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Spain / Chemical and product tankers / Inland ships / **November 2010**

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29-44 Features

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The Royal Institution of Naval Architects is proud to announce that as of January 2008, *The Naval Architect* journal has gone digital. We are very pleased to inform the maritime industry that each issue will be published online, on the RINA website. Visit www.rina.org.uk/tna and click on the issue cover you wish to view. This means that the entire publication, including all editorials and advertisements in the printed edition, can be seen in digital format and viewed by members, subscribers, and (for a limited time) any other interested individuals worldwide.

The World Superyacht Awards

Young Designer of the Year 2011

A prestigious award for talented young superyacht designers is to be awarded at the Boat International Media 2011 World Superyacht Awards

The Royal Institution of Naval Architects, the Boat International Media and Camper & Nicholsons International invite entries for the 2011 World Superyacht Young Designer Award competition.

Introduced with great success in 2008, the World Superyacht Young Designer Award competition provides a showcase for young designers to demonstrate their ability and talents, and encourages the development of the next generation of superyacht designers.

The World Superyacht Young Designer Award will be presented to the winner of the competition at the World Superyacht Awards ceremony in May 2011, at which the remarkable ingenuity and innovation demanded in the design, engineering and construction of the world's finest luxury yachts is demonstrated, and is the most obvious place for new designer talent to be recognised and celebrated.

The Competition

The competition is open to anyone who is studying for a degree or vocational qualification in a subject relating to yacht or small craft design,or anyone who has already graduated within three years of the closing date for entries, which is 31 January 2011.

The 2008, 2009 and 2010 competition saw many entries from all over the world, as far afield as NZ and China, as well as from all over Europe. RINA's CEO Trevor Blakeley is proud that RINA is continuing to support this award for young designers: 'The superyacht industry is one of the most successful sectors of the maritime industry, and owes much of that success to the work of its designers who provide that unique combination of form and function, which is the modern superyacht.'

The Award

The World Superyacht Young Designer Award will be presented to the young designer who produces the best concept design for a superyacht. The entries will be judged by a group of leading world-class designers selected by the Royal Institution of Naval Architects and Boat International Media. The winner of the Award will receive a prize of €5,000 and will be invited to receive the award at the renowned World Superyacht Awards ceremony.

The sponsor

The Award is organised by the Royal Institution of Naval Architects and Boat International Media, and is sponsored by Camper and Nicholsons International: 'Following the joint Camper & Nicholsons International – Boat International initiative four years ago to reward the work of yacht designers and naval architects, we thought it was only natural to continue to collaborate with the Boat International Media and RINA in order to identify the young designers of the future, 'says Camper & Nicholsons International's CEO Jillian Montgomery. 'Taking an active part in this competition prepares the grounds for the future in many ways. Firstly, by giving up and coming designers exposure and the opportunity to get in touch with potential clients, and secondly by offering our existing and future clients a glimpse of designs that could soon be on the drawing boards, 'explains Laurent Perignon, director of marketing for CNI.

The closing date for entries is 31 Jan 2010. If you are interested in submitting an entry or would like more information, contact Giuseppe Gigantesco, E-mail: ggigantesco@rina.org.uk, Tel: +44 (0)20 7235 4622
The Royal Institution of Naval Architects, 10 Upper Belgrave Street, London, SW1X 8BQ The rules for the competition can be viewed at www.rina.org.uk/wsyaward

Critical mass

A view from the bridge, as Spain's shipyards and the chemical and product tanker building industry enter crucial phases.

Spain's yards are entering a crucial period in their history. With substantial new orders failing to materialise over the past year, yard owners must hope and pray that the coming year sees some sort of recovery.

Exports in this scenario will be crucial and the race to devalue the euro against other currencies will be a critical element to the chances of the Iberian yards to save jobs and attract orders or face what could amount to a substantial restructuring of Spain's shipbuilding industry.

Orders during 2009 fell by more than 82% compared to 2008 in vessel terms and in tonnage terms a decline of a little more than 191,000gt from 220,000gt in 2008 tells its own story. In Galicia four firm orders and two more in the process of being closed, €600 million in new orders that are the first in nearly two years, are evidence for some that the recovery, if not exactly on its way, is about to begin.

However, with not a single new order for any of the Basque yards in 2009 and a total of only 13 new orders for the entire country's privately owned yards, the recovery, if it comes, will need to be substantial for all 23 private yards to be sustained. Astilleros Balenciaga's order from Graig Group secured earlier this year for four emergency response vessels may well be a lifeline linking the yard to a period of growth some time in the future.

Crucially, this is only one yard and for Spain and its yards that once boasted a turnover of €4 billion the road to recovery may prove long and hard and unfortunately some may fail to arrive at the Promised Land.

Although the chemical and product tanker industry is not in any way similar to the ship building industry in Spain the travails of the sector are caused in part by the financial crisis that killed demand for goods and had a knock-on effect on the Spanish yards.

> "Orders during 2009 fell by more than 82% compared to 2008 in vessel terms and in tonnage terms a decline of a little more than 191,000gt from 220,000gt"

The chemical tanker sector has, however, also been blighted by the years of high demand that has led to growth. Demand for ships soared as owners saw the opportunity to make cash on the back of high freight rates in an era where some politicians and many industrialists were claiming year-on-year growth was here to stay.

Encouraged by the bright lights of high demand and comparatively affordable new ships new owners came into a complex and demanding business with ships that were substandard. Here the phrase 'killing off the goose that laid the golden egg' comes to mind. Such was the drive to enter this lucrative tributary to the mainstream shipping that the spot market all but dried up.

Charterers looking to hire ships to transport goods were faced with a flood of calls from brokers trying to place vessels in advantageous positions. An already cut throat business turned terminal as charterers started to return vessels to owners. Demand for new ships tailed off and today few new ships are being ordered in this sector, unless they are the Toyotas from Japan, those 19,900dwt workhorses that are so reliable that they can be placed at any time, according to one industry source.

That source also indicated that it was extremely unlikely that any new vessels would be contracted in the next two years. Unlike the Spanish yards – where there is no element of the cowboy builders engaged in the construction of vessels on the cheap – those ephemeral chemical carrier builders that sprang up on river banks in China, who built vessels to meet an unknown demand and whose quality in shipbuilding was at best questionable, are now gone. In the face of falling demand the yards that had little substance were washed away with the financial tsunami that overcame the global markets. The next wave of yard closures may be far harder to take.

Growth now remains in stasis as the yards are either mothballed or are switching to ship repairs or the offshore business to stave off the wolves at the door. Like the Spanish yards, chemical tanker builders now wait in the hope that they can survive the recession and return to profit in the future. Many in the maritime industry will hope that their prayers will be answered sooner than later. *NA*

European Commission

EC consults on state aid for yards

The European Commission (EC) announced that it has launched a public consultation on the application of the European Unioin (EU) Framework on state aid for shipbuilding, with a view to determining whether to maintain it unchanged, revise it or repeal it, the EC said early last month.

The current Framework came into effect at the beginning of 2004 and was prolonged in 2006 and 2008, but it is due to expire by the end of 2011. The Framework contains provisions that are unique to the shipbuilding industry, including the use of aid for innovation, provisions that allow the closure of non-viable yards and specific rules on aid for shipyards located in less developed regions.

"Shipbuilding is one of the few sectors that are still subject to a specific state aid regime, derogating from the horizontal rules applicable to other sectors," said EC vice president in charge of competition policy Joaquín Almunia. He added: "The Commission will carry out an open-minded assessment to measure the impact the Shipbuilding Framework has had so far. This will allow the Commission to determine whether it is justified to maintain specific rules in order to safeguard competition and continue to foster innovation in the sector".

The shipbuilding framework provides the rules for the Commission to assess whether sate support to shipbuilding is compatible with the European internal market.

The general principle of the current Framework is that state support for shipbuilding may be granted under the common EU state aid rules, except where the specific provisions of the Shipbuilding Framework apply. These specific provisions were designed to reflect certain features of the shipbuilding market, in particular that of a global market suffering from cyclical overcapacity. The Framework also contains specific provisions on aid for innovation, regional aid, closure, export credits, development and employment aid.

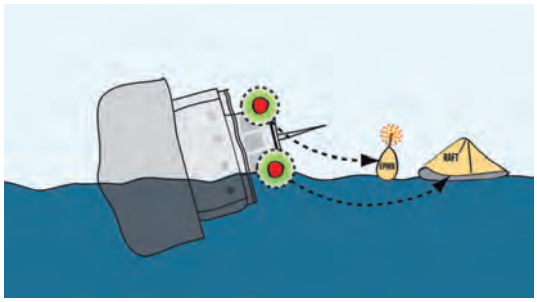
Given that shipbuilding is also eligible for aid under the common state aid rules, the present consultation should in particular help determine, whether the sector is still in need of specific provisions or whether its state aid regime could be aligned to the rules applicable to other sectors.

The public consultation is available at:
http://ec.europa.eu/competition/consultations/2010_shipbuilding_framework/index.html

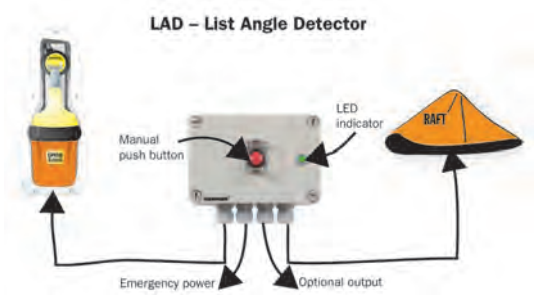
Lifesaving

LAD's a lifesaver

Swedish maritime safety company CM Hammar has found a solution to the well known safety problem, namely that lifesaving equipment becomes entangled or trapped as a ship capsizes. With its List Angle Detector (LAD), liferafts and emergency position-indicating radio beacons (EPIRBS) can be released and float freely as a capsizing ship starts to list.



Today's problem is that liferafts, epirbs or other safety equipment can be trapped under capsized vessels or fail to surface.



With the new List Angle technology from Hammar lives can be saved as epirbs and liferafts are released at a specified degree of list when a vessel capsizes.

LAD allows the automatic release, at a specified degree of list, of lifesaving equipment. The released units surface before the ship capsizes, significantly reducing the risk for it to be trapped or entangled on deck-equipment and structures.

The LAD consists of a control box with two activating outputs for Hammar H20 ERU´s. The control box has an integrated inclination sensor designed to release the ERU´s automatically in case the vessel capsizes. The preset activation angle can be adjusted to suit different ships and vessels. There is also a pushbutton used for controlled manual activation.

Output number two is activated automatically two seconds after output number one has been activated. The system has an integrated battery back-up and is built for the tough marine environment.

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Vietnam

Vinashin repays French debt

Vietnam's deputy transport minister Nguyen Hong Truong announced that Vinashin shipyard has repaid its US$25 million debt to France's Natixis SA bank.

Using US$3 million in bond proceeds the final tranche was repaid last month, but the yard still has a reported debt of some US$4.5 billion and is committed to selling 35 ships, for a total of US$160 million before the end of this year. Government funds of around US$130 million have ensured the shipbuilder would be able to complete its orders this year.

Even with the total US$290 million income Vinashin is expected to make further losses over the next two years, not returning to profit until 2013-2014 said government sources.

Class

LR keeps oil and water apart

The sudden, if not unexpected proliferation of new ballast water treatment systems (BWTS) on offer could be confusing to owners looking for a suitable system to comply with new regulations.

In an effort to help owners through the BWTS maze Lloyd's Register (LR) is providing analysis on the procurement, installation and operation of new BWTS's entering the market and has issued guidance notes to help owners and operators who are preparing to install ballast-water treatment systems on their ships.

The new guidance complements LR's Ballast Water Treatment Technology Guide and reflects the current status of regulations proposed by the International Maritime Organization (IMO) and provides owners with recommendations that will help them to prepare their ships.

"With the ballast-water convention awaiting ratification, shipowners and managers are working hard to determine the consequences for their ships – including the associated costs – and whether the skills of their crew will need to be upgraded to effectively and safely operate any new equipment and technology," said Dr Anne Marie Warris, Environmental Advisor to the Lloyd's Register Group.

In addition LR is offering tanker owners and operators a plan and checklist to promote safer ship-to-ship oil transfers at sea. This support is offered as MARPOL's deadline for compliance with new regulations draws near. The STS regulation, MARPOL ANNEX I will be enforced from 1 January 2011.

Ship-to-ship (STS) oil-cargo transfers are a common feature of the tanker trades, making the prevention of spills and the safety of those involved a long-term industry a priority.

LR supports its new guidance, which was developed following consultation with the industry, with a streamlined plan-approval process to help tanker operators prepare for the regime as quickly as necessary.

The plan and checklist, which are expected to serve as an enhanced safety template for the industry, were developed with the needs of operators in mind, said Mark Darley, Marine Client Manager for LR, adding that LR expects to work with operators to provide STS manuals and approve customised plans.

Full details of the regulatory requirements and further information links can be found at www.lr.org/tankers.

Ferry Design

Finn's on a parametric roll

Finnish engine manufacturer Wärtsilä and marine design consultants Deltamarin have collaborated on an innovative series of ferry designs.

The companies said that by working in partnership they have identified the need for a rational approach to ferry design, and to the entire newbuilding process. They added that ferries are a niche market and represent less than 1% of the world's shipping fleet.

Most ferries have a unique design that is produced according to the special characteristics of each route, highly diverse passenger and freight requirements, and the owner's own business model. This diversity results in very high prototype costs for each vessel, to the extent that ferries may be hard to trade and finance. Standardisation has seldom been the answer and has most often led to vessels designs that are not ideal and that are blighted by low profitability.

In future ferries will have to operate using less fuel and creating lower emission levels which can be achieved through design improvements, optimising machinery and systems, and by implementing the latest innovations in propulsion technology. These innovations are costly and must be standardised wherever possible.

The break-through achieved by Wärtsilä and Deltamarin is the development of the Parametric Design Method (PDM). Using the PDM designers can make a clear distinction between the marketable and non-marketable features of a vessel. This includes the size and architecture of the passenger accommodation and recreation areas which can be tailored to each customer's particular needs while the construction

An artist's impression of a series of ferries designed using the parametric Design Method.

of the ship - the engine room layout, piping and ventilation, power, navigation and automation systems can all be designed using a more industrial method. Through PDM these key systems within the ship can be standardised and used in subsequent ships without them becoming duplicates.

Cost savings through the use of the PDM approach will be considerable, both in the initial investment as well as in operational costs. The industrial engineering of ship systems and the serial effect created from pre-designed modules are estimated to result in cost savings of approximately 15%. The fuel economy of these ferries, compared with ferries built 10-15 years ago, will also improve by 15%, not least as a result of developments in Wärtsilä's technology and Deltamarin's advances in ship design.

In addition through this collaboration Wärtsilä and Deltamarin will be able to quickly generate reliable, customised, ferry concept designs for an owner's feasibility and budgeting purposes. This will shorten time-to-market considerations notably. The subsequent basic design can be generated rapidly, thanks to the combination of parametrically pre-designed elements and pre-engineered ship machinery and systems.

Engines

Rolls-Royce to supply Fjord1

Rolls-Royce is to provide gas engines and main azimuth thrusters for a double ended passenger/vehicle ferry to be built for the Norwegian operator Fjord1. The vessel will be the world's largest gas engined ferry.

On completion, the 20+knot ferry will primarily serve the busy Arsvågen-Mortavika route forming a link in the main road system on the west coast of Norway between Bergen and Stavanger.

"In planning the new ferry, Fjord 1 called for a substantial increase in efficiency," explained Matias Mork, sales manager – Rolls-Royce System Solution Merchant Vessel. "The Rolls-Royce Azipull thrusters, two at each end of the vessel, have pulling propellers and streamlined underwater units which turn the swirl energy from the propeller water into useful thrust. They are a key to raising efficiency, in combination with the latest LNG fuelled gas engine design from Rolls-Royce. A significant improvement was found on the final model testing compared to existing ferries," Mork said. In conjunction with Multi Maritime, Rolls-Royce developed a hullform with extensive studies and tank testing that were undertaken to optimise the hydrodynamic integration of the Rolls-Royce AZP100 azimuth thrusters and the hull.

Three Bergen C25:33L9A nine cylinder gas engines power the four thrusters through an electric transmission. The C-series is a new design of gas engine now going into production, taking over from the older K series, using the same successful lean burn combustion principle but incorporating the latest engine technology. The result will be a major reduction in CO_2 and NOx emissions and the virtual elimination of soot and sulphur emissions. A diesel engine genset, Bergen C-series, is also to be installed to power the vessel in case it should need to serve as a reserve ferry on routes without gas supply, or in emergency.

The contract to build this ferry was won by Fiskerstrand BLRT, a Norwegian registered joint venture between Fiskerstrand Verft in Ålesund, Norway, and Western Shipyard in Klaipeda, Lithuania. The vessel will be 129.9m long and 19.2m beam with a deadweight of 1300dwt, giving a capacity of 242 cars or its equivalent of 22 trucks plus cars on two decks, and it will be approved for 600 passengers.

Contact Rolls-Royce International Limited, 65 Buckingham Gate, London, SW1E 6AT, UK.
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Ancillary equipment

Alfa Laval filters further

Alfa Laval has announced the expansion of its lubricating oil filter range with its latest Protector T350 and Protector X350 lubricating oil filters. The Protector T280 and X280 automatic lube oil filters will provide increased capacity for very large crosshead and trunk-piston engines.

Dedicated to high capacities, the new Protector T350 and Protector X350 lubricating oil filters is designed specifically for full-flow filtration of lubricating oil used in large engines that burn all types of fuels (distillate, Gas, DO, bio-fuels and HFO). The T350 and X350 lube oil filters feature a simple, environmentally friendly design using with minimal components to facilitate maintenance, guarantee low operating costs, reduce lube oil consumption and eliminate the cost of filter cartridge disposal.

The T350 and X350 lube oil filters offer robust disc-type filter elements reducing risk of the filter element cracking. Continuous backflushing using the filtered oil eliminates the need for auxiliary power (no air or electricity required) and prevents adhesion of retained solids to filter surfaces so that no manual cleaning of the filter elements is required. Constant pressure drop across the filter facilitates the detection of any malfunction in the lube oil system.

Another cost-savings feature of the T350 or X350 lube oil filters is the optional diversion chamber, by adding a diversion chamber the need for a separate sludge treatment system is eliminated. The optional diversion chamber acts as an automatic maintenance-free sludge treatment unit, collecting particles backflushed from the full-flow chamber and concentrating the particles into sludge. Sludge is then drained periodically – either manually or automatically.

Contact Alfa Laval Corporate AB, PO Box 73, SE-221 00 Lund, Sweden.
Tel +46 46 36 65 00
Fax +46 46 32 35 79
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www.alfalaval.com

Propulsion

Wärtsilä and Ecospec MoU

Finnish-based Wärtsilä and Ecospec Global Technology, owner of the CSNOx emissions abatement technology, recently signed a Memorandum of Understanding (MOU) to work together towards the common goal

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By combining the joint expertise of Wärtsilä and Ecospec, the carbon footprint of both marine and onshore heavy industries can be significantly reduced through the development of clean power solutions. The aim is to achieve the lowest possible CO_2 emissions, near zero SOx emissions - even when using heavy residual fuel, and to attain the capability to meet future NOx emission requirements.

Under the MOU, Wärtsilä is responsible for integrating the CSNOx system into various engine applications. This includes the engineering, installation, supervision, project management, and commissioning of the system for both newbuildings and retrofits. Ecospec, as the supplier of the CSNOx system, would be responsible for supplying the key components of the system.

Ecospec CSNOx is the world's first emissions abatement system capable of removing carbon dioxide (CO_2) emissions from greenhouse gases, while at the same time removing, in a single system and in one process, sulphur dioxide (SO_2), nitrogen oxide (NOx), and other pollutants, without the use of harmful chemicals.

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Propulsion

Becker looks to composites

German propulsion manufacturer Becker Marine has introduced more products to its portfolio. One of the latest products from Becker is a composite rudder flap and rudder stock. One of Becker's approaches - along with Bureau Veritas - is the use of new materials such as carbon composites. Due to the huge potential of composite materials it is expected that the number of composites and their application in merchant shipping will rise in future. Especially for smaller components – like rudder flaps – composite materials enable the manufacture of hull surfaces

With better propulsion properties such as a slim design providing less drag and improved lift. Composite rudder flaps are available for all types of Becker high-efficiency rudders such as FKSR, SA/SC and Heracles rudders. Becker also offers composite material for rudder stocks. The weight of a rudder stock for a 8400TEU container ship e.g. can be reduced from 72.2tonnes to 26.6tonnes by using the new material. By specially adapting the fibre arrangement to meet the requirements for each different type of rudder, Becker ensures long equipment service life at the lowest operting costs.

In order to optimise operation in automatic control modes, Becker has developed the BIMS (Becker Intelligent Monitoring System), consisting of a Becker full spade rudder incorporating numerous measuring sensors. These sensors transmit rudder data such as forces, torques and loads to the automation system. Receiving feedback from the rudder is an entirely new situation for control system makers and enables their systems to minimise movements of the rudder, but also those of the exciter and propeller.

Consequently, holding the ship's position with smaller and fewer rudder and propeller movements will result in reduced natural wear and lower energy consumption.

Contact Becker Marine Systems, Neulander Kamp 3, 21079 Hamburg, Germany.
Tel +49 40 241990
Fax +49 40 2801899
www.becker-marine-systems.com

Propulsion

Schottel latest design

Schottel is introducing the first Rudderpropeller of the entirely new future generation of azimuth thrusters with the SRP 4000. Through research and development in the areas of structural mechanics and hydrodynamic design, Schottel developed a very compact Rudderpropeller with a weight reduction of some 20% in relation to the equivalent model from the current series. Besides the noise-optimized gearbox, which has been designed for a large range of possible input speeds, and the compact construction, which allows an approximately 35% reduction of the oil charge, this new SRP generation is also characterised by integrated steering hydraulics. For high-speed applications, a propeller nozzle specially tailored to these requirements is available. The weight reduction and the decreased oil charge are directly reflected in attractive cost benefits for the customer.

The new SRP 4000 generation is also available in the proven design as a Schottel Twin Propeller

STP for vessels with relatively high speeds (offshore supply vessels, ferries). The propulsion system can be operated with a high efficiency and free of cavitation up to 18knots.
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Engines

Tognum launches latest genset

Tognum subsidiary MTU Friedrichshafen has launched its latest standardised genset for diesel-electric propulsion and onboard power generation. The genset family consists of a workboat engine taken from the proven MTU Series 4000 "Ironmen", with a choice of 8, 12 or 16 cylinders, a generator and electronic control system mounted on a rigid base frame. The genset is designed specifically for commercial marine applications, such as offshore supply vessels for wind parks or oil and gas platforms, and covers a power range from 760 to 2240 kW. Engines can be configured for power outputs of up to 3000kW on request.

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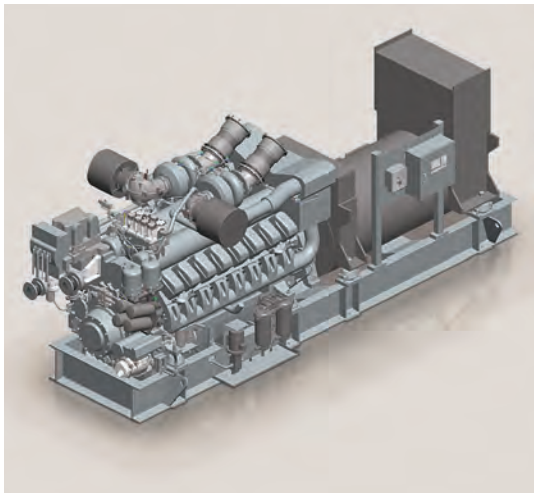

Redefining fouling control technology

In a two part feature evaluating anti-fouling coatings Diego Meseguer Yebra and Pere Català, fouling control managers in Denmark and Spain respectively for Hempel A/S, compare Silylated Acrylate and fouling release coatings. Part I self-polishing, biocide-based technologies. Part two will be published in January.

After the abandonment of the tin-based technology by the major coating suppliers in 2001, the fouling control market is ready for a new paradigm shift. Economic and environmental drivers are pushing for higher energy efficiency in marine transportation, which is highly dependent on the performance of fouling control products.

This paper will first list some of these drivers before presenting the most recent fouling control products launched since the extensive review by Yebra et al. (2004). Special emphasis will be made on the Silylated Acrylate and fouling release technologies, since they are currently the ones showing the highest degree of activity in terms of development of new products.

Introduction

Excluding ship design and the choice of propulsion system, few other parameters influence the ship's overall energy efficiency to the extent that fouling control systems for the underwater hull do. The colonisation of ship bottoms by sessile species has a widely acknowledged negative impact on the vessel's hydrodynamics (Schultz, 2007; Hellio and Yebra, 2009; Chapter 7). In this respect, fouling control coatings have a major role in keeping the frictional resistance of sailing vessels as close as possible to new-build levels and, consequently, dramatically impacting the vessel's fuel consumption (see Table 1) as well as its exhaust gas (CO_2, NOx and SOx and particulate matter) emissions to the atmosphere.

According to Table 1, the presence of seaweeds on a ship's hull may increase the fuel consumption by up to 50%, significantly more than the benefits offered by optimisations of rudder or propeller designs or even over the use of propulsion aid systems such as towing kites. In spite of the above facts, it is surprising to note that fouling control coatings and their influence on the ship performance have attracted very limited attention in the past decades.

Hull condition	$\%\Delta S_T$
Newly applied AF coating	-
Old system or thin slime	9.4%
Thick slime	26.8%
Algae and small-size shell fouling	50.7%
Medium-size shell fouling	82.3%

Table 1. Increase in fuel consumption due to types of fouling

"the presence of seaweeds on a ship's hull may increase the fuel consumption by up to 50%,"

A proof of this statement is that top performing tin-free self-polishing copolymer (SPC) antifouling (AF) paints are not dominating the market, with a significant amount of owners preferring to cut down on dry docking costs by choosing more economical AF products.

According to A.P. Møller-Mærsk (press release June 2010), this decision could well mean over 5% increased fuel costs. This scenario is probably the result of several historical factors:

- The traditional use of low price, highly-efficient and toxic organotin-based coatings, which largely dominated the market until the major marine paint producers withdrew them from their assortments in 2001 (Yebra et al., 2004)
- The lack of biocide registration schemes (Hellio and Yebra, 2009; Chapter 10) which has allowed economical biocides to be placed in the market worldwide without extensive studies about their environmental profile and effectiveness.
- The scarcity of reliable studies linking Fouling Control performance to fuel consumption
- The absence of reliable performance monitoring systems (Hellio and Yebra, 2009; Chapter 7) which can quantify the value of investing in high performance Fouling Control systems
- The relatively low cost of heavy bunker fuel.

But, the picture is definitely changing. The increase in the crude oil price registered in the period 2004-2009 (and more recently the global financial crisis) has triggered the alarms in the maritime industry. Ship owners and operators have been forced to maximise profitability by setting up strict fuel saving policies (e.g. slow steaming), re-evaluating the choice of fouling control products and suppliers and, when necessary, laying up vessels.

Such an alarm coincided with the rising concern about climate change which also hit the maritime industry, as demonstrated by the MEPC 60/4/21 document and by the International Maritime Organization's (IMO) guides to set up Ship Energy Efficiency Management Plans (MEPC.1/Circ.683, August 2009). In addition to greenhouse (GHG) gasses, other harmful

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Company	Product name	Description	Global launch date
Jotun A/S	SeaQuantum range	Silylated acrylate	2000
	SeaMate	Silylated acrylate	2008
International Paint	Intersmooth 460-465	Copper acrylate	First versions 1994.
	Intersmooth 7460HS	Higher solids version	2008
Chugoku Marine Paints	Sea Grandprix 1000/2000	Silylated acrylate	1995
	Sea Grandprix 660 HS	"Advanced Fusion"	
	CF-10 (copper free)	Zinc acrylate "ionomer"	
PPG-Sigma Coatings	SylAdvance 800	Silylated acrylate	2009
	EcoFleet 530	Unknown	
	Alphagen 230/240	"Pure organic"	
KCC	SeaCare Plus A/F 850	Silylated acrylate	
	SeaCare A/F 795		
Hempel A/S	DYNAMIC	Fibre-reinforced Silylated Acrylate	2002 (first version)
	GLOBIC NCT	Fibre-reinforced NanoCapsule Technology	2006
	OCEANIC	Fibre-reinforced Zinc Carboxylate	2000

Table 2. Summary of high performance products reviewed

emissions from low grade bunker fuel are also in the spotlight. The MEPC.176(58) resolution amending the MARPOL's Appendix VI highlights the need to reduce SOx, NOx, and particulate matter, which will certainly result in increased operating costs for the maritime industry.

It is unarguable that the use of improved fouling control systems strongly contributes to minimising the fuel bills and exhaust gas emission rates. In addition, a shift to high performance fouling control products would also mitigate the risk of introducing invasive species into sensitive ecosystems an escalating problem already acknowledged by the IMO; see e.g. BLG 13/9.

Taking all the above facts into consideration, it seems clear that as the marine market progressively recovers from the economic downturn, optimised efficiency and minimised environmental impact will remain at the top of the agendas to a much larger extent than ever before in the history of shipping.

Self-polishing, biocide-based paint technologies

Many tin-free technologies commercially available today were already described by Yebra et al. (2004), and they have been optimised cost and performance wise since then. However, there are quite a few new high-performance products as reviewed in Table 2.

Silylated Acrylate based paints are progressively populating the assortments of most paint manufacturers, as shown in Table 2, with several new products launched in recent years. Two companies, Jotun A/S and Chugoku Marine Paints, already had Silylated Acrylate products at the time of the organotin abandonment by the major paint suppliers in 2001, but have enlarged their assortment with new products over the past years.

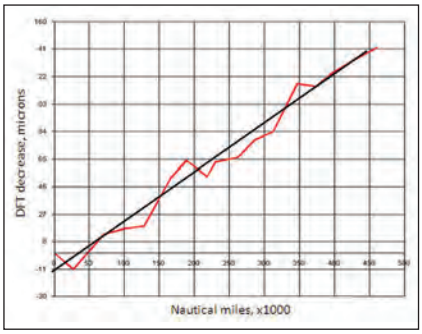
In the early 2000s, Hempel A/S developed a new binder technology (NanoCapsule Technology) as an improvement to their first 60-month tin-free product family which was described by Yebra et al. (2004). The innovative NanoCapsule Technology has been described in detail by Yebra et al. (2006) and in Hellio and Yebra (2009; Chapter 18) and offers excellent fouling protection for drydocking periods up to 60 months.

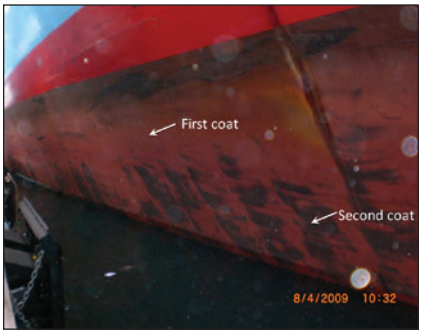
In order to meet the rising demand for products reaching the 90 months dry-docking interval, Hempel has recently re-designed their Silylated Acrylate assortment, including new product features, and re-launched it under the name DYNAMIC. As outlined in Table 2, only International Paint has kept a non-silylated product as their top performing technology.

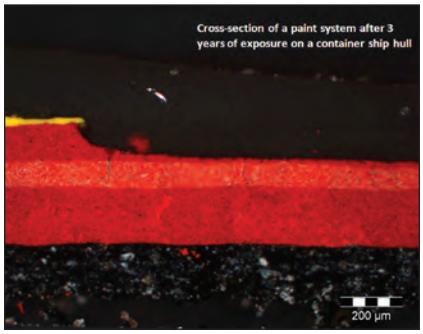
The clear trend towards the expansion of Silylated Acrylate products may be partly encouraged by the decision of some major performance-oriented customers to shift to these products aiming at optimised and reliable performance, especially for those vessels which are granted permission to trade for up to 90 months without dry-docking.

This conclusion is achieved after analysing hundreds of tin-free performance

Figure 1.







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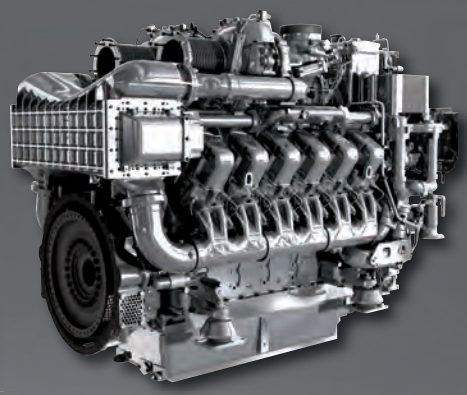

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	Handysurf, Rz (µm)	Interferometry, Ra (µm)
DYNAMIC	5.82±0.08	0.92±0.1
Cu-Acrylate	12.45±0.60	1.88±0.2
Relative increase	114.0%	104.3%

Table 3. Micro-roughness measurements

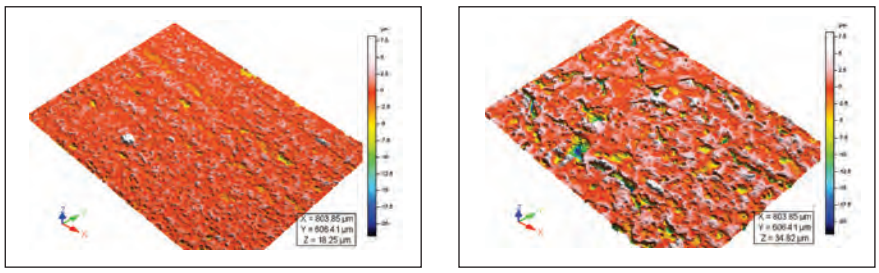

Figure 2.

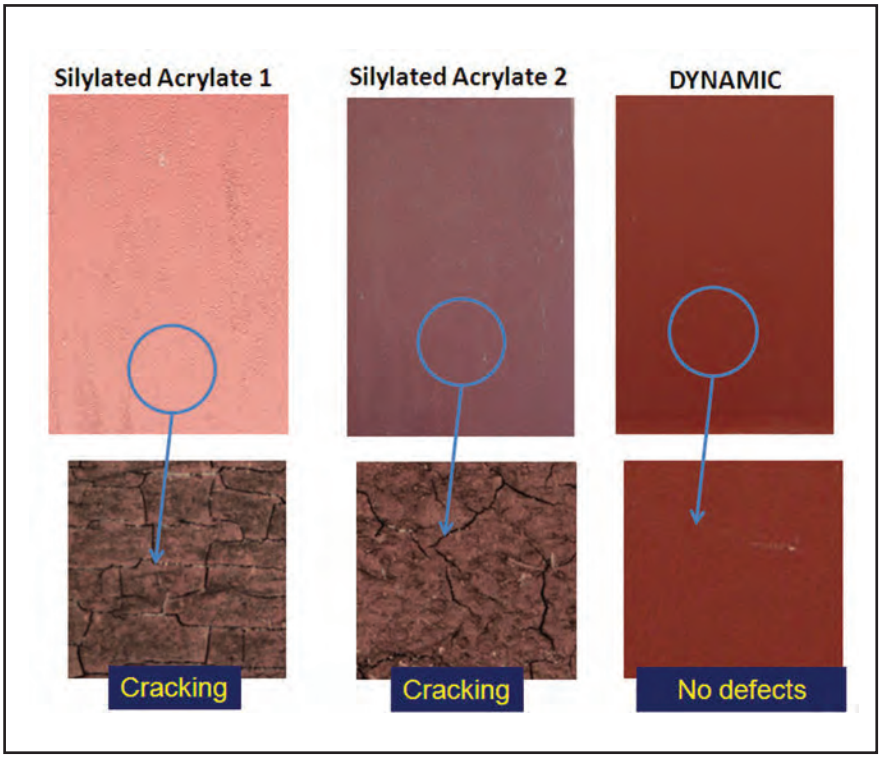

Figure 3.

(torsiometer) data gathered throughout their fleets, showing that Silylated Acrylate products were the tin-free technology best suited to work beyond 60-month dry docking intervals. The Silylated Acrylate technology definitely shows a very constant and predictable polishing rate and very thin leached layers (Figure 1), both parameters are crucial for a stable long-term performance (Yebra et al., 2004).

Silylated Acrylate paints also show a smoother surface during service, as shown next. Panels coated with a commercial Silylated Acrylate paint (DYNAMIC) and with a pure Copper Acrylate-based product were exposed to dynamic testing in natural seawater as described in Hellio and Yebra (2009; Chapter 16). After more than 200,000NM (peripheral speed), the panels were withdrawn and slime was carefully removed by fresh water rinsing ensuring no erosion of the paint. The micro-roughness of the panels was analysed by means of a Handysurf E-350 (Weinell et al., 2003) and also by 3D White Light Interferometry (MicroXAM 100HR ex. ADE Phase Shift Technology/ KLA Tencor). The results are shown in Figure 2 and Table 3.

It is not clear whether the Silylated Acrylate technology will achieve the same levels of market share as the TBT-SPC did, mainly because its advantages compared to some other advanced tin-free technologies are only obvious after long operating periods. In spite of this, Table 2 shows that there is a clear winner in the battle to replace TBT-SPC as discussed in Yebra et al. (2004).

According to Yebra et al. (2004), the discussion on what a "true self-polishing" copolymer paint is should be based on the final paint performance and not so much on the binder chemistry. In this respect, it would not be surprising if all major marine paint manufacturers will soon position a Silylated Acrylate product at the top of their assortments.

Other authors, such as Finnie and Williams (2010), prefer to classify the different technologies based on the chemistry of the main resin largely regardless of the performance of the paint. If we follow their definition strictly, an "SPC" could very well perform worse than what they call "Controlled Depletion Polymer" (CDP) technology. An example of the chemistry-performance mismatch is the well-known sensitivity of copper acrylate technology with respect to immersion in fresh water, compared to the stability of TBT-SPCs and Silylated Acrylate products (Risberg et al., 2010).

In order to allow the reader to choose for herself, Table 4 reviews the chemistry of the main candidates to the "true self-polishing" position. All resins have both strong similarities and significant differences to the TBT-SPC chemistry. Please note that no matter how simple this classification is made, it would be a mistake to forget that the main SP resin is

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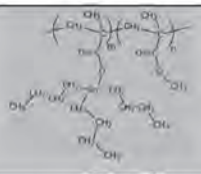
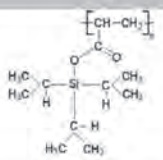
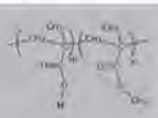
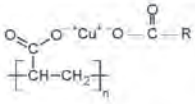
Technology	Name	Initial Chemistry	Final chemistry	Notes
Tributyltin methacrylate copolymer	TBT-SPC		Sodium acrylate copolymer	Covalent bond. Kinetically controlled hydrolysis. Biocidal pendant group. Can be formulated without rosin-derivatives.
Triisopropyl silylated acrylate	Silylated Acrylate		Sodium acrylate copolymer	Covalent bond. Kinetically controlled hydrolysis. Non-biocidal pendant group. Poor properties without rosin-derivatives.
Non-aqueous methacrylic acid copolymer dispersion	Nanocapsule Technology		Sodium acrylate copolymer	Diffusion controlled hydrolysis. Non-biocidal pendant group. Poor properties without rosin-derivatives.
Acrylate bearing a copper salt of a monobasic organic acid	Copper acrylate		Sodium acrylate copolymer	Ionic bond. Ion exchange-type reaction. Non-biocidal pendant group. Can be formulated without rosin-derivatives.

Table 4. Chemistry of self-polishing technologies

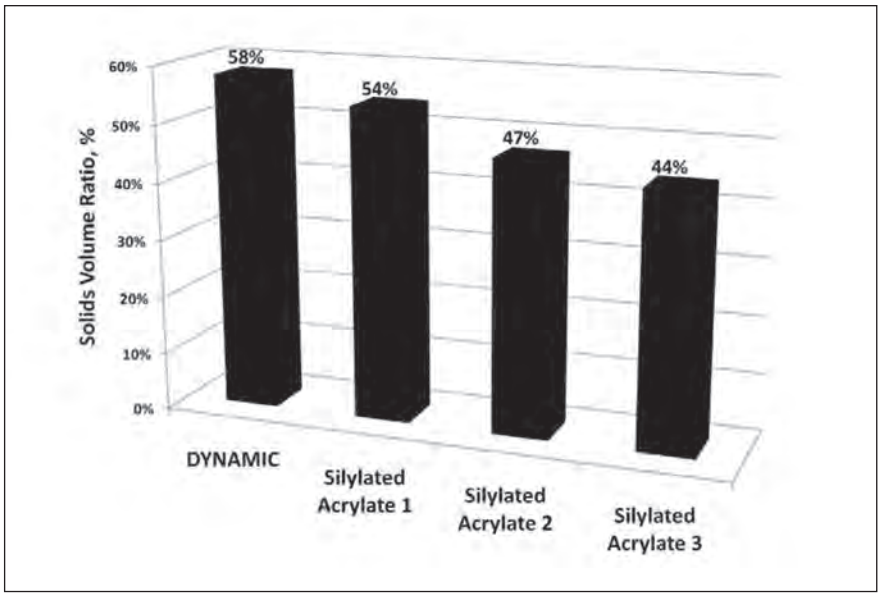


Figure 4. Comparison of solid volume ratio

only part of the full formulation, and that other co-binders, pigments and biocide package also play a key role in the final performance. A good example of the latter is the difference between Jotun's SeaMate and SeaQuantum, which share the same high performance binder but, are positioned differently in terms of expected performance.

Hempel's DYNAMIC series can be used as another example of the compositional differences within the Silylated Acrylate family. Compared to products based on the same technology (and often regarded as equivalent), the patented use of mineral micro-fibres provides DYNAMIC with mechanical properties unmatched by any other Silylated Acrylate product in the market (Figure 3). As correctly pointed out in Finnie and Williams (2010), Silylated Acrylate products achieve peak performance when blended with controlled amounts of rosin derivatives. Compared to similar products, DYNAMIC does not use natural gum rosin, but rather the zinc salt of a synthetic derivative, which has been shown to provide a more predicable behaviour in seawater (Yebra et al., 2005; Table 5).

Finally, and related to workability in the yard and environmental profile rather than performance, Figure 4 also shows that DYNAMIC has the lowest solvent content amongst all commercial Silylated Acrylate products. This feature facilitates the application of high film thicknesses in fewer coats, and lowers the risk of solvent retention, which could affect the paint performance if the application takes place at low temperatures or short recoating intervals are used.

To conclude, we have shown in this section that there is strong evidence pointing to Silylated Acrylate as an increasingly important technology in the market. It should be emphasized, however, that all "silylated" products reviewed in Table 2 are not necessarily performing at the same level, even if they use exactly the same polymer chemistry, and only experience and complex performance analysis can tell which formulation yields the best cost-efficient balance. *NA*

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	Natural Gum Rosin	Synthetic Rosin
Advantages	Excellent seawater solubility	Excellent seawater solubility Free of impurities Resistant to oxidation
Disadvantages	Impurities Variable composition Sensitive to oxidative degradation Poor mechanical properties Poor controlled release properties	Poor mechanical properties Poor controlled-release properties

Table 5.

Yebra, D.M., Kiil, S., Dam-Johansen, K. (2004). *Antifouling Technology: Past, Present and Future Steps Towards Efficient and Environmentally Friendly Antifouling Coatings*. Progress in Organic Coatings, 50, 70-104

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Increasing the life expectancy of marine equipment

Alan Robinson, managing director of Arc Energy Resources, discusses the benefits of weld overlay cladding (WOC) to protect marine equipment and components from corrosion and reviews the options available using corrosion resistant alloys.

Paints and coatings are readily available to protect surfaces on a ship's superstructure from saltwater in the atmosphere, but marine engineers must also ensure the long-term integrity of mechanical and piping equipment against aggressive corrosion caused by the sea itself, either below the surface or in areas subjected to significant amounts of saltwater spray.

In order to maintain the efficient and reliable operation of marine equipment the ship's engineer needs to know what techniques are available to extend the life of new plant or refurbish worn or corroded components. Just as important are their cost benefits compared to the use of expensive base materials or replacing the part.

There are a number of options available to protect marine surfaces but, the final choice will normally be based on an evaluation of factors such as the application (above or below the water?), required service life, operational priorities, installation deadlines and budget restraints.

Where budget is not a constraint, engineers can simply specify components in corrosion or wear resistant alloys known to withstand marine conditions. However, this is rarely the case and other, more cost-effective options are usually sought.

Where shipboard components such as valves, pumps, pipe, flanges or fittings require protection WOC is a versatile option, providing the assurance of a heavy-duty metallurgically-bonded protective layer that will not be degraded in chloride environments.

For use in aggressive underwater applications such as propellers and their shafts (spinning in saltwater causes electrolysis, which removes metal by galvanic attack), dredger buckets and chains, weld overlay cladding should be considered the default option because it will provide additional protection and extended service life for new equipment, as well as refurbishing worn or older equipment that is already badly corroded.

Arc Energy MD Alan Robinson.

Even equipment housed in engine rooms and other enclosed areas could benefit from weld overlay cladding. For example, a conventional and inexpensive stainless steel deposit would be adequate for the flange seal faces of valves and pumps that may suffer corrosion during their normal service.

For the most corrosive applications, the use of a higher grade stainless steel, complex nickel chromium or hard-facing alloys is normally recommended. Whilst these tend to be prohibitively expensive if used in solid form, a 3mm thick layer applied to the affected surface will offer the same operational performance and could lead to significant savings from the extended life expectancy of the equipment.

Protective materials

These include austenitic (300 series) stainless steels, ferritic/martensitic (400 series) stainless steels, duplex stainless steels or the more complex high nickel chromium alloys. With apologies to the manufacturers of austenitic stainless steels, it is unlikely they would have the resistance required for the very worst conditions.

Duplex steels and nickel based alloys, such as alloy 625, are the only materials in general production which, when welded, will achieve the levels of strength to match those of the carbon steels.

When repairing equipment, the affected areas can in many cases be pre-machined and, using automated WOC or specialised manual welding, rebuilt with a corrosion resistant alloy (CRA) such as complex nickel aluminium bronze. Typically, the repair will be superior to the original metal.

Protection methods

The use of carbon and low alloy steels clad with a corrosion resistant alloy has been common practice for some years and is a well proven, economical and technical alternative to solid alloys.

Where standard, off-the-shelf carbon steel components are installed, WOC is certainly the most versatile process, providing the assurance of a heavy-duty metallurgically-bonded protective layer that will not be undermined or dislodged in service.

Welding processes

After first identifying the surfaces (new or old) that need to be protected, engineers can choose from a number of welding processes and a wide range of cladding alloys. The WOC technology presents the materials engineer with a wide choice of welding processes that offer immense flexibility. An almost infinite range of component shapes and sizes can be protected, with an equally wide range of base material/cladding alloy alternatives.

The GTAW (TIG) process can be used in bores as small as 15mm, and is ideally suited for components of varied geometry, where

the position of the welding head requires frequent adjustment.

These could range from a simple flange that needs to be clad through the bore and across the sealing face, to a complex valve body with several interconnecting bores. This flexibility also lends itself to the cladding of irregular shaped components, such as pump and valve internals.

GMAW (MIG), submerged arc and electroslag welding processes are used where large areas and thicker deposits are required. Fast deposition rates mean these methods also offer cost savings. A wider selection of consumable materials, which may not be produced in the standard solid wire form, is also available. These methods may well be most appropriate for wear surfacing large areas subjected to abrasion.

Selection of the most appropriate welding process is largely dependent on factors such as the size of the clad area; access to the area to be clad; alloy type, specified clad thickness; chemical composition limits; welding position; and NDT acceptance standards.

Automated or mechanised processes generally offer the best deposition rates and provide the most consistent quality of deposit, which enables adherence to the results provided during procedure qualification testing. Mechanised equipment can be designed to access areas that simply cannot be reached by manual methods.

Using this process the chemical composition of the welding consumable can be achieved at 2.5mm from the base material/cladding interface (this can be reduced to 1.5mm in the case of 300 series stainless steels, where over alloyed wires are available).

Submerged arc welding is used where larger surfaces are clad and access is easy. Traditionally larger diameter (2.4mm+) consumables have been used for this process, again resulting in the need for fairly thick substrates to accept the high heat inputs and large weld deposits.

Recently, procedures have been developed using 1.2mm wires, allowing use on thinner section components and giving more controlled thickness of deposit, while maintaining deposition rates in the region of 5kg per hour. There are consumable/flux combinations available that make single layer deposits viable. This is particularly true with duplex and ferritic/martensitic stainless steels.

When WOC was first employed, re-machining after cladding was the norm, but as techniques and equipment have improved the 'as welded' finish has become much smoother, to the extent that many areas of clad equipment are now left as clad. This would not apply to the sealing/gasket areas, which have to be produced to the very finest of tolerances.

The fact is that WOC parts are now widely used in the oil and gas, power generation, chemical and marine industries because the process has proved to be a fast, flexible and cost effective remedy to the effects of corrosion and wear.

There is a wide choice of coating chemistry and the processes available extend from manual metal arc to multi head hot wire TIG to laser and beyond. Many previously 'difficult to weld' materials are now commonly welded with consistent success. And the development of the cladding process is such that now the market acceptance standards for the cladding material (a cast structure) are identical to the acceptance levels for the base material.

The acceptance and viability of weld overlay cladding in marine environments has been proven by Arc Energy when its weld overlay cladding expertise was pressed into service on behalf of the Royal Navy, most recently to help cut costs on new Astute submarines. The latest of two separate contracts involved the delivery of a total of 24 tubular components for the main circulating sea water system used to cool the nuclear reactors on two new Astute-class submarines being built by BAE Systems Submarine Solutions at Barrow-in-Furness, numbers four and five in the Astute series.

BAE and the MoD have an on-going programme to achieve significant cost-cutting and productivity gains on Astute; and as the same components for the first three submarines in the class had been produced from solid billets of an expensive copper nickel alloy, engineering and procurement staff investigated alternatives.

The material is very expensive and extended delivery lead times could have impacted on the vessels' build schedule. But, by using readily available high-quality carbon steel protected by a suitable corrosion resistant alloy in areas

Arc Energy specialises in cladding complex geometries.

Cladding in progress.

ElectroSlag cladding in progress

Tig cladding of smaller diameter bore.

where there is contact with sea water, Arc Energy's weld overlay cladding process was indeed able to make a contribution on both cost and delivery.

Eight 2m long Centre Tubes and sixteen 1.1m long End Sections – all 430mm in diameter – were clad throughout the bore and in the complex sealing areas at each end. Arc Energy recommended the use of ASTM A694 F65 forged steel as the base material as it is used extensively in similar pressure-related environments.

Nickel Copper alloy 400 (AWS A5.14 ERNiCU-7) – noted for its resistance in chloride environments such as seawater – was selected as the welding consumable. An overlay thickness of 5mm was applied to ensure that the surface of the deposit would meet the chemical requirements of the alloy.

Included in the 'source and supply' contract was the purchase of the carbon steel and the pre-machining of the components to ensure that sufficient material was deposited to achieve the very tight tolerance specified for the final dimensions.

After cladding, final machining and NDT inspection, Arc Energy's fabrication division produced and welded in place the location bosses, which enable the three sections of each assembly to be fitted together. Arc Energy then arranged for the external surfaces of the components to be coated with an aluminium spray.

On such a complex project Arc Energy was pleased to be able to offer weld procedures that had been tested and qualified in other, similar marine and naval contracts, thus providing the customer with documented proof of the successful application of the processes. Although the size of the components was well within Arc Energy's scope of manufacture, it was decided to produce special jigs and fixtures due to the precision finish required, particularly for the fabrication and mounting of the location bosses.

This recent project followed on from a previous contract completed some years ago for the WOC of hull penetrator inserts, again destined for a Royal Navy Astute class submarine being built by BAE Marine Systems. That project was commissioned by Cumbria-based specialist subcontractor Orwelco (Barrow) Ltd, which was producing the inserts on behalf of Seacon Phoenix, a leading manufacturer of underwater electrical and optical connectors and cable assemblies.

Seacon had previous experience of Arc Energy's work and suggested that Orwelco contact them. After visiting their website and Gloucestershire factory and being impressed with what they saw, Arc Energy was awarded that contract and a further contract for a ninety hull penetrator inserts to be clad.

The hull penetrator inserts, which as the name suggests are welded into the hull of the boat, are designed to allow external instrumentation connections to pass to the inside of the vessel. As the inserts are part of the main structure, they have to be made from the same type of high strength steel as the hull itself. Unfortunately the steel doesn't have the corrosion resistance needed to ensure a secure seal for the connectors, so the internal and sealing areas that are exposed to seawater were WOC with Monel 400, a 70% nickel 30% copper alloy that is acknowledged to be the ideal material for this environment.

Following on from the Astute projects, Arc Energy is currently working on a long-term contract to clad a variety of safety-critical pressure retaining components for submarines being built by another NATO member. The sizes range from very small to large complex components.

To summarise, in marine environments WOC offers clear advantages because protection can be applied specifically to the areas under attack, eliminating the need to produce a whole component or item of plant from an expensive corrosion resistant material.

However, the overwhelming advantage is its versatility. Whatever the shape or size of the equipment or component – from a deck pump to power transmission train – there is a process that can be applied and an alloy to counteract the different levels of corrosive attack.

WOC is a proven and recognised cost saving technology that is already well established in the oil and gas industry offshore and onshore. Now, engineers and designers in marine environments are sharing the significant benefits, both practical and financial, of increased life expectancy. *NA*

Spain sees no end to orderbook slump

Boom time comes to an end as Spain sees a year-on-year decline in new orders, making the immediate future for the industry looks bleak, write Brian Reyes and Iñaki Carrera.

After five years of strong business and ample orders, Spain's shipbuilding sector plunged into a head-on collision with the global economic downturn in 2009. Where orders had flowed in consistently during the boom years of 2003 to 2008, last year they all but fizzled out.

From north to south, yards across Spain's extensive coastline reported a sharp slump in orders as owners struggled to secure the necessary financing to push ahead with new projects. In some cases, even existing contracts fell through.

The shipbuilding sector is of vital economic importance to the Spanish economy, a fact that was underscored during a seminar last September organised in the Spanish Congress by the Spanish Association of Naval Engineers. The seminar heard that Spain's privately-owned shipyards handle some €4 billion in turnover every year, with 95% of production geared to foreign owners.

The yards employ some 15,000 persons, both directly and in auxiliary industries, and generate four ancillary jobs for every direct employment post. During the seminar José Romero Bernabéu, the chairman of PYMAR, the organisation that brings together private yards in Spain, was bullish about the sector's future prospects, citing recovering freight markets, rising oil prices, and the trend toward fleet renewal programmes driven by high scrap rates, as factors that would help Spanish yards secure new contract in the coming years.

> "In 2009, Spanish yards contracted just 13 vessels compared to the 75 ships ordered in the preceding year."

But, while the medium-term forecast may be optimistic, the reality on the ground presents a mixed bag of fortunes for many Spanish shipyards.

In 2009, Spanish yards contracted just 13 vessels compared to the 75 ships ordered in the preceding year. Not only that, there was also a year-on-year drop in tonnage terms, down 87% from 220,322gt in 2008 to 28,979gt last year. The collapse of orders and concern about the long-term prospects for the sector prompted scenes that had not been witnessed outside shipyards in many years, including occasional angry street protests by disgruntled workers.

Spanish yards had accumulated a solid orderbook in the run-up to the downturn. But, with some 50 vessels completed and delivered during 2009, there were few new orders to pick up the slack. Between them, Spain's 23 privately owned shipyards and its single state-owned shipbuilder had a total of 815,134gt in contracted tonnage under construction at the end of 2009, a 24% year-on-year drop.

In theory, this amounts to two years' work, making the coming months vital for the country's work-hungry shipyards. In the private sector, the Galician yards have the most work in progress. HJ Barreras has vessels amounting to 131,889gt under way, followed by Vulcano (83,259cgt) and Metalships & Drydocks (41,135cgt). The Basque sector is led by Construcciones Navales del Norte – CNN La Naval, with 94,649cgt, while Astilleros Armón holds the top spot in Asturias with 44,950cgt.

At first glance, the situation improved sharply during the first half of 2010. In particular yards in Galicia and the Basque country reported modestly-optimistic orders and are hopeful of closing new deals in the short term. Some 11 merchant vessels amounting to 33,435gt were contracted nationwide during the first six months of the year, all of them for foreign owners.

But Spain's shipyards continued to deliver vessels during the same period and by June, just 89 ships representing 587,300gt were under construction, a 35% drop compared to the same months last year, according the data from the Ministry of Industry. Six of those orders went to the Basque yards Astilleros Balenciaga and Astilleros Zamakona, five for the former company and one for the latter.

In total, those six orders amounted to 14,971cgt. In Galicia, Cardama secured two small orders, while Construcciones Navales P. Freire secured an order for a single 4288gt vessel and Metalships & Drydocks another for an 11,000gt ship. Lastly, Astilleros Gondán also won an order for a small 894gt vessel. *NA*

Madrid approves yard funds

The Spanish Government approved a €62.2 million tranche of funding earmarked for the ship construction industry in this year's budget, despite deep cost-cutting across all areas of public spending.

The funding package complies with European Union (EU) rules on state aid and will help yards boost their competitiveness through investment in research and development and staff training.

Some €47.3 million will be geared to restructuring projects to help yards adapt their facilities to improve efficiencies and productivity, with the balance set aside as subsidies to cover interest on loans.

New orders fail to fire Basque yards

Basque shipyards continued to play a key role in Spain's shipbuilding sector last year, handling just under a third of national production in the private sector during 2009, write Brian Reyes and Iñaki Carrera.

The Basque region's four main yards – Astilleros Zamakona, Construcciones Navales del Norte-La Naval, Astilleros Murueta and Astilleros Balenciaga – collectively built some 340,759gt in orders contracted at their facilities. By year-end, the Basque orderbook contained orders for some 35 commercial ships out of 113 vessels under construction in Spain, amounting to 237,356gt in terms of contracted tonnage. But, while the work in progress presented a positive picture, this was not the case in respect of new orders. Last year, Basque yards failed to secure a single new order out of the 13 contracts closed by Spain's main 23 privately-owned yards.

CNN-La Naval, the former state-owned yard in Sestao on the outskirts of Bilbao, was Spain's second-busiest private yard last year, second only on the Galician company HJ Barreras. The Basque yard handled some 49,062gt in work last year. In terms of workload, CNN-La Naval was followed by Balenciaga, which saw its contracted tonnage increase year-on-year by 56.3% to 13,029cgt. Next in line was Murueta, which saw a dip in the workload compared to 2008 partly driven by completion of six contracts including one for the largest ship ever built at the yard.

This year brought positive news for Astilleros Balenciaga, which won a four-ship contract from Britain's Craig Group. The order for four offshore emergency response and rescue vessels, with an option for a fifth ship in the series, assures the yard's workload through to 2012. The design is for larger vessels than previous constructions and the first ship is slated for delivery in early 2012, with the rest following through the year.

The contract illustrates the strengths of Spanish yards in building high-tech ships and the benefits of close relationships with owners. Balenciaga has a long association with the Graig Group and this year delivered two offshore support vessels from a previous order placed at the yard about five years ago.

Balenciaga has previously delivered 12 vessels to North Star Shipping, with three of these currently under construction. The latest delivery, the *Grampian Citadel*, an IMT 948 design emergency response and rescue vessel, was launched at Balenciaga in August and is the 16 ship in a £130 million investment programme by the British group. The ships, which are fitted with fast launches and anti pollution equipment, are designed for rescue operations in offshore oil fields and can accommodate up to 300 persons.

> "Last year, Basque yards failed to secure a single new order out of the 13 contracts closed by Spain's main 23 privately-owned yards."

Balenciaga is also working on four escort tugs for the Abu Dhabi National Oil Company in the United Arab Emirates, due for delivery next year. Each 35.8m vessel will be powered by two Wärtsilä diesel engines which, together with azimuth thrusters, will give an estimated bollard pull of 80tonnes. The ships will also be fitted with fire-fighting and oil spill response equipment for work in the Middle Eastern company's oil fields.

In Sestao, CNN-La Naval also had some positive news with a new order for Belgium's Jan de Nul, a company with which the yard has worked in the past. The order is for a sister ship to the *Simon Stevin*, a 36,000dwt fallpipe rock dumping vessel delivered by the yard earlier this year.

With a capacity to carry 33,500 tonnes of rocks, this one-of-a-kind ship can work at depths of up to 2000m and is equipped with four rudder propellers, two azimuth thrusters and two bow thrusters. It is also fitted with a remote operated vehicle capable of working at depths of up to 2500m. Steel work for the sister ship, which is valued at over €250 million, will commence in the first quarter of 2011. The contract will provide a boost for the yard, which is currently at work on a dredger, also for Jan de Nul, due to be delivered in February of next year. Delivery of the second fallpipe rock dumping vessel was initially scheduled for early 2013 but has now been pushed forward to the end of 2012.

Further along the Basque coastline, Astilleros Zamakona attracted a new customer to its list of regular clients with an order for a terminal escort tug for the Italian shipowner Rimorchiatori Riuniti. The tug, slated for delivery in 2011 and earmarked for work in offshore oil fields, will be built at Zamakona's facilities in Pasaia. The 30m vessel, equipped with two azimuth thrusters and fire-fighting capabilities, will have a bollard pull of 72 tonnes and a top speed of 12.5knots.

The remainder of Zamakona's orderbook includes vessels 15 vessels slated for delivery during the course of this year and 2011. By the end of 2010, the company will have delivered nine of those ships, four more than last year. In 2009, Zamakona's two facilities – one in Vizcaya, the other in Guipúzcoa [and a third repair yard in the Canary Islands] – delivered five ships, launched nine others and laid the keel on eight additional orders. That amounted to some 29,730gt in terms of contracted workload, a 29% improvement on the previous year. The company's yards specialise in the construction of high-tech offshore support vessels, tugs and trawlers. *NA*

HYDREX OFFICE FULLY OPERATIONAL AT THE STRAIT OF GIBRALTAR

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Underwater maintenance services include hull cleanings, propeller polishings, class accepted surveys and tail-shaft wear down readings. Underwater repair work consists of propeller repairs, shell plating crack repairs, mobdock repairs, rudder pintle repairs and any type of welding work.

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Optimism pervades Galician yards

Small orders for small vessels brings hope that the shipyards in Galicia may have weathered the worst of the financial storm, write Brian Reyes and Iñaki Carrera.

After 20 months without single new order, private shipyards in Galicia have started to contract new vessels once again. But, the comeback is modest, with two orders for each of the main yards closed at prices below those obtained in 2006 and 2007, when ship owners were queuing to secure slipway slots.

According to the Asociación Clúster Naval Gallego [Aclunaga], the Galician maritime cluster association, the six new contracts – four confirmed and two in the process of being sealed – represent a €600million injection of work to a regional orderbook valued at €1.5 billion.

A comparison with historical data illustrates the drop in work as a result of collapsed interest from ship owners during the financial crisis. In 2007 and 2008, the best two years in the recent history of Galicia's yards, the region's shipbuilders were handling €4 billion in orders. Even so, Aclunaga remains confident that the present orderbook will help its member yards through these lean times to recovery. Or at least until 2012, whichever come first.

From Aclunaga, the forecast is cautiously optimistic. "There are indications that the market is changing," said Tomás Casquero, the association's general manager, said in a recent interview. "A year ago there wasn't a single enquiry whereas these days, all the shipyards are negotiating orders."

Mr Casquero highlighted the need for yards to improve productivity, competitiveness in pricing and innovation in order to better their chances of winning orders. "Another very important factor in order to win the confidence of ship owners is to scrupulously adhere to delivery schedules," he said. Mr Casquero also identified the benefits of streamlining processes and production logistics.

Aclunaga is working on a study to identify goods and materials that could be constructed and sourced locally in order to trim costs. A parallel project, run jointly by the Centro Tecnológico Aimen, auxiliary companies and a group of Galician yards, is exploring ways of reducing by 20% the number of hours needed to build a ship. The initiative is looking at ways of introducing new technologies in fabrication processes – steel cutting, soldering and the transfer of blocks – in order to minimise the scope for errors during the ship assembly phase.

In assessing the recent performance, Mr Casquero recognised that the business climate had become tougher. "There's no doubt that securing financing has become more difficult in the last few years," he said. "Having said this, good projects are never abandoned due to a lack of financing. It may take longer and it might be harder to finance, but I don't know of any case of a vessel construction that has not gone ahead because of this reason."

With an eye on yard protests over recent months, Mr Casquero said peaceful industrial relations was vital in order to win new orders. "The need for a peaceful workforce is an important factor when it comes to a shipowner selecting a yard for a new vessel," he said. "When it comes to signing contracts, they all demand clauses guaranteeing the delivery."

Among the new contracts secured by the region's yards is an order from the British Government's Natural Environment Research Council for a new oceanographic research vessel. The 98m vessel, to be named *RRS Discovery*, will be built by Construcciones Navales Freire at a cost of €85 milliion and represents three year's of work for the yard. It will replace an existing ship of the same name built in 1962.

The design of the new research ship was developed by Skipsteknisk AS, a leader in the design of sophisticated and noise reduced research vessels which also designed another UK research ship, the *RRS James Cook*.

Freire has more than 100 years' experience in building research vessels, offshore vessels, and merchant and fishing vessels, specialising in those with high technological requirements. In 2006 the shipyard built a research vessel for the Consejo Superior de Investigaciones Cientificas, the Spanish National Research Council. As well as this contract the yard is also working on an order for an oceanographic vessel for Qatar University. Work on the British ship will start next year.

Another of Galicia's principal shipyards, Hijos de J. Barreras, is working on a deal for two ferries for Spanish shipowner Naviera Armas. The agreement is said to be at an advanced stage and will be worth over €200 million. Barreras has several other orders under various stages of negotiation and hopes to seal at least two more contracts by the end of this year. "Activity is starting to pick up bit by bit," said Barreras' chairman, José Alberto González Viñas, in an interview with a local newspaper last month. "All the yards in the ría de Vigo are in serious negotiations with ship owners."

Mr González Viñas said the surge in orders in Asian yards was good news for Spanish and European shipbuilders because future capacity constraints in the Far East would prompt owners to look elsewhere. "Activity in those countries is coming back with energy and it won't be long before it shifts to Europe. We only have to wait a little." The chairman of Barreras, the largest privately-owned shipyard in Spain, said it was important to find a balance between yard capacity and orders. In the past, periods of hectic activity have been followed by sustained slumps, resulting in high peaks and deep troughs. "We can't allow a saturated market, as in recent years, nor valleys of inactivity as is the case now," he said.

Metalships & Drydocks, the steel construction division of the Rodman group, closed an order for an offshore support vessel for the USA-Dutch consortium McDermott and Ocean Team. This represents an €100 million order for the yard, which specialises in support and prospecting vessels for the oil industry. The ship will operate in the Gulf of Mexico and the order reflects a trend over recent months, with rising oil prices prompting increased interest from offshore operators.

Another Galician yard, Cardama, won orders for two tugs in the first half of the year and has ongoing contracts for three more, as well as an oceanographic research

ship and two pontoons. In total, the orders represent €24 million in work. The yard has ridden the crisis well and this year will make record deliveries this year, with prospects remaining positive for the year ahead.

The Armón group of shipyards, which has facilities in Asturias, Burela and Vigo, is said to be in advanced negotiations with a Mexican shipowner for construction of three deepsea trawlers worth €20 million each. The group is also close to signing an order for construction of a research ship for the Spanish Oceanographic Institute.

While new orders are materialising for many of Galicia's yards, the regional shipbuilding sector was dealt a blow over the past year by the cancellation of various contracts. One affected yard was Factorías Vulcano, which last July managed to sell two seismic vessels to Norwegian owner Rieber Shipping after Petroleum Geo Services cancelled the original orders. The deal was sealed at a total value of €108 million, about half the original price of the vessels.

The hulls of the seismic ships were built in Vulcano's Gijón subsidiary, Factorias Juliana, and transferred to Vigo for completion. Vulcano is now in the process of selling Factorias Juliana to the Armón group. Once complete, the deal will inject €16 million of capital into the Gijón yard, which is negotiating a hotel ship project for the Norwegian oil industry. *NA*

CNN-La Naval delivers dredger

The 78,000dwt mega trailing suction hopper dredger *Leiv Eiriksson* was delivered by Construcciones Navales del Norte-La Naval to Belgium operator Jan de Nul in May this year.

Together with its sister ship, *Cristóbal Colón* also built by the Spanish yard, these dredgers are the largest hoppers available on the world dredging market, with capacity for 46,000m^3.

The vessels are also capable of working in depths of up to 155m, pushing the limits of deep dredging.

The 223m long ships can reach a speed of 18knots and accommodate up to 46 personnel onboard.

For both propulsion and working functions, the dredgers are powered by two MAN 16-cylinder, vee-configuration type 16V48/60B main engines, each rated 19,200kW at 514rpm.

These drive twin, controllable-pitch propellers via single input and output shaft-reduction gears, as well as two 18,500kW shaft generators located on power-take-offs on the reduction gears.

For dredging operations, the ships have a discharge pump power of 16,000kW and two 6500kW pumps while trailing. *NA*

The launching of the suction hopper dredger *Leiv Ericsson* earlier this year at the CNN-La Naval yard.

Rescue vessel delivered

The multi-role IMT960 tanker assist and rescue vessel *Grampian Endurance* was delivered earlier this year by Astilleros Balenciaga to North Star Shipping, part of Britain's Craig Group.

The 2113gt vessel has a length of 60m and 16m beam, it is equipped with two daughter craft, one fast rescue craft, 200tonne towing winch and sophisticated equipment to deal with emergency situations from Fire Fighting - type 1 incidents to oil spills.

Two 4050bhp diesel engines and bow, stern and azimuth thrusters give the vessel a bollard pull of 105tonnes.

Balenciaga has delivered a dozen vessels for the Craig Group over the past five years and now has orders for four more ships, with an option for a fifth.

LNG or fuel cell power?

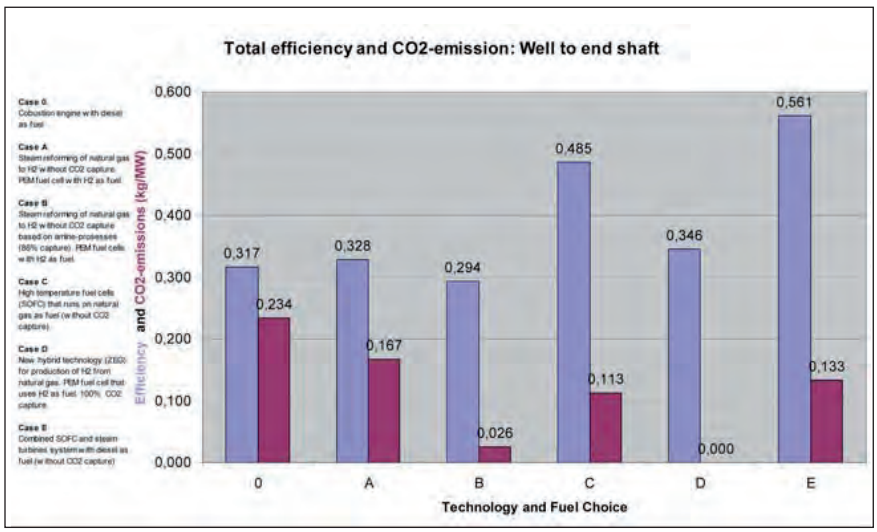
It is accepted that future ship power will come from green fuels, reducing the reliance on diesel, if ship owners are to meet regulations. However, choosing the fuel of the future is taxing owners.

Fuel cell technology looks to be an equal contender for inland vessels.

Both LNG and fuel cell technologies have now been put through tests and installed onboard vessels, with the uptake of both propulsion types looking to be made by ship owners for future vessels. Norway is backing the development of LNG as the future fuel, with DNV announcing its support for the use of the fuel back in June at Poseidonia in Greece. It stated that LNG was the way forward for short sea shipping due to the cut in emissions and the ease of use of the technology. DNV was the first classification society to class an LNG powered vessel in 2001 and since then has classified a further 20 vessels.

In Germany the first fuel cell-powered inland river vessel was developed and launched back in 2008, under the Zemships banner, the European Union (EU) funded-project's aim was to produce an inland river vessel that produced zero emissions. The vessel, *Alsterwasser*, was launched with great success and has been in service as a passenger vessel on the Alster in Germany. Earlier this year it was reported that a fire had broken out whist the vessel was undergoing maintenance and testing on the Elbe. Zemships has confirmed that the lead-acid batteries onboard the vessel overheated and caused a fire, but there was no risk to the fuel cells or the hydrogen storage facility. But, this could be a cause for concern for the future of fuel cell technology.

Tomas Ryberg, researcher at Christian Michelsen Research AS (CMR), Norway has commented on the *Alsterwasser* incident as something that shouldn't have happened. He points out that in Norway there are rules from DNV that cover the handling and management of fuel cell technology, which is the main issue with fuels cells. He



Efficiency and CO_2 emission – From well to shaft, different fuels and propulsion systems.

Fjord1 expands fleet with its second gas powered ferry, that will be the largest of its type in service.

continues by saying that because of an incident or previous historical incidents with hydrogen, it should not deter us from using this as a form of propulsion.

"We need to prove that fuel cells are reliable and can work on bigger vessels. At the moment the market already has the combustion engine as a proven technology that works. We now need to show that the fuel cell is a viable option for owners, which is the difficult task," said Mr Ryberg. "The problem I think is that people think that hydrogen is dangerous, but it is not as dangerous as someone filling their car with petrol with a mobile phone in their pocket. The risk factor is subjective. If it is done the right way and handled correctly then there is no problem," he added.

He continued to highlight that the hydrogen stored in fuel cells is kept at a low pressure because of this it gives the gas less density and so less combustable. Adding to this the use of the correct battery type, correct ventilation and handling of fuel makes the fuel cell a safe option. Adapting this form of technology into larger vessels types will be different due to cruising cycle, loading and offloading. Mr Ryberg expects that the introduction to fuel cell technology onboard larger vessels will be done gradually through hybrid systems allowing the phase in of the technology.

Fuel cell technology is a viable option for smaller vessel at the moment due to the load pattern of inland vessels such as ferries. Fuel cell technology gives high efficiency for these types of vessels, says Mr Ryberg. The added advantage to the fuel cell is that it can use any type of fuel and also has higher efficiency than that of LNG, which has 43% efficiency compare to fuel cell that has in the region of 60-70% fuel savings.

LNG is the buzz word as the next step in propulsion for ships, with Norway in full support of this form of fuel for ships. It has been shown that engines that run on LNG instead of marine diesel fuel emit 99.9% less sulphur (SOx), 90% less nitrogen (NOx) and 97% less particulates and 25% less carbon dioxide (CO_2).

Recently, the Norwegian ferry operator Fjord1 has added its first LNG powered vessel to its fleet with another ferry that is expected to be the largest gas powered ferry to be constructed so far at Fiskerstrand BLRT, Estonia.

The ferry will be 129.9m long and 19.2m across. It will take up to 242 cars and/or trucks in combination with passenger vehicles and accommodate up to 600 passengers, including crew. The ferry is expected to have a reduction in emissions by 90% and will be delivered at the end of 2011, supporting the emerging LNG market. *NA*

Electric ships opt for hybrid

Electric Ships Facility in Heeg, The Netherlands and Capstone Turbine Corporation has together developed a vessel that is powered by a low powered generator, opening up another option for inland vessels.

The announcement came that the world's first boat powered with an ultra low emission microturbine was launched in the Netherlands in early June. The prototype craft is owned by Electric Ship Facilities in The Netherlands, developer of a hybrid-electric propulsion system for ships that can operate on multiple forms of power generation. The ship features the innovative onboard energy system a Capstone C30 diesel fueled microturbine.

The Capstone C30 microturbine comes in 30, 60 and 200kW with a single or multiple ESF that can be integrated to a hybrid energy system, adding to this is the microturbine's ability to switch between main components. The microturbine can operate on different fuels, as demonstrated by the prototype vessel can operate on (bio) diesel, with gas such as CNG or LNG also possible.

The emissions from the microturbine are very minimal for that of the very high combustion temperatures that it operates. In addition, virtually no wear was reported on the tests and no additional lubricants were included. Maintenance of the microturbine is a fraction of a conventional combustion engine. Both environmentally and commercially sound, this is a strong, effective step forward.

"Microturbines are ideal for power generation in marine applications because of their ultra low emissions and maintenance, small footprint, ease of installation, quiet operation and lack of lubricants and coolant," said Jim Crouse, Capstone's executive vice president of sales and marketing.

For years, cruise ships and other large vessels have used diesel-electric systems because of the systems' ability to efficiently produce propulsion and auxiliary power on long, uninterrupted trips across the ocean. A problem, however, is that emissions increase and efficiency deteriorates when a ship is operating at less than cruise speed.

Electric Ships Facility prototype powered with an ultra low emission Capstone C30 microturbine was launched in the Netherlands in early June.

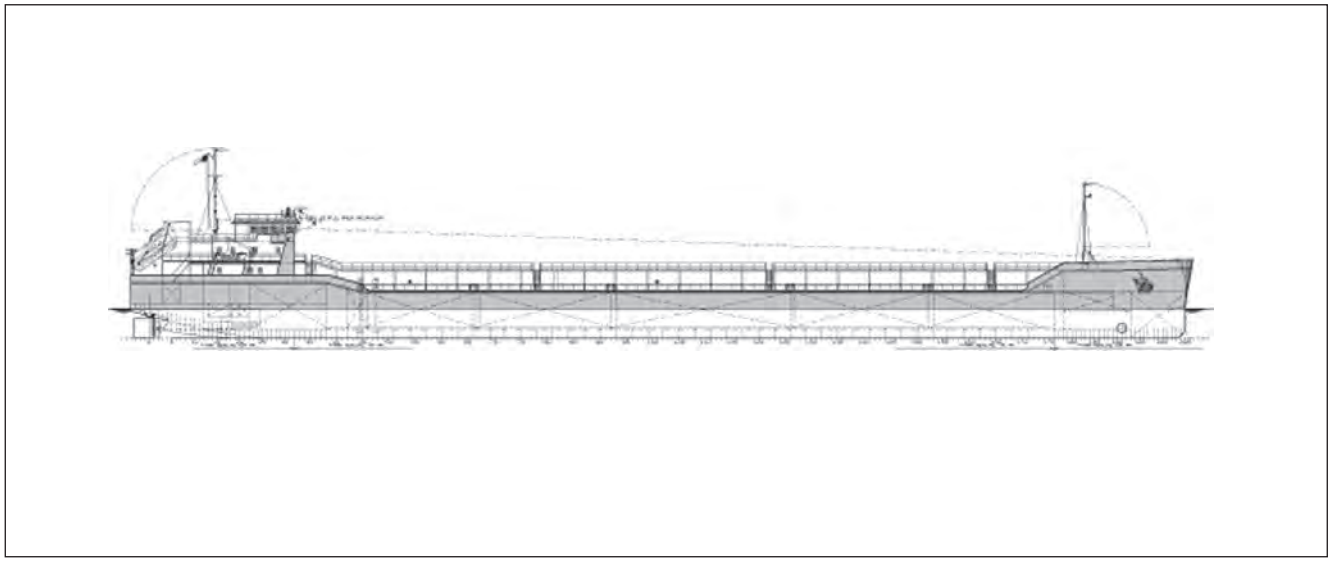
Current diesel-electric technology is unfeasible for small and mid-sized vessels that start and stop often at various ports, or that work harder when travelling against river currents. In a battery supported hybrid system, Capstone microturbines efficiently address both emission and efficiency issues that arise in smaller craft not suited for diesel-electric technology.

"Reducing emission pollution from marine vessels is a key issue for the International Maritime Organization (IMO), which in 1997 adopted an international convention protocol to reduce air pollution from ships," said Darren Jamison, Capstone's president and chief executive officer. "Capstone microturbines are an excellent solution in marine applications, for the same reasons as our land based products; low emissions, low noise, high efficiency and extended maintenance benefits."

According to Jamison, the addressable market for marine installations of Capstone energy systems is potentially as large as US$800 million annually. "The marine industry is looking for cleaner and more reliable solutions," he said. "We made the strategic decision two years ago to develop hybrid product solutions focused on the Marine, Vehicle, UPS and Solar Concentrator markets and Capstone is now starting to see fruits of that labour," added Jamison. *NA*

Conoship adapts to the market

The inland vessel market has been relatively untouched by the financial crisis, with vessel design and delivery still strong as is the demand for shallow draft vessels.



Conoship's latest design 6750m^3 IMO Type II Chemical Oil Tanker.

The inland vessel market has been fairly protected from financial crisis, mainly due to its size and the vessel types. Construction and interest in shallow draft vessels has carried through the crisis with rivers in Europe and Russia increasing volume carried on the waterways.

However, there is a growing demand for new concepts and designs of vessels in this market, due to most vessels coming to the end of their operational life. Owners and operators are now starting to look for vessels that are both greener and more economical to run. Dutch-based Conoship has developed its latest design for an International Maritime Organization (IMO) Type II Chemical/Oil tanker for a Russian tender.

"The concept design was based on previous hull form designs that we had worked on," said Mr van Ingen, managing director marketing & sales, Conoship International BV. "The design has double propulsion and is of shallow design draft to suit the area that it is designed to sail [on the White Sea]," added Mr van Ingen.

The vessel has been designed to sail on Russian waterways as well as for non arctic sea areas. The vessel will be used for the transportation of oil products with a specific gravity of up to 99tonnes m^3 and a flash point below 60°C.

The propulsion for the vessel consists of two fixed pitch propellers, each driven by a 900kW main engine. The cargo area has been subdivided in 12 cargo tanks and two slop tanks. The cargo handling has been designed for six segregations.

Design optimisation

Adding to its latest design Conoship has also been working on its vessel design initatives, coming up with an aft hull and propulsion optimisation method in cooperation with Delft University and Marin, both of which are based in The Netherlands.

"The market is busy with optimising hull form at the moment," said Mr van Ingen. "We have developed the new optimisation through combinations of existing designs. Adding to this we have also increased the propeller diameter," he added.

TECHNICAL PARTICULARS

6750m^3 IMO Type II Chemical Oil Tanker

Length o,a	140.95m
Length b,p	137.55m
Breadth moulded	16.80m
Depth	6.15m
Draught (design)	3.60m
Deadweight	5300dwt
Draught (Summer)	3.82m
Deadweight	5800dwt
Speed	10knots
Main engines	2 x 900kW
Auxiliary engines	3 x 450kW
Emergency generator	168kW
Bow thrusters	350kW
Cargo tanks (100%)	6750m^3
Slop tanks	135m^3
MDO	250m^3
Potable water	40m^3
Ballast water	3800m^3

The optimisation method, however, is better for smaller vessels, Mr van Ingen points out. For larger vessels, such as sea river vessels a bigger propeller is applied to the design, which works better.

Conoship claims that with this optimisation its designs make a 15% saving on fuel consumption. Conoship are now in the process of extending this optimisation to its full range, which as Mr van Ingen points out totals 25,000dwt of vessels.

Adding to the increase of the Russian market Conoship has also been working on more special vessels that have shallow drafts. One vessel that it has developed is a specialist vessel for windmill parks. Conoship says the main feature of the vessel is its compactness. Although the vessel, which is 85m loa, is of a narrow design it is still capable of doing the work of a heavy-lift vessel.

Competitive market

The development and progress of the market for such specialist vessels has been slow, highlights Mr van Ingen. But, there is development going on to take ship design to the next step and to keep the market competitive. If anything, Mr van Ingen points to a market that is a little too competitive, with designs for vessel being kept hidden away by ship owners.

"There is a market out there for specialist designs and if a ship owner acts quick to get a specialist design they stand to gain. However, if their design is published then they feel that their position will be effected," comments Mr van Ingen. He continues that this pressure is keeping designs being held back, where as at the end of the day everyone is working towards the same goals.

With the developments of ship designs it is expected that future vessels will have a life of 30 years, including developments in the area of greener fuels. Mr van Ingen believes that Europe can be a forerunner in the development of green vessels, especially with the increased interest in LNG.

Supply chain

However, the supply of LNG still needs to be considered if this is to be the fuel of choice and support in the development needs to come from the Governments, comments Mr van Ingen. Companies that supply the LNG will also need to invest and this in turn will also have a knock on effect to the customer. As Mr van Ingen points out "someone has to pay the bill".

Looking to the future, Mr van Ingens has highlighted that there has been interest on the market for LNG propulsion for vessels. "We have projects for this type of propulsion but so far none have materialised into anything. The market is there for LNG and owners are there, the problem is that there is currently no supply chain for the LNG," he comments.

Conoship has seen major developments in both designs of vessels and engine room systems come onto the market. It believes that the market now needs to prepare for the change to LNG in the future. *NA*

Parcel force

Chemical and product tanker builders are facing another two years of recession as the industry scraps older tonnage but replaces them with new ships.

Over-ordering of ships in the chemical and product tanker sector has led to a glut of vessels in a market that was, before early 2008, a booming shipping sector.

Many owners, who ran bulk carriers, and other less successful types of ship, looked on enviously at the booming profits of chemical and product tanker owners and decided they wanted a slice of the chemical tanker action. One senior industry figure, who preferred not to be named, said that "principally it was the Greeks and the Chinese that had ordered and built chemical tankers on the cheap."

Ordering of tankers boomed as yards could not resist the lure of the dollar, some taking on orders that amounted to twice their annual capacity, with no prospect of being able to meet the deadlines for the delivery of ships. Such was the frenzy that delivery dates were pushed aside and the ordering spree continued.

At the close of 2006 some 2781 chemical tankers consisting of a total of 52,369dwt were operating in the market. By the close of the third quarter of 2010 this number had swelled to 3905 ships of 78,560dwt, an increase of 40.4% in ship numbers and 50% by deadweight on 2006 figures.

This ordering frenzy led to the evolution of small yards on China's river banks and internet yards, where the facility would be built if it could get orders. These yards were building vessels that were substandard. The industry insider said that: "These ships had only four pumps with a limited capacity, they were poor ships yet they were meant to trade in international waters. In fact they were so poor they were refused international licences, but they still affect the industry because they operate in China's lucrative coastal market."

This situation endured right up until the failure of the banks in 2008, where upon the industry went into reverse with an unprecedented swiftness. Orders that had been made were suddenly cancelled, owners refused to take delivery of ships that were not delivered on time, prices tumbled and yards have been left scrabbling around for business.

One deal that epitomised the swift and painful retreat saw an eight-ship deal between Stolt Nielsen and SLS in South Korea reduced to four vessels. The yard, however, was late in delivering the four vessels that remained on order, breaching its contract with the owner, who refused to accept the vessels.

In time the yard was forced to accept a US$10million discount on each ship in order to convince the owner to take delivery of the vessels.

In Turkey where there was a hub of chemical tanker building activity the orders and the speculative building dried up over night leaving an industry that had employed in excess of 30,000 staff prior to the banking scandal decimated with possibly as little as 10,000 workers still employed. Most of these were merely administrators while the others were mainly covering ship repair work.

In China and South Korea new orders for chemical tankers are few and far between, however, Japan has maintained its level of ordering, if not to the pre-crash levels, to levels that can be considered sustainable for yards.

According to the industry source this is almost entirely due to the Japanese yards, Fukuoka, Kitanihon, Uzuki and Shin Kurushima that build the so-called "Toyotas" (labelled as such because they never break down). The 19,900dwt chemical tankers are so reliable that owners are continuing to order the design.

"These ships can trade anywhere in the world, they are the workhorses of this sector and it is because of these ships that the numbers of vessels in the 10,000-20,000dwt range is expanding," said the source. He added that these ships are extremely flexible. With some 162 Toyotas currently trading, all under five years old, and a further 30 on order the sector is set to expand further.

Ships in the 50,000dwt division are also recording a massive increase in numbers and capacity, however, the source said that this was mainly due to the owners acquiring International Maritime Organization (IMO) certificates that will allow the vessels to carry "easy chemicals", such as urea, fertilisers and vegetable oils, if necessary, but in reality they rarely carried these cargoes. They are mainly contracted to carry clean petroleum products.

Owners of these larger ships obtain the

Table 1. Chemical tanker orderbook development ('000dwt) *as at 30 Sept 2010.

Size (dwt)	1,000-5,000		5,001-10,000		10,001-20,000		20,001-30,000		30,001 - 40,000		40,001 - 50,001		50,001 +		Total	
Year	No.	'000 Dwt	No.	'000 Dwt	No.	'000 Dwt	No.	'000 Dwt	No.	'000 Dwt	No.	'000 Dwt	No.	'000 Dwt	No.	'000 Dwt
2009	33	143	177	1,274	205	3,250	79	1,995	57	2,060	145	6,808	60	3,070	756	18,600
2010*	25	105	150	1,076	168	2,665	66	1,663	45	1,625	120	5,617	47	2,402	621	15,153
4 Q 08	29	121	194	1,401	306	4,843	86	2,146	93	3,423	151	7,030	65	3,298	924	22,262
1 Q 09	26	110	179	1,300	286	4,519	88	2,192	84	3,097	140	6,519	62	3,146	865	20,883
2 Q 09	28	117	205	1,454	276	4,364	82	2,052	73	2,637	142	6,530	92	4,663	898	21,817
3 Q 09	28	118	185	1,334	233	3,683	76	1,904	69	2,506	160	7,498	67	3,426	818	20,469
4 Q 09	33	143	177	1,274	205	3,250	79	1,995	57	2,060	145	6,808	60	3,070	756	18,600
1 Q 10	32	139	176	1,246	190	3,021	79	1,990	43	1,557	133	6,234	50	2,557	703	16,744
2 Q 10	25	105	150	1,076	168	2,665	66	1,663	45	1,625	120	5,617	47	2,402	621	15,153
3 Q 10*	23	97	121	851	147	2,362	48	1,214	22	779	86	4,076	61	3,287	508	12,666

Size (dwt)	1,000-5,000		5,001-10,000		10,001-20,000		20,001-30,000		30,001 - 40,000		40,001 - 50,001		50,001 +		Total	
Year	No.	' 000 Dwt	No.	' 000 Dwt	No.	' 000 Dwt	No.	' 000 Dwt	No.	' 000 Dwt	No.	' 000 Dwt	No.	' 000 Dwt	No.	' 000 Dwt
2005	38	123	40	283	43	676	12	322	29	1,046	44	1,979	12	625	218	5,054
2006	43	141	29	215	83	1,223	11	289	30	1,102	44	1,942	19	974	259	5,886
2007	48	178	43	316	108	1,588	8	202	41	1,539	49	2,245	22	1,130	319	7,198
2008	26	99	94	681	173	2,586	8	195	41	1,520	55	2,510	58	2,986	455	10,577
2009	22	76	95	692	140	2,150	10	240	31	1,127	53	2,396	50	2,548	401	9,229
2010	24	94	119	852	134	2,072	23	567	31	1,137	51	2,373	44	2,272	426	9,367
2011	10	46	45	313	60	951	17	441	15	532	45	2,140	31	1,652	223	6,075
2012	0	0	11	87	23	400	12	300	3	104	12	584	12	641	73	2,116
2013+	0	0	1	7	2	40	2	50	0	0	3	138	3	206	11	441
4 Q 08	2	9	33	228	50	720	3	73	10	374	19	863	19	993	136	3,260
1 Q 09	6	21	21	157	38	581	3	72	10	365	13	597	15	761	106	2,554
2 Q 09	4	13	25	179	41	628	4	94	7	256	17	760	16	816	114	2,746
3 Q 09	5	17	27	183	36	564	3	74	7	251	11	488	11	562	100	2,139
4 Q 09	7	25	22	173	25	377	0	0	7	255	12	551	8	409	81	1,790
1 Q 10	3	11	26	189	30	481	2	47	13	470	14	644	14	719	102	2,561
2 Q 10	7	29	19	146	27	411	3	72	7	263	4	190	8	408	75	1,519
3 Q 10	1	3	10	73	15	209	1	25	7	261	7	325	7	357	48	1,253

Table 2. Chemical tanker deliveries.

IMO 2 certificates for these ships often so that they can carry the occasional backhaul cargo if it is available.

Even with a surge in scrapping levels, with some 100 ships of 2.12million dwt scrapped in the first nine months of 2010 compared to 84 ships of 1.76million dwt in the whole of 2009, there is insufficient demand in the market to generate a

Size (dwt)	1,000-5,000		5,001-10,000		10,001-20,000		20,001-30,000		30,001 - 40,000		40,001 - 50,001		50,001 +		Total	
Year	No.	'000 Dwt	No.	'000 Dwt	No.	'000 Dwt	No.	'000 Dwt	No.	'000 Dwt	No.	'000 Dwt	No.	'000 Dwt	No.	'000 Dwt
2005	8	25	8	54	4	60	5	132	11	372	0	0	0	0	36	643
2006	11	31	7	51	7	110	11	300	7	237	0	0	0	0	43	729
2007	8	18	14	102	7	102	12	339	23	783	3	132	1	55	68	1,531
2008	10	34	15	109	7	105	8	212	14	505	4	180	0	0	58	1,145
2009	13	33	12	86	21	306	12	317	13	462	12	511	1	51	84	1,766
2010*	6	19	30	218	18	263	15	388	23	837	11	494	1	51	100	2,127
2010**	103	284	39	259	9	126	1	28	7	244	0	0	0	0	159	941
2011	15	46	23	158	5	77	1	30	5	181	3	136	0	0	52	628
2012	8	29	7	52	10	131	4	99	5	194	5	210	1	53	40	768
2013	12	31	14	97	8	131	6	141	2	78	3	130	0	0	45	608
2014	15	48	32	218	9	147	5	123	1	33	2	87	1	51	65	707
1 Q 09	1	1	4	28	3	41	4	113	3	106	1	45	0	0	16	334
2 Q 09	2	3	2	16	3	51	0	0	3	101	3	125	0	0	13	296
3 Q 09	6	15	0	0	9	132	5	122	4	142	4	166	0	0	28	577
4 Q 09	4	14	6	42	6	82	3	82	3	113	4	175	1	51	27	559
1 Q 10	0	0	12	87	5	79	6	154	11	409	3	133	0	0	37	862
2 Q 10	5	15	11	78	9	129	4	98	7	251	6	266	0	0	42	837
3 Q 10	1	4	7	53	4	55	5	136	1	34	2	95	1	51	21	428

Table 3. Chemical tanker demolition ('000dwt).

significant confidence that would translate into new orders.

Consequently the chemical tanker orderbook has fallen from 924 ships of 22.4million dwt in the fourth quarter of 2008 to 508 ships of 12.66million dwt by the end of the third quarter this year. Many of these ships will never be built as owners seek to withdraw from newbuilding contracts that had appeared to be a good idea at the time, but are now looking more and more like a serious financial error.

Many ships have already been cancelled, United Arab Chemical Carriers ordered 16 tankers and have accepted delivery of eight ships, the remainder were cancelled; Malaysian operator MISC cut its eight ship order to four vessels of which two have been delivered, a further two will be delivered at some point.

"People jumped on a bandwagon that suddenly stopped, there is no justification for new chemical tankers orders over the next two years, we must roll forward a big backlog that must be spread out over the coming years," said a chemical industry source. *NA*

Brodosplit delivers *Stena Penguin*

Stena Penguin is the ninth of 10 P-Max sisterships built by Croatia's Brodosplit yard.

Delivered in October the latest vessel in the series is being chartered out to ST Shipping on a three-year lease. Two other P-MAX tankers *Stena Polaris*, which was delivered in February this year, and *Stena Premium*, which will be delivered at the beginning of 2011, have also been signed to three-year charters with ST Shipping.

The other eight tankers in the series have all been signed to charters of between three and 10 years from delivery. The fleet operates in different geographical markets all over the world, transporting both light and heavy petroleum products as well as crude oil.

The first P-MAX tanker was delivered in 2005 from Brodosplit Shipyard. The tankers have double hulls, optimum corrosion control, two engine rooms with full water and fire integrity and two separate propulsion systems. Superior manoeuvrability and an integrated bridge layout facilitate the safe navigation in narrow channels. However, the *Stena Penguin* is the second tanker in the series with ice class 1A. *NA*

***Stena Penguin* gets delivered.**

Technical particulars

Stena Penguin

Length, overall	182.9m
Breadth, moulded	40.0m
Draft, design	11.3m
Deadweight, design	65,200dwt
Cargo volume (100%)	70,200m^3
Heavy fuel oil volume (100%)	2000m^3
Water ballast volume (100%)	26,200m^3
Main Engine	2 x B&W 6S46MC-C
Power, output (MCR)	2 x 7860kW @ 129rpm
Design speed, at design draft, CSR and 15% sea margin	14.5knots
Tanks	5 x 2 lasttankar + 2 sloptankar
Tank coating	Epoxy
Tank Heating	Steam, SS SUS316L värmeslingor

Global Sea takes a bow

Delivered in February this year *Global Sea* is the first ship to be built in China with the 'Clean Ship Super' and 'Comfort Noise' notations from Bureau Veritas, the highest environmental notations available.

Flexibility is the major selling point for *Global Sea,* which is fitted with the highest European-standard operational equipment, making it suitable for European trading and enabling it to carry a full range of products including semi-gases such as propylene oxide and isocyanates, phenol plus high heat waxes.

The vessel's cargo system is fully insulated with heat-traced lines and phenol filters fitted, and offers the possibility of both hot water and thermal oil heating with two secondary heating systems, depending on the cargo to be carried.

Global Sea **sports the highest available environmental notations.**

TECHNICAL PARTICULARS

Global Sea

Gross tonnage:	5424
Deadweight:	7470
Total cubic capacity	8341
Slop tank(s) capacity (98%):	143.2m^3
Total capacity of SBT	3573.1m^3
Percentage of SDWT	48
Number of cargo tanks	20
Maximum loading rate:	450m^3
Brake horse power of bow thruster:	536bhp 399.69kW
Type of fuel is used for main propulsion:	IFO 380
Type of fuel is used in the generating plant:	MDO
Capacity of bunker tanks - IFO and MDO/MGO	239.1m^3 62.4m^3

Weighing in at 7470dwt the vessel sports 20 cargo tanks totalling 8544m^3 all with separate pumps and it is designed with four smaller cofferdam tanks for minimal loss of capacity when incompatible adjacent cargoes are being carried offering better optimisation and parcel size utilisation.

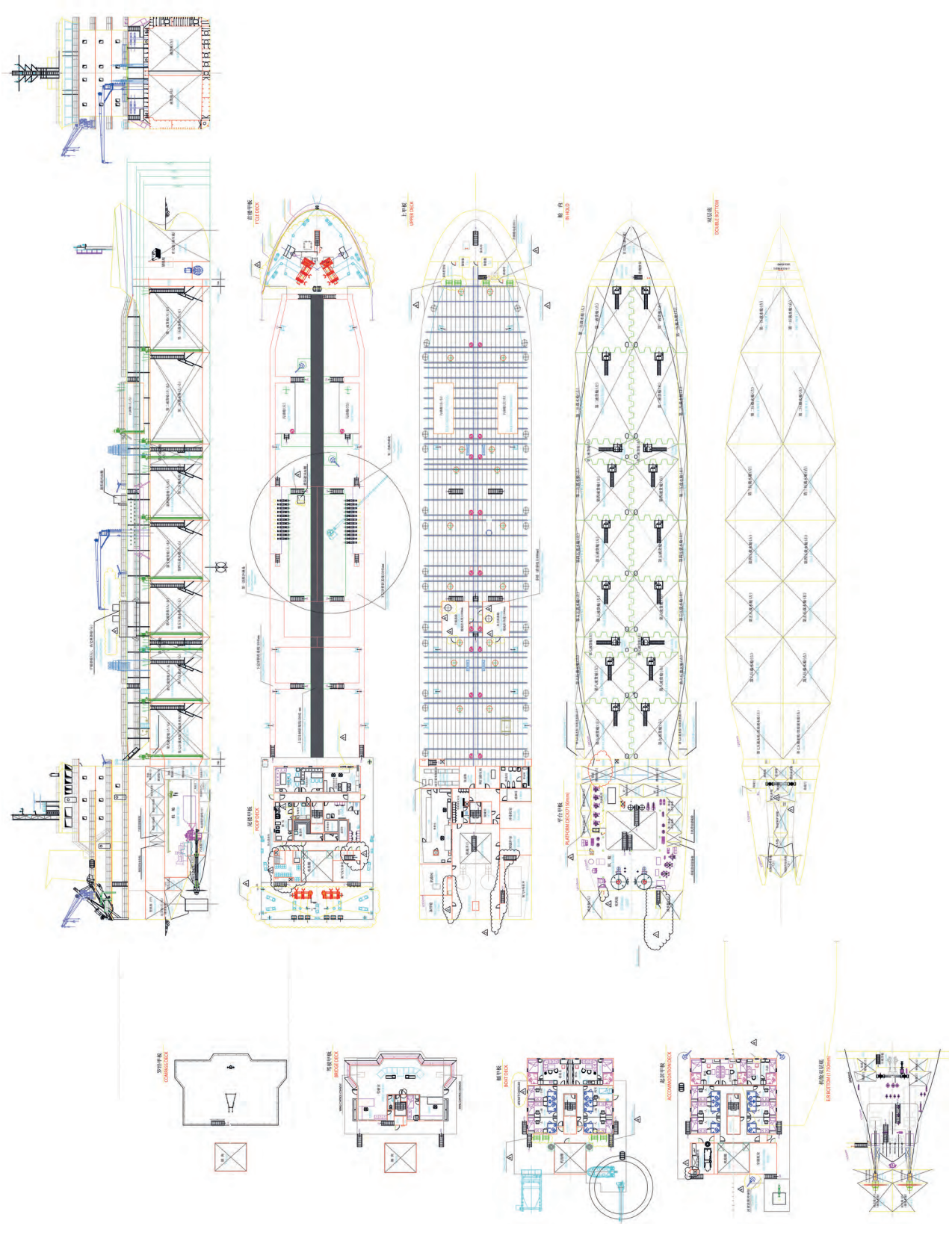
Its good cubic/DW ratio, with superior stowage flexibility will allow trading with a good mix of sophisticated special chemicals, commodity chemicals and petroleum products in any market segment, including areas requiring Ice Class 1A tonnage.

Global Sea is fitted with a pair of Man BW type 8L21/31 engines, each of 1760kW, and a pair of shaft generators each of 500kW, providing a speed in ballast of 14knots.

For safety and quality purposes, the vessel is fitted with a nitrogen generator for compliance with existing customer requirements and new port regulations.

It is also equipped with two engines, two controllable pitch propellers and two Becker rudders. Complemented by a 400kW bow thrusters, the propulsion configuration will provide the vessel with superior manoeuvrability, eliminating the possibility of a single point of failure. With the Normal Service (NS) notation, the vessel can trade on one engine if required, if one engine requires to be shut down for maintenance, or in order to maintain an economical speed. *NA*

General arrangement of *Global Sea*.



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The Branch currently needs applicants who have the ability and experience to manage UK ship safety policy for passenger or cargo shipping. However they should expect to work on other policy areas - including offshore vessels, high speed craft, inland waterways, fishing vessels and small commercial and recreational craft - during a varied career in the MCA.

Ship Surveyor candidates should be graduates in naval architecture. Engineer Surveyor candidates should have at least an MCA Chief Engineer III/2 unlimited Certificate of Competency plus suitable experience as chief engineer or second engineer. Alternatively Class III/2 experience at senior watch keeper level may be acceptable if coupled with other qualifications, e.g. a relevant or higher degree, an Extra Class 1 Certificate or Chartered Engineer status.

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THE SUPERYACHT PAVILION AT METS 2010

Getting down to business

What is the SuperYacht Pavilion?

The SuperYacht Pavilion (SYP) and its service-oriented Refit Boulevard form a show-within-a-show at METS. Dedicated to companies who offer equipment and services specifically to the large leisure yacht sector, the SYP is a destination in its own right, but also sits at the heart of METS, the world's biggest and best attended leisure marine trade show. Over 115 exhibitors assembled in the SYP and Refit Boulevard in 2009 – to sell, promote and network. It's busy, it's professional – and it's special.

Why special?

The SYP/METS combination is unique. At no other trade-only event can you visit a thriving superyacht equipment exhibition and also have access to over 1,000 other marine trade exhibitors, some of whom also cater to the superyacht sector. It's also a unique launch pad, as Ian Taylor, group sales manager of Quest International, reveals: "As a supplier of new and novel technology we were looking for the right approach to allow us to undertake a technology transfer into the superyacht and megayacht arena. METS provided us with a fantastic platform... and the organisers invited our managing director to be part of the Superyacht Forum. All of this support led to a fantastic reception from the industry and what we believe to be an unprecedented level of interest on the stand."

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All GSF delegates have free entrance to SYP. Visitors of the SYP do not automatically have access to GSF.

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To visit the SYP you need a FREE three-day entrance pass to METS 2010. Please pre-register for this on metstrade.com. To help with your planning, Amsterdam RAI can also book hotel rooms for you and assist with other travel requirements. Go to metstrade.com and click on 'visit' and 'hotel & travel service'. To exhibit at the SYP, please contact the organisers.

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HUMAN FACTORS FOR NAVAL MARINE VEHICLE DESIGN & OPERATION

By Jonathan M Ross MRINA Ref: HFNM

There is a driving need for naval professionals to focus on human factor issues. The number of maritime accidents is increasing and the chief cause is human error, both by the designer and the operator. Decreasing crew size, lack of experienced operators, operations in higher sea states and fatigue worsen the situation. Automation can be a partial solution, but flawed automated systems actually can contribute to accidents at sea. This book integrates knowledge from numerous resources as well as the advice of a panel of eight recognised experts in the fields of related research, development and operation.

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SAFETY MANAGEMENT AND ITS MARITIME APPLICATION

By Professor Chengi 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.

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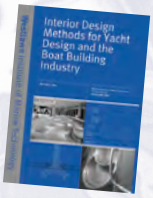

By Lisa C. Hix Ref: IDMYD

In a first-time release to industry and the general public, the Westlawn Institute of Marine Technology announced in April 2009 this textbook was now available for purchase. Specifically prepared as a textbook for Westlawn's intensive Yacht & Boat Design Program, and also used as the text for Westlawn's continuing education course in boat interior design this book provides detailed technical information not available from any other source. Heavily illustrated, with numerous line drawings and photos on nearly every page, this textbook will answer almost any question a designer, builder, surveyor, crewmember, or serious boater may have about the accommodations and arrangements required for safe, comfortable, and efficient crew and passenger spaces. Though focused on boats (vessels under 200 feet or 60 meters), the information is equally valuable for commercial vessels of all sizes.

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