user needs more control over the selection, and so they can choose from a pre-defined set of answers. Whenever the user chooses a new Question answer, the rule will re-fire to utilise the user's answer.

The product of the rules selection can be additional objects in the model, like a bracket placed automatically where a profile is bounded by the flange of another profile. The rules selection can also result in a cutting curve that removes material from objects in the model, as in the case of a radius that is placed to avoid a slot. In Figure 9, a single assembly connection has automatically placed a slot, a collar, a bracket, an end connection with a radius, and all necessary welds. If the profile or plates coming together in this assembly connection are modified, the rules will run through the selection process again.

#### Parametric selection

In addition to choosing features, the rules are used to control the size and shape of the feature. A single parametric symbol can be used for any size of corner radius, or different corner radius symbols can be selected based on the geometry case. In the previous example, a corner radius was placed automatically because the vertical profile was bounded to the flange of another profile. The rules also detected the slot, calculated the gap, and placed a long scallop feature that would provide 25mm clearance above the slot.

In another example, an angle profile that is bounded to the web of another angle profile

will get an end connection automatically. If the angle is bounded to web right of the second profile, an end cut will be applied to cut around the flange of the bounding profile, as shown in Case 1 of Figure 10.

If the same profile is applied to web left, the flange is no longer in the way, and an end cut with flange clearance is no longer needed. If the rule finds that the bounded profile is shorter than the bounding profile, a straight welded cut is applied. If the profiles are the same height, or if the bounded profile is taller, a snipe cut is applied, as shown in Case 2 of figure 10.

The key to the rule-based decision making is that the user does not have to make any of these decisions, either during creation or modification.

Once the detailed design is complete, SmartMarine 3D provides output in the form of drawings and manufacturing data. These deliverables are also rule-based to provide automation capabilities to the customer. Drawing resymbolisation is based on a series of object filters and logic. The user can customise the drawing resymbolisation logic to choose the output that meets the shipyard's standards.

Rule-based design is a necessity for shipyards that intend to lead the industry. In addition to embedding the shipyard's knowledge and reducing mistakes and rework, rules can speed up the design process, enabling the shipyard to accomplish more in less time. The result goes beyond accuracy and time-savings; the business benefits of reduced risk and increased competitive advantage go hand in hand with these engineering benefits. SmartMarine 3D has a built-in rule-based capability that can be customised minimally or extensively to match each shipyard's workflow, or to drive a new and improved process workflow. The SmartMarine 3D rule-based system is in production in some of the most demanding shipbuilding processes in the world, proving that the SmartMarine 3D architecture is setting the standard for design automation. ☺

## EFFICIENT SHIPBUILDING: SHIPYARD TRANSPORTERS



Visit us at  
Marintec China, Hall W2,  
Booth 2F41-0

In the shipbuilding industry, SCHEUERLE is your competent partner for the transport of ship sections weighing more than 2,500 tons.

#### Shipyard Transporter

- Smooth startup and acceleration through hydrostatic drive propulsion
- Combination of several section transporters in an open compound
- Accurate pickup and precise positioning of loads
- Freely programmable electronic steering

**SCHEUERLE**

Turn mass into motion!

SCHEUERLE Fahrzeugfabrik GmbH • P. O. Box 20 • 74627 Pfedelbach • Germany • Phone ++49(0)7941/691-0 • www.scheuerle.com

# The tools are at hand

**HULL variation and improvement using the generalised Lackenby Method of the FRIENDSHIP-Framework, by Claus Abt and Stefan Harries, FRIENDSHIP SYSTEMS GmbH.**

NAVAL architects are rather familiar with hull variation by swinging a parent form to derive modified lines. The method is often referred to as the Lackenby method or Lackenby shift, in acknowledgement of the gentleman who extended the one minus prismatic method with its linear shift functions to a more flexible method with quadratic shifts. Lackenby's paper [1] published in 1950 thus set a milestone in lines development.

FRIENDSHIP SYSTEMS – a German company specialising in optimisation of functional surfaces such as ship hulls, propellers, pumps, and turbines – has taken up the idea and extended it with respect to shift functions and range of application. Honouring Lackenby's accomplishments, it called the method Generalised Lackenby and made it available in their Computer Aided Engineering system FRIENDSHIP-Framework.

An overview of the FRIENDSHIP-Framework was presented in *The Naval Architect* January 2007 [2]. Further aspects of the FRIENDSHIP-Framework were published in CAD/CAM reviews of *The Naval Architect* in April and August 2007. But the aims of this article are to:

- (i) Introduce the generalised Lackenby
- (ii) Show how hull variations are brought about easily using the new method
- (iii) Discuss which tools are made available to naval architects to help them improve their designs even further.

### Partially parametric modelling

In Computer Aided Design (CAD), three ways of modelling may be distinguished, all of which are supported by the FRIENDSHIP-Framework [3]:

- Conventional modelling
- Partially parametric modelling
- Fully parametric modelling.

Conventional modelling is widespread and it is well-known that shapes are defined by data items which are independent of each other and do not contain any task-related information. Parametric modelling takes the route of capturing the specifics of the design task at hand. The purpose is to reduce the complexity of the modelling process while assuring high-quality shapes. Partially parametric modelling builds on existing shapes. The changes are then described via parameters which act as the controls to create variants. Fully parametric modelling, meanwhile, tries to generate the geometry purely from parameters, each variant being an instance of the actual values in the parameter set.

In retrospect, the classic Lackenby method represents a very creative partially parametric model. Hull variants are realised by taking a parent hull and modifying it according to four parameters:

- Change in prismatic coefficient  $\Delta C_p$
- Change in longitudinal center of buoyancy  $\Delta X_{CB}$

- Change in forward position of parallel mid-body  $\Delta L_{PE}$
- Change in aft position of parallel mid-body  $\Delta L_{PR}$

To do so, shift functions for both the forward and aft half-bodies are used. The shift functions describe which amount each section needs to move longitudinally so that the new sectional area curve (SAC) readily complies with the desired changes. The classic method is illustrated in Figure 1, see diagram in the middle.

Lackenby worked out the necessary mathematics to compute the appropriate sectional shifts. However, probably to avoid formula too complicated for practical use, he needed to introduce certain restrictions. First of all, the shift functions were assumed to cover both half-bodies up to the forward (FP) and the aft perpendicular (AP), respectively. Secondly, the shift functions were taken to be simple polynomials. Using two quadratic polynomials with three coefficients, each yields six degrees of freedom in the parametric model. However, in order to avoid an elongation or shortening of the hull, Lackenby rightly assumed the shift functions to be zero at either perpendicular. In this way, the problem became fully determined and could be solved in closed form. The classic method is very elegant, yet two drawbacks arise.

Designers do not always want to induce changes to the entire hull (ie, from AP to FP), but would like to modify selected regions, too.

Quadratic shifts only give positional continuity at the points of transition (ie, at the perpendiculars and mid-ships) which may cause unfavorably squeezed or stretched waterlines.

These problems are now overcome within the FRIENDSHIP-Framework by employing B-spline curves instead of quadratic polynomials. The shift functions are optimised for fairness while the four classic parameters are captured as equality constraints. This not only allows handling parameter subsets, but gives leeway to cope with eight additional parameters:

Control of the regions of application (ie, up to four positions at the beginning and at the end, respectively).

Control of the slopes at either end of the shift functions (ie, up to four angles).

This extra freedom of the Generalised Lackenby method can be nicely seen in the diagram at the bottom of Figure 1.

### Example applications

The new feature has been made available by FRIENDSHIP SYSTEMS in the CAD-CFD integration platform FRIENDSHIP-Framework. Within the system, the Generalised Lackenby method can be applied to offsets, panels, and surfaces as one of several partially parametric techniques.

Hull variations of refined quality are realised with great ease. An example is presented in Figure 2 for data imported from a SHIPFLOW offset file. In the lower left window, both the parent and new sectional area curves are shown, see labels. The perspective view depicts the baseline (black) along with its variant (red). The shift curves with their smooth transition at either end are also given and are marked for clarity. If working on pure offsets is insufficient

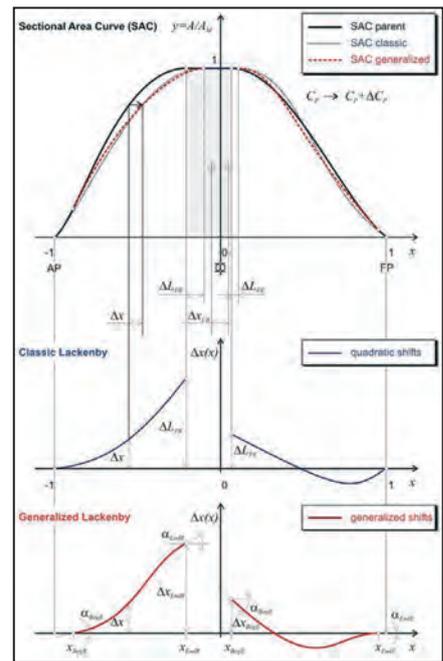


Figure 1: Classic Lackenby shift and new Generalised Lackenby method.

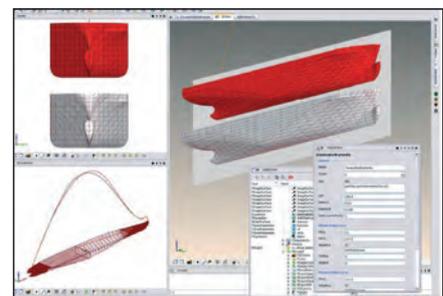


Figure 2: Example variation of offsets.

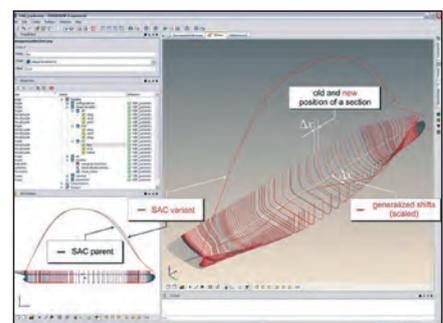


Figure 3: Example variation of surfaces.

for the many different variations of interest, the FRIENDSHIP-Framework also provides means to transform offset data into a surface representation.

A second example is put forward in Figure 3. Here, the Generalised Lackenby was applied to a set of surfaces. The maximum section and the centre of buoyancy were shifted slightly forward and the displacement volume was increased. The parent

form (silver) and a variant (red) are displayed together, the new hull being positioned above the original for better comparison. In the lower left window, the hydrostatics input is depicted along with the two sectional area curves.

The hull geometry for this example was originally modelled within the FRIENDSHIP-Framework by means of B-spline surfaces. However, the geometry might as well have been imported from an iges file or an OpenNurbs file coming from an external source. Since the Generalised Lackenby is based on FRIENDSHIP SYSTEMS' imaging functionality, see [4], the method can be used for offset data, panel meshes, and surface sets alike. Upon variation, the new geometry can be exported in the same formats for further processing.

**CFD analysis and hull improvement**

As elaborated in *The Naval Architect* April 2006 [5], the direct coupling of efficient geometric modelling to a state-of-the-art code of Computational Fluid Dynamics (CFD) serves to check and improve the hydrodynamic performance of a design. Within the FRIENDSHIP-Framework, the influence of form changes on, say, the resistance of a new hull at design speed and draught can be studied and the Generalised Lackenby may serve as the shape engine. Naturally, the method can be combined with the other partially parametric models offered within the system, for instance to control the size and shape of the bulbous bow [3].

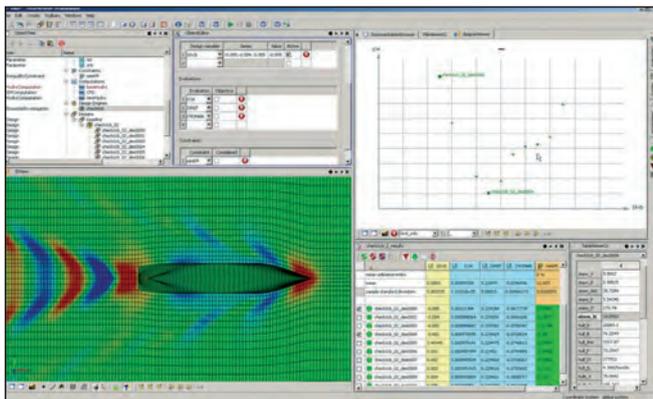
Figure 4 depicts a small investigation in which the longitudinal centre of buoyancy was systematically moved forward and aft. The wave resistance was computed with SHIPFLOW by Flowtech Int, a state-of-the-art system that can be launched from the FRIENDSHIP-Framework. Figure 4 shows several windows as arranged to get an overview. The upper right diagram presents the dependency of the wave resistance from  $\Delta X_{cb}$ . The numerical results for all variants and selected hydrostatics data are summarised in the tables below. In the lower left window, a wave pattern is shown from a bird's view, together with the panel mesh for the potential flow calculation. The upper left windows feature the ObjectTree and the ObjectEditor for the ensemble investigation.

FRIENDSHIP SYSTEMS has extended the classic Lackenby shift for more flexibility and higher quality. The Generalised Lackenby method has been made available in the FRIENDSHIP-Framework, thus bringing it to the fingertips of the practicing naval architect. In combination with CFD simulations, the tum-around time for design exploration and exploitation can be much decreased, leading to better performance. Even designers who would not consider themselves CFD experts but still need to deliver first-class hullforms with all their diverse functionality, quickly benefit from the new approach.

**References**

[1] Lackenby, H 'On the Systematic Geometrical Variation of Ship Forms', RINA-Transactions, Vol 92, 1950.  
 [2] Abt, C; Harries, S 'FRIENDSHIP-Framework – integrating ship-design modelling, simulation, and optimisation', *The Naval Architect*, RINA, January 2007.  
 [3] Abt, C; Harries, S 'A new Approach to Integration of CAD and CFD for Naval Architects', 6th International Conference on Computer Applications and Information Technology in the Maritime Industries (COMPIT2007), Cortona, April 2007.  
 [4] FRIENDSHIP SYSTEMS 'Imaging functionality for flexible shapes', *The Naval Architect*, RINA, April 2007.  
 [5] Harries, S 'Fundamentals of advanced hydrodynamic design', *The Naval Architect*, RINA, April 2006.

**Figure 4: Results from a systematic variation to identify potential for improvement of the parent hull.**



**NEW**   
 a l t r o  
 t r a n s f l o r

**Altro Transflor Gallium™**

Unique, fully IMO compliant safety flooring, specially engineered for Maritime interiors. Altro Transflor Gallium is an impervious seamless floorcovering providing safety underfoot for both passengers and crew. As a solution provider Altro Transflor Gallium is the ideal choice.

Call now for your Altro Maritime sample card or visit [www.altrotransflor.com](http://www.altrotransflor.com)

**For enquiries in UK/Europe**  
 Call: +44 (0) 01462 707 700  
 or e-mail: [info@altrotransflor.com](mailto:info@altrotransflor.com)

**For enquiries in Asia Pacific**  
 Call: +61 3 9764 5666  
 or e-mail: [info@asf.com.au](mailto:info@asf.com.au)

  
 TYPE APPROVED

  
 SGS

  
 UKAS

## Design for life

**RINA's new president, Stephen Payne, recounts a life defined by the design of ships.**

FOR a man whose fascination with naval architecture stretches back to boyhood, it is perhaps a surprise to learn that shipping is not in Stephen Payne's blood.

In fact, the designer of *Queen Mary 2* and current vice president chief naval architect, Carnival Corporate Shipbuilding, was born in 1960 to a father who was a tea taster and a mother who was a school secretary.

But Mr Payne's 1 July 2007 election as 28th president of the Royal Institution of Naval Architects is another staging post in a life defined by a love of the arts and crafts of ship design and construction.

Mr Payne will happily tell the tale of how, as a boy of 7, his imagination was captured by children's television programme Blue Peter and presenter Valerie Singleton's trip onboard *Queen Elizabeth*. Meanwhile, viewers of the more recent 'Mega Structures' programme on Channel 5 may not have been aware that cinefilm footage of a 1969 tour of *QE2* was taken by Mr Payne's father, after a nine-year-old Stephen insisted on a detour from a holiday being spent in Bournemouth, to Southampton docks.

Some will also know that Mr Payne is, in fact, a member of the exclusive 'Gold Blue Peter Badge' club. The rare feat was achieved after the delivery of *Queen Mary 2*, but traces its roots back to 1972, when 12-year-old ship enthusiast Stephen turned on the tv show to a live outside broadcast of *Queen Elizabeth* on fire and sinking in Hong Kong harbour.

'In the very last paragraph of that year's Blue Peter annual, it said that it was a sad day when *Queen Elizabeth* sank, because there would never be another liner like her again,' says Mr Payne.

Having been set homework on how to write a letter of complaint, Mr Payne decided to make his views known to the makers of Blue Peter. 'I told them there would be another liner and that I had the full intention of designing it.'

Mr Payne says that the letter he received from Blue Peter editor Biddy Baxter telling him not to be too disappointed if his plans did not work out, which was accompanied by the regulation 'blue' Blue Peter badge, only spurred him on.

Indeed, his thirst for information about ships was only growing stronger. He began to bombard shipping lines with almost weekly requests for brochures. He persuaded his father to take him to Le Havre, just to see the Atlantic liner *France* before it departed for New York on its ultimate voyage.

Then, with no little chutzpah, the then 12-year-old wrote off to P&O to express his interest in working for the shipping company in the capacity of ship's purser. It would be interesting to know who was more surprised: Stephen, at being called for interview; or the head of fleet recruitment asked by the interviewee if it would be all right if he brought his mother.

Stephen Payne, OBE, on graduation at University of Southampton 25 July 2007 Honorary Doctor of Science.



'To be honest, when he saw me, he was beside himself, but he was decent enough to take me through the process and said that, if I was still as keen and enthusiastic when I was 17 or 18, that I should get back in touch and they would put me on a training course.'

With all this in the background, another surprise lies in the fact that Mr Payne came to naval architecture relatively late, graduating in Ship Science from Southampton University in 1984.

This he puts down to poor careers advice. 'I said I wanted to be a naval architect, but the advice was that this was not a sound course, and that I would be better off pursuing chemistry,' he says. It was for this reason that Mr Payne found himself at Imperial College, embarked on a chemistry course but, after one year, he left, disillusioned.

'One of my original school teachers said I should have followed the path I'd envisaged and he helped me to get a second grant at Southampton.'

Armed with his BSC (Hons), Mr Payne rekindled his contact with P&O, looking for opportunities. At this point, another of the incidents that eventually saw Mr Payne in position to fulfil his pledge to design a new type of ocean liner, and to his current role, occurred. With a relish born of hindsight, he recalls the fact that P&O was, at that time, in the throes of resisting unwelcome takeover attentions from Trafalgar House. As part of

these machinations, the shipping company brought in one Jeffrey Sterling. One of the later Lord Sterling's edicts saw a ban on new recruitment.

Years later, after Mr Payne had established his credentials as a top notch cruiseship designer, he was to meet Lord Sterling on an informal basis, over a shared interest in saving The Royal Yacht *Britannia*. On a tour of P&O Headquarters, during which Mr Payne says Lord Sterling mischievously wrongly identified a series of ship models in order to see whether the naval architect knew his liners well enough to correctly recognise them, the peer asked: 'Why didn't you come and work for me?' Mr Payne explained that he had been right on the verge of doing so, but 'some boulder stopped me'. When asked who 'some boulder' was, Mr Payne explained that it was none other than Lord Sterling. The news was to elicit roars of laughter.

But that was to be the future. After leaving university, Mr Payne joined Marconi Radar, Chelmsford, and was assigned to the company's bid to become prime contractor for RFA's auxiliary oil replenishment vessels. Work primarily consisted of a risk assessment study with an outside consultant and formulation of a comprehensive database for naval auxiliaries.

After just nine months, Mr Payne was effectively head-hunted by Technical Marine Planning Ltd, then the organisation

which undertook all newbuilding work for cruiseship operator Carnival. He joined TMP as a junior naval architect.

His first project with Carnival involved the ship *Holiday*, which was then undertaking her first sea trial. His role involved inclining experiments and working out the ship's stability.

However, Mr Payne says his first 'big' project came with involvement in *Festivele*, the old Union Castle ship *Transvaal Castle* that had been converted into a cruiseship in 1978. The seven month project involved assessment as to whether a further conversion could be made. In the event, Carnival took the bolder step of initiating construction of what was to become the first of the eight Fantasy class of ships but, from that moment on, Mr Payne had been blooded in cruiseship design.

Promoted to naval architect with full responsibility as owner's representative for new cruisehip designs with regards to naval architecture in 1987, he has been directly involved in all of Carnival's construction programmes since, including the Fantasy, Destiny, and Spirit classes of ships.

1987 was also the year that Carnival took over Holland America Line and, in some respects, it was with the 1995-1997-built HAL ship *Rotterdam* that Mr Payne truly began to make his name. Now senior naval architect, he was appointed project manager for construction and basic design of the vessel that was to become HAL's new flagship.

'I worked very hard to raise the profile of this ship with the yard,' says Mr Payne. 'The existing *Rotterdam* was a well-liked ship, so her replacement had to be a bit special. We wanted to incorporate features reminiscent of the old *Rotterdam*. For example, we included two funnels side by side at the aft end.'

There then followed work on a series of ships out of Helsinki, including *Costa Atlantica* and *Carnival Spirit*. But, while such work would be enough to satisfy the most adventurous of naval architects, the defining moment in Mr Payne's career to date was in fact, yet to come.

## Stephen Payne in his own words:

**O**N project *Pinnacle*: 'Dead in the water. We are not going to compete on size.'

**O**n *QE2*: 'She could have met 2010 SOLAS – there has been a lot of misinformation about that. But £50 million for a ship of that age was an opportunity too good to pass by.'

**O**n gas turbines: 'We wouldn't build a ship with gas turbines again. It was worthwhile at the time when you considered the space released and the potential to raise revenue, but as the price of fuel increased those advantages disappeared.'

**O**n podded propulsion: 'The problems with pods are on the way to being solved. We're still building podded and conventional ships and we haven't given up on pods, but one of the big problems is that now we face a monopoly situation on the supply side, since Rolls-Royce is not active anymore.'

**O**n ballast water management: 'We are trying to achieve a one week cruise without taking on any ballast water. This is a special requirement of our new projects.'

**O**n future designs: 'We need to do a lot more work on hydrodynamics. Sometimes we hear about propellers with special tips that the manufacturers claim offer huge advantages, but when you talk to owners and the testing tanks, they are much more sceptical.'

1998 saw the acquisitive Carnival Corp snap up Cunard. Prior to this, Cunard was under threat of sale to Prudential and Mr Payne's response was to take a voyage aboard *QE2*, 'I wanted to do one last trip,' says Mr Payne.

'It was during this crossing that the surprise announcement came through that Carnival was to purchase Cunard. It was also

stated that Carnival intended to build a new transatlantic liner, and that they were only waiting for me to come home to start the design.'

The new ship was to be capable of crossing the Atlantic in the harshest of conditions. 'This was my biggest ever challenge,' says Mr Payne. 'No one had built a proper liner since *QE2*, and Carnival had no experience in this area. We needed to develop a ship with 40% more strength and power, with the knowledge that we would lose a lot of volume at the bow and upperworks because of the tiered upper deck arrangement, compared to an ordinary cruiseship.'

40% more strength and power also meant 40% more expense, with *QM2*'s final bill amounting to US\$800m, but the eventual design optimised the space constraints set by the liner hull lines. 'We maximised the number of outside balcony cabins [79%], for example,' says Mr Payne. 'It was clear that we could not have passenger cabins with balconies low down, so we designed around the idea of placing the public rooms at the bottom and increasing the tweendeck heights. That gave us a cushion, so that we could position balconies in the middle section of the hull.'

For two years, Mr Payne and assistant Rick Moore worked on putting together the initial concept design for *QM2*. Subsequently, they wrote a mini-specification, including initial design calculations, weight estimates, and powering requirement, and sent it out to five yards. Kvaerner Masa-Yards, HDW, and Fincantieri dropped out, either because of lack of capacity or lack of experience in building such a ship.

The choice came down to two yards – Harland & Wolff or Chantiers de l'Atlantique.

'At the end of the day, it came down to the fact that Harland & Wolff needed a government guarantee that was not forthcoming,' says Mr Payne, 'so that only left Chantiers.'

After the famous liner was ordered, Mr Payne spent the first year overseeing project management, appointing a site team, and installing a project manager in the yard. The project, he says, ran 'extremely smoothly'. 'There were a huge number of problems but, because we worked together, we were able to solve them. The ship was delivered on time and under budget and, unusually, 100% complete.'

And, confirming that *QM2* has lived up to her billing, Mr Payne reports: 'She has operated at 27knots in Force 10 with no appreciable discomfort to passengers. In fact, where all other ships have been hoisted to on her radar, she gets messages asking "which ship are you?" as she speeds through turbulent seas.'

It was on the day of *QM2*'s completion that Blue Peter came aboard to deliver Mr Payne's gold Blue Peter badge.

Post *QM2*, Mr Payne has remained extremely busy, not least after Carnival took over P&O's cruise business. With 17 ships on order across the various Carnival brands, he oversees a staff of eight designers.

*QM2* early morning on the day of delivery 22 December 2003.



(S Payne photo)

And new challenges lie ahead. While understandably cagey over future design innovations, Mr Payne said designers faced new tests in meeting new probabilistic damage stability rules which would raise metacentric heights on ships, while the whole concept of 'safe return to port' would be 'very difficult to adapt to'. Carnival was just at the initial stages of gathering its thoughts on these matters.

'Overall, the probabilistic approach is good, but it is very complicated, and the whole industry is still grappling with the way of actually using it. There are so many ways some elements of the rules can be interpreted that consistency is going to be the biggest problem.'

Still only 47, Mr Payne continues to spend around 40 days a year at sea and has, of course, many years of ship design to look forward to. This is one reason why, he says, he has been a little surprised at being honoured with the RINA presidency. 'As a naval architect and one in the public eye, I have had the aspiration of being president but, to be honest, I thought it might come between 60 and 65, not at 47.'

And, during his three years as president, Mr Payne is committed to ensuring that the potential naval architects and engineers of tomorrow are not deflected from their chosen career path.

'I very much want to use my tenure to promote engineering in general to youth and, when appropriate, to encourage people into



Rotterdam - 'I worked very hard to raise the profile of this ship with the yard,' says Mr Payne.

naval architecture as a profession. As far as possible, I want to make sure that no one is faced with the discouragement I faced. I want to get children and teachers involved, in order to see what opportunities are really out there.'

What is not in doubt is that Mr Payne's enthusiasm for his chosen profession will

prove infectious. And anyone doubting that enthusiasm need only read pre-1995 copies of *The Naval Architect*. There, they will find articles by one 'Tony Newman', a nom de plume adopted by Mr Payne so that his ship designer boss didn't get annoyed that he was writing about naval architecture, in his spare time. 



## We sail great ships...

For more than 70 years MARIN has been serving the maritime industry with high-grade technology. The synergy between scientific research and industrial services has always been a major focus point. It ensures that our research is fine-tuned to the industry's demands. And it enables you to benefit from our ever-growing pool of knowledge.

Our services incorporate a unique combination of simulation, model testing, full-scale measurements and training programmes. For the design, optimisation and operation of ships and offshore structures.

## ...even before they're built



[www.marin.nl](http://www.marin.nl)

Maritime Research Institute Netherlands  
 T +31 317 493911  
 E [info@marin.nl](mailto:info@marin.nl)

# Riding on the crest of a wave

Our publications Naval Architect, Ship & Boat International and Shiprepair & Conversion Technology are leaders in their field. They provide up-to-date technical information, regular features, news and product information. Each publication is tailored to specific markets, with Naval Architect featuring information on commercial ship design, construction and equipment. It includes the bi-monthly Warship Technology, as well as quarterly supplement Offshore Marine Technology.

Ship & Boat International features information on vessel types from 5m up to 100m,

including fast ferries, workboats, fishing vessels, patrol and pilot boats, tugs and offshore vessels.

Shiprepair & Conversion Technology has indepth coverage on all aspects of shiprepair and conversion work. It also provides shipyard news together with contract news, appointments and industry news.

For more information contact The Marketing Department, RINA, 10 Upper Belgrave Street, London SW1X 8BQ. E-mail: [subscriptions@rina.org.uk](mailto:subscriptions@rina.org.uk)

## SHIP & BOAT INTERNATIONAL



JULY/  
AUGUST  
2005

2005 Subscription  
UK £76  
EUR €81 OVS  
91 Ref: J7

Published six  
times a year

SUBSCRIBE  
NOW AND GET A

# FREE

COPY OF  
GENESIS OF A QUEEN



2005 Subscription  
UK £100 €EUR 105  
OVS 115 Ref: J6

Published ten  
times a year



2005 Subscription  
UK£30 EUR€35  
OVS 43 Ref: J8

Published  
quarterly

# The Royal Institution of Naval Architects

## Performance Standards for Ballast Tank Coatings Seminar by Mr J Hinchley and Dr R Kattan, Safinah



10th October 2007



being held in conjunction with ShipRepair & Conversion 2007, National Hall, Olympia, London

The new IMO PSPC poses real challenges for Shipyards, owners and classification societies and Maritime Administrations. The requirements raise issues such as:

- What does the paint specification defined mean for shipyards?
- What should the contents of the Coating Technical file be?
- What should owners expect to get on delivery of the ship?
- Who should be the certified inspector?
- What will be the role of Class?
- What are the owners responsibilities through life of the vessel?
- What will the Maritime Administrations need to do to audit the process.

All these challenges are real as there is a shortage of skilled people to meet these needs. The course sets out to make the delegates familiar with the standard and offer solutions to some of these problems and highlight issues that the end-user - whoever they may be are likely to face.

The seminar is practical and uses a non-technical approach to address these problems and so the delegates do not need much of a coatings background. The sessions allow for plenty of time for Q&A and discussion amongst delegates to compare experiences.

Established in 1998, Safinah is a unique consultancy employing naval architects, coatings experts and chemists, which provide it with a comprehensive understanding of all aspects of coatings in the marine and offshore industries.

To register, simply complete all sections of this form and return it with your payment to:  
**THE CONFERENCE DEPT, RINA, 10 UPPER BELGRAVE STREET, LONDON SW1X 8BQ.**  
Tel: +44 (0)20 7201 2401 Fax: +44 (0)20 7259 5912 email: conference@rina.org.uk

Name:	Postion:
Company:	
Address:	
	Postcode:
Telephone:	Fax:
Email:	RINA Membership No (if applicable):

Please indicate your preferred method of payment:

I enclose a cheque/Eurocheque for: £ \_\_\_\_\_  
Please send me an invoice for: £ \_\_\_\_\_  
Bank Transfer details enclosed for: £ \_\_\_\_\_  
Please debit my credit card: £ \_\_\_\_\_

Card Number: | | | | | | | | | | | | | | | | | | | | | |

Expiry date: | | | | | |

Signature: \_\_\_\_\_

Payment must be made in pounds sterling by Eurocheques, cheque drawn on a bank with a UK branch address, credit card (VISA/AMEX/Mastercard) or bank transfer. Please note RINA requires payment *before* the seminar date.

**Account Name:** The Royal Institution of Naval Architects

**Account Number:** 10042127 **Account code:** 160016

**Bank address:** Royal Bank of Scotland PLC, Belgravia Branch, 24 Grosvenor Place, London SW1 7HP, UK.

The following charges will be made in the event of a cancellation: £60 if received before 10th September 2007. Cancellations made anytime after that date will not be refunded. Delegates may be substituted in writing subject to the consent of the Conference Organiser.

**Registration fee: RINA Members: £300+VAT (Total £352.50) Non Members: £350+VAT (£411.25)**

## Sember adds a touch of class

**AFTER taking the reins as ABS Europe president, Bill Sember gives an overview of his workload.**

**B**ILL Sember is three quarters of the year into his new role as president, ABS Europe. The 30 year ABS veteran joined the class society as a surveyor after serving at sea as a marine engineer, and can look back on a geographically broad career marked by stints as manager of ABS's offshore engineering department in Houston, regional vice president Western Europe, regional vice president Middle East, and regional vice president of Eastern Europe.

In the first few months in his newly-elevated position, Mr Sember has been doing what anyone sitting at the top of a service-orientated operation should – gathering customer feedback.

In the case of class, however, this process is formalised, and Mr Sember spent a good deal of the early part of this year liaising with clients through the national committees ABS organises that include customers, but also regulators.

Part of the function of such gatherings is simply to service lines of communication. It is useful, for example, to be in regular contact with the Greek owners that represent the number one ordering country in the tanker, chemical carrier, container carrier, and capesize bulk carrier sectors, particularly since most of their ordering is being done in China, where ABS is the number one class body.

But it is also at these events that shipowners get the chance to express their views on how class rules stand and to explore possible changes that might be justified by technical innovation. And this year, there has been plenty to digest from the regulatory point of view, as common structural rules on tankers and bulk carriers have started to bite.

'We have been doing continuous analysis and reviews of the CSRs,' says Mr Sember, 'working with the clients, but also with the shipyards and on the overall process, to ensure that everybody is on the same wavelength, and to establish what are the differences from the way we worked before.'

'We're seeing the emergence of different designs and it is very important that we work closely with designers. We're seeing the emergence of new yards in China, and it is very important that our Shanghai technical office works especially closely with the shipyards. The CSRs are new and, with new designs, we need our experienced people working with the designers and the shipyards and, perhaps, they have to pay a little more attention.'

Returning to London after a five year gap, Mr Sember has also been alert to the changed nature of the market.

'When I left in 2002, some things were on the verge of taking off, but the offshore sector was fairly steady, with only a few rigs being built. This has really taken off over the last two years, with new yards in the Middle East developing to handle the overflow from Singapore.'

Mr Sember said that over 130 rigs were under construction around the world. He and his energy development team have been credited



*Excelsior – the first LNG carrier with onboard regasification plant to take to the sea.*

with the recent success ABS has had in securing the classification work for a dominant share of the offshore exploration and production units. For example, ABS reckons to be classing all of the rigs under construction at Middle East yards – in a run of work extending to 13 units under construction, plus five options. Mr Sember is chairman of the International Association of Classification Societies (IACS) Working Party on Drilling Units.

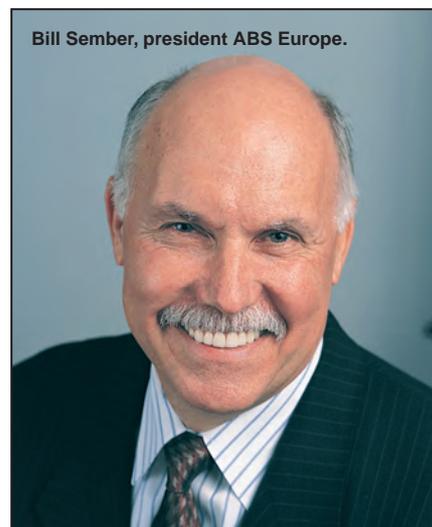
In the wider energy market, ABS reckons to have classed 24% of the liquefied natural gas carriers in operation, and has also been aggressively pursuing LNG ships on order, where its share is 17%.

'We have worked very hard on LNG after making the decision that, what would probably happen, would be that the market would veer towards membrane-type ships. That work focused on CFD analysis and, specifically sloshing, where we also took data from model tests to develop criteria for tanks.'

In passing, Mr Sember acknowledges the sea change that has occurred in the LNG carrier market in terms of ship design over the last two to three years. 'Until 2005, ships had grown slowly, from around 125,000m<sup>3</sup> capacity to around 145,000m<sup>3</sup>, and were driven by steam turbines. Now, 265,000m<sup>3</sup> ships are being built in almost one jump, with propulsion now being delivered by medium-speed engines and slow-speed diesels. All of this has been driven by the Qataris.'

Mr Sember emphasised that it was incumbent on ABS to anticipate the direction of the market, so that it could be prepared to meet new demand. The class body draws on various market sources, but also employs its own analysts to forecast trends. Last year the class body elected to focus

**Bill Sember, president ABS Europe.**



much of its energy on developing services for the capesize bulk carrier market, anticipating this year's run on bulkers.

Again, ABS must be alive to new markets. Having opened an office in Baku to cover activities in Azerbaijan, ABS recently opened for business in Elmar to take on Kazakhstan. For the first time, it has also established a country manager for Russia, with surveyors located in St Petersburg and Novorossiysk. Again, the class body recently added five new surveyors in Angola to handle more offshore work.

However, as well as being present in a given market, Mr Sember says that ABS is looking beyond merely playing its role of applying the rules set down by international law. It is looking

## Military Support Ships

13-14 November 2007, RINA Headquarters, London UK

### Second Announcement



In an increasingly uncertain world the modern navy needs to be able to respond to a wide range of operational commitments and missions anywhere in the world. Logistic support ships are essential in providing these forces with greater reach and endurance, and allow self-reliance and sustained operations to be conducted away from a supply base. These ships may be involved in supplying fighting ships bulk consumables, supporting land based forces from the sea, provide forward aviation support and humanitarian relief.



With the implementation of new technologies, changing operational and regulatory environments new methods need to be investigated to make logistic support ships more flexible and economical. This conference will bring together all those concerned with the design, construction, equipment supply and operation to consider recent developments and discuss how they impact on the design of such vessels.

The conference will cover such topics as

- Ship to Shore Replenishment Craft
- Replenishment Ships
- Strategic Sealift Vessels
- Forward Repair Vessels
- Hospital Ships
- Disaster Relief Vessels
- Underway Replenishment (RAS/UNREP/VERTREP) Systems
- Ship to Ship Interface
- Onboard handling of stores



- I wish to receive details on exhibition space and sponsorship opportunities
- I would like to receive a full programme brochure and registration form

Name:	Position:
Company:	
Address:	
	Postcode:
Telephone:	Fax:
Email:	(MSS 2007)

Please return to: Conference Department, RINA, 10 Upper Belgrave Street, London SW1X 8BQ  
by fax on +44 (0)20 7259 5912 or by email: [conference@rina.org.uk](mailto:conference@rina.org.uk)

at how it can assist clients in developing new technologies that may be in advance of what the rules prescribe.

'We look at whatever the standards and rules require to be in place, but we also go back to first principles, back to the original designs, and develop a risk-based approach where the rules don't cover things, to see how we can come up with an equivalent level of safety,' says Mr Sember. 'That is what we have done with compressed natural gas, for example, where we have looked at the pressure vessel standards and at the pipeline standards, and found that neither of them relate to the marine application.'

ABS and, indeed, Mr Sember in particular, has played a leading role in granting approval in principle to Calgary-based Sea NG Corp to build its 'Coselle' CNG ships. This is the first CNG ship design to be approved in principle by any international marine classification body. One of Mr Sember's former roles saw him as a board member of The Centre for Marine CNG Inc, in St John's Newfoundland - the world's first research and development corporation for large-scale marine transportation of compressed natural gas.

'We have developed a risk-based analysis over a four year period, including HAZID [Hazard Identification] and HAZOP [Hazard Operability] studies that are close to fruition. We are working with most of the major designs for CNG carriers, including SEA NG, but also Enersea and TransCanada,

which have also both received approvals in principle. We can say that there are not any show-stoppers in developing this technology. We developed a guide for CNG two to three years ago, which has provided the framework for the path to approval for concepts where there are no existing criteria - no specific coverage in the rules. After review, we have followed through to come up with a justification for approval where there has not been an original standard.'

That 'path to approval' has seen ABS advising on everything from CNG valve arrangements to pressure and temperature, for example, balancing wall thickness and superstructure weight against pressure.

Also breaking new ground has been the role ABS has played in reviewing *Excelsior*, the first 'regasification' liquefied natural gas carrier (LNGRV) at sea.

The 138,000m<sup>3</sup> *Excelsior*, was delivered in January 2005. The second LNGRV, *Excellence*, followed the same year, and *Excellerate* - the third - was delivered in October 2006. Owner Exmar, in conjunction with Excelerate Energy of Texas, has five more of these LNGRV's on order, each with a larger capacity of 150,900m<sup>3</sup>. DSME Hull N° 2254, to be named *Explorer*, is due for delivery in the first quarter of 2008, with *Express* to follow in the second quarter of 2009. A further three 150,900m<sup>3</sup> LNGRVs are due between the second and fourth quarters of 2009.

Although Bureau Veritas classed these ships, ABS reviewed the design, having been involved in the land-based regasification plant upon which the shipboard installation was based.

'The purpose was to take the land-based system and its exchangers and mount them on hydraulic pedestals, and simulate the motions that would occur at sea. What we found was that the system would work very well in the offshore environment, which was subsequently vindicated by the fact that *Excelsior* was in the process of discharging during Hurricane Katrina and, although not in the eye of the storm, she was subject to swells of up to 6m-8m.'

And, with the energy market pressing on to reclaim ever more remote resources from beneath the seabed, technical challenges clearly remain. ABS has also taken a leading role in classing the complex drillships now offering the capability to drill in extremely deepwater, to depths up to 12,000ft below the surface.

'That means drill strings of up to 40,000ft,' said Mr Sember. For its part, ABS certifies the drilling system of such designs, and reviews equipment onboard, including derricks and drives. The class body will also verify that the dynamic positioning system used on the ship is up to scratch.

'What once would have seemed extraordinary is now just normal. When I started in this business, 500ft was deepwater and now to talk about a 40,000ft drill capacity - these are mind-blowing numbers.'

## RINA – LLOYDS REGISTER SHIP SAFETY AWARDS

Nominations are invited for the 2007 RINA - Lloyds Register Ship Safety Awards.  
Entries close 1st January 2008

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

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

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

There are separate categories for universities and industry. An Award of £1500 is made in each of the categories and will be presented at the 2008 RINA Annual Dinner.

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



Director of Professional Affairs  
The Royal Institution of Naval Architects  
10 Upper Belgrave Street, London SW1X 8BQ  
Tel: +44(0)20 7235 4622  
Fax: +44(0)20 7259 5912  
Email: profaffairs@rina.org.uk



# Innovation is the key to success – people are the key to innovation

AS the Chief Executive of The Royal Institution of Naval Architects, a leading international professional institution, Trevor Blakeley CEng FRINA FIMarEST FIMechE, is well placed to comment on the contribution which professional societies can make to the future success of the maritime industry, and in particular to ensuring that industry has the engineers who will provide the innovation which is the key to that success.

THE international maritime industry is currently enjoying a prosperity which it has not known for some time. It is perhaps understandable that the industry would wish to concentrate on meeting this demand and enjoying the benefits of this historic upturn in the industry's fortunes. However, at such a time it is all the more important for all sectors of the industry to look ahead in order to respond to the challenges it will face from the increasing demands of operators, regulators, and society for greater efficiency, safety and the protection of the environment. Such challenges will require innovative thinking from all sectors of the industry, but particularly from engineers whose knowledge and skills will be essential to the future success and prosperity of the industry. Professional institutions have an important role to play in helping to identify industry's needs, and in helping to ensure that engineers have the knowledge and skills to meet the needs of industry. Innovation is the key to success, but people, and especially engineers, are the key to innovation.

In order to determine the contribution which professional societies can make to the future success



Trevor Blakeley, RINA chief executive.

of the maritime industry, I believe it is necessary to first identify the nature and the state of the industry today, the challenges it faces in the future, and how it should respond to those challenges.

There are three key factors which I believe determine the nature of the maritime industry – its diversity, its globalism, and its dependence on technology.

## Diverse industry

The maritime industry is a complex and diverse industry with many sectors in which engineers are involved, including design, construction, equipment supply, operation, regulation, and

others. This diversity will require engineers to have a wide range of skills, including finance, contracts, legislation, communication, leadership, and project management, as well as technical skills. Professional societies have a role to play in identifying such non-technical skills needed by engineers and in helping them to achieve these skills.

## A global industry

The maritime industry is also a global industry. This globalism is reflected in all its sectors, whether it be research and development, design and construction, equipment supply, regulation, or operations, and requires the global movement and of both information and people. The global nature of the industry must be reflected in the knowledge and skills required by engineers in all these sectors. Whether national or international, and both through their individual activities and by working together, professional societies have an important role to play in promoting and enabling the global exchange of information.

With the increasing global movement of engineers, it is essential that both industry and society have confidence in the individual engineer's standard of professional competence and commitment to professional integrity. Professional institutions have a role to play in helping to provide this confidence by setting high standards of professional competence and integrity for their members, and by ensuring that these standards are maintained.

## An industry highly dependent on technology

But perhaps most significant as far as engineers are concerned, the maritime industry is an industry which is highly dependent on technology, and whilst all sectors of the industry must seek the innovative solutions to the challenges facing the industry, it is the technological and scientific advances made by engineers which will have the greatest impact in providing ships and marine structures which cost less to design, build, and operate, are safer, and more sensitive to the environment. And whilst such advances will mainly come from research and development, engineers involved with design, construction, and operation must be aware of such advances so that they can make best use of them. Professional societies have a key role to play in ensuring that information on technological and scientific advances is made readily available to engineers through such activities as publications and conferences. Such information must be accurate, credible, and impartial.

## The industry today

The international maritime industry is currently enjoying a prosperity which it has not known for some time, with the orderbooks of many shipyards at record levels for recent times.

Environmental considerations require the introduction of double-hull tankers.



This industry boom is tied largely to three factors. Tougher environmental requirements by the International Maritime Organization are calling for the phase-out of single-hull tankers in 2010, and many shipowners want to build the double-hull ships which will eventually become the industry standard vessels, before the new rules come into force.

Another driver behind demand is China's hyper-growth economy and a big upswing in global commerce that is increasing seaborne trade between Asia and the West. With so much global trade transported at sea, shipowners are demanding the creation of larger containerhips of over 10,000TEU capacity.

Then there is a surge in oil demand from developing countries such as China and India that has sent oil prices to record levels. This not only requires more tankers, but has also prompted a rise in the use of liquid natural gas. That in turn is sparking demand for LNG carriers. The global hunt for oil and gas is also leading to an increase in the search for new offshore oil production facilities.

It is perhaps understandable that, given the cyclic nature of the industry, the industry would wish to concentrate on meeting this demand and enjoying the benefits of this historic upturn in the industry's fortunes. However, I believe that at such a time it is all the more important for all sectors of the industry to look ahead in order to respond to the challenges it will undoubtedly face from the increasing demands, particularly from operators, regulators, and society.

I believe that there are three key issues which the industry will have to face, and which technological innovation, and therefore engineers and professional societies, must

address. These are safety and the protection of the environment, changes in shipbuilding, and research and development.

#### **Safety and the protection of the environment**

Notwithstanding the many studies which show that sea transport is one of the safest, cleanest, and most efficient forms of mass transport, the maritime industry must respond to society's increasing awareness and sensitivity to the safety of both people and the environment.

Through global communication, society is much better informed of maritime incidents involving loss of life. Society is demanding higher standards of safety for those who travel by sea or work in the maritime industry, and increasingly it is holding the industry accountable when they are not achieved. Few engineers would disagree that safety at sea begins with good design, and continues with sound construction and skilled operation.

The maritime industry faces several challenges with regard to the external environment. Air pollution, ballast water, and the disposal of marine vessels and structures are examples that must be addressed. The maritime industry must also contribute towards the aim of maintaining a sustainable environment, particularly in the way in which it uses resources. The industry must address the challenge of how to dispose of ships and structures, safely and economically with the minimum detriment to an increasingly fragile environment. To do so, I believe that industry will have to adopt a through life approach to such a requirement, accepting that as with safety, recycling also begins on the drawing board, and continues throughout

a vessel's construction and operational life. Engineers are involved in all these stages of a vessel's life, and both safety and environmental issues should be particularly addressed by professional societies in their activities.

Society's demands for greater safety and the protection of the environment will inevitably lead to greater regulation. Innovative thinking will be required in both in the framing and the response to such regulation. Such innovation, for example, is already reflected in the introduction of goal based standards as a means of ensuring that such regulation is effective, whilst causing minimum impact on the efficiency and prosperity of the industry. Engineers have a key role to play in ensuring that regulation is both effective and sensible, and professional societies can help to ensure that they have the knowledge and skills to do so. Professional societies can also contribute their collective expertise in such forums as the International Maritime Organization, for example, through participation in the IMO Naval Architecture Group which utilises RINA NGO status to provide professional societies with information on IMO activities and the opportunity to represent their views.

#### **Shipbuilding**

The shipbuilding sector of the maritime industry faces increasing competition, both internally, as capacity and access to the market increases, and externally, for increasingly scarce resources, both material and manpower. The challenge that shipbuilding faces is how to respond to the continuing demand for lower cost ownership. The past discrete improvements in efficiency are not enough: it must now apply innovative

The demand for energy is resulting in an increase in LNG carriers.

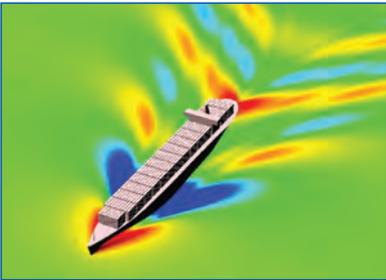


# The Royal Institution of Naval Architects

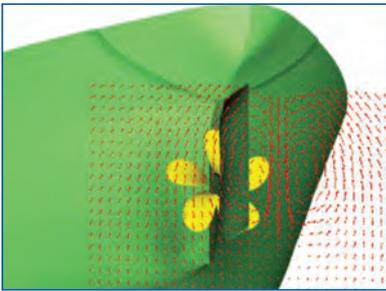
## MARINE CFD 2008

26 - 27 March 2008, Southampton, UK

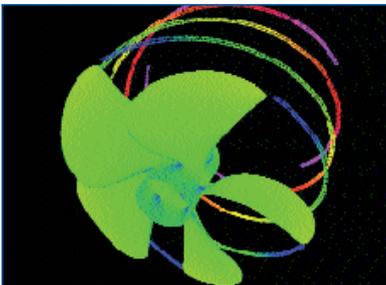
### Call for Papers & First Notice



Computational Fluid Dynamics (CFD) is an increasingly important tool for analysing flows around ships and propulsors. It is used to solve a wide range of maritime applications from resistance prediction to slamming loads calculation. It can provide important insights into physical flow characteristics and can offer an economic way to investigate design options.



Generic CFD codes often lack some features and capabilities needed to address specific maritime applications. The presence of the free surface provides a major departure from conventional CFD applications. The need to represent this fluid interface accurately presents a considerable challenge, not least because its behaviour can vary considerably within the computational domain, and as a function of hull form and speed.



Advances in computer technologies over the past two decades are slowly turning the dream of the complete numerical towing tank or 'virtual basin' into a reality. However, today's methods still lack the accuracy to match results obtained in real-life experiments. While it is unlikely that a single CFD tool suitable for all applications will be developed, there are many synergies that could be better exploited. The three major requirements for practical engineering applications are computational speed, accuracy and integrated into the overall design process.

This International conference will offer delegates an opportunity to meet and discuss the latest developments and practical marine application of CFD. The programme will also include software workshops which will give delegates a chance to participate in and discuss demonstrations of the latest CFD software. Papers are invited in such areas as:

- Practical applications of CFD techniques to marine design
- Experimental and computational validation & benchmarking
- Improvements in automatic mesh generation
- Developments in adaptive grid generation
- Coupling CAD and CFD software
- Development of quality standards and best practise.

A Riviera Maritime Media Ltd  
event organised by the Royal  
Institution of Naval Architects

- I would like to offer a paper and attach a synopsis of no more than 250 words by 23 November 2007
- I wish to receive details on exhibition space and sponsorship opportunities
- I would like to receive a full programme brochure and registration form

Name:	Position:
Company:	
Address:	
	Postcode:
Telephone:	Fax:
Email:	(CFD08)

Please return to: Conference Department, RINA, 10 Upper Belgrave Street, London SW1X 8BQ  
by fax on +44 (0)20 7259 5912 or by email: [conference@rina.org.uk](mailto:conference@rina.org.uk)

thinking to the whole design and construction process to improve productivity and cost-competitiveness.

This is not just a matter of introducing more efficient equipment or advanced IT, but of using such technology within a single integrated environment to support flexible ship design, production, and life cycle management. Professional societies can contribute towards increasing shipbuilding efficiency by ensuring that engineers have access to up to date information on developments in shipbuilding technology and their application.

### Research and development

Research and development are key elements in achieving the innovation in technology needed to respond to the challenges which the industry faces. However, such research and development must be focused on industry's needs, and be carried out by engineers of the highest standards of professional competence if it is to be successful.

Too often, research and development projects result in increased knowledge among a selected few, but do not result in new products or processes. Innovative thinking is wasted if the ideas cannot be brought to the marketplace. But, perhaps a more pertinent question is whether such investment has been effective and efficient - has it given value for money? I believe that this will only be achieved if there is close cooperation between those sectors of the industry requiring, and therefore generally funding such R&D, and those engaged in such activities, whether in research institutes or universities. Such dialogue is essential if technology is to provide the innovative solutions to the challenges faced by the industry. Professional societies have an important role to play in providing a forum where industry's needs for research and development can be presented to those who will carry it out. It is important that such a forum, whether it be through publications or conferences, should not just look back at what has been achieved, but also to the future at what will be required. With members in industry, universities, and research organisations, professional societies are uniquely placed to provide such a forum.

### Increased trade is demanding larger containerships.



Innovation will come from research and development.

### Providing the engineers of the future

It is self evident that the innovation which I believe is necessary if industry is to respond to the challenges which it faces in the future, will come from engineers who have the necessary knowledge and skills. But where are such people to come from? It is the role of universities to provide the knowledge and understanding which underpin the professional skills which industry requires. But what are those skills which industry needs now and, more importantly, in the future, given that it takes four or five years of academic study before the graduate enters industry. Industry must identify those changing needs, not just in research and development, but in all other sectors, so that universities can respond to them. I believe that professional societies are uniquely placed provide a forum in which industry's needs and the universities' response can be debated.

Innovation will require the best engineers with up to date knowledge and professional skills. If the maritime industry is to compete with other industries for the best engineers, it must demonstrate that it provides a challenging and rewarding career. Professional societies have an essential role to play in promoting the maritime industry as a career and in encouraging the best high school leavers and university graduates to enter the maritime industry.

However, achieving professional competence does not just come from education, but also requires training and experience gained after graduation. Whilst industry has a responsibility to provide its engineers with such training and experience, professional societies can help them to achieve this by, for example, advising on graduate training programmes.

And of course, professional development, that is the updating and developing of new skills, and the widening of experience, is a lifetime activity. Essential to that activity is access to up to date information on developments in the maritime industry. Professional societies have an important role to play in providing such access, whether through publications, conferences, or increasingly the Internet, to ensure that engineers remain competent to meet industry's needs.

I believe that the future success of the maritime industry will require innovative thinking in all sectors of the industry. Such innovation will require commitment, investment, and perhaps most importantly, competent engineers. The future success of the maritime industry lies largely in the hands of the industry itself. However, I believe that professional societies have a key role to play in ensuring that engineers in the maritime industry have the knowledge and skills needed by the industry, both today and in the future.

Whilst innovation is the key to the future success of the maritime industry, people are the key to that innovation. I believe that professional societies can be the key to providing such people. ☺



## The Fifth International Maritime Exhibition and Forum

### Supported & Endorsed by:



### Sponsors:



### Organised by:



For enquiries, please contact: PDA Trade Fairs, A division of Pradeep Deviah & Associates Pvt. Ltd. 'PDA House'  
 No. 32/2, Spencer Road, Frazer Town, Bangalore - 560 005, India. Tel: +91-80-2554 7434 Fax: +91-80-2554 2258.  
 E-mail: nazeeba@pdatradeairs.com Website: www.pdatradeairs.com

### Aker shuttles to Russia

A CONTRACT totalling Nkr40 million has been awarded to Aker Kvaerner from Russian Admiralty Shipyards for equipment for two shuttle tankers which will operate in Arctic waters. The vessels are being built for Sovcomflot to service the Prirazlomnaya field in the Pechora Sea.

Included in the deal are bow loading systems and complete mooring and emergency towing systems, all designed for extreme low temperature conditions. The bow loading systems will be of the latest Arctic version with completely oil spill-free connection and disconnection of the offloading hose for environmental protection.

All the equipment will be manufactured in Europe, and the delivery of the shuttle tankers to Admiralty Shipyards will take place in September 2008 and January 2009.

Contact: *Siv Anett Enerud, communication manager, Aker Kvaerner Products and Technologies, Prof Kohtsvei 15, PO Box 169, N-1325 Lysaker, Norway.*  
Tel: +47 22 94 71 92. [www.akerasa.com](http://www.akerasa.com)

### Drawing developments out of AVEVA

AN open approach to piping and instrumentation drawings (P&IDs) has been announced by AVEVA for its AVEVA Plant software. This should facilitate consolidation of P&IDs, and is based on the creation of a common schematic model to represent the complete logic of systems in a project. It is an extension of the database technology for storing plant models.

AVEVA Schematic Model can store P&IDs from various intelligent P&ID applications in an ISO15926 compatible format, and runs on the AVEVA technology platform, with access to all the database and functional capability of the environment. It is claimed to give a fully-functional multi-user database, with the potential for use in globally distributed projects and the tracking of changes during design development.

Currently supported P&ID formats are: AVEVA VPE P&ID; AVEVA P&ID Designer; SmartPlant P&ID. AVEVA P&ID Designer, jointly developed with Autodesk, is based on AutoCAD P&ID. The package is said to give customers the flexibility to mix and match modules to suit their business requirements.

Contact: *Alison Patey, AVEVA Group plc, High Cross, Madingley Road, Cambridge CB3 0HB, UK.* Tel: +44 1223 556653.

E-mail: [alison.patey@aveva.com](mailto:alison.patey@aveva.com) [www.aveva.com](http://www.aveva.com)

### MacGregor's Chinese commission

ENGINEERING company MacGregor has won contracts in China for both cranes and hatch covers. Yangzijiang Shipyard has commissioned MacGregor to supply 39 shipsets of cranes for installation on bulkers, cargo ships, and feeder container carriers, in contracts worth an estimated US\$37 million.

21 7600dwt bulkers will each feature a pair of GLB cranes, four 12,600dwt multi-purpose cargo ships will each use two GL cranes, and GL cranes are also specified for two feeder containership series: four 1350TEU ships will have two cranes installed, and 10 2500TEU carriers will each feature three GL cranes and a service crane.

In a separate contract, MacGregor has won hatch cover orders for a further 12 17,300dwt multi-purpose cargo ships being built by Hudong-Zhonghua Shipbuilding Group for Wagenborg Shipping. The deal is thought to be worth around €5 million, and the vessels are due for delivery between 2008 and 2011.

MacGregor will design and supply key components for the folding weatherdeck and tweendeck hatch covers, plus supplying lashing equipment – fixed equipment on deck and stanchions, on hatch covers, and in cargo holds. The weatherdeck hatch covers are the high-stowing folding type, operated by external hydraulic cylinders and bell crank arms, while tweendeck covers are lift-away panels. Container stack loads are 50tonnes for TEU and 60tonnes for FEU.

Contact: *Tomi Sundell, director, general cargo ships, dry cargo division, MacGregor (FIN) Oy, Hallimestarinkatu 6, FIN-20780 Kaarina, Finland.* Tel: +358 2 4121 370.  
Fax: +358 2 4121 380.  
E-mail: [tomisundell@macgregor-group.com](mailto:tomisundell@macgregor-group.com)  
[www.macgregorgroup.com](http://www.macgregorgroup.com)

### Bridge systems for Royal Caribbean's Genesis project

NORTHROP Grumman's Sperry Marine business unit has been awarded a contract to supply integrated bridge systems (IBS) for Royal Caribbean's Genesis project cruise ship building programme at Aker Yards in Finland. The suite of navigation, communication, and control systems will be based on Sperry Marine's VisionMaster technology, and will include a total of 13 TotalWatch multi-functional workstations on the bridge, as well as a TabletBridge wireless node in the captain's cabin.

TotalWatch brings together information from radars, electronic chart display, and information systems, plus other shipboard systems for display on a single high-resolution flat screen. Dual redundant network architecture has been developed, with a built-in backup for all critical components.

The bridge layout will be based on a modified U-shaped cockpit with trackball controls built into the watch officers' chairs. A separate command and safety centre will be located adjacent to the wheelhouse, and for easy access, all processors will be rack-mounted in two separate electrical rooms.

Sperry Marine is also under contract to supply the IBS for Royal Caribbean's next Freedom-class ship, currently under construction, and has supplied the same equipment for all of the cruise line's new Voyager-, Radiance- and Vision-class ships. Sperry Marine also provides extensive navigation training for the ships' watch officers and fleet-wide service and technical support.

Royal Caribbean's new class of giant cruiseships, rated at 220,000gt, will carry more than 5400 passengers. The first ship is scheduled to enter service in 2009, and the second, also on order from Aker Yards, is due for completion in 2010.

Contact: *Sperry Marine, 1070 Seminole Trail, Charlottesville, VA 22901, USA.*  
Tel: +1 434 974 2000. Fax: +1 434 974 2259.  
[www.sperrymarine.northropgrumman.com](http://www.sperrymarine.northropgrumman.com)

### Minimax fans Dutch market flames

FIRE protection systems outfit Minimax GmbH & Co KG has taken over the operation of Seafix,

a Netherlands-based competitor. Minimax intends to improve its position in the marine fire protection market in The Netherlands with this acquisition.

Seafix specialises in the engineering and installation of fire protection systems for inland navigation and ocean-going vessels, as well as offshore platforms. Minimax feels that the purchase will complement its existing Dutch subsidiary, MX Brandbeveiliging BV, bringing the total number of employees in The Netherlands to 31.

Contact: *Airi Loddock, corporate communications, Minimax GmbH & Co KG, Industriestraße 10/12, D-23840 Bad Oldesloe, Germany.* Tel: +49 4531 803 495.  
Fax: +49 4531 803 581.  
E-mail: [LoddockA@minimax.de](mailto:LoddockA@minimax.de)  
[www.minimax.de](http://www.minimax.de)

### Common rail steams ahead

MAN Diesel's type 32/44 CR engine with common rail fuel injection has continued to win contracts world-wide. By mid-June 2007, the company had sold 22 of the new engines, with a total output of over 148MW.

The offshore heavylift vessel *Pieter Schelte* had had nine of the engines installed, with a total output of 94.6MW; seven engines for tankers built by Turkish owners have also been supplied, and the orderbook includes engines for two special purpose vessels which have converted from MAN Diesel's 32/40 engine.

One of the engine conversion contracts is for *Arrow Seismic*, which has ordered a 102m, high-capacity seismic survey vessel from Factorias Vulcano shipyard in Vigo, Spain. It will be powered by two six cylinder and two eight cylinder inline 32/44 CR engines, and features a twin propeller propulsion system with 'father and son' engines connected by a common, twin input shaft, single output shaft reduction gear.

The six cylinder engines are rated at 3000kW at 750rev/min, and the eight cylinder versions each produce 4500kW at the same rated speed. The ship was designed by Skipsteknisk AS of Aalesund, Norway, type ST-321, and it should have a transit service speed of about 19knots.

The second special application of the common rail engine is *Combi Dock III*, a semisubmersible heavylift vessel being built for K/S Combi Lift, a joint venture between shipowners Harren & Partner, Germany, and J Poulsen Shipping, Denmark. The hull of the 11,000dwt vessel is being built at the Christ steel fabrication works in Danzig, Poland, and will be completed at the Lloyd Werft shipyard at Bremerhaven, Germany, in 2008.

*Combi Dock III* will employ two eight cylinder inline 32/44 CR diesel main engines, each rated at 4480kW at 750rev/min, and the auxiliary engines are two MAN Diesel inline five cylinder 23/30 diesels, producing 910kW at 900rev/min. The main engines drive four-blade controllable pitch propellers at 160rev/min via single input/output reduction gears featuring 1070kVA shaft generators, and giving the vessel an operating speed of just over 16knots.

The common rail engines are claimed to have lower specific fuel consumption and exhaust emissions under part load operation, due to the ability to optimise the operating values of a common rail engine across its entire load profile. It is also thought that the 560kW/cyl maximum



Artist's impression of the 102m, high-capacity seismic survey vessel building at Factorias Vulcano shipyard, Spain, due to be fitted with two six cylinder and two eight cylinder inline 32/44 CR engines.

unitary output allows a given application to be powered with fewer cylinders, saving maintenance costs.

Contact: MAN Diesel Group Communications, Stadtbachstr 1, D-86224 Augsburg, Germany. Tel: +49 821 322 4357. Fax: +49 821 322 4240. E-mail: press@mandiesel.com www.manbw.com

### Training programme for engine operation

CHARENTE Group member PC Maritime has introduced the Turbo Diesel 4 marine diesel engine diagnostic simulator. It is a PC-based training program which is intended to educate users in all aspects of engine operation and maintenance.

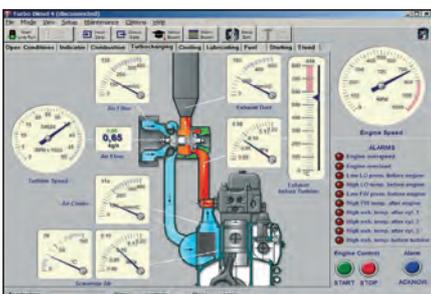
Wallem Shipmanagement has already acquired multiple units of Turbo Diesel 4 for Wallem training centres in The Philippines, Ukraine, Russia, Romania, and Hong Kong.

Said to enhance student understanding, it is also claimed to give transfer training to more experienced engineers, and it has 15 hours of ready-made lessons included in the accompanying manual.

The program is designed to comply with STCW and ISM Codes, and can operate in either Evaluation, Live Run, or Replay Run modes. Evaluation allows trainees to change the technical state of the engine elements, engine load, and operating conditions. It can be used for testing the relationship between engine operation conditions, or technical state and engine operation parameters.

Live Run simulates changes in engine technical state, allowing trainees to carry out maintenance and repair, and to change engine speed, but not technical state. Live Runs can then be saved and then replayed in Replay run mode for debriefing and evaluation.

PC Maritime's new Turbo Diesel 4 provides training in all aspects of marine engine operation and maintenance.



The program is also equipped with two 'Experts': Setup Expert explains the relationship between a change in engine setup and a change in operating parameters, useful when learning about engine diagnostics; Maintenance Expert indicates any necessary maintenance and evaluates what maintenance was necessary but not done.

Designed for Microsoft Windows operating systems, Turbo Diesel 4 is a network-enabled program that includes free instructor software for LAN installation. Upgrades of previous versions are available to existing Turbo Diesel customers around the globe.

Contact: Anne Edmonds, PC Maritime, Brunswick House, Brunswick Road, Plymouth PL4 0NP, UK. Tel: +44 1752 254205. E-mail: aedmonds@pcmaritime.co.uk www.pcmaritime.co.uk

### Tritex hangs on to thickness gauge

TRITEX NDT has developed a new multiple echo ultrasonic thickness gauge, specifically designed for hands-free use when using rope access techniques during ship surveys. The Multigauge 5500 has a bright LED display on the top of the gauge which can be easily viewed when mounted onto the chest harness straps.

The mounting system ensures the gauge hangs vertically so the display is always visible. Mounting the gauge onto the chest harness eliminates the need to wear a belt and avoids the gauge swinging around if a neck strap is used or if it is attached to gear loops, preventing damage to the gauge.

The probe cable socket has been mounted on top of the gauge so that the probe can be stored in a top pocket or around the back of the neck, between measurements.

Specified by class societies, the gauge uses multiple echo, and all probes have intelligent probe recognition, which automatically adjusts settings in the gauge, resulting in a matched probe and gauge,

claimed to enhance performance. In addition, the automatic measurement verification system ensures only true measurements are displayed, even on the most heavily corroded metals.

An enhanced through coating measurement feature, called Coating Plus, allows measurements to be taken through coatings up to 20mm thick, depending on the coating type. All gauges are manufactured to comply with British Standards BS EN 15317:2007.

Contact: Patrick Meech, Tritex NDT Ltd, Unit 10, Mellstock Business Park, Higher Bockhampton, Dorchester, Dorset DT2 8QJ, UK. Tel: +44 1305 257 160. Fax: +44 1305 259 573. E-mail: sales@tritexndt.com www.tritexndt.com

### Beasy cracks the case load

CRACK growth software from Beasy already had the capability to perform fatigue crack growth analysis using multi-axial loading, where a number of different load cases can be combined to represent the loading history. This has now been extended so that an individual load cycle itself can be defined.

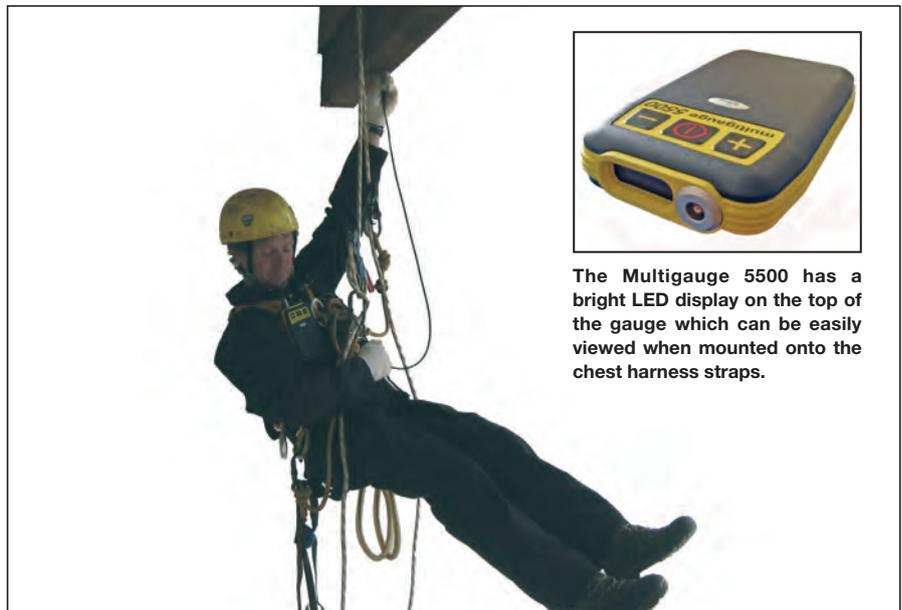
It can either be done by using a sequence of load cases, or by giving a series of load values for individual load cases through a cycle, allowing for load cycles to be constructed where the part of the load cycle that will give the maximum and minimum load states cannot be pre-determined. This is also said to facilitate the construction of the combination of load cases where two load cases act out-of-phase with each other.

In addition, there are improvements in the BEASY meshing so that groups of elements in the original mesh can be preserved during remeshing, and this new release is said to enable more complex loadings to be simulated, and further simplifies the modelling of cracks.

Contact: CM Beasy Ltd, Ashurst Lodge, Southampton SO407AA, UK. Tel: +44 2380 293 223.

E-mail: sales@beasy.com www.beasy.com

Tritex NDT has developed a new multiple echo ultrasonic thickness gauge, specifically designed for hands-free use when using rope access techniques during ship surveys.



The Multigauge 5500 has a bright LED display on the top of the gauge which can be easily viewed when mounted onto the chest harness straps.

**Wärtsilä acquisition is electric**

SCOTTISH company Electrical Power Engineering Ltd, which specialises in electrical power engineering for the marine and offshore segments, amongst others, has been acquired by Wärtsilä. The annual net sales of the company are approximately €20 million, and it employs 31 people, mainly electrical engineers.

The business designs and builds its own control panels, automation solutions, and switchgear, with its main activity covering full electrical conversion and upgrade of marine power systems and offshore applications.

Electrical Power Engineering also operates in the USA, offering service, maintenance, and project support in the Gulf of Mexico area.

Wärtsilä aims to further expand its service offering and add depth to its existing automation business with this acquisition, and for Electrical Power Engineering, the intention is to open up new markets and compete for larger projects.

Contact: Eeva Kainulainen, VP corporate communications, Wärtsilä, John Stenbergin ranta 2, FI-00530, Helsinki, Finland.  
Tel: +358 10 709 5235. www.wartsila.com

**Warning for shiplift operators**

KEITH Mackie, the published consulting coastal and harbour engineer, has issued a warning with regards to the corrosion of steel wire ropes in a shiplift. He claims that the ropes are subject to a peculiar pattern of corrosion which is difficult to detect with conventional wire rope inspection programmes, and is the cause of many rope failures.

The corrosion is said to occur at periodic spots along the rope, usually at 2metre to 3metre centres, depending on the system design. It seems to start in the core of the rope with an initial extent of about 200mm along the rope, and occurs on the portions of the ropes which are immersed during docking, as well as at spots that lie at the top of the winch drum and at the tops of the upper sheaves and bottom of the lower sheaves when the platform is in the upper or parked position. Mr Mackie surmises that the intensity of this corrosion seems to be a function of the total ton-metres of work done by the rope.

Lloyd's rules for inspection of shiplift ropes are reckoned not to provide for this behaviour and can miss a defective rope. Mr Mackie advocates an annual magnetic NDT inspection of the full length of all ropes on a lift as the only safe practice to undertake. He says if nothing is detected, then convention inspection should proceed, or if a clear periodic pattern is shown, then rope replacement should be considered.

Contact: Keith Mackie, consulting coastal and harbour engineer, Mistral, Fishermans Bend, Llandudno 7806, South Africa.  
Tel: +27 21 790 2263.

E-mail: keith@mackie.co.za www.mackie.co.za

**Light scanning from Hexagon**

A NEW incarnation of a high-speed, hand-held scanner has been introduced by Hexagon Metrology. The Leica T-Scan, model TS50, is claimed to be 30% smaller and weigh 20% less than previous versions.

The TS50 is said to have improved ergonomics, with a new handle design, and optimised

marker positions for more accurate 6 Degrees of Freedom readings over the full range of scanner positions have also been included. It also features instant temperature compensation facilitating measurements in almost any environment, and an intuitive LED display on the reverse of the scanner, with the read-out said to facilitate accurate distance-to-object data for optimal scanning.

Other features include a measurement volume of up to 30m, a 'no surface preparation required' capability, and tolerance of changing environmental light conditions. The scanner also works with Leica's T-Scan Collect 6.0 software, a package said to assist the real-time transfer of data to point cloud inspection and reverse engineering programs.

To date, over 350 scanners have been sold and are in use in sectors ranging from automotive to shipbuilding.

Contact: Gavin Bell, UK sales and marketing manager, Hexagon Metrology Ltd, Metrology House, Halesfield 13, Telford, Shropshire TF7 4PL, UK.

Tel: +44 870 446 2667.

E-mail: enquiry.uk@hexagonmetrology.com

**Satellite support contract for Thrane & Thrane**

INMARSAT has awarded a DKK20 million contract to Thrane & Thrane to supply and install two radio network controller stations in Hawaii. The contract has been awarded ahead of the implementation of the necessary BGAN infrastructure to support the third Inmarsat-4 satellite.

Delivery is planned to take place over the next two fiscal years, with installation of equipment scheduled to take place this year, and integration and testing due the year after. Thrane & Thrane has worked with Inmarsat since 2001 to design, manufacture, and install BGAN radio network infrastructure with a total value for Thrane & Thrane of more than DKK500 million, over this period.



A radio network control station, such as one due to be installed by Thrane & Thrane in Hawaii.

This deal assists in working towards providing global BGAN coverage, especially for the Pacific Ocean. Global coverage will open the BGAN services to large merchant vessels, whose communication needs can be met with FleetBroadband and SwiftBroadband services.

Contact: John Alexandersen, VP corporate communications, Thrane & Thrane A/S, Lundtoftegårdsvej 93 D, 2800 Kgs,

Lyngby, Denmark. Tel: +45 39 55 88 35.  
E-mail: info@thrane.com www.thrane.com

**Successful viscosity sensor shipboard test**

THE ViSmart viscosity sensor from the Sensors and Advanced Packaging business unit of Vectron International is thought to have been successfully evaluated in a simulated shipboard application. This was undertaken by the Defense Research and Development Canada – Atlantic (DRDC – Atlantic), an agency of the Canadian Department of National Defense (DND).

Due to this testing, DRDC – Atlantic has applied to DND to conduct shipboard tests for consideration of installation of ViSmart into shipboard equipment for continuous real-time lubricant monitoring. The evaluation results are claimed to show the sensor tracking the change in viscosity as a function of temperature, while also



The ViSmart viscosity sensor is thought to have been successfully evaluated in a simulated shipboard application.

accurately monitoring fuel dilution effects on the condition of oil.

The sensor was integrated into a diesel engine and testing was carried out across the entire temperature spectrum, ranging from 0°C to 120°C, for a series of specified commercial oils that are used on-line at the ship as part of the routine operating conditions. After testing for repeatability and reproducibility, the manufacturer's test data seemed to show that ViSmart detected oil aging as a function of viscosity to accuracy and repeatability values of ±1%.

This sensor is designed to provide instantaneous sample and/or continuous, real-time, in-process viscosity measurements for embedded in-line environments requiring high resolution and accuracy in low- to mid-range viscosity fluids. It has no moving parts, is sealed for complete immersion, and is said to be unaffected by vibration or flow conditions.

The ViSmart model series can be connected to any computer or control platform via the standard USB port and the forthcoming CANBUS and 4mA to 20mA options, to provide a continuous audit trail for process monitoring markets to control operating costs and maintain quality standards.

Contact: Colin Field, business development manager, Vectron SAP, UK.  
Tel.: +44 1959 570263.

E-mail: cfield@vectron.com www.visensor.com

## Cup could run over for Aquatankers

**A**NEW proposal for purpose-built, environmentally-friendly ships designed to transport water from north west Tasmania to mainland Australia has emerged from start-up consortium Aquatankers, a vehicle set up by Solar Sailor Holdings, of Sydney, and New York City-based Ambrose Partners.

Tasmania is considering plans to export billions of litres of fresh water from its wild rivers to parched mainland cities using supertankers.

A number of companies, including one chaired by former Australian prime minister Bob Hawke, are negotiating to capture excess water from swollen rivers on the state's high-rainfall west coast.

Although the Tasmanian Government was initially sceptical, state Water Minister David Llewellyn recently told *The Weekend Australian* he now believed the idea stacked up economically - and could be used to benefit Tasmanians as well as mainland consumers.

Mr Llewellyn said a proposal from Solar Sailor, the New South Wales company chaired by Mr Hawke, to export 50 billion litres of water a year from Tasmania's Reece Dam and Lake Palooana areas, was just one of a number before the Government.

'I don't think it's pie in the sky,' Mr Llewellyn said. 'It comes within the realms of possibility when you judge it against the cost of desalination and large infrastructure costs.'

'And it's a resource that Tasmania has. With proper consideration and assessment and long-term planning, it could be used to the advantage of development of drought-proofing arrangements here in this state.'

Mr Llewellyn said Tasmania's fresh water supplies were equivalent to two Murray-Darling systems. The state has a population of about 485,000, or 2.3% of Australia's total, yet it has 12% of the nation's water.

Mr Llewellyn said revenue from the sale of water otherwise flowing from rivers into the sea could be invested in dams and irrigation infrastructure in the state's dry north and east.

'If we derive money from that type of enterprise, then that money could be used to develop the infrastructure elsewhere that provides water for people,' he said.

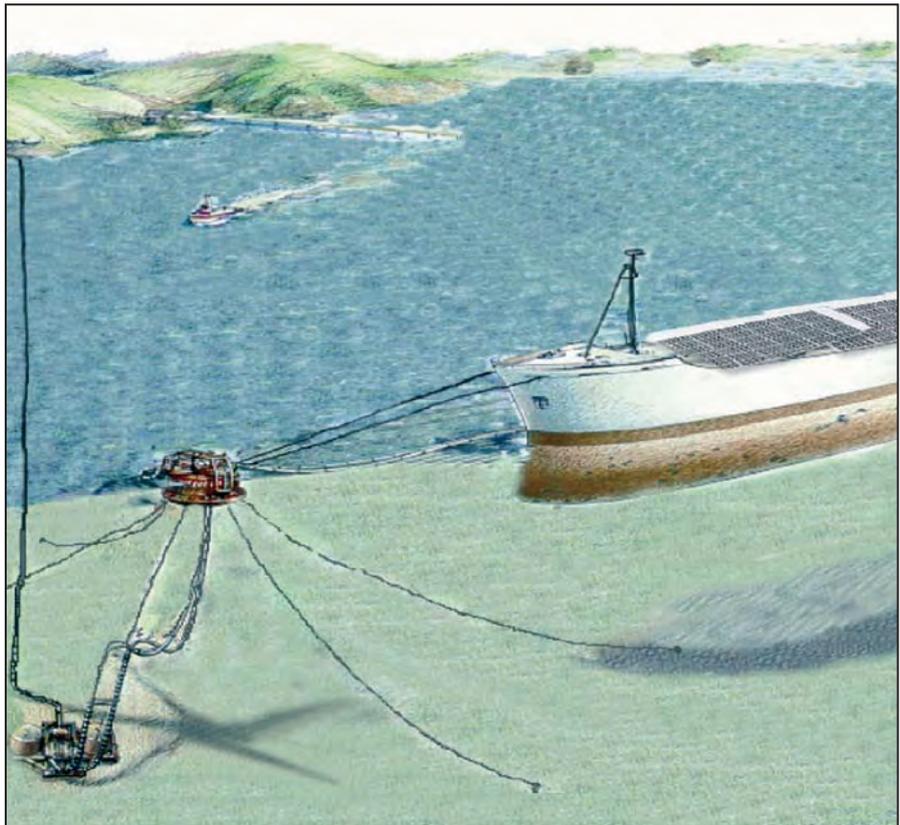
'In other words, it's a way of actually building a pipeline from the west coast to the east coast - without the pipeline.'

In the first instance, Solar Sailor envisages shipments being made by conventional tankers of 330,000dwt, which would be 50% more efficient in terms of energy consumption than is currently the case using desalination plants to generate potable water. It concedes that water treatment facilities would probably be necessary to account for some of the oil residues that might be released from steel in tanks, years after a tanker had stopped carrying oil.

However, the company designs vessels partly powered by sails made of solar panels that generate solar energy and also utilise



Proposal for a partly wind- and solar-powered supertanker to carry potable water from Tasmania to mainland Australia.



The tanker would draw water off risers connected to up to 15km of subsea piping.

wind. Thus, it is proposing newbuilds for the carriage of potable water, of anything from 330,000dwt up to a 550,000dwt double skin supertanker design within four years, with the option to run on coal, supplemented by sails. Predicated on a HFO cost of US\$270/tonne, the sails would reduce fuel consumption over a conventional tanker by 40%-60% by drawing on wind power, with the solar panels saving a further 2%.

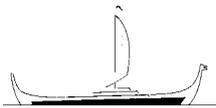
The company's chief executive, Robert Dane, who has held talks with Tasmania's Department of Primary Industries and Water, has flagged using several supertankers to ferry water to centres along the eastern seaboard, including Sydney, Melbourne, and Queensland.

Solar Sailor envisages two single point moorings (SPMs) able to dock up to eight ships, drawing between 40gigalitres and

200gigalitres of water from risers connected to 15km of subsea piping off Tasmania, themselves connected to 2.5km of twin land pipes. At the other end of the trade, suggested at Sydney and Wyong, would be similar SPMs and subsea piping. Surge ponds at the collection and delivery sites would have capacity for 1.5 x the ship's loading capacity.

Loading and discharge times are estimated to be in the range of 20,000m<sup>3</sup>/hr-50,000m<sup>3</sup>/hr, with the cycle time of the envisaged 885km voyage set at three days.

Should the plans come to fruition, Aquatankers will lead engineering, including all necessary economic and social impact studies, risk assessment, and reliability analysis. It will also procure, install, and commission the complete system and operate the vessels and port facilities. 



# KNUD E. HANSEN A/S

Naval Architects · Designers · marine engineers  
Since 1937

*Knud E. Hansen A/S has provided naval architectural, engineering and design services to the maritime industry world-wide since 1937. Knud E. Hansen A/S is a project-orientated company with a lean organisational structure which is dynamic and constantly developing, in order to serve our clients from our offices in Copenhagen and London and on-location around the world.*

## Naval Architects

Copenhagen, London, Northern Germany

**We are** looking for highly motivated individuals with 3+ years of experience in ship design to join our established offices in Copenhagen and London and our upcoming office in Northern Germany.

**You will** be joining a team of approximately 30 naval architects and marine engineers who are involved in all aspects of ship design from concept development to basic design and beyond; as well as providing consultancy and project management services. We are involved in a broad range of vessel types, predominantly for the commercial markets. For information about present and past projects please visit [www.knudehansen.com](http://www.knudehansen.com).

**You will** have strong experience with team work while also having the ability to drive stand alone projects. Experience with AutoCAD (or similar CAD software), Classification Society software and/or NAPA will be a distinct advantage.

**We offer** a competitive salary package, exciting and challenging tasks in an international and dynamic environment and the opportunity for personal and professional development in a friendly and informal work atmosphere.

### For further information about the position(s), please contact:

Mr. Finn Wollesen, Copenhagen & Northern Germany, Phone +45 3283 1391  
Mr. Christian Bursche, London, Phone +44 (0)207 953 1129

Please submit your written application and CV to: [keh@knudehansen.com](mailto:keh@knudehansen.com)

Islands Brygge 41-43  
DK-2300 Copenhagen S  
Denmark

1 Goodman's Yard  
London E1 8AT  
United Kingdom



"Where will our knowledge take you?"

BMT Defence Services is a wholly owned subsidiary of the BMT Group, a leading engineering, science and technology consultancy. The Company is internationally recognised for its independence and professionalism in naval architecture, marine engineering, systems engineering and software development for ministries of defence and other clients in the defence sector. We believe in our mission, "where truly outstanding people design and deliver engineering success."

## NAVAL ARCHITECTS AND SENIOR/PRINCIPAL NAVAL ARCHITECTS

We are looking for Naval Architects, Senior and Principal Naval Architects with special emphasis on those having warship, submarine or structural design expertise. You will join our Naval Architecture Team of 'adventurous thinkers and responsible, responsive doers' working on a range of varied and challenging work that will develop your skills and experience. The Team is currently working on a range of projects including the design of the Royal Navy's new aircraft carriers, the support of the UK's in-service submarines, the concept design and development of vessels for overseas clients, ship modernisation and advice on the safety of vessels at all stages of their lives. Our state of the art tools, our involvement throughout the life of a vessel and our internal research programme provide BMT's Naval Architects with an environment where we constantly challenge ourselves, our colleagues, our partners and our competitors.

For graduates, you will have a good degree in either Naval Architecture or a marine engineering related subject. Assistance in attaining Chartered Engineer status is provided through our accredited training scheme.

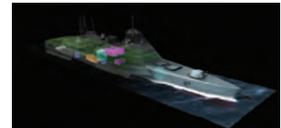
Applicants for the Senior and Principal roles should have either structural expertise in linear/non linear analysis or have ship or submarine design experience in concept and detailed design. Chartered status is preferred although not essential as support will be provided to enable professional development.

**Benefits include competitive salaries, substantial bonuses paid twice per year, final salary pension scheme, subsidised gym membership and private medical insurance after 2 years.**

**Call 01225 473601 for an application form or further information, or visit [www.bmtdsl.co.uk](http://www.bmtdsl.co.uk). Please return applications to Lee Hayes at BMT Defence Services Ltd, 210 Lower Bristol Road, Bath BA2 3DQ. Or via email at: [lhayes@bmtdsl.co.uk](mailto:lhayes@bmtdsl.co.uk).**

**NO AGENCIES PLEASE**

(C) Thales UK 2005. Image Credits: Defencemaging.com; Mark Lewis, Criterion



INVESTOR IN PEOPLE



Anglo Eastern Group is an internationally established provider of maritime services to third parties. We currently provide technical management to over 200 ships of various types employing over 500 staff onshore. Our head office is in Hong Kong with key offices located worldwide. We are proud of our linear management style, where individual ideas are valued while teamwork remains a fundamental attribute.

We are currently seeking a suitable candidate (M/F) to fill in the following position:

**PROJECT ENGINEER – (Hong Kong)**

**CHALLENGE**

Within the Group is the Technical Services division looking after design, new construction and conversion projects. Due to client-driven expectations, our ambition is to expand into engineering services in the oil and gas sector. The candidate will have a leading role in overseeing this new business venture, influencing its development and ensuring a successful outcome. In return, a promising career path will be attainable for the right candidate with the right attitude.

**CANDIDATE**

The role calls for a qualified and innovative Naval Architect or Offshore Engineer or Structural Engineer with experience in project planning, rig transport, motion and mooring analysis, FPSO conversions, production system conceptualization and structural design. Strong knowledge in engineering calculations, either by first principles or by FEA, is necessary. Your ability to manage and execute projects while monitoring cost and schedule controls will be expected. Given the importance of the role, you shall have a credible and presentable personality where client-focused relationship is just as important as your technical confidence.

**JOB DESCRIPTION**

You will report to the Technical Director and your main accountabilities are:

- project management and execution
- preparing bidding documentation and budgets
- on site supervision
- perform engineering calculations and design studies
- reporting and liaising with clients, Class, contractors, etc
- managing and coordinating subcontractors, vendors, etc
- provide CAD draughting support
- formulate and develop quality procedures
- assist the Technical Director in business development

We offer competitive remuneration package to the right candidate. If you are interested, please fax your CVs to +852-2863-6499 or e-mail to aehr.hkg@angloeasterngroup.com

Anglo Eastern Group is an equal opportunities employer - minorities and physically-challenged are encouraged to apply. Personal data collected will be treated in strictest confidence and handled confidentially by authorized personnel for recruitment.

# Careers in the Marine Industry

**Naval Architects**

Cumbria to £42k + benefits

A world-renowned defence company requires Senior and Principal Naval Architects to be responsible for the hydrostatic and stability requirements of its current and future projects. Successful candidates will be degree qualified in Naval Architecture or equivalent and have experience working on Hydrostatics and Stability Control.

**Senior / Principal Naval Architect** South West to £45k + benefits

Our client is established in the build and delivery of world class mega yachts together with commercial and naval vessels. Candidates will be degree qualified with proven experience of ship design calculations for a range of vessels.

**Structural Engineer**

Hampshire to £28k + benefits

Required for a major UK Shipbuilding company. The successful candidate will carry out associated tasks with the concept, design, test and production support of structural aspects of the company's ships and related products. Candidates will be degree qualified in a relevant discipline.

**Naval Architect**

London £45 - £50 p/h Ltd

Our client requires a Naval Architect, based in their London office, to carry out motion analysis, stability calculations and analysis of offshore installation and marine operations for an offshore LNG project in Australia. The ideal candidate will be degree qualified in Naval Architecture and hold (or be eligible for) Chartered status. Proven experience in the Offshore industry is essential.

specialist recruitment to the offshore & marine industry

e: marine@matchtech.com  
w: www.matchtech.com  
t: 01489 898160



1450 Parkway, Solent Business Park, Fareham, Hants PO15 7AF



LOC Limited

Ibex House, 42-47 Minories  
London, EC3N 1DY  
www.loc-group.com

LOC is a leading firm of marine & engineering consultants in the shipping & energy industries with offices in the UK, Americas, Norway, Australia, Middle East, SE Asia and China.

We seek degree qualified, experienced, naval architects primarily for our London office, although opportunities exist across the Group. The role involves undertaking assignments in all areas of our business, particularly shipping incident investigations, marine casualty and legal work in an expert capacity. An ability to assist in complex analysis work would be an advantage. The ideal candidates will have or will be:

- Chartered status and a degree in naval architecture
- Relevant experience of marine and offshore investigations
- Strong oral and written communication skills
- Self motivated, organised and willing to travel overseas on assignments

We also seek recent graduates to work in our London office. The ideal candidate will be enthusiastic and keen to progress within the Group and hold a naval architecture degree enabling them to gain Chartered status.

A competitive salary and benefits will be offered to the successful candidates.

Applicants should apply by e-mail with a CV and covering letter to the Group Engineering Director, LOC Limited: recruitment@loc-group.com



Gearbulk Holding Limited, Bermuda, ("Gearbulk") is an international shipping company with a fleet of over 70 specialised vessels operating globally and a network of world wide offices. Gearbulk (UK) Ltd., with over 130 staff, is the UK agent for Gearbulk and responsible for providing commercial, operational and financial management services.

Gearbulk is involved in the transportation of breakbulk and conventional bulk cargoes, using both its own open hatch type vessels and chartered vessels. In addition, Gearbulk is involved in various terminal operations. As part of an extensive newbuilding programme, Gearbulk currently has a number of vessels on order.

## PROJECT MANAGER - TECHNICAL

Based: Weybridge, Surrey, UK

Gearbulk (UK) Ltd. is seeking a qualified candidate for a newly established position as Project Manager - Technical. The position will be assigned responsibility to coordinate and manage the technical/operational aspects of the company's newbuilding programme. In addition the candidate will lead projects on the technical side and also undertake independent project work as part of a team. The candidate will work closely with our selected partners within marine engineering and ship management and periodically undertake extensive overseas travel.

The successful candidate is likely to have a BSc/MSc degree within Naval Architecture/Marine Engineering and is likely to have a minimum of 5 years' relevant experience. International experience from newbuilding projects is an advantage but not essential. The successful candidate will be self motivated and ambitious. You must be able to demonstrate good communication skills, a creative mind set, a structured yet flexible approach and have written and oral fluency in English. Eligibility to work in the EU is essential.

In return, Gearbulk (UK) Ltd. offers excellent working conditions, a competitive salary and a comprehensive range of benefits based on local terms.

*If you would like further details about this position please contact  
Petter Hatlem, Senior Vice President, Projects & Business Development,  
telephone +44 (0) 1932 838500.*

To apply please send full personal and career details, including details of current remuneration, to

*Julie Gladman, HR Administration Officer, HR Department, Gearbulk (UK) Ltd.,  
5 The Heights, Weybridge, Surrey KT13 0NY.*

Alternatively, applications may be submitted by fax to +44 (0) 1932 838508, or by e-mail to [julie.gladman@gearbulk.com](mailto:julie.gladman@gearbulk.com). Further information about Gearbulk can be found on our website [www.gearbulk.com](http://www.gearbulk.com). We would request that applications are submitted as early as possible.

Gearbulk (UK) Ltd. Operates an Equal Opportunities Policy.

## Marintec China 2007 Shanghai

The Royal Institution of Naval Architects will be exhibiting in the British Pavilion:

Stand number 3A01-11

We look forward to welcoming you to our stand, November 26th - 30th.

*See you there!*

## Naval Architectural Recruitment

**Up to £60k + Benefits**

### Naval Architect

Faststream are working with several consultancies who wish to expand their ranks of specialists, in South England based offices. Their desire is to catch the attention of Naval Architects, who wish to expand their career in a company who specifically aim to develop their workers.

We have a range of roles, and our clients encourage a diverse background. Positions from grad to principle are available whilst engineers with a strong structures or stability background are highly desired.

**South/South West**

**Excellent Salary + Ex pat Package**

### New Build Surveyors / Project Managers

Korea has some of the most advanced shipyards in the world and is the largest shipbuilding nation today!

Due to rapid business growth and an extremely demanding market place, we are looking for highly competent and experienced individuals to work in Korea.

We are seeking engineers with a shipyard environment background, with proven experience working with new build projects or classification. You should have a degree or equivalent.

**Korea**

# The Royal Institution of Naval Architects

## Marine Heavy Transport & Lift II

27-28 February 2008, RINA HQ, London

### First Announcement & Call for Papers



The marine heavy transport and lift sector is enjoying a buoyant and growing market due to the recent boom in offshore oil & gas and large project cargo work. Current oil & gas prices have led to an increase in the number of offshore projects requiring transportation, installation or removal of a wide range of structures and modules. The project cargo transport market has been growing by 8-10% per year, particularly power generation and refineries work in US, South America, Africa, India, Pakistan and China.



As the structures and cargo become bigger and heavier and destinations seemingly more difficult to access the market is looking for more and better equipped vessels. There are also increasing safety and greater environmental concerns for all aspects of marine operations. Currently, there are about 450 heavy lift ships worldwide but of these about 40% are older than 25 years. The new generation of heavy lift vessels designs are responding to the demand for higher lifting capacity and larger outreach. There are also an increasing number of new design concepts aimed at servicing this increasing demand in the marine heavy transport and lift industry.



This conference aims to bring together naval architects, operators, project engineers, warranty surveyors and designers to examine the various design and operational issues associated with this industry. Papers are invited on all related topics including the following.

- Current design and operational experience
- Float over and float off: offshore discharge
- Station keeping
- Propulsion system redundant
- Ballast control, stability and stress monitoring
- Weather routing
- Design criteria for short trip scenarios
- Extreme cribbing loads
- Risk management

- I would like to offer a paper and attach a synopsis of no more than 250 words by 19 October 2007
- I wish to receive details on exhibition space and sponsorship opportunities
- I would like to receive a full programme brochure and registration form

Name:	Position:
Company:	
Address:	
	Postcode:
Telephone:	Fax:
Email:	(HL2008)

Please return to: Conference Department, RINA, 10 Upper Belgrave Street, London SW1X 8BQ  
by fax on +44 (0)20 7259 5912 or by email: [conference@rina.org.uk](mailto:conference@rina.org.uk)

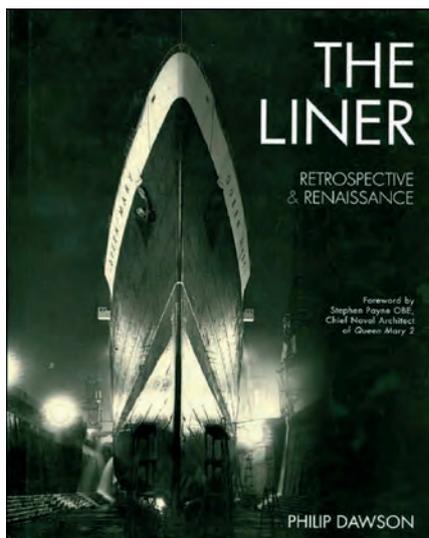
## The Liner - Retrospective & Renaissance

By Philip Dawson, published by Conway as a paperback, 2007, 256 pp. ISBN-10:1844860493; ISBN-13: 9781844860494, £14.99.

THE book was first published by Conway as a hardback version in 2005. There is a forward by Stephen Payne, chief naval architect of *Queen Mary 2* and the current president of The Royal Institution of Naval Architects. An eight page appendix sets out the overall specifications and brief service records of the major ships discussed in the book. A second appendix presents a 'Timeline' of noteworthy events.

The book traces the development of the liner from the 19th Century up to the present day, linking it with changes in society generally and noting the impact of two World Wars and of the economic changes taking place over the same period. By modern standards, conditions onboard the early ships were primitive. Travelling in *Britannia* in 1842, Dickens and his wife occupied a cabin which Dickens described as 'this utterly impractical, thoroughly hopeless, and profoundly preposterous box'. At that time Cunard regarded passengers as second priority to the carrying the Royal mails. Breakfast was at 6am and, because passage times were long, live animals were carried to provide fresh meat owing to the lack of any refrigeration. Before electric lights were available, public spaces were lit by oil lamps and cabins had candles: there was no running water and smells and seasickness must have made travelling unpleasant and boring.

Of course, life ashore for most people in those days was also very bad. Life onboard was governed by strict rules for both crew and passengers, including rules for disposing of slops from wash bowls and chamber pots; bed linen was changed every eight days. On long journeys to India, the lack of laundry facilities onboard led to first class passengers having a luggage allowance of four hundredweight so that they could carry all they needed. The trunk sizes



were dictated by the fact that they had to be carried overland by camel between Cairo and Suez. The book paints a vivid picture of life onboard and this makes for fascinating reading.

Rapid changes occurred during the Victorian era. First there were iron and then steel ships; paddle wheels gave way to propellers; subdivision improved; conditions onboard improved in line with those ashore. By the end of the 19th Century, travel by ship had become more pleasant and could be enjoyed for its own sake. The book notes that Second- or Cabin-Class accommodation of any given ship were generally as good as the First-Class facilities had been on its predecessor of a generation earlier.

Naturally, the book covers the rivalry between companies and countries for the Blue Riband. When RMS *Queen Mary* became the Blue Riband holder in the '30s, Cunard declined the Hales Trophy, as it

was the company's policy not to race its ships but merely go about their business in the usual way. It also covers the ill-fated *Titanic*, although it points out that there had been little special publicity about the debut of the new White Star Line ship, as it was but the follow-on ship to *Olympic*. The fact that a number of wealthy high-society personalities sailed on her was probably only because her sailing date suited their schedules.

The book covers the design developments such as the introduction of diesels; the use of liners for cruising during the winter months; how different aims/philosophies can lead to significantly different ships which may be equally successful. Some of the facts quoted are fascinating. *Normandie* had a total electrical generating capacity greater than that needed to run the entire Paris Metro system of the day; *Aquitania* steamed over 3 million miles, and carried over 1 million passengers during her career. The genesis and life of *Queen Elizabeth 2* is covered with its many design changes over its life, as well as its service in the Falklands War.

The last chapter I found particularly interesting. It sets out the design rationale for *Queen Mary 2*, explaining how the final design was reached, including the influence of earlier ship designs and the changing needs and expectations of passengers. It outlines the differences inherent in designs for liners and for cruiseships, which have done so much to popularise sea travel, and liners. Many of these differences are of direct interest to the naval architect, including safety, strength, and stability.

Overall, the book provides a fascinating read. It is very well illustrated with many photographs and deck plans. It will be of interest to all naval architects and to those who have ever travelled by sea. I can do no better than quote from the Foreword by Stephen Payne where he says that the author '...has carefully researched and studied the liner form, mystique, and contribution to the movement of mankind across the seas of the world. Step aboard this voyage of discovery and celebration. It is all here.'

E C Tupper

## DIARY

**September 18-20, 2007: Computer Applications in Shipbuilding, international conference**, Portsmouth, UK. Contact: Conference Department, RINA, 10 Upper Belgrave Street, London SW1X 8BQ, UK. Tel: +44 20 7235 4622. Fax: +44 20 7259 5912. E-mail: conference@rina.org.uk

**September 24-25, 2007: Offshore Supply Vessels 2007, international conference**, Singapore. Contact: Conference Department, RINA, 10 Upper Belgrave Street, London SW1X 8BQ, UK. Tel: +44 20 7235 4622. Fax: +44 20 7259 5912. E-mail: conference@rina.org.uk

**September 24-27, 2007: NEVA 2007, international exhibition and conference**, St Petersburg, Russia. Contact: Dolphin Exhibitions, P O Box 68, Ipswich IP7 7ZY, UK. Tel: +44 1449 741801. Fax: +44 1449 741628. E-mail: info@dolphin-exhibitions.co.uk

**September 26-27, 2007: 3rd Fast Ferry Information Conference, international conference**, London, UK. Contact: Fast Ferry Information Ltd, 14 Marston Gate, Winchester SO23 7DS, UK. Tel: +44 1962 869842. Fax: +44 1962 843863. www.fastferryinfo.com

**September 28-30, 2007: Interferry 2007, international conference**, Stockholm, Sweden. Contact: Len Roueche, CEO, Interferry, 1619 Warren Gardens, Victoria, British Columbia, Canada V8S 1S9. Tel: +1 250 592 9612. Fax: +1 250 592 9613. E-mail: len.roueche@interferry.com

**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

**October 3-5, 2007: Fundamentals of Contract and Change Management for Ship Construction, Repair, and Design, course**, London, UK. Contact: Conference Department, RINA, 10 Upper Belgrave Street, London SW1X 8BQ, UK. Tel: +44 20 7235 4622. Fax: +44 20 7245 6959. E-mail: conference@rina.org.uk

**October 10, 2007: Performance Standard for Ballast Tank Coatings, seminar**, London, UK. Contact: Conference Department, RINA, 10 Upper Belgrave Street, London SW1X 8BQ, UK. Tel: +44 20 7235 4622. Fax: +44 20 7245 6959. E-mail: conference@rina.org.uk

**October 11-12, 2007: Modern Yacht, international conference**, Southampton, UK. Contact: Conference Department, RINA, 10 Upper Belgrave Street, London SW1X 8BQ, UK. Tel: +44 20 7235 4622. Fax: +44 20 7245 6959. E-mail: conference@rina.org.uk

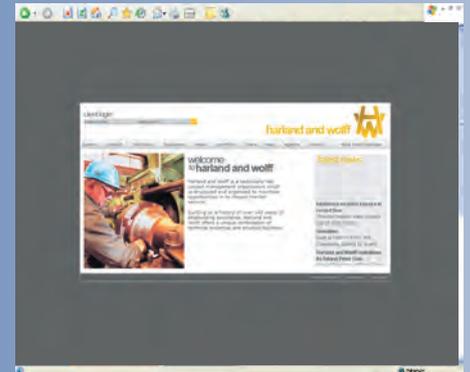
# marine web directory



[www.veth-motoren.com](http://www.veth-motoren.com)



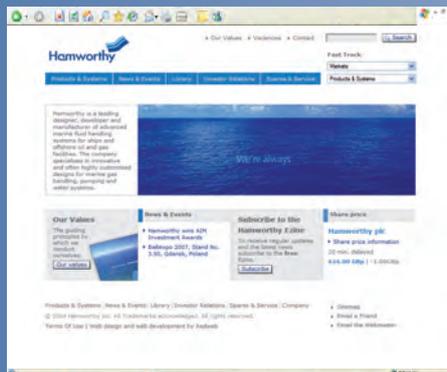
[www.icepronav.ro](http://www.icepronav.ro)



[www.harland-wofff.com](http://www.harland-wofff.com)



[www.bctq.com](http://www.bctq.com)



[www.hamworthy.com](http://www.hamworthy.com)



[www.bmt.org](http://www.bmt.org)



[www.jaure.com](http://www.jaure.com)



[www.b-hepworth.com](http://www.b-hepworth.com)



[www.lass.nu](http://www.lass.nu)

[www.rina.org.uk/tna](http://www.rina.org.uk/tna)

# marine web directory



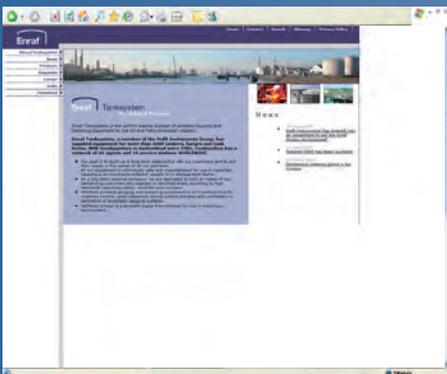
[www.napa.fi](http://www.napa.fi)



[www.akerarctic.fi](http://www.akerarctic.fi)



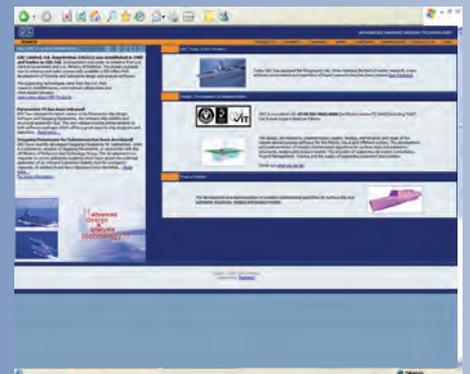
[www.bakkersliedrecht.com](http://www.bakkersliedrecht.com)



[www.enraftanksystem.com](http://www.enraftanksystem.com)



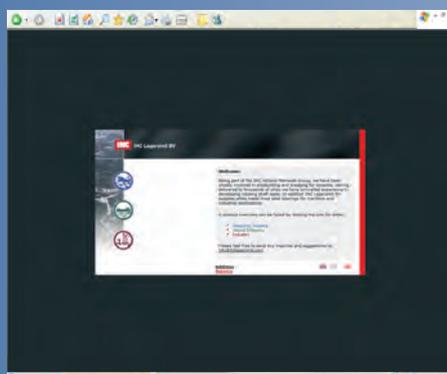
[www.bv-industrie.com](http://www.bv-industrie.com)



[www.grc-ltd.co.uk](http://www.grc-ltd.co.uk)



<http://pbcf.motech.co.jp>



[www.ihclagersmit.com](http://www.ihclagersmit.com)



[www.giroeng.com](http://www.giroeng.com)

[www.rina.org.uk/tna](http://www.rina.org.uk/tna)

# professional directory

## BAE SYSTEMS

## DESIGN SERVICES

### Whole Lifecycle Marine Consultancy

- Naval Architecture
- Marine Engineering
- Ship Design
- Human Factors
- Safety Management
- Requirements Engineering
- Litigation & Expert Witness
- Acoustic, IR & RCS Signatures
- Engineering Dynamics & Simulation
- Supportability Engineering

### Customer Solutions & Support

South Street, Scotstoun  
Glasgow, G14 0XN  
United Kingdom

Telephone +44 (0) 141 957 2453  
Fax +44 (0) 141 957 2328  
Email keith.figg@baesystems.com

### Ship design software, loading software, Engineering support PIAS:

Intact and damage stability, automated probabilistic damage stability (generation of damages, optimisation of damage boundaries, etc.), stability for open hopper vessels (DR67), grain stability, speed and power predictions, propellor calculations, manoeuvring calculations, etc.

### FAIRWAY

Hull design and fairing, plate expansions, hull transformation, solid modeling and boolean operations, conversions of hull data, etc.

### LOCOPIAS

Software for on-board stability and strength calculations including damage stability, torsion, interfacing with tank gauge systems, multiple loading options, etc.

SARC BV  
Brinklaan 109-1  
1404 GA Bussum  
The Netherlands



www.sarc.nl  
sarc@sarc.nl  
t:+31 35 6915024  
f:+31 35 6918303

## ShipmoPC

### Seakeeping Predictions Software

Advanced ship motion analysis,  
comprehensive reporting



BMT Fleet Technology Limited  
Tel: 1 613 592-2830 E-mail: fleet@fleetech.com Website: www.fleetech.com



## GHS

### General HydroStatics

Ship Stability and Strength Software



Creative Systems, Inc.

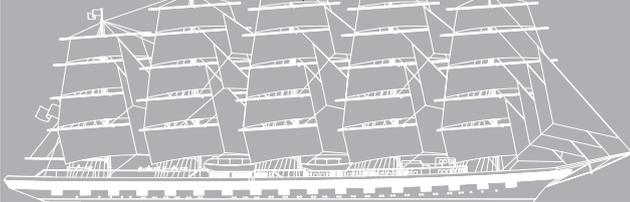
Creators of GHS™

P.O. Box 1910 Port Townsend, WA 98368 USA  
phone: (360) 385-6212 fax: 385-6213  
email: sales@ghsport.com  
www.ghsport.com/ghs

## MCFARLANE - SHIPDESIGN

Ship Design - Naval Architecture - Marine Engineering

Passenger Ships Commercial Yachts



Le Panorama C D - 57 rue Grimaldi - 98000 MONACO  
tel +377 97 70 69 26 - fax +377 97 70 69 27  
robert@mcfarlane-shipdesign.mc www.mcfarlane-shipdesign.mc



## ROBIN A WILLIAMS & Co Ltd

Watson House, 2 Cora Street  
Barry, Vale of Glamorgan  
CF63 4EP, United Kingdom

Tel: (01446) 739127  
Fax: (01446) 732945  
e-mail: robin@rawcoltd.fsnet.co.uk



## KEEL MARINE LTD

MARINE CONSULTANTS, DESIGNERS AND SURVEYORS

Ridgeway Office Park,  
Unit 6-8,  
Bedford Road, Petersfield  
Hants, GU32 3QF, UK

T: (01730) 268889  
F: (01730) 269361  
E: office@keelmarine.com  
www.keelmarine.com

## Malin Marine Consultants Ltd

naval architects & heavy lift specialists



- Heavy Lift and Transportation Specialists
- Naval Architecture
- Structural Analysis
- Motion Response Analysis
- Bespoke Software Solutions
- Marine Procedures
- CAD Services

17 Sandyford Place, Glasgow G3 7NB info@malinmarine.com  
Tel: 0141 243 2242 Fax: 0141 226 5501 www.malinmarine.com

P.O. Box 54  
NL-8064 ZH Zwartsluis  
www.kerstholt-teakdecks.com  
Tel: +31 38-3867677  
Fax: +31 38-3867728

**KERSTHOLT**  
Teakdecksystems B.V.



# professional directory

**COST EFFECTIVE DESIGN & PRODUCTION  
ENGINEERING SERVICES**



**Fred Black, Engineering Manager**

Email: fredb@harland-woff.com

Mobile: 07967589830

Queen's Island, Belfast, BT3 9DU

Tel: +44 (0)28 9045 8456

Fax: +44 (0)28 9045 8515

www.Harland-Wolff.com



**Harland and Wolff  
Heavy Industries Ltd**



**international  
contract engineering**

offices in Douglas (Isle of Man), Oslo (Norway), Glasgow (United Kingdom), Galati (Romania)

PROVIDING ENGINEERING AND DESIGN SERVICES

- Full Design Capabilities (Conceptual, Class & Detail Design, Workshop & Production Information)
- Full Range of Hydrodynamic Tests, R&D and Consulting
- Latest CAD-CAM Solutions
- Project Management & Through Life Support

TO THE MARINE, ENERGY AND SHIPBUILDING INDUSTRIES

International Contract Engineering Limited  
19-21 Circular Road, Douglas, Isle of Man, IM1 1AE British Isles  
Phone +44 (0) 1624 623 100, Fax +44 (0) 1624 628 297  
Registered in the Isle of Man: www.icedesign.com

## WOLFSON UNIT

FOR MARINE TECHNOLOGY & INDUSTRIAL AERODYNAMICS

- Model tests in towing tank and wind tunnel
- Wide range of PC based marine software
- Bureau service and stability booklets
- Trials data acquisition and onboard analysis
- Expert witness on technical issues
- Innovative research to customers world wide
- Full consultancy service at competitive rates

University of Southampton, Southampton, SO17 1BJ, UK

Tel: +44 (0)23 8058 5044

Fax: +44 (0)23 8067 1532

www.soton.ac.uk/~wumtia e-mail: wumtia@soton.ac.uk



**SAFETY AT SEA LTD**  
Naval Architects - Specialist Services

www.safety-at-sea.co.uk

Tel (main) +44 (0)141 572 5570

Fax +44 (0)141 572 5580

E-mail: enquiries@safety-at-sea.co.uk

280 St Vincent Street

Glasgow, G2 5RL

United Kingdom

### The Royal Institution of Naval Architects *The Naval Architect* Chinese-language edition

Twice each year, *The Naval Architect* is translated into Chinese-language, for a further distribution to more than 7000 Shanghai SNAME members and also to 500 members of the Shanghai Association of Shipbuilding Industries. Advertisements in the Chinese-language edition are offered FREE OF CHARGE, including translation, to those advertisers participating in the regular February and September issues.

To reach these key decision-makers, book your advertisement space now by contacting:

Debbi Bonner, dbonner@rina.org.nl

**Tired of bearing problems?  
Then try Vesconite Rudder  
and Stern Tube Bearings**

No swell. Low friction. Long Life.

- ABS, Lloyds, DNV etc. approved

Call for Free Design Manual



Tel: +27 82 853 1434

marine@vesconite.com

www.vesconite.com



## BURNESS CORLETT - THREE QUAYS

THE MARITIME CONSULTANTS

www.bctq.com

Ship Design - Naval Architecture - Marine Engineering - Surveying - Expert Legal & Casualty Investigation Services

### MARINE DESIGN, NAVAL ARCHITECTURE & ENGINEERING SERVICES

London

t: +44 (0)20 7929 2299

f: +44 (0)20 7929 1650

e: enquiries@bctq.com

Southampton

t: +44 (0)23 8033 9449

f: +44 (0)23 8033 9440

e: info@bctq.com

Newcastle

t: +44 (0)191 217 3660

f: +44 (0)191 217 3838

e: service@bctq.com

### EXPERT SERVICES DIVISION

London

t: +44 (0)20 7621 2943

f: +44 (0)20 7929 4167

e: london@bctq.com

Isle of Man

t: +44 (0)1624 815110

f: +44 (0)1624 815113

e: iom@bctq.com

### MARINE SURVEY SERVICES

London

t: +44 (0)20 7621 2953

f: +44 (0)20 7929 1655

e: surveys@bctq.com

# RINA Publications



## A selection from the RINA bookshop

Please note all prices include postage & packaging

### BUSINESS FUNDAMENTALS FOR ENGINEERS

By Professor Chengli Kuo FRINA Ref BF001

This book deals with essential business topics, so often treated in a specialised and lengthy way, as related to practical engineering situations. Eight chapters cover: business and the engineer; fundamental elements of business; markets; management; money; manpower; case examples; and application. This volume provides engineering students and practising engineers with an affective and well-integrated introduction to business.

Member price: UK £26.00 EUR £27.00 OVS £31.00  
Non-Member price: UK £27.00 EUR £28.00 OVS £32.00

### DRYDOCKING & SHIPBOARD MAINTENANCE

A Guide For Industry - First Edition - Ref: DRYD

The need for shipboard maintenance in an age of the principles of International Safety Management (ISM) has never been more important. If the industry is to operate at all it must be within the safety guidelines. Many shipboard tasks fall inside the planned maintenance programmes which can be conducted on a day to day basis but many of the annual tasks required to operate ships tend to accumulate and can only be catered for within a docking scenario. Over 100 Photographs - Numerous diagrams and check lists. Listing of Dry Dock operations, handling facilities, main ship builders and repair yards.

Member price: UK £37.00 EUR £42.00 OVS £46.00  
Non-Member price: UK £40.00 EUR £45.00 OVS £49.00

### EVER THE APPRENTICE

By Kenneth Rawson FRINA Ref: ETA

This book recalls a time and way of life which are beginning to fade from memory. Kenneth Rawson saw major changes in society from a hangover of Victorian attitudes through his war experiences. He provides wonderful snapshots of life lived against a backdrop of historical events. He won a scholarship into the body responsible for the design of all warships for the Royal Navy thereby satisfying an intellectual endeavour and a deep love of the sea and ships. He was recognized in 1996 by the University of Portsmouth with the award of Doctor of Engineering, Honoris Causa.

Member price: UK £15.45 EUR £16.45 OVS £18.95  
Non-member price: UK £17.45 EUR £18.45 OVS £20.95

### SAFETY MANAGEMENT AND ITS MARITIME APPLICATION

By Professor Chengli Kuo FRINA Ref: SMMA

The author introduces this book by asking a seemingly obvious question "What is safety?". To show there is no straightforward answer he illustrates from his experience in conducting a number of safety workshops worldwide. In the foreword to this book Mr E E Mitropoulos Secretary General of the IMO writes: "As Professor Kuo points out early in his book, safety is not an absolute concept and the levels chosen are based on shared values. It is for this reason that this book is so useful because it introduces safety concepts, explains safety terms, and demonstrates how the different techniques can be applied in practice.

Member price: UK £25.75 EUR £28.00 OVS £30.50  
Non-Member price: UK £29.25 EUR £31.50 OVS £34.00

### FIFTY YEARS A SHIPBUILDER

By Patrick G Martin FRINA FImarEST Ref: FYSB

Having pursued the science of mapmaking, his earliest excursion abroad took him to the interior of Newfoundland as explorer and surveyor. Returning to Scotland, he was debarred from his intended entry to the Royal Navy due to colour blindness, but instead devoted the rest of his working life to Naval Architecture and Marine Engineering. After serving his time as apprentice in a Scottish shipyard, he spent 4 years' seafaring as an Engineer in the liners of Alfred Holt & Company of Liverpool mainly on the China Coast. Appointed Assistant Naval Architect with the same company in 1956, he later became Chief Naval Architect at Verolme Cork Dockyard (1960-1984), and finally a design consultant, principally in India, Singapore and Australia. This book tells the story of his fifty years as a shipbuilder.

Member price: UK £19.45 EUR £21.83 OVS £25.80  
Non-Member price: UK £21.45 EUR £23.80 OVS £27.80

### MERCHANT SHIP NAVAL ARCHITECTURE

By Dr DA Taylor FRINA & Dr Alan ST Tang MRINA

Ref: MSNA

This new and up-to-date book defines a ship and its parts, the methods used in calculating the areas and volumes of ships hulls (with worked examples), followed by chapters on Buoyancy, Stability and Trim; Ships and the Sea; Structural Strength; and Resistance, featuring the use of model testing and its relationship to full scale ships. It also features Propellers and Propulsion Manoeuvring and Motion Control; and Vibration, each of which is described from the first principles through to various formulas used in necessary calculations.

Member price: UK £33.50 EUR £34.50 OVS £36.50  
Non-Member price: UK £36.50 EUR £37.50 OVS £39.50

### MULTI-HULL SHIPS

By V. Dubrovsky FRINA, A. Lyakhovitsky Ref: MHS

Catamarans, SWATH, and other multi-hull ships are among the dynamically progressing types of marine vessels both in terms of performance and production growth. This progress has been accompanied by a remarkable growth in the number of technical publications. Although these publications, scattered over many sources, decades, and languages, constitute a great database they cannot fulfill the demand for a comprehensive state-of-the-art reference book. This monograph satisfies such demand. For multi-hull ships it is what "Principles of Naval Architecture" (PNA) is for traditional ships.

Member price: UK £191.00 EUR £191.00 OVS £191.00  
Non-Member price: UK £201.00 EUR £201.00 OVS £201.00

### SEAKEEPING: SHIP BEHAVIOUR IN ROUGH WEATHER

(Second Edition)

By Dr A R J M Lloyd FEng FRINA Ref: SEA01

Comprehensive revised account of waves, ship motions, trials, model testing, probability formulae, roll stabilisation, added resistance, slamming, deck wetness, propeller emergence, human factors, seakeeping criteria, operational effectiveness and the effect of hull form and size on seakeeping. Worked examples and design recommendations

Member price: UK £48.50 EUR £51.00 OVS £59.00  
Non-Member price: UK £50.50 EUR £53.00 OVS £61.00

### SHIP KNOWLEDGE

Third Edition

By K Van Dokkum Ref: SHKN

Ship Knowledge is all about ships and shipping. Topics range from the structure and systems of various types of modern ships, to engineering, maintenance, safety and the laws and regulations governing the shipping industry. The text is richly illustrated with detailed drawings, photographs and cross-sections of many different types of seagoing vessels, all in full colour, making the book extremely attractive and very informative for anyone interested in shipping. After reading this book you will no longer think of a ship as an inanimate object, but as a completely self-supporting entity embodying all the modern technologies found in a small town. An indispensable book for anyone interested in modern shipping.

Member price: UK £50.00 EUR £51.00 OVS £57.00  
Non-Member price: UK £54.00 EUR £54.00 OVS £61.00

### SHIPS WITH OUTRIGGERS

by V. Dubrovsky FRINA Ref: SHWO

This new book is focused specifically on a multi-hull-ship type having one or more small hulls, called outriggers, connected to a much larger main hull of any form. This book is kind of a supplement to MULTI-HULL SHIPS by Dubrovsky & Lyakhovitsky (MHS). Like MHS, the new "Ships with Outriggers" provides detailed technical discussions of arrangements, hydrostatics, propulsion and seakeeping in calm and rough seas, maneuvering, strength, and design of these ships, assuming that the reader is generally familiar with the background or can find it in MHS".

Member price: UK £68.00 EUR £68.00 OVS £68.00  
Non-Member price: UK £71.00 EUR £71.00 OVS £71.00

When purchased with Multi-Hull Ships  
£25 RINA member £23 + p&p for MHS only.

### SHIPS AND SCIENCE

The Birth of Naval Architecture in the Scientific Revolution,

1600-1800, By Larrrie D. Ferreiro MRINA Ref: SSBNA

The first book to portray the birth of naval architecture as an integral part of the Scientific Revolution, examining its development and application across the major shipbuilding nations of Europe. Naval architecture was born in the mountains of Peru, in the mind of a French astronomer named Pierre Bouguer who never built a ship in his life." So writes Larrrie Ferreiro at the beginning of this pioneering work on the science of naval architecture.

Member price: UK £29.35 EUR £38.70 OVS £40.90  
Non Member price: UK £33.65 EUR £42.70 OVS £44.90

### SIGNIFICANT SHIPS OF 2006

By John Lingwood MRINA Ref: SIG06

One of RINA's most popular publications, Significant Ships has been published annually every February since 1990 and presents in one volume approximately 50 of the best commercial designs, completed by shipyards worldwide in the preceding year. Emphasis is placed on newbuildings over 100m in length, although some significant smaller cargo ships, fast ferries and offshore vessels may also be considered. Concise technical information, general arrangement plans and a colour illustration of each ship. Individual copies or a set from 1993-2006 can be purchased.

Members price: UK £40 EUR £40 OVS £40  
Non-Members price: UK £46 EUR £46 OVS £46

### SMALL WATERPLANE AREA SHIPS

By V. Dubrovsky, K. Matveev, S. Sutilo

Ref: SWAS

Small waterplane area (SWA) ships, like other multi-hull ships, are relatively novel in the marine industry. Statistical databases and practical experience for designing these ships are sporadic and spread in scattered publications. The book presents the basic information required for designing the SWA ships encompassing the first principles and a bulk of necessary databases both developed by the authors and available in the public domain, collected under a single cover. This is an extension to the book Multi-Hull Ships providing new and significantly extended knowledge for practical design and demonstrating great potentials for future applications of SWA ships.

Member price: UK £78 EUR £78 OVS £78  
Non Members price: UK £88 EUR £88 OVS £88

## BOOKSHOP ANNOUNCEMENT

Please note you will receive a 10% discount if you order any book from Elsevier through the following link on our website:

<http://www.rina.org.uk> click on publications, then books, then on the Elsevier icon. Please note you do not have to register to receive the eNEWS to receive your discount.

A selection of books available includes: An Introduction To Naval Architecture, Basic Ship Theory, Contemporary Ideas on Ship Stability, Practical Ship Design, Practical Ship Hydrodynamics, Safety and Security at Sea, plus many more.

For a full book list please contact the Publications department on: Tel: +44 (0)20 7235 4622, e-mail: [publications@rina.org.uk](mailto:publications@rina.org.uk) or visit our website at <http://www.rina.org.uk>

## Journals

### THE NAVAL ARCHITECT

Published 10 times a year

- Providing up-to-date technical information on commercial ship design, construction and equipment.
- Regular reports on centres of shipbuilding activity worldwide.
- Comprehensive, technical descriptions of the latest newbuildings.
- News, views, rules & regulations, technology, CAD/CAM, innovations.
- Includes the bi-monthly publication

WARSHIP TECHNOLOGY

2007 SUBSCRIPTION  
UK: £110 Europe: £115 Overseas: £125 Ref: J6

### SHIP & BOAT INTERNATIONAL

Published 6 times a year

- In depth coverage of small craft/small ship design, building & technology.
- Specialist sections include: fast ferries, tugs, salvage & offshore, patrol & paramilitary craft, coastal & inland waterway vessels, pilot boats, propulsion and transmissions.
- Advances in construction materials, electronics, marine equipment.
- Contract news and the latest market developments.

2007 SUBSCRIPTION  
UK: £84 Europe: £89 Overseas: £100 Ref: J7

### SHIPREPAIR

Published Quarterly

- In depth coverage of all aspects of shiprepair and conversion work and comprehensive technical descriptions of major conversion projects.
- Regular regional surveys on the major shiprepair centres.
- Developments in shipboard and shipyard equipment technology.
- Contract news, appointments, industry views, new regulations.

2007 SUBSCRIPTION  
UK: £37 Europe: £42 Overseas: £47 Ref: J8

## Transactions

Prices are inclusive of postage and packaging

### TRANSACTIONS PART A (IJME) PART B (IJSCT) & ANNUAL REPORT

Members Volumes 149 (2007) Price per volume £48 Ref BV07

Non-Members Volumes 149 (2007)

Price per volume £120 Ref BV0149

### INTERNATIONAL JOURNAL OF MARITIME ENGINEERING (IJME)

2007 Members Part Ref: IJME07 Set Ref: ST07 Part A1 Part A2 Part A3 Part A4 Set  
£9 £9 £9 £9 £30

Non-Members Part Ref: IJME07 Set Ref: ST107

Part A1 Part A2 Part A3 Part A4 Set  
£18 £18 £18 £18 £60

### INTERNATIONAL JOURNAL OF SMALL CRAFT TECHNOLOGY (IJSCT)

2007 Members Part Ref: IJSCT07 Set Ref: SS07 Part B1 Part B2 Set  
£9 £9 £18

Non-Members Part Ref: IJSCT07 Set SS107

Part B1 Part B2 Set  
£18 £18 £32

For further information on previous editions please contact the Publications department on: Tel: +44 (0) 20 7235 4622, Email: [publications@rina.org.uk](mailto:publications@rina.org.uk) or Website: <http://www.rina.org.uk>



## ADVERTISERS' INDEX

If you would like to receive further information on the advertisers featured within *The Naval Architect*, please contact Debbi Bonner, Group Sales Director, [dbonner@rina-org.nl](mailto:dbonner@rina-org.nl), quoting the relevant enquiry numbers listed below.

<u>Client</u>	<u>page</u>	<u>enquiry</u>	<u>Client</u>	<u>page</u>	<u>enquiry</u>
ABB Industry Oy	27	H01	Knud E. Hansen AS	185	-
ABB Turbo Systems Ltd	1	H02	Kwant Controls BV	48	H81
ABS	6/7	H03	Lloyd's Register	OBC	H82
AMOT	15	H04	London Offshore Consultants Ltd	186	-
Aco Marine S.R.O	62	H05	MARIN	170	H83
Air Products AS	79	H06	MTU Friedrichshafen GmbH	101	H84
Aker Arctic Technology Inc.	92	H07	MacGregor Group	12/13	H85
Altro Ltd	167	H08	Macor Marine	71	H86
Anglo-Eastern (UK) Ltd	186	-	MAN B&W Diesel AS	23	H87
Ariston Norway AS	58	H09	Mar-In Controls BV	147	H88
Astillero Barreras	104	H10	Marine Engineering Services	126	H89
Aveva	2	H11	Matchtech Group Plc	-	-
Azcue Pumps	53	H12	Merrem & La Porte BV	37	H90
BMT Defence Services	185	-	Miros AS	150	H91
Bakker Slidrecht	58	H14	Mitsui O.S.K Techno Trade Ltd	63	H92
Baltic Design Centre Ltd	94	H15	Muestral S.L.	60	H93
Becker Marine Systems	75	H16	Munters Europe AB	131	H94
Blohm & Voss Industries	79	H17	NASDIS GmbH	50	H95
Bolidt	104	H19	Napa Oy	150	H96
Bronswerk Marine Inc.	35	H20	Ned-Deck Marine	58	H97
Brunvoll AS	94	H21	Neuenhauser Kompressorbau GmbH	142	H98
Bureau Veritas	44	H22	Niigata Power Systems Co Ltd	146	H99
CD Adapco	142	H23	Norac AS	40	H100
CJR Propulsion	67	H24	PG Marine Group	47	H101
Cadmatic Oy	138	H25	PPG Industries	115	H102
Centrum Techniki Okretowej SA	95	H26	PSM Instrumentation Ltd	64	H103
Chugoku Paints BV	131	H27	Pemamek Oy	45	H104
Class NK	8	H28	Polski Rejestr Statkow SA	92	H105
Clorius Controls AS	97	H29	Polyflor Limited	135	H106
Converteam	19	H30	RFD Beaufort Ltd	108	H107
Daikin Industries Ltd	66	H31	RINA	128	H108
Dellner Brakes AB	82	H32	RWO GmbH	55	H109
Desmi AS	55	H33	Reintjes GmbH	124	H110
Det Norske Veritas	34	H34	Renk Aktiengesellschaft GmbH	105	H111
Doosan Engine Co Ltd	11	H35	Rivertrace Engineering	79	H112
Dreggen AS	128	H36	Rolls-Royce Marine AS	21	H113
ESAB Holdings Ltd	33	H37	SAM Electronics GmbH	25	H114
Eliche Radice SpA	144	H38	SEC Bremen GmbH	69	H115
Enraf Tanksystem SA	126	H39	SSPA Sweden AB	142	H116
Europort Maritime 2007	154	H40	Safe-Line Marine After Sales Ltd	132	H117
Evac Oy	118	H41	Scandinavian Electric Systems AS	31	H118
FKAB AB	41	H42	Scheuerle GmbH	165	H119
Faststream Recruitment	187	-	Schiffko GmbH	48	H120
Fischcon Trading & Engineering	64	H43	Schottel GmbH & Co	73	H121
Force Technology	113	H44	G. Schwepper GmbH	82	H122
Formation Design Systems	148	H45	Semco Marine AS	25	H123
Friendship Systems	81	H46	Sener Ingenieria Sistemas	140	H124
Gastech 2008	122	H47	ShipConstructor Software Inc.	50	H125
Gearbulk (UK) Ltd	187	-	SigmaKalon Marine	46	H126
Genfer Lloyd Sp. z o.o.	61	H48	Sika Danmark AS	132	H127
Germanischer Lloyd	29	H49	Solar Solve Ltd	25	H128
Giro Engineering Ltd	132	H50	Spurs Marine	87	H129
Graphics Research Corp.	140	H51	Stone Manganese Marine Ltd	57	H130
HRP Thruster Systems	136	H52	Sunflame Co Ltd	134	H131
Hagglunds Drives AB	144	H53	TTS Marine ASA	55	H132
Hamburg Messe	156	H54	Thordon Bearings Inc	17	H133
CM Hammar AB	103	H55	Tracto Technik	82	H134
Hamworthy Plc	111	H56	UMC International Plc	39	H135
Harland and Wolff Heavy Industries	106	H57	Unifrax Ltd	98	H136
Hatlapa	85	H58	University of Newcastle Upon Tyne	94	H137
Helkama Bica Oy	15	H59	Vacon PLC	52	H138
Hempel AS	43	H60	Veth Motoren BV	85	H139
Henri Systems Holland BV	62	H61	Voith Hydro	69	H140
B. Hepworth & Co Ltd	92	H62	Volvo Penta AB	106	H141
Hydrex NV-Belgium	120	H63	Vosta LMG	113	H142
IHC Lagersmit	164	H64	Vulkan Kupplungs GmbH	86	H143
IMO Publishing Services	IBC	H65	Wartsila Corporation	FC	H144
INMEX 2007	180	H66	Yanmar Co Ltd	65	H145
Indasa	59	H67	Zodiac	146	H146
Indian Register of Shipping	136	H69	ZF Padova SpA	IFC	H147
Industrie Cometto SpA	124	H70			
Inmarsat	117	H71			
Intelligent Engineering (UK)	158	H72			
Interferry 2007	152	H73			
International Paint Ltd	5	H74			
Jotun Paints AS	89/91/93	H75			
KM Europa Metal AG	76/77	H76			
Kamome Propeller Co Ltd	148	H77			
Kanagawa Kiki Kogyo Co Ltd	66	H78			
Kawasaki Precision Machinery Ltd	160	H79			
Kinon Aachen GmbH	96	H80			

IMO - Vega  
D A T A B A S E

# Target your IMO requirements



**IMO Publishing**

**International Maritime Organization**

4 Albert Embankment  
London SE1 7SR  
United Kingdom  
[www.imo.org](http://www.imo.org)

Designed by Flipside [www.flipsideweb.co.uk](http://www.flipsideweb.co.uk)





Leading technology

Future-proof designs

Safety regulations

Passengers

Professional  
competence

Fuel consumption

**Availability matters**

Noise and vibration

Environment

High value

Reputation

Security

**Life** is easier when you keep to a timetable. We help ferry owners and operators get their customers safely to destinations around the world without delay – helped by better control of classification and maintenance schedules. Together, we'll improve your availability **matters**.

LIFE MATTERS

[www.lr.org](http://www.lr.org)

Lloyd's  
Register

Services are provided by members of the Lloyd's Register Group. Lloyd's Register is an exempt charity under the UK Charities Act 1993.