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"Unlike other forms of transport, the marine industry has yet to establish a credible alternative to fossil fuels"
Ryan Maugham, managing director of Avid Technology, **see page 77**

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Ballast water treatment systems are like coffins: **"Nobody wants one… everyone needs one"**

At a recent event held by manufacturer Evoqua, the company's business manager for ballast water treatment system Matt Granitto offered a quote that I suspect will resonate with shipowners with regard to this technology.

He said: "There is no economic benefit to this – we know that." He continued:: "I tell my salesmen – we're selling coffins here. Nobody wants one, but guess what? Everyone needs one."

And that – starkly – is the situation faced by shipowners at the moment with regard to ballast water. They grudgingly have to invest in this technology in the clear knowledge that in most cases it represents a cost with no potential for return.

However, this situation also represents a problem for manufacturers in the long term. At the moment, they are able to differentiate themselves by acquiring the necessary type approvals that mean the customer can have reasonable confidence that they will be compliant if tested. While the current regulatory uncertainty exists, those manufacturers able to offer this confidence will naturally thrive.

But what will happen when uncertainty no longer exists? When all the systems still on the market can offer compliance, what then? It seems likely to me that, as a grudge purchase, the only differentiators customers will care about when it comes to ballast water treatment systems will be price and cost of ownership, at which point manufacturers may be faced to a cutthroat race to the bottom.

At the moment, of course, manufacturers are frantically trying to make the most of the market's need for reliable, compliant systems. Look ahead a few years, however, and they may be faced with different challenges.

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The ship of things to come?

We are all used to hearing that digitisation is the greatest transformative force in shipping, but if we're honest, few of us are quite certain what form that transformation will take.

In this respect, a good bellwether is probably Maersk since, as the world's biggest container shipping company, you would expect it to be in the technological vanguard.

And Maersk doesn't disappoint. It is currently generating attention with a number of digital initiatives that may well offer a clear idea of how shipping is changing due to digitisation. One of these is a deal with IBM to digitise, manage and track shipping transactions using blockchain technology.

This followed on from the news of another groundbreaking collaboration with online retailer Alibaba, whereby its customers can now book space on Maersk vessels via its website – thus giving the cargo owners greater control over their own supply chain.

On the surface, these developments may seem merely interesting, but what they represent is revolutionary. This is because they are part of a bigger picture whereby shipping becomes a fully-digitised part of the supply chain – something in which it is rather late to join the party,

The implications of this are huge and have ramifications for all aspects of how such vessels are likely to operate in future. And, of course, where Maersk leads, others will have to follow. So it is a question of either embracing this digital disruption or being consumed by it. *MP*

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NEW STANDARD TO SHAKE UP SHIPPING

The new ISO 19030 hull and propeller standard could be good news for shipowners

The new ISO 19030 standard has been launched and is to undergo revision every three years (credit: Jotun)

The new ISO 19030 hull and propeller standard has come into force and looks set to have a huge impact on ship operators' bottom lines.

The benefits were unveiled at an open forum on the new standard, which was held in London, UK and hosted by paints and coatings supplier Jotun, class society DNV GL and the Baltic and International Maritime Council (BIMCO) – all driving forces behind the launch of the new standard.

Jotun's global sales director for hull performance solutions Stein Kjølberg said in an interview: "By applying the standard, ship operators have a tremendous opportunity to have access to more data to analyse performance, both historically and in the future. It enables them to make a decision about the right solution to be applied to a vessel. This does not need to be the most expensive or advanced, but suited to the trade of that vessel. There is a lot of money to be saved by applying this standard."

He explained how one ship operator saved US$1.8 million in between two drydocking periods after applying the standard – but it could have saved even more if it had applied the standard earlier. "Within the first period there was a significant drop in performance. If it had carried out initiatives and inspections more quickly, it probably could have saved US$1 million – just by doing that," Mr Kjølberg said.

The standard will also bring clarity to the industry. "There have been several cases of owners not understanding that the underwater hull is affected if cleaning is delayed, so a lot of fuel is used before they do something about it. By having this standard, a ship operator can analyse and have a better idea of if, and when, it should carry out cleaning and what effect this will have."

The standard is just the beginning. "It is a good start. Ideally you should have a set up that can measure every step of the way – not just hull and propeller monitoring, but also engine management, crew management… There should be chain of different initiatives that identify ship efficiency," Mr Kjølberg said.

The standard will be revised and – based on what has been learned – updated every three years. Mr Kjølberg said: "We expect the standard to be refined and revised and made simpler to use and more accurate. More default methods will be put in so there is more variety. But there will be the same KPIs [key performance indicators], so it will be open, transparent and equal."

AkzoNobel was involved in developing the standard, too. Michael Hindmarsh, business development manager at AkzoNobel's marine coatings business, said: "We believe ISO 19030 represents a solid, initial 'line in the sand' in relation to monitoring hull and propeller performance, but there is still further progress that needs to be made."

He added: "To ensure the continued relevance of the standard, it is essential that ISO 19030 keeps pace with the ongoing development of technology and analysis capabilities that ship performance monitoring specialists are currently developing."

The main challenge of applying the standard is the handling of the sensors to collect the data needed. Tobias Gröger, DNV GL senior consultant for maritime performance solutions, Western Europe, added: "The challenge is to ensure that they are well calibrated and well maintained and that people know how to read data." ***MP***

Stabiliser demand prompts investment

Martin Visser, service director Aegir-Marine discusses stabiliser repair

Aegir-Marine has added stabiliser repair to its service package

In our contacts with shipowners we notice that they could do without the hassle of co-ordinating several parties to repair their ships.

Shipowners want to focus on their core business of transporting cargo, and they need strategic partners to maintain their vessels. At a time of ruthless competition, shipowners are constantly looking for ways to improve this balance, and Aegir-Marine is now supporting its clients by adding stabiliser repair to its portfolio of services.

Why are stabilisers employed?

To guarantee cruise ships more stable sea state behaviour, vessels are equipped with stabilisers port and starboard. These stabilisers, some more than 10m wide, are mounted below the waterline. Another advantage of stabilisers is that they considerably contribute to fuel reduction. They play an important role in improving the onboard experience for both passengers and crew.

What are passive stabilisers ?

The maritime industry recognises three types of stabilisers. The first are 'bilge keels' – strips of metal attached to the outer hull of the ship. The second type consists of fins attached to stern and bow. These usually protrude further than bilge keels, and offer more ship resistance against rolling movements. Both of these stabilisers are also called passive or non-retractable stabilisers.

What are retractable stabilisers?

The third type is the gyroscopic, active, stabiliser. The hydraulic systems enable the fins to be retracted into the hull of the ship. They are operated by a gyroscopic control system which senses the ship's roll, and is able to accurately change the stabiliser angle and effect. For lifting or down-force actions of the stabilisers, the control system has to take into account a great number of fast changing variables, such as waves, wind and ship motion.

Aegir-Marine employs 43 specialist engineers worldwide, in Europe, the Middle East and Africa (EMEA), Asia, and North and South America. The company works with a pool of 15 propulsion specialists and 15 seal specialists in EMEA. Now the company has added a specialist in stabilisers and steering gear to its team.

Our own Aegir Academy is developing a course to share the knowledge of our stabiliser expert. By the end of this year we hope to have trained two more employees in this field. By adding stabiliser expertise to our portfolio, we now are able to offer a full package."

Of all the stabilisers, 99 per cent are applied in naval and cruise ships and ferries. In cruise ships and ferries they are used to prevent passengers from becoming seasick. Navy vessels have to be swift and agile and are therefore prone to rolling, which adds to the risk of the ship heeling over. Stabilisers are mounted to dampen this unwelcome movement.

Since its establishment, Aegir-Marine has been very active in the cruise ship industry. Slowly but surely, we have been building a loyal customer base, thanks to an intensive customer oriented strategy. Our service level is the highest in the industry. To offer cruise shipowners an integrated and complete service package, we have now added stabiliser know-how to our company."

This summer, a new building, adjacent to the company's existing headquarters, will house a state-of-the-art workshop and fully equipped and certified repair shop. This will enable Aegir-Marine to deal with the growing demand for repair services in the maritime industry. Moreover, the company will be able to deal with larger ship components. The new location permits the overhaul of ship components of up to 50 tonnes. The height under the new crane hooks is 12.5m.

How is repair undertaken?

In our new repair shop, we will have no problem overhauling stabiliser components, but most of the work is still done when a ship is docked. Stabilisers are fairly complex. The system works with several rotary cylinders that have to be maintained properly.
In the past, Aegir-Marine positioned itself as a seal expert and, as a result, we also performed overhaul projects on stabiliser seals. But we had to refer to other companies when it came to stabiliser functionality problems. To obtain the knowhow that it needed, Aegir-Marine recruited an expert in this field. We can now offer a one stop shop. *MP*

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The DL36 range has expanded ABC's market to include larger vessels

ROBUST GROWTH FOR BELGIAN BUILDER

In tough times for enginebuilders, Anglo Belgian Corporation (ABC) has proved highly resilient

Headquartered in Ghent, Belgium, Anglo Belgian Corporation (ABC) was founded in 1912 by a group of Belgian entrepreneurs soon after they had built the first licensed Rudolf Diesel engine.

Since the 1980s the company has designed and manufactured medium speed, four-stroke diesel engines for marine, traction and power generation applications and turnkey power plants around the world.

In 2016, the company's engine production rose by 9 per cent, which also resultied in a record turnover. This was a mixture of new clients and existing ones, choosing the company's engines for challenging applications worldwide.

In marine applications, the company reports that the quantity of dual-fuel gas engines is increasing, while others go for diesel or heavy fuel oil in combination with catalyst solutions. In the meantime, the company's 8DL36 engine with 5,200kW at 750 rpm is ready for the world market.

The DL36 range has expanded ABC's market to include larger vessels such as ferries, coasters, offshore vessels, military ships, dredging applications and large tugboats. With the 8DL36 and the V-versions (up to 10,400kW) that will soon follow, ABC will be able to supply all major shipyards with solutions for any type or size vessel. The DL36 range will also enable ABC to be competitive in the 20MW-80MW power plant range.

With a bore of 365mm and stroke of 420mm, the DL36 will deliver 650kW per cylinder at 750 rpm with brake mean effective pressure (BMEP) of only 24 bar, ensuring that the traditional ABC reliability and robustness is maintained.

Introducing innovative technology such as exhaust gas recirculation, two-stage turbocharging and a radically optimised common rail system, the engine's emissions are designed to meet IMO Tier III requirements without a catalyst, maintaining excellent competitive fuel and oil consumption. For applications not requiring Tier III compliance, a full mechanical version will remain available. To be as versatile as possible, a wide variety of fuels, including marine diesel oil, heavy fuel oil, dual-fuel and bio-fuels are possible.

The 6 and 8-cylinder in-line engines will be focused mainly on the marine market, while the V engines (12 and 16 cylinders) will penetrate the large generator set applications to be found in thermal power plants, as the 16DV36 will produce over 10MW.

As a result of its recent growth, ABC has built a new assembly hall of 2,800m^2. This new, modern building represents an investment of $US3.2m. In order to handle future developments in ABC's product line-up, the hall has been equipped with a heavy-lift overhead crane with a capacity of 130 tonnes.

The building will initially serve as a buffer area for emergency diesel generator sets that will be used in EDF's nuclear facilities in France. In the course of the next year, the new DV36 engines will be assembled and tested in this hall. In order to do this, ABC has installed a brand new test bench that will be operational by mid 2017.

Speaking at the end of 2016, ABC's chief executive Tim Berckmoes expressed optimism, saying: "Although the economy today is not in very good shape, our orderbook for 2017 is quite good. A further increase in production capacity is ongoing. We continue research and development towards lower emissions and higher performance in combination with simplicity of design." ***MP***

Horizon yard pursues its vision


Hornblower on its way to New York

Alabama, USA-based Horizon Shipbuilding has brought technology and expertise together to achieve success

Horizon Shipbuilding describes itself as a 'best value' shipyard, founded in 1997 by a father and son team with considerable experience in ship design, construction, operations, maintenance and repair.

Located on a dredged inlet off the Mississippi Sound and the USA's Intracoastal Waterway and adjacent to Mobile Bay and the Gulf of Mexico, Horizon's shipyard is located on 35 fenced acres of land.

With the acquisition and development of its West Yard facilities, Horizon has tripled its production capacity. Located directly across the Bayou from its main yard, the West Yard adds about 89,000m^2 to Horizon's footprint, including 280m of waterfront, three production bays, and multiple launchways. The West Yard has recently been used to produce 40 crew boats in 20 months.

One of the company's most recent successes was the departure of the first of 13 New York Citywide Ferry vessels, built for Citywide Ferry operated by Hornblower, which will launch this summer. Each vessel takes about eight months to complete.

The ferry, hull H200, departed the shipyard on 21 March. The second ferry, hull H201, is scheduled to depart soon.

Prior to this, Horizon Shipbuilding delivered towboat *AB York* to its long-standing customer Florida Marine Transporters. This is the 19th vessel delivered to Florida Marine Transporters by Horizon and the ninth 36.5m towboat.

Travis Short, president of Horizon Shipbuilding, stated: "After the delivery of *AB York* this brings the total horsepower delivered to Florida Marine Transporters by Horizon to nearly 100,000, and counting. It is hard to grasp that nearly a decade has passed. Horizon appreciates the privilege to have been given the honour to build incredible boats for a truly incredible company."

AB York, designed by John Gilbert, is a 36.5m long by 10.6m wide, 3m draught towboat. It is four-decked and outfitted for service in areas with restricted overhead clearances and draught limitations. It is powered by two 1,471kW 3512C Caterpillar engines, provided by Louisiana Machinery Co, that are coupled to Twin Disc MG-5600 reduction gears with a 5.04:1 ratio, supplied by Sewart Supply. They turn 254cm five-blade, stainless steel wheels made by Sound Propeller, on 254mm shafts. Auxiliary power is supplied by two 175kW Caterpillar C9 generators. *AB York* is an open-wheel boat that holds 264m^3 of fuel.

"We have built a lot of towboats for Florida Marine Transporters," said Mike Sims, project manager for *AB York*. "This boat is not a thoroughbred racehorse but more like a Clydesdale – big and beefy with lots of oomph." Mr Sims went on to say: "Our craftsmen stepped up and built an excellent boat. It is quiet but powerful and can push a bunch of loaded barges while the crew relaxes in superior accommodation."

Horizon used its Gordhead management software to ensure that *AB York* remained on schedule and on budget. This software has reduced production man-hours and shortened delivery schedules, enabling Horizon to become more competitive.

With Gordhead, Horizon claims to be able to manage its projects like no other builder in the industry, enabling its team to communicate in seconds, the company claims. The software provides the ability to share drawings, specifications, schedules and other necessary information with production leaders and, in turn, with the team building the vessels.

Customers are able to join in the use of Gordhead to track, in real time, the progress of their vessel. The customer representative can be part of the discussions, monitor progress and even review the real-time production schedule. All problems, information and communication are readily available with a click of the mouse. Each production task is tracked using Gordhead, from the beginning of the design to delivery of the vessel. MP

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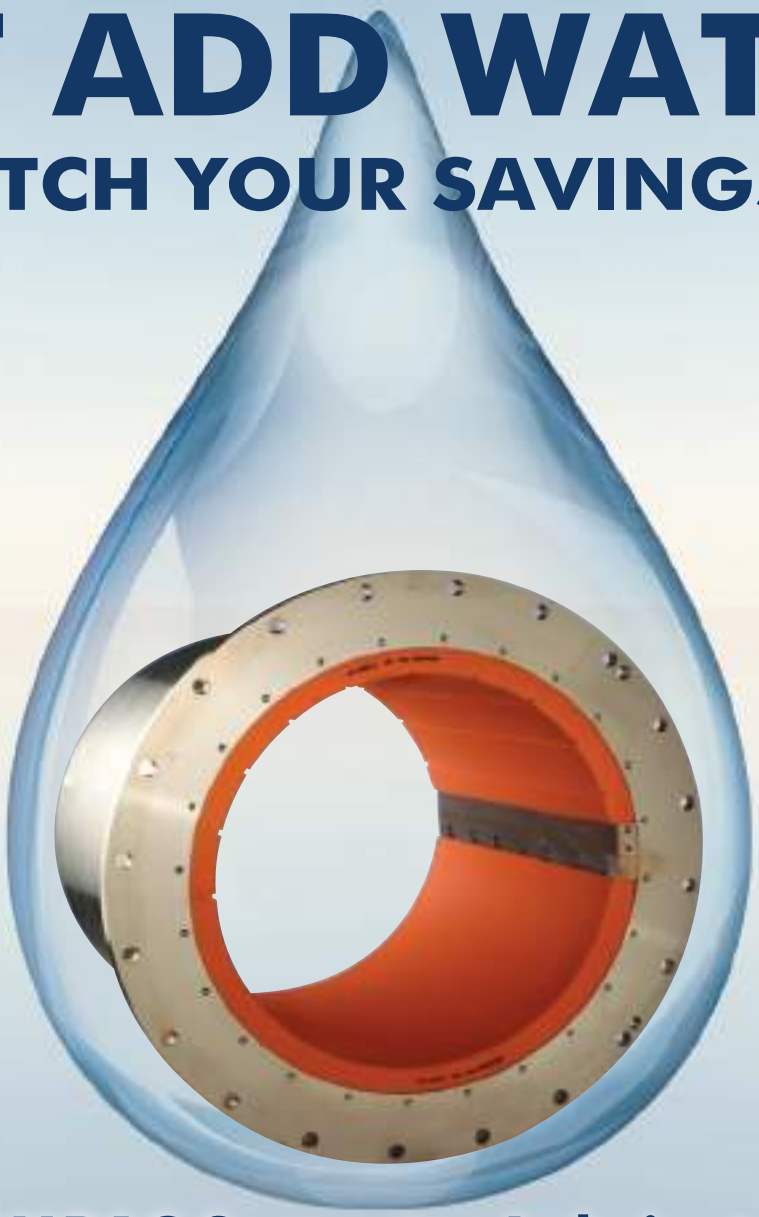

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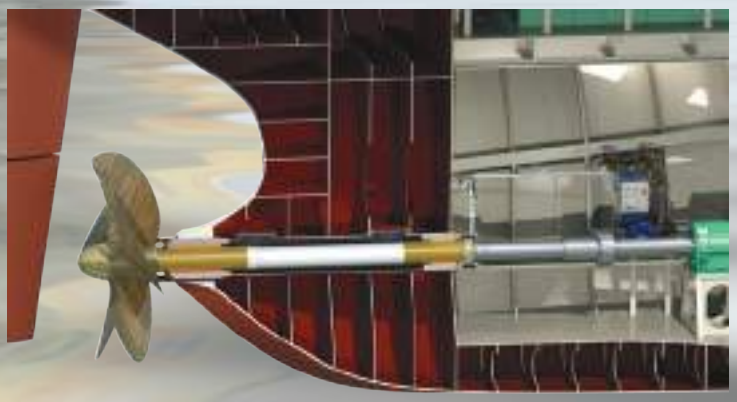

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HYUNDAI EXTENDS TWO-STROKE LICENCE AGREEMENTS

Hyundai Heavy Industries (HHI) has announced extensions to its licence agreements with the two biggest two-stroke engine manufacturers.

At a recent ceremony in Copenhagen, Denmark, HHI's Engine & Machinery Division signed a contract extending its two-stroke licence agreement with MAN Diesel & Turbo. This latest extension continues a collaboration on low-speed technology that began in 1976.

Thomas Knudsen, MAN Diesel & Turbo senior vice president and head of low speed, said: "MAN Diesel & Turbo has enjoyed a long working relationship with HHI, one that we are delighted to extend. HHI has always played a significant role in the development of two-stroke innovation and, indeed, produces the full range of our low speed portfolio. We look forward to inspiring each other for many years to come."

HHI has also signed an amendment to extend its current licence agreement with Winterthur Gas & Diesel (WinGD) for another ten years. The agreement covers the sale, manufacturing and servicing of WinGD low-speed marine engines. HHI is a long-standing member of the WinGD family of low-speed engine licensees.

WinGD and HHI have enjoyed a long, successful and fruitful relationship. As well as building many engines HHI has, over the years, contributed to the development of WinGD low speed engines and has built the first examples of new engine types such as the RT-flex82C, the RT-flex82T and the X92.

"WinGD and HHI have a long common history of introducing new technologies to the international shipbuilding industry. The extension of our licence co-operation agreement will enable us to strengthen our presence in the important Korean shipbuilding market and ensures that in the years to come our customers will continue to benefit from the availability of competitive, high quality fuel-efficient and environmentally friendly main propulsion engines for all merchant vessels built by shipyards in HHI territory. It also shows WinGD's long-term commitment to be a reliable and innovative partner to the Korean ship and enginebuilding industry," commented Martin Wernli, WinGD chief executive.

The signing ceremony between HHU and MAN took place in Copenhagen

Booster systems readied for LPG

Alfa Laval's FCM One low-flashpoint fuel booster systems are being readied for operation on liquefiLPG) fuelled tankers, having proved themselves on methanol fuelled tankers with MAN Diesel & Turbo's ME-LGI engines.

In 2013, Alfa Laval was selected by MAN Diesel & Turbo to deliver low flashpoint fuel supply systems for the world's first methanol fuelled tankers. The two companies had been collaborating since 2012 on fuel conditioning for MAN Diesel & Turbo's new two-stroke diesel engines with liquefied gas injection (LGI) technology. But when the engine maker contracted to equip nine vessels with methanol burning ME-LGI engines, methanol became the focus.

"MAN Diesel & Turbo has worked closely with Alfa Laval on development projects such as exhaust gas recirculation, where Alfa Laval's PureNOx technology cleans the circulation water," said Søren H Jensen, vice president and head of research and development for two-stroke business at MAN Diesel & Turbo. "That, together with deep expertise in fuel conditioning, made Alfa Laval the natural choice to deliver the low flashpoint fuel supply systems for methanol."

The finished booster technology, the Alfa Laval FCM One low-flashpoint fuel system, was installed on tankers built by Minaminippon Shipbuilding in Japan and Hyundai Mipo Dockyard in South Korea. The vessels' three owners, Mitsui OSK Lines (MOL), Westfal-Larsen and Marinvest, have since logged over 4,500 running hours with the FCM One in the past three years.

"The effectiveness and market-readiness of our ME-LGI engine technology has been clearly demonstrated by the fleet, said MAN Diesel & Turbo customer director Kjeld Aabo. "Alfa Laval's low-flashpoint fuel booster technology has played a significant role in that success, and we look forward to further co-operation as the application develops."

New booster developments are already underway. MAN Diesel & Turbo is in the process of modifying the ME-LGI engine series to use LPG as an alternative fuel, and Alfa Laval is preparing the booster system. After more than a year of development, the first Alfa Laval FCM One LPG will soon be delivered to MAN Diesel & Turbo's test facility in Copenhagen, Denmark.

"Tests of the engine and booster are expected to be completed by the end of 2017," said Roberto Comelli, fuel conditioning systems business manager at Alfa Laval. "In the meantime, Alfa Laval is preparing to support MAN Diesel & Turbo when the first LPG related orders come in. We are proud to be associated with LGI engine technology and to help give more customers access to this low emissions alternative." *MP*

NAVAL TANKERS LOOK TO MAN

MAN Diesel & Turbo has achieved notable successes powering naval fleet support tankers.

Major Spanish shipbuilder Navantia has chosen MAN main and genset engines to power two fleet support tanker newbuildings it is constructing for the Royal Australian Navy.

Each vessel will feature two MAN 18V 32/40 main engines and four MAN 7L21/31 gensets with shipset deliveries scheduled for December 2017 and June 2018 respectively.

Lex Nijsen, MAN Diesel & Turbo head of four-stroke marine, said: "We are currently receiving a lot of enquiries within the navy and governmental segment for MAN engines and experiencing solid interest in the form of orders, as evidenced here. As with the engines they replace, these Royal Australian Navy newbuildings are powered by MAN units. We welcome the repeat business and feel it is testament to the quality of our portfolio."

The order was made under Phase 3 of the Royal Australian Navy's SEA 1654 programme, which includes the replacement of existing supply ship HMAS *Sirius*, powered by MAN Diesel & Turbo two-stroke engines. Navantia offered the Royal Australian Navy a design proposal based on the Spanish Navy's proven, auxiliary-oiler replenishment ship *Cantabria*.

In addition to this, the United States Navy has chosen the Fairbanks Morse MAN 12V 48/60CR engine as main propulsion for a new series of 17 ships as it begins to phase out its existing tanker fleet. Known colloquially as oilers, the existing ageing fleet of 15 tankers is used to transfer fuel from coastal ports to naval vessels at sea.

Mr Nijsen said: "The US Navy knows our 48/60 engine very well, especially our L48/60A variant, and this played a key role in Fairbanks Morse winning this contract. The 48/60CR is the next generation of this proven engine, with a further optimised performance featuring improved fuel efficiency, reduced emissions and increased reliability."

The MAN 48/60CR engine was chosen for the US naval tankers

In studying the replacement of the existing tankers, the United States Department of Defense carried out detailed design studies with specific shipyards capable of building the new tanker class. The Fairbanks Morse MAN 48/60CR engine was chosen on the basis of the set programme goals of energy efficiency, equipment reliability and cargo-handling efficiency.

This new order came just two months after the United States Coast Guard selected multiple Fairbanks Morse MAN 28/33D STC engines for its offshore patrol cutter programme.

Cummins to power new DSV

Cummins has supplied engines and gensets to a new, state-of-the-art dive support vessel (DSV) recently delivered to Brazilian owner Oceânica.

The vessel's builder believes that a combination of shallow diving ability, a wide performance range and DP2 capability, will establish a new benchmark in subsea operations, reducing costs and increasing work flexibility and safety compared with previous existing concepts.

For a vessel of this kind, the engine power and propulsion method are of paramount importance. The owner chose four Cummins QSK19-M main engines and coupled them to ZF 2000 gearboxes driving Hamilton HM521 waterjets. With each of the four engines delivering 485kW the vessel, at just under 500gt, has a maximum speed of 12.5 knots and a cruising speed of 10 knots. The jets eliminate the danger that propellers can present for divers.

Electrical power for the bow thrusters and a variety of deck cranes and winches is provided by three Cummins QSM11 powered 300 ekW gensets as well as a Cummins 6BT5.9 powered 92 ekW emergency genset. The vessel is also equipped with a hyperbaric chamber, a CaviBlaster, a dive bell, a remotely operated vehicle (ROV) for 1,500m and another for 300m, an ROV A-frame and a complete range of equipment to handle a wide range of subsea tasks.

In the hull the main engines and jets are arranged in two pairs, port and starboard, with the three QSM11-powered gensets forward of the propulsion engines. Forward of the engineroom an auxiliary machinery room contains, among other equipment, the main switchboard, five compressors, the ROV power pack, and three water makers. Forward of that, six four-person cabins, with a head in each cabin, share a companionway and stairs up to the main deck.

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VARIED FACTORS SLOW LNG'S PROGRESS

Although the LNG sector is moving forward, it is still hampered in some areas, **says Barry Luthwaite**

The first LNG carrier for Yamal – *Christophe de Margerie* – is currently undergoing extensive ice trials (credit: SCF)

The energy slump is still affecting LNG prospects. Ordering has slowed considerably and several exploration projects under development by the oil majors have been delayed or are facing mothballing until things improve.

Demand for gas is steady, but many of the exploration projects are linked to long term Certificates of Authenticity (CoAs) from newbuildings. The result is that owners are seeking newbuilding delays or negotiating lay-up on delivery. Some will trade on the spot market but this is not always possible since vessels are built to specifications to serve purpose-built terminals.

Spot fixing however is becoming a way of life and the market is now witnessing owners establishing LNG pools as they wait for higher time charter rates. All the energy majors have taken a bashing from the fall in oil prices with OPEC's remedial situation failing after a few short weeks.

The encouraging factor is that the markets are seeing more tenders emerging for long term development projects and developing countries like Indonesia and Bangladesh pursuing their own LNG ambitions by acquiring or leasing tonnage. LNG prices have dropped over the last few years and it is a good time to be ordering gas carriers.

A study of the LNG orderbook reveals a backlog of 137 vessels on order including floating storage and regasification units (FSRUs) that will commission 26,333,266m^3 of capacity by 2019 for all but eight units. The latter take deliveries as far ahead as 2023. Most owners are optimistic of better times ahead from the end of 2017. Clean air regulations will always boost the gas industry. Around 20 LNG carriers are currently laid up on a cold state basis, while several others are in a warm status position waiting for spot employment prospects.

In the meantime, research and development continues apace. Japan is gaining ground against South Korea in the LNG construction rivalry. The country received a blow this year, however, when Kawasaki Heavy Industries confirmed the transfer of conventional ship construction from Japan to China.

The shipbuilder already has interests in China but will retain construction at Sakaide for gas carriers only in both LNG and LPG sectors. The company has been hit hard by the offshore slump but sees a future in gas because of tightening environmental regulations.

Due to the difficult market conditions, more owners are turning to FSRUs. Pioneered by Norwegian owner Hoegh LNG, 2017 so far has been productive in this sector. Maran Gas, Greece booked a single unit from Daewoo for delivery in 2020 but no employment has been secured so far. An option is attached for two more. Hoegh itself has followed up with a further 174,500m^3 FSRU option at Hyundai where all seven previous vessels have been built.

In a break with previous policy, Samsung has been chosen for a further FSRU with options attached for three more, vindicating the faith of Hoegh LNG in this concept.

More countries are expected to employ LNG offshore but charters at the right rates are not easy to achieve. Hyundai is currently negotiating a further FSRU with Turkish construction companies Kolin and Kaylon in working partnership with the government. New markets are expected to spring up in South Asia, Middle East and South America for imports of FSRUs.

Dynagas is expected to order at least one FSRU. Plans to convert an existing fleet unit were abandoned when the vessel secured a favourable charter. Unconfirmed reports indicated two FSRU's were committed at China's leading LNG builder – Hudong Zhonghua – but nothing transpired. Undoubtedly this yard will be among the bidders for any new contract.

With the downturn in the short term, some existing LNG newbuildings with long lead times are under the microscope for conversion to FSRUs, with Golar LNG leading the way. Tenders are expected to be invited by the end of 2017 for a 135,000 to 170,000m^3. FSRU to be anchored off Alexandroupolis and linked to a natural gas transmission system and subsequent markets. It will be built for Greek utility company Gastrade which will be assisted by shipowner GasLog, which has a 20 per cent shareholding in the utility company. Other bids for FSRUs

are in the pipeline from India, Indonesia and Argentina. Excelerate Energy has signed a letter of intent for one plus optional six 173,400m³ FSRUs.

Now Asia is examining more dual-purpose vessels to serve dual roles of coastal trade and bunkering duties. Offers have been invited from South Korean owners for construction of two 7,500m³ LNG tankers whose principal purpose will be to supply the island resort of Jeju Island with natural gas. The ship design will allow for bunkering operations also. The duo will operate for the state owned utility Kogas.

The Chinese were to first to introduce a policy of construction of small scale LNG vessels to serve their vast hinterland. Kogas has specified utilisation of its KC-1 cargo containment system, which is normally employed on very large gas carriers. Imabari has revived the application of self-supporting prismatic type-B LNG cargo tanks for a newbuilding 165,000m³ unit for Mitsui OSK Lines. The vessels are being built by Japan Marine United.

Japan Marine United will seek a licence to adopt the tank system for a series of proposed coastal LNG tankers to serve Japan's hinterland. Imabari has also supplied two 13,160m³ SPB cargo tanks for an FSRU for Exmar, Belgium in China.

With a dearth of conventional business there is intense competition for four specialist ice breaking shuttle tankers to serve the Yamal Peninsular in the Russian Arctic. Export of Yamal's first cargo is expected to materialise by the end of the year. Shipments will be handled by the Arc 7 173,400m³ icebreaking units capable of conquering sea ice of up to 2.1m thick. The first LNG carrier for Yamal – *Christophe de Margerie* – is undergoing extensive ice trials for SCF Group (Sovcomflot). MP

GAS CARRIER ORDERBOOK

Gas Carriers	Total		2017		2018		2019		2020	
Type	no.	m³	no.	m³	no.	m³	no.	m³	no.	m³
Liquid Natural Gas	133	20,029,398	62	8,949,498	35	5,318,900	28	4,866,000	2	340,000
LNG/LPG	4	109,500	4	109,500	–	–	–	–	–	–
LPG Carrier	103	4,991,868	74	3,501,068	20	776,400	8	631,400	1	83,000
LPG/Ammonia	3	114,000	3	114,000	–	–	–	–	–	–
LPG/Ethylene Carrier	35	1,088,500	23	534,500	8	342,000	4	212,000	–	–
Grand Total	278	26,333,266	166	13,208,566	63	6,437,300	40	5,709,400	3	423,000

LNG ORDERBOOK

Country of shipbuilder	Total		2017		2018		2019		2020	
Type	no.	m³	no.	m³	no.	m³	no.	m³	no.	m³
China	25	2,049,500	17	1,054,500	5	473,000	3	522,000	–	–
Germany	1	18,000	1	18,000	–	–	–	–	–	–
Japan	26	4,425,100	12	2,010,400	9	1,538,700	2	342,000	–	–
Korea (South)	82	13,625,498	35	5,970,298	19	3,292,200	23	4,002,000	2	340,000
Netherlands	1	5,800	1	5,800	–	–	–	–	–	–
Singapore	2	15,000	–	–	2	15,000	–	–	–	–
Grand Total	137	20,138,898	66	9,058,998	35	5,318,900	28	4,866,000	2	340,000

LPG ORDERBOOK

Country of shipbuilder	Total		2017		2018		2019		2020	
Type	no.	m³	no.	m³	no.	m³	no.	m³	no.	m³
Bangladesh	1	1,200	1	1,200	–	–	–	–	–	–
Brazil	2	8,000	1	4,000	1	4,000	–	–	–	–
China	40	1,700,500	26	994,500	11	523,000	3	183,000	–	–
Japan	37	1,535,618	21	630,018	8	204,200	7	618,400	1	83,000
Korea (South)	57	2,795,050	48	2,404,350	7	348,700	2	42,000	–	–
Philippines	4	154,000	3	115,500	1	38,500	–	–	–	–
Grand Total	141	6,194,368	100	4,149,568	28	1,118,400	12	843,400	1	83,000

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Damen Shipyards Group's range of Liquefied gas carriers is a response to the changes seen in the maritime LNG market in recent years

DAMEN REACTS TO GROWING LNG MARKET

The maritime liquefied natural gas (LNG) market has long been faced with a conundrum about supply and demand. Shipowners have been reluctant to make the switch to LNG because of the lack of bunkering infrastructure. At the same time, the development of bunker infrastructure has been slow to get off the ground because of low demand from the market. This has been described on numerous occasions as a 'chicken and egg' situation.

However, the outlook for the LNG market is changing. This can be put down to a number of factors. First, according to Bastiaan Schurink, Damen Shipyards Bergum's design and proposal marketeer, there is a continued focus on tightening exhaust emissions.

"Emissions regulations are getting tighter every day. Ships need to reduce their emissions, and one way to do that is by using LNG." Indeed, following the establishment of emission control areas (ECAs), shipowners are looking for solutions to meet the requirements of new legislation. "Of course there are other ways, but LNG is a preferred method to reduce not only SOx and NOx, but also a substantial volume of CO_2 emissions."

"Another important point is that the subject of LNG is becoming more and more of interest, both commercially and politically," explains Mr Schurink. "There is a growing number of European LNG bunkering projects that have been initiated by well-known oil and gas majors. EU funding is also making its presence felt."

In response to these developments, Damen is promoting its range of liquefied gas carriers. Richard Nugteren, Damen's cargo vessels product director, explains: "These vessels will be capable of transporting all types of liquefied gases – LPG [liquefied petroleum gas] and VCM [vinyl chloride monomer] in addition to LNG, for example. They will also exhibit a wide range of cargo capacities, including 500m^3, 1,500m^3, 3,000m^3, 5,000m^3, 6,500m^3 and 7,500m^3."

Damen's liquefied gas carrier designs draw on a number of tried and tested characteristics. "For example, they are designed with proven hullforms," says Mr Nugteren. "Focused on efficient hydrodynamics, this results in minimal resistance during sailing which, in turn, minimises fuel consumption."

Fitted out to the highest levels of comfort, accommodation areas can be designed to considerably reduce sound and vibration levels.

With regard to cargo, Damen's designs use industry-recognised tank layouts provided by suppliers specialising in cryogenic gas handling systems and tanks. Vaporised LNG can also be used for propulsion or auxiliary engines.

"At the moment this is a small niche market, but it is up and coming," continues Mr Schurink. "The European market is getting the ball rolling, and we expect these developments to continue in other regions too."

"For example, the North American market is paying more attention to emissions. And the feeder markets in Indonesia and the Mediterranean are also interesting. We have designs and specs available. All in all, we are ready to build these vessels."

Harris Pye to convert carriers to LSDO

At the end of 2016, the Harris Pye Engineering Group announced that it had been awarded a contract by a prominent Chinese liquefied natural gas (LNG) company to convert six vessels to low sulphur diesel oil (LSDO), with an option for conversions on further vessels to follow. The group has undertaken work, predominantly on main and auxiliary boiler plants, on more than 75 vessels around the world, including some 30 LNG carrier main boiler plants on behalf of more than a dozen clients, offering the conversion as a turnkey package.

"We are particularly active in the crucial area of LSDO conversions as required by Marpol Annex VI, which sets limits on NOx and SOx emissions from ship exhausts," explained Chris David, Harris ›››

››› Pye's chief technical officer.

"After the initial push for vessels to be compliant for US and European emission control areas (ECAs) the new ECAs in China, which came into effect late in 2015, have resulted in an influx of enquiries and orders. While the sulphur limit in the Chinese ECAs is at the 0.5 per cent mark at present, potential shortages of compliant heavy fuels, and the option to lower the limit to 0.1 per cent sulphur by the ports, means that converting the vessels to operate on LSDO will ensure a ready fuel supply and future-proof them against stricter emission limits."

When undertaking conversions of this kind Harris Pye takes care of class submissions, carries out a complete survey, undertakes the full design with the assistance of the client and of class, and fabricates and installs, whether at sea, in drydock, or a combination of both.

CNdM signs LNG cargo tank repair deal with Europe Technologies

French shipyard Chantier Naval de Marseille (CNdM) has signed a memorandum with the liquefied natural gas (LNG) division of Europe Technologies to develop and market membrane cargo tank-repair services for LNG carriers, floating storage and regasification units and, in future, other ship types that use natural gas propulsion.

The two companies will promote the CNdM shipyard for drydock surveys for these ship types, building on the dock's strategic Mediterranean location and on Europe Technologies' experience in carrying out these repairs.

Europe Technologies has a technical service agreement with market-leading membrane containment system manufacturer Gaztransport & Technigaz. It will supply the material, tools and equipment to the new partnership.

Last year it signed a similar partnership with Shipbuilding and Repair Development Co of Trinidad & Tobago.

CNdM carries out occasional LNG carrier repairs but wants to grow this business. It is part of Holding Genova Industrie Navali. Its base at Marseille handles shiprepairs and conversions.

The shipyard said in a statement: "CNdM aims to boost its market share in the LNG tanker specialist market. We have the certification and trained staff to operate on these vessels."

Teekay makes maintenance deal with MAN PrimeServ

MAN PrimeServ, the after-sales division of MAN Diesel & Turbo, has signed a maintenance contract with Teekay Shipping, one of the world's largest marine energy transportation, storage and production companies.

The new Engine Management Concept (EMC) contract is for the maintenance of *Oak Spirit, Creole Spirit* and *Torben Spirit*, sisters from Teekay's 173,400m^3 liquefied natural gas (LNG) carrier series. The agreement covers the provision of spare parts, maintenance management and the servicing of each vessel's two MAN B&W 5G70ME-GI gas injection, dual-fuel main engines.

Jeffrey Ang, MAN Diesel & Turbo head of CoC for engines and marine systems, Asia Pacific, said: "This agreement is significant in that it is the first market agreement that MAN PrimeServ has clinched involving our dual-fuel, two-stroke ME-GI engines. Furthermore, with Teekay nominating us as its preferred service provider, this contract will undoubtedly add momentum to our efforts to expand the EMC's reach within the gas engine segment."

According to the terms of the contract, MAN Diesel & Turbo in Copenhagen will deliver maintenance management and spare parts, while MAN Diesel & Turbo in Shanghai will take care of service for the engines.

Jens Seeberg, head of retrofit and upgrades and EMC, praised the co-operation between the two geographically diverse PrimeServ entities that facilitated the drawing up of the final agreement. He called the close relationship between the locations in PrimeServ's global organisation and its headquarters "an essential prerequisite for the success of the EMC concept."

The EMC is a tailor-made service model that is customised to suit each customer's particular requirements. Operating on a fixed budget, MAN PrimeServ takes care of equipment, planned and unplanned maintenance, the dispatching of personnel, and the provision of spare parts – all obvious tasks for the engine designer.

MAN Diesel & Turbo describes the adoption of the EMC by the shipping industry as a paradigm change within maintenance, as shipowners have traditionally taken care of maintenance themselves. The close co-operation within MAN PrimeServ's global network means that it can pool resources and exchange knowledge, and is able to offer customers a considerably higher level of service than individual PrimeServ hubs would otherwise be able to. MP

SWITCH ON TO CARRIER MARKET

PM machines manufactured by The Switch convert energy from a mechanical form to electrical and vice versa

The Switch is seeing demand for its advanced drive train technology, both for LNG carrier newbuildings and LNG-fuelled

Owned since 2014 by Japan-based Yaskawa Electric Corp, The Switch is a leading player in advanced drive train technology, with an installed base of more than 13GW of megawatt-class permanent magnet (PM) machine and converter packages.

The Switch has stepped up its efforts to win marine business in general since being taken over by the €3.3 billion turnover Yaskawa, then having bought out Wärtsilä's power drives product portfolio in Norway in November last year.

The company specialises in megawatt-class variable speed drives and PM technology. It has unveiled a business development plan to grow its marine-related business by 200 per cent over the next five years.

PM machines manufactured by The Switch convert energy from a mechanical form to electrical and vice versa. The company's PM shaft generators convert energy from mechanical to electrical for hotel power and heavy consumers.

When using pumps or propellers, the change of form goes from electrical to mechanical. In all cases, The Switch says, its technology provides smooth conversion.

The Switch also distributes the energy created in the most cost-efficient way – for example, through the use of DC hubs.

During distribution, it also stores energy to ensure smooth loading or peak shaving, balancing and maximising power resources.

The Switch PM shaft generators aim to create cost-effective electricity and to save fuel. The systems also aim to improve efficiency, as the designs are modular, flexible and lightweight. The Switch claims that its systems can help large merchant vessels, such as liquefied natural gas (LNG) carriers, to consume less energy during slow steaming.

Its frequency converters aim to deliver reliable speed control with PM machines. They are well suited for vessels that operate in diverse environments and at different speeds – including LNG-powered ferries, cruise ships, ice breakers and tugs – to meet the demands of modern, flexible power production and consumption.

Having entered the marine market in 2013, by January 2017 The Switch had received nearly 30 orders for its PM shaft generator technology through WE Tech Solutions, its Finland-based solutions provider and business development partner.

"We entered the marine market four years ago," said The Switch business development manager Mika Koli. "We saw potential to transfer our competency and the benefits that our technology can deliver to a sector facing challenges with regard to operational costs, falling profit margins and increasing environmental impact and regulations.

"Our products address all these issues. With this in mind, we believe we can make a real difference in marine, championing enhanced efficiency, the environment and our customers' competitiveness. We see this as the beginning of a new energy era."

In April last year, Saga LNG Shipping ordered a PM shaft generator for the 45,000m^3 LNG carrier newbuilding it has ordered from China Merchants Heavy Industries (Jiangsu) Co. Norway based, Singapore-owned Saga LNG Shipping will take delivery of the newbuilding in the first quarter of next year.

The order is part of a complete energy-efficiency solution from Finland-based WE Tech and includes the PM shaft generator technology from The Switch. The order also contains the option to build a second system, if Saga LNG Shipping exercises its option with the shipyard.

The PM technology-based system will help the mid-sized LNG carrier to improve its efficiency, no matter what speeds it sails at. That flexibility may be crucial, as the vessel has yet to be chartered.

The WE Tech drive active front-end low harmonic drive technology enables The Switch's PM shaft generator to operate over the full range of main engine speeds and to generate electricity for the ship's networks as efficiently as possible. That offers a particular advantage for electrical part-loads, which is the normal electrical load condition on a ship.

WE Tech will also supply an efficient power distribution solution to provide the vessel's electrical network with up to 1,200kW in power take-out (PTO) mode. The high-speed PMM 500 shaft generator will connect to the PTO shaft of the reduction gear in the propulsion line.

The Switch offers PMM 500 shaft generators across the 0.5MW-4MW power range, at speeds of up to 2,000 rpm for optimum flexibility.

Moss-type LNG carriers highlight green technology

MISC Berhad has taken delivery of its new liquefied natural gas (LNG) carrier *Seri Cenderawasih*. The 150,200m^3 LNG carrier is the second in a series of five Moss-type LNG carriers ordered from Hyundai Heavy Industries. On delivery, these new LNG carriers will be on a long-term charter to Malaysia's Petronas.

Seri Cenderawasih, along with its sister vessel *Seri Camellia* which was launched in September last year, *will be* part of the new generation of the Seri C class LNG fleet of Moss type vessels.

The newbuilds are part of MISC's long-term fleet expansion programme to cater for the energy transportation needs of Petronas. They have been designed for worldwide trading capability to enable them to call at all major LNG terminals around the world. These new vessels provide a more robust and superior cargo containment system and ensure a higher degree of operational flexibility for MISC to operate in harsh meteorological conditions.

The new generation of LNG carriers incorporate state-of-the-art technologies in various forms, including the integrated hull structure with four spherical tanks shielded by the continuous cover, which improves the overall structural strength of the hull.

Additional green technology features adopted for these new carriers include energy efficiency, emissions reductions, biodiversity management and end-of-life disposal. These features also include the installation of a selective catalytic reduction system for the diesel generator to comply with the latest IMO Tier III requirements and an ozone ballast water treatment system. The carriers will be powered by a Mitsubishi Ultra Stream Turbine plant, and installed with a pre-swirl duct and a propeller boss cap fin. *MP*

The *Seri Cenderawasih*, MISC's Second Moss-type LNG carrier (credit: MISC)

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Steerprop expands thruster solutions

The end of 2016 saw some significant product innovations from Steerprop

Development of the Steerprop ECO LM concept began in 2015

Finnish manufacturer Steerprop chose maritime trade fair SMM in Hamburg to unveil the expansion of its Steerprop CRP ECO product line with the new, compact and cost-effective Steerprop CRP ECO LM propulsor with integrated vertical permanent magnet (PM) motor.

The LM model is claimed to offer reduced lifetime costs, improved fuel efficiency and low vibration and underwater noise levels, while its compact construction makes installation and maintenance easier and maximises onboard comfort.

Development of the Steerprop CRP ECO LM began in 2015. The manufacturer planned to integrate a vertical electric motor onto the propulsor, to replace the upper gear and separate electric motor. The aim was to combine the hydrodynamic features of Steerprop CRP ECO propulsors with an efficient and compact electric motor to create a highly efficient, extremely compact propulsive unit.

The new model consists of a mechanical azimuth propulsor, an electric motor and a shaft line with flexible couplings. The integrated PM motor, auxiliary electric systems and instrumentation are located inside the vessel hull above the waterline, enabling maximum reliability and easy service access. The compact arrangement also results in saved space inside the hull.

The PM motor does not need a separate base and the LM unit can be retrofitted easily. The shaft line and flexible couplings are inbuilt, so no separate shaft alignment is needed during the installation of the propulsor. The bearing and lubrication systems are integrated with the propulsor and are equipped with standby systems. Propulsor cooling motors and lubrication pumps are controlled by a frequency converter, optimising the auxiliary system's power usage and enhancing overall propulsive efficiency.

The PM motor has a simple hollow rotor which makes it lighter in weight, while the inbuilt air and water cooling units are easy to connect to the vessel's water cooling circulation system. The PM motor offers high efficiency through the whole speed range, especially at lower power and speed. These features help to bring Steerprop CRP ECO propulsors to an even higher level of efficiency and compactness in the form of the Steerprop CRP ECO LM concept.

Steerprop has also launched a new generation of ducted azimuth propulsors with an upgraded design and improved technical features.

The company claims that the new generation of Steerprop propulsors offers greater agility and endurance in a compact package, with a lighter-weight construction, cast steel housing and enhanced robustness.

The unit is designed for hydrodynamic optimisation to achieve improved free-running efficiency and fuel economy, with a more slender body, a smaller hub ratio and a new high performance HJ4-nozzle design. The HJ4-nozzle guarantees superior bollard pull and allows optimal nozzle positioning. Traditional sacrificial anodes have been replaced with a new, non flow-disturbing shape cast anode.

The new generation of Steerprop propulsors are available with either electric or hydraulic steering, with direct diesel drive, electric motor drive and the option of a hybrid drive. A shallow draught version is also available that is designed especially for confined spaces at the stern.

The control system architecture is also new, from its programmable logic controller to levers, enabling functions such as the collection of data on performance history.

Steerprop propulsors offer various installation methods and, it claims, have an overhaul time of at least 15 years, which can potentially be lengthened by the company's optional condition monitoring service. *MP*

Rolls-Royce delivers Damen's 1,000th azimuth thruster

Damen's 1000th and 1001st Rolls-Royce US-type thrusters were delivered at the end of the year for installation in Romania

Rolls-Royce has delivered its 1,000th azimuth thruster to Damen Shipyards Group. This is a milestone achievement in a relationship that spans more than 30 years.

The 1,000th and 1,001st Rolls-Royce US 255 FP type azimuth thrusters, each with a power of 2,525kW, will be installed on a new Damen ASD Tug 2913, meeting customer demand for high bollard pull and cost efficiency.

Damen's first ASD tug design with Rolls-Royce US azimuth thrusters was delivered in 1993, but the relationship between the two companies goes much further back.

Ronald Lindeman, head of Rolls-Royce Marine sales for Central Europe West, said: "In 1983, before its acquisition by Rolls-Royce, Rauma, Finland-based Aquamaster supplied the first retractable thruster for installation on the anchor handling tug Damen Dragon Fly.

"In 2002 the ASD Tug 2810 design was introduced and is today one of the world's most popular tug designs. More than 420 Rolls-Royce azimuth thrusters have been delivered to this series.

"The milestone delivery of the 1,000th and 1,001st US units underscores our partnership with Damen, our biggest customer for this type of thruster."

Aila Lainio, Rolls-Royce marine area sales manager, who has 20 years' experience at the Rauma thruster plant, said: "You could say that Damen has become part of our life now. Rauma has produced a wide range of azimuth thrusters for Damen's various tug designs. The ASD [azimuth stern drive] design and the Rolls-Royce US-type azimuth thrusters make a unique combination."

She added: "We have worked closely in co-operation with Damen over the years to develop the optimum azimuth thruster range for tugs. We have a very creative and talented team in Rauma. Whenever Damen presents new requirements, we accept the challenge of developing solutions that allow us to continue to be Damen's first choice for propulsion equipment. We continually invest in research and development to optimise thruster performance and environmental efficiency. Ultimately we endeavour to design the best propulsion solution for all of our customers."

Mr Lindeman added: "We are constantly developing our azimuth thrusters to meet customers' expectations...Work to transform the facility in Finland is underway and is due for completion in 2020."

Damen's 1,000th and 1,001st Rolls-Royce US-type thrusters were delivered at the end of the year for installation in Romania.

Coating enhances thruster performance

ZF Marine Krimpen is applying Subsea Industries' Ecoshield hard coating to the nozzles and underwater components of its azimuth thruster units supplied to vessels operating in inland waterways.

The Netherlands-based company, a division of Germany's ZF Group, is using Ecoshield on thrusters supplied to a number of its US-based customers to reduce operational wear and tear in brown waters such as the Mississippi River.

Frank van der Vegt, ZF Marine's area sales manager for commercial craft thruster systems, explained: "We were looking to improve protection of the thruster's underwater components against damage due to the debris, sand and silt that is common in shallow draught inland waterways, particularly the Mississippi, as well as preventing damage due to cavitation and corrosion."

The solution was found in 2015, when ZF approached Subsea Industries to investigate whether its hard coating could protect its thrusters from the effects of abrasive waters.

After a series of patch tests proved successful, ZF Marine began applying the hard coating to all the underwater surfaces of the thruster. Since then, Ecoshield has been applied to the ZF 1,000hp azimuth thrusters that are installed on 12 towboats and pushboats operating in US waters.

"We offer the Ecoshield-coated thruster as an option, but it is a very good solution for increasing the life of thruster installations ›››

››› aboard tugs and pushboats operating in shallow waters," said Mr van der Vegt. "We see a really big improvement. They are less prone to damage, which reduces maintenance and operational costs. We see these benefits not only with the towboat applications, but also with other applications such as harbour tugs and passenger vessels."

Manuel Hof, production executive and NACE Inspector at Subsea Industries, said: "We are pleased that ZF Marine's decision to apply our award-winning Ecoshield hard coating to its thrusters is paying dividends for its customers. The Ecoshield-coated thruster option adds considerable strength to its position as the leading supplier of propulsion systems to the US pushboat market."

Subsea Industries has more than 400 ship references for Ecoshield on rudders but is seeing a marked increase in its application to thruster tunnels and gearboxes because of the operational savings it brings.

"We are also seeing an increase in interest from original equipment manufacturers," said Mr Hof. "Ecoshield safeguards propulsion systems and steering gear against cavitation and corrosion damage throughout the vessel's service life. This can significantly increase the operational life of rudders and thrusters. We have Ecoshield-coated rudders and thrusters that have not needed recoating after more than five years of operating in some of the harshest marine environments."

After a series of patch tests ZF Marine has applied the Ecoshield hard-coating to all underwater areas of its thrusters

ABB expands polar cruise sales with MV Werften

ABB will supply the complete power, propulsion and automation package for a series of new cruise vessels being built by MV Werften for Genting Hong Kong brands Crystal Cruises and Star Cruises.

The three Crystal Cruises luxury Endeavor class megayachts will be built to Polar Class 6 and will enable cruising in the Arctic. They will then follow the route of migrating whales along the coast of the Americas and Europe to Antarctica during the northern winter.

The two new Star Cruises Global Class ships will each be installed with three Azipod XO thrusters (Credit: ABB)

The Star Cruises Global class vessels will be two of the largest on the market with 204,000 grt each. These impressive vessels are specially designed for the Asian cruise market.

The five vessels will all feature a complete ABB propulsion system, electric power plant, automation and a marine software system. The three Crystal Cruises ships will each be powered by two Azipod D units, to enable the ships to navigate polar conditions, while the two new Star Cruises Global class ships will each be installed with three Azipod XO thrusters. All the vessels will also feature ABB's flagship automation with Intelligent Maneuvering Interface and OCTOPUS marine software for optimised energy management.

Approximately two thirds of modern large cruise ships, ice-breakers and high Ice class cargo vessels are fitted with Azipod propulsion. Cruise ship owners have been using Azipod units for two decades, favouring their increased efficiency, manoeuvrability and space saving properties over shaft line systems.

Marcus Högblom, vice president of global sales, passenger vessels and Azipod propulsion, said: "We are seeing increased interest in the polar regions from the passenger sector, so our expertise in the cruise and ice-going sectors means we are ideally positioned and can fully support our customers with their new projects."

Delivery of the five vessels is scheduled for 2019 onwards. *MP*

Schottel Combi Drives give increased manoeuvrability for a wide range of different applications (credit: Ulstein Verft)

Island Venture manoeuvres with Schottel thrusters

Schottel thrusters have brought considerable benefits to an offshore application

Norway's Ulstein Verft shipyard has commissioned an offshore construction vessel, *Island Venture*, which is designed for a high level of multifunctionality. Schottel supplied three powerful SCD 710 Schottel Combi Drives (formerly SCD 3040) in the Rudderpropeller version with an input power of 3,300kW each. They give the vessel increased manoeuvrability for a wide range of different applications.

Island Venture is 160m long, 30m wide and has been designed in such a way that it can be redeployed with a change of use. It was the product of a European joint venture, with building work carried out at two different locations. While the stern was produced at the Crist shipyard in Poland, the bow was built by Ulstein in Norway, where both parts were also assembled.

The vessel is designed for operation as an offshore construction vessel with multifunctional applications. Its equipment includes a 400 tonne crane for deepsea drilling operations down to a depth of 4,000m, a 140-tonne crane with 3,000m cable capacity, and three moon pools. It is ready for a subsequent change-over to passenger and cargo operations, including special measures for use as a module carrier.

The SCD is an electric azimuth thruster. In combination with a power management system, electric drives increase the efficiency of the propulsion system and reduce fuel consumption. Electric energy generation systems on board are capable of producing only the power that is required at the time and distributing it to the various consumers.

The desired thrust is set via the speed of the electric motor (frequency control). The connected generators always run at the optimum operating point. Combined with an SCD, offering high hydrodynamic and mechanical efficiency, a system of this kind is particularly economical.

The SCD is based on the Schottel Rudderpropeller, the mechanical azimuth thruster proven in decades of service in all sectors of shipping. According to the manufacturer, with the SCD Schottel's engineers have implemented a concept that unites the decisive technical and economical advantages of the Rudderpropeller with the electric drive principle.

The SCD is available in both single and twin-propeller versions. As with the Schottel Rudderpropeller, extensive positive experience with the mechanical Schottel Twin Propeller has contributed to the electric concept.

Its compact design makes the SCD suitable for applications when space is limited. This is particularly the case with offshore supply vessels, but the SCD is also an ideal propulsion system for ropax and double-ended ferries, tankers, container ships and yachts, according to Schottel. The SCD is based on the successful Rudderpropeller models SRP 1515, SRP 2020 and SRP 3030, with their proven mechanical components, and covers the power spectrum from 2,000kW to 3,800kW, with propeller diameters ranging from 2,500mm to 3,500mm.

In contrast with other commercially available systems, in which the electric motor is housed in an underwater pod that is over-dimensioned for this purpose, the motor in the SCD is vertically integrated into the support tube of the thruster and is thus inside the vessel. The SCD therefore features a very compact, hydrodynamically optimised underwater housing. It is also easy to install and to maintain. *MP*

MJP wins military waterjet orders

Marine Jet Power is to supply waterjets for the Korean Coast Guard (credit: RoK Navy)

The third Car Nicobar class vessel, *Tillanchang*, was commissioned in March (credit: Indian Navy)

Marine Jet Power has been awarded a repeat order to supply waterjets to another three Patrol Killer Experimental (PKX-B) fast attack craft for the Republic of Korea Navy. Last year, South Korean shipbuilder Hanjin Heavy Industries & Construction Co (HHIC) launched the first unit, which is currently undergoing sea trials.

The propulsion system comprises an MJP 950 single drive and MJP 650 double drive waterjet installation. Powered by General Electric's 7,355kW LM500 gas turbine engines and Caterpillar Marine's 1,397kW CAT C32 diesel engines in a combined diesel and gas turbine configuration, the top speed is 40 knots.

The 275 tonne platform has an overall length of 44m and an overall beam of 7m, and can accommodate a crew of 20. The PKX-B is lighter and faster than the previous generation of PKX-A guided-missile patrol boats. A total of 16 vessels are planned with an option for another 18.

Marine Jet Power has also been awarded two new contracts to supply waterjets for another eight 500-tonne patrol vessels for the Korea Coast Guard. Five vessels are to be built by HHIC and three by Kangnam Corp.

The propulsion system comprises an MJP 950 double drive and MJP 750 double booster waterjets. Powered by four diesel engines at a total of 14MW, the top speed is over 35 knots.

The new vessels will be delivered during 2018, continuing the existing 500-tonne programme and extending the series to comprise a total of 23 vessels.

Indian Navy launches waterjet fast-attack craft

The Indian Navy has commissioned a waterjet fast attack craft to enhance its maritime capabilities in the Indian Ocean region.

Built by government-owned Garden Reach Shipbuilders and Engineers (GRSE), the third Car Nicobar class vessel, *Tillanchang*, was commissioned on 9 March at Karwar on the west coast. The first two ships, *Tamugli* and *Tihayu*, were commissioned last year in Vishakhapatnam.

"These ships play a vital role in light of the security environment in the country, and are designed to take on both conventional and asymmetric threats. *Tillanchang* was able to achieve the fastest speeds – more than 35 knots – among all waterjet fast attack craft during speed trials," said vice admiral Girish Luthra.

DSVs use Hamilton waterjets

Oceânica Offshore in Rio de Janeiro, Brazil, has taken delivery of *Oceanicasub V*, the second vessel of a pair of monohull diving support vessels that will be chartered to Brazilian oil company Petrobras.

Designed by Incat Crowther in Australia and constructed by Arpoador Shipyard in Guarujá, *Oceanicasub V* is a 43m vessel and is classed by RINa. The new diving support vessel is fitted with an array of support equipment, including a deck crane, an A-frame for a remotely operated vehicle, another A-frame for a diving bell, a hyperbaric chamber, a high precision acoustic positioning system, a rescue or workboat with associated davit, and all necessary diving operations-related spaces and equipment.

Crew accommodation and operational spaces are finished to a high standard, and the layout of machinery and open deck spaces are well thought out to provide safe operations. As a result, the two vessels are said to be exceeding the expectations of both the operator and the charterer.

Four Cummins QSK19 660 bhp main engines coupled to Hamilton HM521 waterjets through ZF 2000 gearboxes provide propulsion power to the vessel. The waterjet propulsion was selected to reduce the risk to divers. Electrical power is provided by threeCummins QSM11 300 ekW gensets plus one Cummins 6BT5.9 92 ekW emergency genset. Three Thrustmaster 150kW tunnel thrusters enhance manoeuvring. **MP**

Wind propulsion to be tested on Maersk tanker

Flettner rotor sails are to be installed on a product tanker

An illustration of the Maersk P-class product tanker with two Norsepower Rotor Sails

Finland's Norsepower, Maersk Tankers, the UK's Energy Technologies Institute (ETI), and Shell Shipping & Maritime have announced that Flettner rotor sails are to be installed and trialled on board a Maersk Tankers owned vessel.

The project will be the first installation of wind-powered energy technology on a product tanker vessel, and will provide insights into fuel savings and operational experience. The rotor sails will be fitted during the first half of 2018, before undergoing testing and data analysis at sea until the end of 2019.

Maersk Tankers will supply a 109,647 dwt LR2 product tanker vessel which will be retrofitted with two 30m tall, 5m diameter Norsepower Rotor Sails. Combined, these are expected to reduce average fuel consumption on typical global shipping routes by 7-10 per cent.

The project is majority funded by the ETI with contributions from Maersk Tankers and Norsepower. Shell will act as project co-ordinator and provide operational and terminal and port consultancy to the project team. Maersk Tankers will provide technical and operational insight.

The Norsepower Rotor Sail Solution is a modernised version of the Flettner rotor – a spinning cylinder that uses the Magnus effect to harness wind power to propel a ship.

Each Rotor Sail is made using the latest intelligent lightweight composite sandwich materials, and offers a simple yet robust hi-tech solution. When wind conditions are favourable, the main engines can be throttled back, providing a net saving in fuel costs and emissions, without affecting the vessel's schedule. Independent experts will analyse the data gathered from the project before publishing technical and operational insights, and performance studies.

Commenting on the partnership, Norsepower chief executive Tuomas Riski said: "We are privileged and excited to be collaborating with Maersk Tankers, Shell, and the ETI on this project. We are optimistic that support for this trial from these industry-leading organisations will open up the market for our technology to a larger number of long-range product tanker vessels – paving the way for ship fuel efficiencies, and ultimately reducing emissions, including greenhouse gases. As an abundant and free renewable energy, wind power has a role to play in supporting the shipping industry to reduce its fuel consumption and meet impending carbon reduction targets."

Tommy Thomassen, Maersk Tankers chief technical officer, explained:"Together with our partners, we have the opportunity to deploy an innovative technology that can improve fuel efficiency on our LR2 product tanker vessels and help to reduce their environmental impact. We look forward to contributing to the project, and sharing our decades of experience and knowledge within safety and tanker operations."

Karrie Trauth, technology and innovation general manager for Shell Shipping & Maritime, commented: "At Shell, we believe that innovation and technology are key elements to improving the efficiency and environmental performance of shipping operations. We look forward to using our shipping and technical expertise to support this trial."

Andrew Scott, ETI's programme manager for marine, heavy duty vehicles and offshore renewable energy, added:"Flettner rotors have the potential to reduce ship fuel consumption substantially, especially on tankers and dry bulk carriers. It is one of the few fuel saving technologies that could offer double digit percentage improvements. To date, there has been insufficient full-scale demonstration on a suitable ocean-going marine vessel to prove the technology benefits and operational impact. Demonstrating the technology in this project will make it more attractive to shipping companies and investors, and could play a significant role in reducing the fuel costs and improving the environmental impact of shipping in the future." *MP*

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NAVAL APPLICATIONS EXPLOIT STRENGTHS OF TURBINE POWER

Military applications still dominate the landscape when it comes to the use of gas turbines, with light weight and high power being the key differentiators

To date, the US Navy – GE's largest marine gas turbine customer – has taken delivery of over 700 LM2500 engines

While gas turbine engines are increasingly finding applications in vessels including ferries, cruise ships, container ships and gas carriers, their most widespread use remains in naval vessels, where their power-to-weight ratio gives them a key advantage over diesel engines.

GE's Marine Solutions is one of the leaders in this field. Worldwide, more than 1,400 GE gas turbines log over 14 million hours serving 35 navies on 500 naval ships for 100 military ship programmes, ranging from patrol boats, destroyers and cruisers to corvettes, frigates, amphibious ships and aircraft carriers.

GE is one of the world's leading manufacturers of marine propulsion products, systems and solutions including aeroderivative gas turbines ranging from 6,000 to 70,275 shp, or 4.5MW to 52MW. According to the company, these gas turbines operate reliably all over the world in some of the most arduous conditions, in temperatures ranging from -40°C to +48°C.

Recently, GE has started offering electric start systems for its line of aeroderivative marine gas turbines. Along with lower lifecycle costs and improved reliability, the electric start system costs 60 per cent less than a hydraulic start system.

GE says that it scaled the electric start system technology to match the requirements for its popular LM2500, LM2500+ and LM2500+G4 engines.

"Our LM2500+G4 gas turbines were selected for the Italian Navy's new Pattugliatori Polivalenti d'Altura or PPA multipurpose offshore patrol ships. This will be the first use of GE's electric start system for the LM2500 engine family," said Brien Bolsinger, GE's vice president and general manager for marine operations. "The benefits of our electric start system include an 82 per cent decrease in footprint and an 85 per cent reduction in weight compared to a hydraulic start system."

The initial application of GE's electric start system is on the LM500 gas turbines that power the Republic of Korea's PKX-B patrol boats. GE's LM6000PC and LM6000PG gas turbines are available with an electric start system, too.

A system of this type has an integrated clutch that is included with the module. The electric start system requires only a single cooling interface on the module with the option of either fresh water or mineral oil cooling media. The system has the same functionality as other starters including engine start, motoring or purge, water wash, and borescope.

The electric start system for GE's marine gas turbines is being designed to meet ABS Naval Vessel Rules certification for the United

"The benefits of our electric start system include an 82 per cent decrease in footprint and an 85 per cent reduction in weight compared to a hydraulic start system."

States Navy, specifically for shock, vibration and electromagnetic interference. For the Italian Navy PPA ship, GE is certifying to RINa's Rules for the Classification of Naval Ships.

GE has also recently marked the milestones in its sales of gas turbines to the United States Navy and United States Coast Guard surface combatant programmes that all use GE's reliable LM2500 aeroderivative marine gas turbines.

In December, the US Navy accepted delivery of the fifth Independence variant littoral combat ship (LCS), Gabrielle Giffords. GE will provide 20 LM2500 gas turbines for the Austal USA LCS programme, part of a contract for up to 10 ships to be built by the manufacturer. The two LM2500s are arranged in a combined diesel and gas turbine (CODAG) configuration with two diesel engines.

John Finn (DDG 113) has also been delivered to the US Navy, by Huntington Ingalls Industries. John Finn is the 63rd Arleigh Burke class destroyer and the first of the DDG 51 Flight IIA restart ships. GE LM2500 gas turbines propel these new destroyers to speeds in excess of 30 knots.

Also in December, the US Coast Guard accepted delivery of the sixth national security cutter (NSC) Munro, in Pascagoula, Mississippi. Munro is scheduled for commissioning in April 2017. A day later, the seventh NSC, Kimball (WMSL 756), was launched at Huntington Ingalls Industries. Ships in the US Coast Guard's Legend class NSC programme feature the same LM2500-based CODAG propulsion system. GE marine gas turbines can be applied in a variety of propulsion configurations so naval architects have the design flexibility to match speed, endurance and mission payload requirements.

To date, the US Navy – GE's largest marine gas turbine customer – has taken delivery of over 700 LM2500 engines operating aboard surface combatants such as frigates and destroyers.

Not to be outdone, Rolls-Royce, too, has recently reached a significant milestone for the Italian Navy's new landing helicopter dock (LHD) multipurpose amphibious vessel, to be built by Fincantieri – one of the world's largest shipbuilding groups – by successfully completing the factory acceptance test for the vessel's first MT30 gas turbine.

Rolls-Royce has been selected to provide two MT30 gas turbines to power the new 20,000 tonne displacement vessel. The LHD will be built and launched in Fincantieri's Castellammare di Stabia shipyard in Naples before being set up and delivered at the company's yard in Muggiano, La Spezia. It is a result of Italy's Navy Act, under which the Government is undertaking a major investment programme to renew the Italian Navy's fleet.

Don Roussinos, Rolls-Royce president – naval, said: "Successful completion of the factory acceptance test is a significant achievement for everyone involved in the LHD programme. Producing 36MW to 40MW, the MT30 gas turbine is the world's most powerful in-service marine gas turbine with the highest power density and will deliver a high power output in a compact space – an essential factor for naval propulsion.

"We are extremely proud that the MT30 will power the new landing helicopter dock and we very much welcome Fincantieri as the latest customer for our MT30 gas turbine which we believe will provide it with the optimum solution for the needs of the vessel they will build for the Italian Navy."

The factory acceptance test, which has to be completed before the gas turbine can be delivered, was carried out at the Rolls-Royce test facility in Bristol, UK. The engine was put through a week of rigorous performance tests, witnessed by representatives from Fincantieri and the Italian Navy.

The MT30 is derived from Rolls-Royce Trent aero engine technology and builds on more than 45 million hours of operating experience and ultra-high reliability. It is initially built as separate modules, on the same build line as the Rolls-Royce Trent aerospace engines, in Derby. It is then assembled at the company's Bristol facility.

The construction of the engine is based on a twin-spool, high-pressure ratio gas generator with a free power turbine. Eight variable geometry stages are included in the intermediate pressure compressor, with six corrosion-protected stages in the high-pressure compressor. Technology for the four-stage free power turbine comes from the Industrial Trent and Trent 800 products. To ensure reliable life, the latest blade cooling technologies are included throughout and emissions levels meet all current and anticipated legislative limits.

Rolls-Royce MT30s are also being installed in the UK Royal Navy's new aircraft carriers Queen Elizabeth and Prince of Wales and the Type 26 global combat ship. They are also in service with the US Navy's Freedom class LCS and its Zumwalt class destroyers, and will power the Republic of Korea's Daegu class frigate programme. ***MP***

"We are extremely proud that the MT30 will power the new landing helicopter dock"

The MT30 is derived from Rolls-Royce Trent aero engine technology and builds on more than 45 million hours of operating experience and ultra-high reliability

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GE SEEKS TO BROADEN COGES UPTAKE

Towards the end of 2016, GE Aviation's marine gas turbine business announced that it had signed a multilateral memorandum of understanding (MoU) to co-operate in the joint development of a liquefied petroleum gas (LPG) fuelled ferry design. The ferry will feature GE's compact and lightweight combined gas turbine, electric and steam (COGES) system for all ship power, including propulsion.

Participating in the MoU signing were Youngsung Global Co chief executive Bumsu Ku, Dintec Co director Hunsoo Ha, Korea LPG Industry Association chairman Joonseok Hong, GE Aviation MSO Korea leader Kirby Luke, Far East Ship Design & Engineering Co (FESDEC) chief executive Jungkang In, and Cryos chief executive Daesung Kim.

As this is the world's first LPG-fuelled COGES ship, the LPG industry is taking an active part in this project. For instance, FESDEC is handling the ferry design, and Cryos brings extensive experience in designing and manufacturing LPG fuel tanks.

The new ferry design is expected to improve safety and efficiency while reducing nitrogen oxide and carbon dioxide emissions, meeting IMO regulatory standards. The ferry's operational expenses will decrease by 35 per cent, too. This means that the newly developed ferry should deliver the economic value and eco-friendliness that global markets require today.

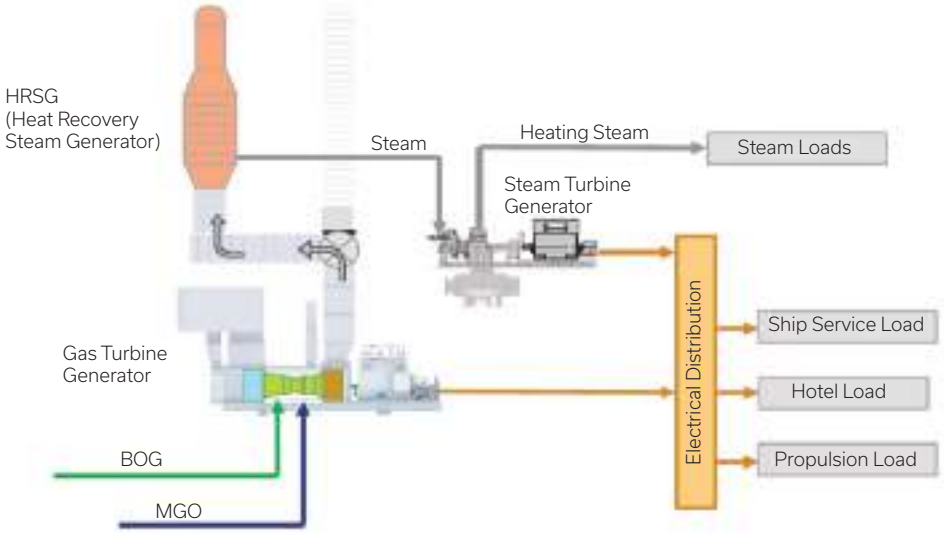
In its efforts to popularise use of its combined gas turbine, electric and steam (COGES) system, GE is focusing on various ship types

In fact, GE gas turbines are no stranger to the seas and no new technology is required to construct the COGES system. Instead, GE is configuring existing products and integrating them into new applications. GE gas turbines operate on cruise ships, eight of which feature COGES arrangements. Other commercial marine applications include fast cargo ships, high speed yachts, offshore platforms, and floating production and offloading ships.

Mr Ku said: "With the use of LPG, we expect to save on operational costs and contribute to the reduction of our global environmental footprint."

This is part of a wider effort on GE's part to popularise the use of COGES for propulsion. In 2016, GE and Dalian Shipbuilding Industry Co received approval in principle for their jointly-developed 20,000 teu container ship design to be powered by a GE COGES system. The design will also permit increased container carrying capability, as well as offering a lower lifecycle cost, better environmental performance and a high level of reliability. The basis of the COGES system is GE's dual-fuel gas turbine, which can meet increasingly stringent worldwide environmental regulations while reducing operating expenses.

Separately, GE and Hudong-Zhonghua Shipbuilding announced an approval in principle received from ABS for a jointly developed liquefied natural gas (LNG) carrier design, also to be powered by a GE COGES system. "Thanks to the compact and lightweight attributes of GE's COGES arrangement, customers can realise an additional 4,000m^3 of LNG cargo space compared with a traditional 174,000m^3 LNG carrier powered by dual-fuel diesel engines," said Hudong-Zhonghua Shipbuilding president Chen Jun. *MP*



The COGES system applied on the design of the Hudong-Zhonghua Shipbuilding LNG carrier

Rolls-Royce is to supply hybrid power systems for Hurtigruten's two new hybrid-propulsion expedition cruise ships (credit: Hurtigruten)

PASSENGER SHIPS EMBRACE BATTERIES AND ELECTRIC PROPULSION

Passenger ship operators, especially in Northern Europe, are adopting electric propulsion and automation technology. One recent order was received last year by Rolls-Royce to supply hybrid power systems and new bridge and automation technology for Hurtigruten's two new hybrid-propulsion expedition cruise ships.

Hurtigruten ordered *Roald Amundsen* and *Fridtjof Nansen* from Kleven Verft in Norway. Rolls-Royce then received a contract to supply the latest automation and control systems, including its Unified Bridge, as well as electrical power systems, Azipull propellers using permanent magnet technology, two large tunnel thrusters, stabilisers, engines and winches.

The hybrid technology is planned for delivery in two phases. In phase one, auxiliary battery power will provide large reductions in fuel consumption by enabling peak shaving. This solution is to be installed on the first expedition ship ready for delivery in 2018.

For phase two, larger batteries will be installed, enabling the possibility of fully electric sailing across longer distances and over longer periods of time. This will be used when sailing into fjords, at port and in vulnerable areas, providing silent and emissions free sailing. Rolls-Royce will install this new technology in the second ship to be built, which is scheduled for delivery in 2019. Hurtigruten intends to retrofit the first ship with the same technology, at a later date.

Hybrid propulsion and batteries have been installed on increasing numbers of ferries operating in Scandinavia and the Baltic. Siemens supplied systems for the first electric-driven ferry, Norwegian operator Norled's *Ampere*, in 2015, and has since gained fresh orders. These have included a follow-up order from Finland-based Finferries. It is also supplying two new battery-driven ferries for Fjord 1 in Norway, due for delivery in January 2018 from Turkey's Tersan Shipyard. The order involves supplying lithium-ion batteries for energy storage, thrusters, and remote control modules for the propellers.

ABB, too, has gained orders – for electric drive technology for battery-powered passenger ships. The latest contract, from Stena Line, is for an energy storage control system and Onboard DC Grid to retrofit two HH Ferries Group vessels, *Tycho Brahe* and *Aurora*, in 2017. They will operate on battery power between Helsingør in Denmark and Helsingborg, Sweden. In another order, ABB is supplying an Onboard DC Grid for a new hybrid car ferry being built at Fiskerstrand Verft in Norway.

Norwegian Electric Systems has signed a contract, valued at up to US$3.5 million, with Remontowa shipyard of Gdańsk, Poland for the delivery of two hybrid electric systems, for two new ferries. The package consists of ultra-light converters forming a DC grid system with four battery packages, two on each side of the DC bus for redundancy. In addition, for the main propulsion there are water-cooled, high-efficiency permanent magnet motors and four direct driven propellers. The ferries are being built to operate the Woolwich service across the River Thames for Transport for London, in the UK. Norwegian Electric Systems has already installed one of Europe's largest test facilities for electric propulsion systems, including energy storage, and is developing a new energy management system.

Ferry operators in the Solent in the UK are harnessing battery power. Cemre Shipyard in Turkey is building a hybrid battery-operated ferry for Wightlink Ferries. The ship will have batteries for powering the ship's electrical supply and motion-activated light emitting diode (LED) lighting, as well as assisting with propulsion. Red Funnel is considering using batteries on a new fast ferry. It took delivery of Red Jet 6, which has conventional propulsion and power systems, in 2016, and plans to order another one from Shemara Refit on the Isle of Wight. It is interested in combining batteries with fuel for future new dual-fuel electric vessels. **MP**

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ABB to power new FRSU vessel

ABB will supply the power and electric propulsion system for a new floating storage and regasification unit (FSRU) for BW Group, which will also be remotely connected to ABB's Collaborative Operations Centers. The equipment on board will provide data to the shore-side centres, enabling ABB and the vessel owner to take a proactive approach to maintenance throughout the lifetime of the vessel.

"The modern power system must be both efficient and connected," said Juha Koskela, managing director of ABB's marine and ports business. "Our hardware will optimise fuel efficiency on board whilst the Collaborative Operations Centers will monitor the vessel, enabling a more informed approach to maintenance."

ABB's power generation and distribution system, along with the electric propulsion system, will work in conjunction with the dual-fuel diesel engine plant to maximise uptime. Much of ABB's scope of supply of generators, switchboards, transformers, main propulsion drives and motors will transmit performance data via sensors. This information is automatically monitored from shore at the Collaborative Operations Centers and ABB will work with the customer during routine and urgent maintenance cases.

The 174,000m^3 capacity FSRU has been ordered from South Korea's Daewoo Shipbuilding & Marine Engineering Co. The membrane-type vessel is expected to be delivered by its Okpo yard in 2019.

Erik Bolstad, sales vice president for liquefied natural gas (LNG) and tankers at ABB said, "ABB's track record in commissioning and servicing LNG installations at South Korean shipyards, coupled with end-user recommendations and the reputation of the ABB brand, all played a key role in securing this substantial order."

ABB's power generation and distribution system will work in conjunction with the dual-fuel diesel engine plant

Norwegian Electric Systems signs ferry contract

Norwegian Electric Systems has signed a new contract with Havyard Ship Technology for the delivery of hybrid electric systems for three new ferries being built for Norway's largest ferry company, Fjord 1. By including the latest environment-friendly technology on its ferries, Fjord 1 sets the green standard within the ferry industry, according to a statement from Norwegian Electric Systems. The ferries are designed by Multi Maritime.

Two of the ferries will operate the route between Brekstad and Valset and one will operate between Sandvikvåg and Husavik. The Norwegian Public Roads Administration's strict emissions requirements for these two ferry routes have resulted in the choice of an electrical propulsion system using chargeable lithium-ion batteries.

Norwegian Electric Systems has developed a very robust DC system for applications such as these. The main DC system ensures the safe charging and discharging of the batteries and includes the Odin's Eye solution. Odin's Eye is an ultra fast-acting safety solution. It is flexible, too, allowing for future upgrades of the vessels such as larger battery capacity or higher charging power from shore.

"We have had close contact with Fjord 1, Havyard and Multi Maritime during this preliminary process," said Stein Ruben Larsen, Norwegian Electric Systems' vice president for sales.

"Teamwork has been the keyword for securing this contract," said Mr Larsen. "It proves that Norwegian Electric Systems has the technical knowledge to win, and strengthen, our clients' trust."

Norwegian Electric Systems has installed one of Europe's largest test facilities for electric propulsion systems, including energy storage.

Norwegian Electric Systems has developed a very robust DC system (credit: multi-maritime.no)

Kohler launches new Tier 3 diesel marine generators

Kohler Power Systems, which manufactures diesel and gasoline marine generators for a wide range of pleasure and commercial craft applications, has launched new single and three-phase Tier III marine diesel generators. The company's 14-24EKOZD/12-20.5EFKOZD generators integrate Kohler diesel Tier III engines and other enhancements, including improved sound shields and Kohler's highly regarded Decision-Maker 3500 controller (DEC 3500).

"Our generators are always evolving to meet the diverse and dynamic needs of today's boat builders and pleasure craft owners alike," said Greg Klompenhouwer, senior product manager for Kohler Marine. "These newest models reduce sound levels with an air induction silencer while also delivering the performance and peace of mind that come with our Kohler Tier III diesel engines. We are confident the market will respond strongly to these new and improved marine generators."

In addition to enhanced sound-dampening and engine reliability, users of these new models will benefit from the ability to quickly and easily parallel two or more Kohler generators with a single communication wire, which is delivered through the DEC 3500.

The DEC 3500's space-saving design eliminates the need for oversized switchgear. Other benefits include built-in load management software, which removes over-fuelling issues and the need for exhaust treatment systems, and remote monitoring, which provides the ability to monitor and control the generator from anywhere on the vessel. There are also fully enclosed circuit boards and sealed connectors, which protect against corrosion, and fewer failure points, providing enhanced dependability.

The DEC 3500's space-saving design eliminates the need for oversized switchgear

Ulstein Verft to build new hybrid vessel

Norway's Color Line and Ulstein Verft have signed a firm contract for construction of the world's largest plug-in hybrid vessel.

The environmentally-friendly vessel will operate between Sandefjord and Strømstad from summer 2019. Ulstein won the contract in competition with several other yards.

"It is very gratifying that the Norwegian shipbuilding industry has proved its competitiveness internationally, and that Color Line is contributing to the further development of the Norwegian maritime industry," said Color Line chief executive Trond Kleivdal.

"We are very pleased that Color Line decided to proceed from a letter of intent to a firm contract for the construction of this hybrid vessel. This is an important milestone for us, and we are looking forward to further co-operation with Color Line," stated Ulstein Group's chief executive Gunvor Ulstein.

The natural environment is an important consideration for Color Line. The vessel will feature new solutions to reduce noise and emissions. It will be a plug-in hybrid, in which the batteries are recharged via a power cable with green electricity from shore facilities or, as a secondary alternative, recharged on board by the ship's generators.

With new shore power in Sandefjord, all Norwegian ports on Color Line's network will have shore power facilities. The ship will have full battery power for its passage into and out of the fjord, to and from Sandefjord's inner harbour, which means that there will be no emissions of harmful greenhouse gases or nitrogen and sulphur compounds in this area.

The 160m vessel, with the working name *Color Hybrid*, can take 2,000 passengers and 500 cars. It will have almost twice as much capacity as Bohus, which is scheduled to be phased out when the new ferry is put into operation in summer 2019. The ship will provide considerably more capacity on the route between Norway and Sweden, and will provide expanded and improved services on board, and thus a new and better travel experience.

The new vessel will be built to Norwegian flag requirements and registered on the Norwegian Ordinary Ship Register. Color Line is the only company providing international passenger and freight traffic to and from Norway with ships registered on the Norwegian Ordinary Ship Register and with Norwegian headquarters.

The solution comprises a number of Nidec Control Techniques' Unidrive M variable speed drives, along with motors, transformers, brake resistors, rectifier units and generators.

The 160m vessel has the working name *Color Hybrid*

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Immanuel's propulsion is diesel-electric with a variable speed generator and DC bus

Power solutions help achieve competitive gain

Nidec Control Techniques and sister company Nidec Leroy-Somer Holding, both formerly part of Emerson Industrial Automation, have recently helped complete a landmark fishing industry project by contributing to the construction of a brand new type of marine vessel, the MDV-1 *Immanuel*. The solution comprises a number of Unidrive M variable speed drives, along with motors, transformers, brake resistors, rectifier units and generators.

The MDV-1 *Immanuel* is a Dutch-built 30.2m long 8.6m wide twin-rig fishing vessel devised for The Netherlands' masterplan for sustainable fishing (MDV). The boat offers a number of key innovations including, notably, savings of up to 80 per cent in both fuel consumption and emissions of CO2 and NOx.

The remit of the MDV, which was established in 2012 to drive innovation in the Dutch fishing sector, is to seek efficiency improvements in every area, including propulsion, which on *Immanuel* is diesel-electric with a variable speed generator and DC bus.

This design means that the generator can be run extremely efficiently, at speeds ranging from 800 rpm to 1,200 rpm. It also means that the boat can be equipped with two generators, one running at a time, instead of the three that would be needed with an AC system, where two would normally be in operation. The larger, 500kW, generator is used during transit and fishing, while the smaller one (117kW) is mainly an emergency generator, capable of bringing the boat back to shore at a lower speed.

The system benefits from the use of a 400kW water-cooled permanent magnet motor (120 rpm) for the main propeller in place of a conventional diesel engine. Along with higher efficiency, further benefits include its small size, with no need for an inline gearbox with transmission.

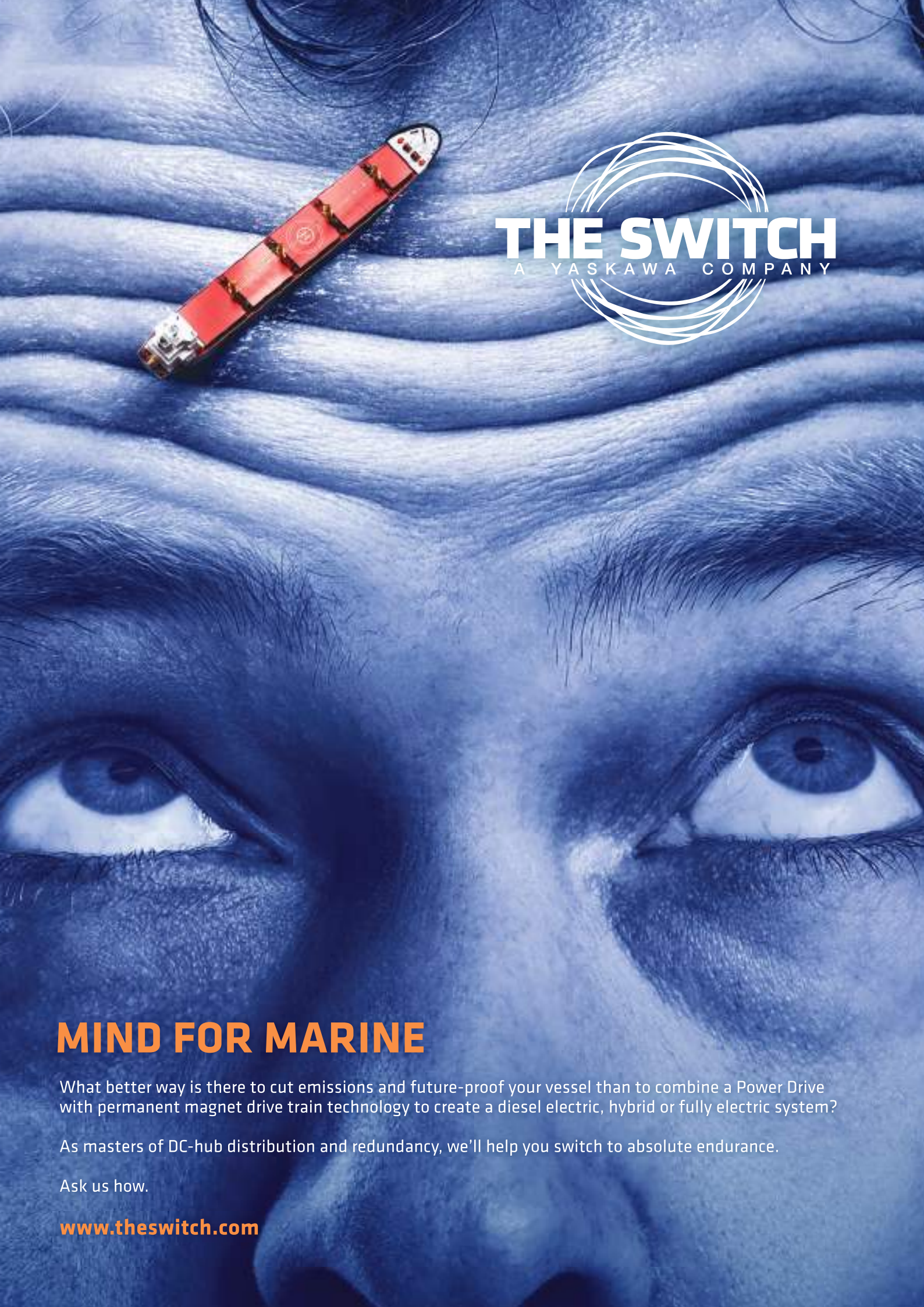
Moreover, the fact that impact loads can be absorbed electrically by the engine controller makes the generator more stable and energy-efficient, with less engine noise, less vibration and virtually no need for maintenance.

Four Nidec Control Techniques Unidrive M variable speed drives work in tandem with the propulsion engine, with another unit deployed for driving the rotary transformer. Others are for the hydraulic pump, flushing pump, engineroom ventilation, and fish hold cooling system, with two more for the pulse fishing windlasses. The windlasses have to pay an electric cable in and out with a stable tensile force (without breaking), but with a variable swell.

Further products supplied include a Nidec Leroy-Somer motor-generator transformer for the onboard electrical system, a brake resistor for the power generation system, rectifier units for the common DC bus, a 12-pulse transformer suitable for variable frequencies, and Leroy-Somer main and auxiliary generators.

As well as the drive components, the two companies were responsible for the engineering, documentation, testing, set-up, training and drives operating software – not just for the programmable logic controller, but for managing the frequency controllers of the propulsion engine and rotary transformer.

In order to reduce harmonic current distortion, engineers also recommended the use of an electrical system in which a 12-pulse isolating transformer was employed. Switching controllers and generators guarantees a broad-based redundant system without any onboard electrical system interference compromising the instrumentation. **MP**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EATON INTRODUCES **MAINTENANCE-FREE CONTACTORS**

Eaton has introduced a new range of hybrid contactors. Described by the power management company as compact and dependable, the new contactors support loads of 300A to 600A at up to 1,000 VDC.

Conventional contactors all require maintenance in the form of replacement of contacts after approximately 10,000 to 25,000 electrical operations. However, Eaton's new DIL DC contactors require no maintenance and provide an operating lifespan of more than 150,000 electrical operations.

As well as having extremely long lifespans, DIL DC contactors can handle 1,000 VDC per pole and current flow in both directions – bi-directional and polarity-insensitive. The contactors, which can be controlled conventionally or with a programmable logic controller, have a compact frame size that reduces panel space requirements. In addition, the contactors feature a wide-range coil that covers AC operating voltages from 110V to 250V as well as DC operating voltages from 110V to 350V.

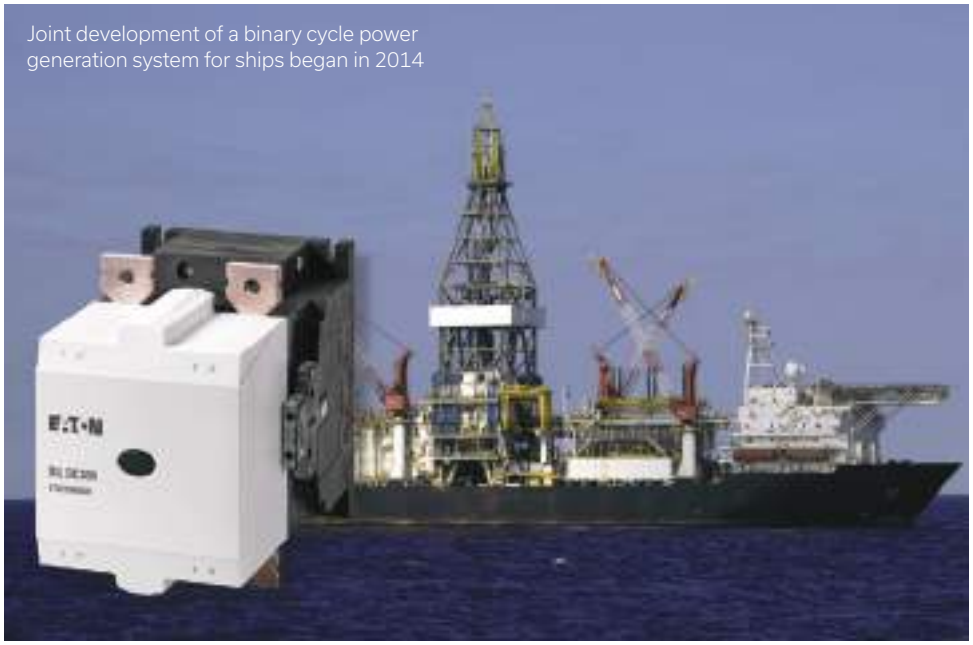
Eaton's new DC hybrid contactors are particularly well suited to applications in the marine sector where alternative energy sources, many of them DC, are rapidly gaining in popularity. In these applications, the compact space-saving design, zero maintenance requirements and long operating life of the contactors are important benefits.

"There has been considerable growth in the need for convenient, effective and reliable DC switching," said Chris Pack, field product manager at Eaton Electric. "But traditional devices have notable limitations. They all have a relatively short lifespan and often need separate bridging links. Our new DIL DC300 and DIL DC 600 contactors have been specifically designed to overcome these limitations and to provide superior control in a wide variety of DC switching applications."

To achieve their performance and long lifespan, Eaton DIL DC 300 and DIL DC 600 contactors use novel hybrid switching technology. They have two mechanical contacts – an extinguishing contact and an isolating contact – connected in series and a solid state IGBT (insulated gate bipolar transistor) switch connected in parallel with the extinguishing contact.

When the contactor is required to break a circuit, the current commutates to the IGBT, with the opening of the extinguishing contact. Next, the IGBT is turned off to interrupt the current and, finally, the isolating contact opens to provide galvanic isolation. With this arrangement, under normal operating conditions neither of the mechanical contacts has to switch off the load current. This means that arcing and contact erosion are virtually eliminated.

Eaton DIL DC 300 and DIL DC 600 hybrid contactors are available in two versions, with extensions to the range planned for introduction in the near future. Both versions are two-pole devices and both can be used on systems up to 1,000 VDC. Maximum operating frequency is 100 operations per hour. *MP*



Joint development of a binary cycle power generation system for ships began in 2014

Kobe Steel binary cycle power generation system for ships completes sea trials

Japan's Kobe Steel plans to start marketing a new binary cycle power generation system for ships.

Kobe Steel, Asahi Shipping Co and Miura Co began the joint development of a binary cycle power generation system for ships in 2014. Land-based testing of the system was successfully completed in 2015 and in December 2016 the system passed sea trials. It recently received approval from Japan's class society ClassNK. Having passed these tests, the new system has been marketed since April, with sales starting in April 2019. Kobe Steel is in charge of marketing and sales.

In the past, exhaust heat from the turbocharger attached to a ship's engine was not used, but allowed to disperse. Kobe Steel's new system is the first in the world to generate electricity from this exhaust heat. The electricity produced by the new system serves as auxiliary power for the ship and contributes to the efficient utilisation of energy. In the sea trials, Kobe Steel confirmed that an engine output of 7,500kW per hour generated 125kW of electricity. This is equivalent to about 20 to 25 per cent of the fuel used in marine generators, depending on conditions, and is the largest scale of power generation from exhaust heat on a ship.

Through the new system, the three companies are promoting the effective utilisation of unused energy. This project to develop the binary cycle power generation system was adopted as a joint research theme by the next-generation marine environment related technology development support programme of Japan's Ministry of Land, Infrastructure, Transport and Tourism and ClassNK and was undertaken with its co-operation.

BECKER POWERS NEW SOLUTIONS

Becker Marine Systems' COBRA compact battery rack is an advanced concept employing tried-and-tested 18650 lithium-ion cell technology and taking the special requirements of maritime operation and classification into account. Any scale of power storage is available by freely configuring modular units in standardised cabinets of up to 1,000 VDC including integrated and individually controlled cooling equipment.

Becker has developed a number of offerings for the use of low-emissions liquefied natural gas (LNG).

"Despite significant regulatory requirements, the operation of our LNG hybrid barge supplying power to cruise ships moored along the quay wall at the port of Hamburg is running smoothly and to our complete satisfaction," said Dirk Lehmann, one of Becker Marine Systems' managing directors.

"During *AidaSol*'s recent call to the port, the barge transferred approximately 35 MWh of energy" he explained. In addition, there is the LNG PowerPac, a specially-designed modular container system used to supply power to ships. It allows the alternative fuel to be used directly on board container ships, for example. This obviates the use of other technologies and construction work on infrastructure at ports, which can be costly.

COBRA was presented at maritime trade fair SMM in 2016 and is currently in test phase. Starting in summer 2017 it can be delivered as a single product or in combination with hybrid drives. Initial orders for passenger ferries, among other vessel types, have already been placed for this technology based on lithium-ion cells. Its use in products such as the LNG PowerPac is also possible and being planned. *MP*

COBRA was presented at maritime trade fair SMM in 2016 and is currently in test phase

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SAFETY FIRST ON LNG BUNKERING

Although ships in northern Europe have used liquefied natural gas (LNG) as fuel safely for more than a decade, as LNG-fuelled ships emerge in other parts of the world and more players are involved, there is a growing case to standardise LNG bunkering operations at the international level. So said the International Organization for Standardization (ISO), as it unveiled a new standard, ISO 20519 *Ships and marine technology – Specification for bunkering of liquefied natural gas fuelled vessels*.

LNG bunkering involves different stakeholders, from the shipowner and the LNG supplier to ports, safety personnel and administrations. The organisation says its new standard ensures that LNG-fuelled vessels bunker in a safe and sustainable way.

"As demand for LNG fuelled vessels has increased, so has the demand for practical, cost-effective and efficient LNG bunkering, so there was an urgent need for an international standard to ensure LNG bunkering operations could be conducted safely," ISO said in a statement.

"ISO 20519 will help operators to select vessel fuel providers that meet defined safety and fuel quality standards."

As the size of ships fuelled with LNG increases, the vessels transit greater distances that require them to bunker in a greater number of ports in different countries. This inevitably increases the number of parties involved in LNG bunkering.

ISO says that standardising safety practices is necessary to ensure a common set of requirements that are understood by all – from LNG provider to ship personnel. It says that ISO 20519 contains requirements not covered by IMO's IGC Code, which covers the safe carriage by sea of liquefied gases in bulk. These include:

- hardware – liquid and vapour transfer systems
- operational procedures
- requiring the LNG provider to provide an LNG bunker delivery note
- training and qualifications of personnel
- requiring LNG facilities to meet applicable ISO standards and local codes.

ISO technical committee chair and convenor of the working group that developed the standard Steve O'Malley said: "The requirements of ISO 20519 can be incorporated as a management objective into existing management programmes and provide verifiable compliance."

This matters, he says, because "the requirement to comply with ISO standards is often incorporated into business contracts and may also be referenced by local regulations."

The working group that developed ISO 20519 included maritime industry experts, equipment manufacturers, representatives from the Society for Gas as a Marine Fuel, trading companies, class societies, international registries and the United States Coast Guard.

Because LNG as a fuel for vessels is relatively new, the standard will need to be updated to incorporate lessons learned over time and technological changes. ISO has created a group to track LNG bunkering incidents and identify when to update the standard.

ISO 20519:2017 was produced at the request of IMO, the European Commission and the Baltic and International Maritime Council (BIMCO).

There is a growing case to standardise LNG bunkering operations at the international level (credit: Transmar)

Last year members of the Poseidon Med II LNG bunkering project staged a series of simulation workshops to evaluate safety and operating issues for LNG vessels carrying out bunkering in port.

Four Greek commercial ports – Piraeus, Patras, Heraklion, Igoumenitsa and Limassol, Cyprus – joined the Revithoussa LNG terminal in the initiative. They studied more than 90 real-time simulation scenarios, modelled using specialist software, based on various environmental issues.

The workshops studied how an LNG feeder ship would carry out cargo transfers to storage units and how an LNG barge might deliver bunkering to ropax ships at each of the five ports. The sessions brought together project teams from the ports, including pilots, masters and other experts, to assess the navigation issues and to identify and mitigate risks.

The workshops concluded in September 2016 and the findings will underpin future safety and environmental impact assessment studies for proposed LNG installations at the five ports and at Revithoussa – Greece's first, and so far only, LNG import terminal.

"The navigation simulation workshops were significant components in fostering collaboration with the project ports and port stakeholders," said Poseidon Med II project manager for Lloyd's Register Anna Apostolopoulou. "We built a common knowledge base about the proposed bunkering operations within each port, aiming at improving operational effectiveness and mitigating risks.

Poseidon Med II brings together ports in Greece, Italy and Cyprus, working to increase the adoption in southern Europe of LNG as marine fuel. The project is co-funded by the EU.

Revithoussa is expanding its re-gas capacity to 4.7 million tonnes a year. Family conglomerate Gastrade plans to develop a floating import terminal at Alexandroupoli. Shipowner GasLog has bought a 20 per cent stake in the company and hopes to supply a floating storage and regasification unit to support the project. MP

MSC Cruises to develop LNG bunkering system with ARTA

MSC Cruises is to develop an LNG bunkering system for its cruise ships after striking a partnership with ARTA Group.

The two companies revealed their new partnership at the LNG Bunkering Summit 2017 in The Netherlands, where they said they would create a tailor-made LNG bunkering system that takes full account of the cruise industry's specific needs.

MSC Cruise Management's LNG project director Yves Bui said: "With up to four LNG powered cruise ships scheduled to join our fleet, we are highly committed to developing the best possible technologies and systems to support the introduction of LNG to cruising. In ARTA, we have found a partner that matches our focus on innovation and the best maritime technology at sea and that understands our industry's specific needs."

The result is a system that features a newly developed coupling and decoupling mechanism and a double-walled hose that will allow MSC Cruises to conduct bunkering operations without disrupting the activities taking place on board the ship.

Andreas von Keitz, ARTA's managing director of gas manufacture and liquid transfer solutions, added: "We are exceptionally pleased with the new system we have developed to suit the cruise industry's specific bunkering needs. Thanks to our partnership with MSC Cruises we have been able to fully understand these needs and have put over 40 years of our bunkering engineering experience to good use. The result is a technologically advanced solution that will help ensure that the double-wall principle is maintained across the entire LNG bunkering supply chain."

MSC Cruises is to develop an LNG bunkering system for its cruise ships after striking a partnership with ARTA Group

MSC Cruises and STX France signed a letter of intent in June 2016 to build up to four LNG fuelled cruise ships. This is part of the operator's plan for 11 new next-generation cruise ships over the next 10 years.

First LNG bunkering in Australia

The first case of a vessel being bunkered with liquefied natural gas (LNG) in Australia took place at the beginning of this year when the offshore vessel *Siem Thiima* took on LNG at King Bay Supply Base near Dampier.

The operation was undertaken by Wesfarmers-owned EVOL LNG in Western Australia. Under an agreement with oil and gas company Woodside, EVOL LNG refuelled the platform supply vessel on 23 January 2017.

Siem Thiima taking on LNG at King Bay Supply Base near Dampier

"Our decision to enter the LNG bunkering market is part of a long-term strategy that recognises the environmental and economic sustainability of LNG as a fuel," said EVOL LNG in a statement. "The LNG marine fuel market is still in development so the fact EVOL has over 15 years' experience in distributing LNG means we saw an opportunity to provide a suite of services. EVOL can safely manage the bunkering process and provide key services such as training in safe handling of LNG, enabling our customers to confidently adopt LNG as a marine fuel."

The company's business manager, Nick Rea, said growth in demand for LNG-fuelled vessels had largely been driven by ›››

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››› IMO regulations and the introduction of emission control areas in Europe and North America. In addition, China has introduced emission control areas around its three major ports. “Interest in LNG as a marine fuel is growing, especially since IMO announced it would introduce a global marine fuel sulphur limit of 0.5 per cent from 2020,” he said.

“LNG is a cleaner fuel than marine diesel, emitting 25 per cent less carbon dioxide, less nitrogen oxides and almost zero sulphur oxides and particulates, which largely addresses emissions concerns for the shipping industry and avoids expensive and complicated scrubbing systems.”

Mr Rea said that as emissions reduction efforts continued to grow in importance globally, including in Australia, the adoption of LNG as a low emissions marine fuel was expected to increase accordingly. “It is certainly an offering we would like to expand, particularly as truck-to-ship LNG bunkering can be achieved relatively inexpensively with existing logistics assets. If interest is there, EVOL LNG will obtain licences from other major Australian and regional ports to conduct LNG bunkering operations.”

Mr Rea said EVOL LNG would be able to supply Fremantle customers with LNG at a price competitive with low sulphur marine diesel and would be able to refuel ships at up to 45 tonnes per hour, which is comparable to traditional bunker fuels.

NEW TANKER COULD CUT BUNKER COSTS

The new type of liquefied natural gas (LNG) tanker would be based on converted offshore vessels

Norwegian company Cryo Shipping says it sees a future for a new type of liquefied natural gas (LNG) tanker based on converted offshore vessels.

The founders of the company say they have extensive experience in developing and operating LNG value chains and in building and operating tankers and shortsea vessels.

“Based on this experience, we have under development new and innovative LNG ship designs,” they say. “Due to confidentiality we cannot convey public details of our designs, but we will gladly discuss any customer requirements.” The company says it aims to become the world’s largest LNG feeder and bunker operator.

It notes that there is plenty of LNG in the world “but infrastructure is missing.” It wants to solve infrastructure challenges using specially designed LNG tankers. Its short-term goal is to develop a fleet of flexible and efficient small-scale LNG tankers that could supply LNG to consumers regardless of location. “The ships will be able to undertake ship-to-ship bunkering operations in all types of waters and ports,” it says.

“We are working on the conversion of platform supply vessels into LNG tankers, which should be ready for operation in the first half of 2018,”
Nicholai Olsen, Cryo Shipping managing director and partner

“We are working on the conversion of platform supply vessels into LNG tankers, which should be ready for operation in the first half of 2018,” said Cryo Shipping managing director and partner Nicholai Olsen. “We have designed the LNG system ›››

›››› using existing technology, but combined in a new way. We have also developed designs for newbuildings with completely new functionality."

"Today there are many industries using LNG as an energy source, in addition to approximately 100 vessels using LNG as fuel. By 2020 the expected number of LNG-powered ships will be about 1,000 with further exponential growth in the next decade," the company said. "Today LNG logistics are predominantly by road transport. The few small-scale LNG tankers that exist are not designed to meet regularity and supply requirements in a growing LNG market.

"Use of LNG storage bunkering facilities will result in congested traffic at storage facilities and harbours, and we therefore focus on providing direct ship-to-ship bunkering at port, at anchor and at sea. Cryo Shipping's solution will provide both marine and land-based industry with more efficient operations with less time consumed in LNG supply, and consequently at a lower cost than what is achieved today."

Another challenge the company will be able to address is the current uncertainty associated with the cost structure of LNG. This is a critical issue that needs to be resolved in order for the shipping industry to implement LNG in its operation. In today's market, it has given rise to questions about the structure of the LNG industry, such as lack of competition and the formation of monopolies, which has resulted in artificially high prices for LNG. Cryo Shipping believes that as an independent player it will create real competition that is essential to the dynamics of the LNG market and credibility for consumers of LNG in terms of both price and supply.

Cryo Shipping will, naturally, use LNG as fuel for its vessels. In addition, it will install battery technology to supply power during loading, unloading and ship-to-ship bunkering. This will completely eliminate local and regional emissions during port stay.

"Based on our preliminary market research, we have received a very positive response in the market where both LNG suppliers such as wholesalers and manufacturers, and LNG consumers such as heavy industry, power generation and shipping, have shown great interest in our solutions," says Mr Olsen. "We are working on specific customer projects that we expect will be announced soon."

MAN Cryo to supply fuel system to LNG ferry

MAN Cryo – MAN Diesel & Turbo's marine liquefied natural gas (LNG) fuel gas system manufacturer – has signed a contract with Sefine Shipyard in Turkey to deliver a marine LNG fuel-gas supply system to an Italian ferry.

The LNG supply system consists of a 150m^3 vacuum-insulated storage tank, with auxiliary equipment that includes an LNG vaporizer, a pressure build-up unit, a bunker station and a heat exchanger.

The MAN Cryo system will supply gas to the ferry's three dual-fuel propulsion engines and is scheduled for delivery in November 2017. The vessel will be the first of its kind with LNG propulsion.

The equipment will be installed aboard a double-ended ropax ferry, designed by Norway's LMG Marin, for Italian shipowner Caronte & Tourist. It will operate primarily on the Strait of Messina between Villa San Giovanni on the Italian mainland and the city of Messina in Sicily.

The 133m long and 21.5m wide ferry will have capacity for up to 290 cars on two vehicle decks, and 1,500 passengers.

World's first purpose-built LNG bunkering vessel delivered

Gas4Sea partners Engie, Mitsubishi Corp and NYK Line, and their project partner Fluxys, have taken delivery of *Engie Zeebrugge*, the world's first purpose-built liquefied natural gas (LNG) bunker supply ship.

Engie Zeebrugge marks a milestone in the development of the European LNG-bunkering chain

Built by Hanjin Heavy Industries & Construction Co at its Yeongdo shipyard near Busan, South Korea, 5,000m^3 *Engie Zeebrugge* took on LNG fuel, delivered to the shipyard by truck, preparatory to making its maiden voyage. The ship is based at Fluxys' Zeebrugge terminal, supplying LNG as marine fuel to ships in northwest Europe.

Its first customer is United European Car Carriers, which has ordered two LNG-fuelled car carriers. Fluxys has recently commissioned a second jetty that can handle small LNG carriers of 2,000m^3. It is considering the business case for a third LNG-supply jetty.

Engie said in a statement: "Currently, the bunker market amounts to approximately 250 million tonnes of heavy fuel oil a year. The challenge in making LNG grow in the bunker market is to develop sufficient supply infrastructure to support the increasing number of LNG-fuelled ships expected to come into operation.

"*Engie Zeebrugge* marks a milestone in the development of the European LNG-bunkering chain."

NYK Line, Engie and Mitsubishi launched Gas4Sea at maritime trade fair SMM in Hamburg last year. The partners plan similar ventures to their Zeebrugge project, in which Fluxys holds an equity stake, in Europe, North America and other regions around the world. MP

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Super Duplex	S32760	1.4501	Zeron 100	x			
Super Austenite	S31254	1.4547	254SMO	x	x	x	
Super Austenite	N08904	1.4539	904L	x			
Super Austenite	N08926	1.4529	6XN	x			
Nickel Alloy	N08031	1.4562	Alloy 31	x			
Nickel Alloy	N10276	2.4819	Alloy C276	x	x	x	
Nickel Alloy	N06059	2.4605	Alloy 59	x		x	x

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The gas combustion unit (GCU) is the centrepiece of the new installation

ALFA LAVAL GETS READY FOR GAS

An extension of its testing facilities reflects Alfa Laval's belief that gas-fuelled vessels are here to stay

Reflecting what it believes will be the shipping industry's transition towards the widespread adoption of gas as a marine fuel, Alfa Laval has expanded its testing facilities to include extensive gas testing capability, the centrepiece of which is the gas combustion unit (GCU).

In March, the company invited marine customers and industry representatives to its Alfa Laval Test & Training Centre in Aalborg, Denmark for the opening of the expansion into gas testing. The company claims that the expansion, which extends the testing space to five times its original size, makes this the world's most advanced test centre for environmental and combustion technology.

The Alfa Laval Test & Training Centre was inaugurated in 2014 and now acts as a hub of the company's research and development in exhaust gas cleaning, ballast water treatment, steam production, fuel cleaning and other key areas. Its original 250m^2 testing space is essentially a full-size machine room on land, equipped with Alfa Laval products that are installed and integrated into major process lines around a 2MW marine engine.

Now a further 1,100m^2 have been added to focus on combustion technologies for gas and other fuel alternatives. Among the new equipment are burner systems, inert gas systems and the GCU, which is installed at the centre in full scale.

"Our investment in the Alfa Laval Test & Training Centre reflects the extraordinary changes we see in the marine industry," said

Peter Leifland, president of Alfa Laval's marine division. "Tightening emissions legislation is driving many customers from residual fuels towards LNG and other alternatives. As a comprehensive marine supplier, we must be at the cutting edge in supporting our customers, no matter what fuel they choose."

As things stand, Alfa Laval already has a substantial portfolio of solutions for gas as fuel and gas as cargo. It includes Alfa Laval's Aalborg dual-fuel boiler systems, the FCM One Gas booster system, its Smit inert gas systems and the GCU, as well as a complete range of heat exchangers for working gas at different pressures. However, the company is convinced that more and more will be required in the very near future in order to keep up with the increasing use of gas as fuel.

"Within 15 years, it is expected that thousands of vessels will be sailing with LNG as fuel, compared with the hundreds using gas today," said Lars Skytte Jørgensen, vice president for Alfa Laval's boilers product centre. "We can clearly see emissions regulations driving the trend. But the success of the transition will depend in large part on advanced technology, much of which has yet to be developed."

Offering some context in this respect was Mark Bell, general manager of the Society for Gas as a Marine Fuel, who offered an overview of the market for gas in which he was keen to manage expectations for this fuel. He said that gas was not a "silver bullet" offering a magic solution for shipping, pointing out that less than 0.2 per cent of the world fleet is currently running on gas. He suggested that a gas-fuelled fleet of around 1,500 vessels was a reasonable assumption.

This, he pointed out, would represent a shift from 0.2 per cent of the world fleet to 2 per cent. He said: "What suppliers would like to see is more like 20 per cent, but it is going to take a long time for that to become reality.

Nonetheless, he made it clear that there were obvious areas where LNG could score, particularly the cruise and container sectors. The cruise sector, he believes, will adopt LNG on a large scale because it has relatively small fleets and the need for a good public perception. Meanwhile, container ships offer the greatest potential for CO_2 savings.

Mr Bell went on to say that an increase in the use of gas as a fuel was inevitable and that this meant a need to grasp the relevant technologies. He said: "What you are going to see is a mix of fuels. Gone are the days when one fuel type dominates."

It is this transition that the expanded Alfa Laval Test & Training Centre is designed to address. In this regard, Alfa Laval is in the process of testing a new dual-fuel burner for gas-diesel applications on smaller boilers. This will later be developed into a multi-fuel solution in partnership with the Technical University of Denmark in Copenhagen.

ABOVE: The Alfa Laval Test & Training Centre has been expanded

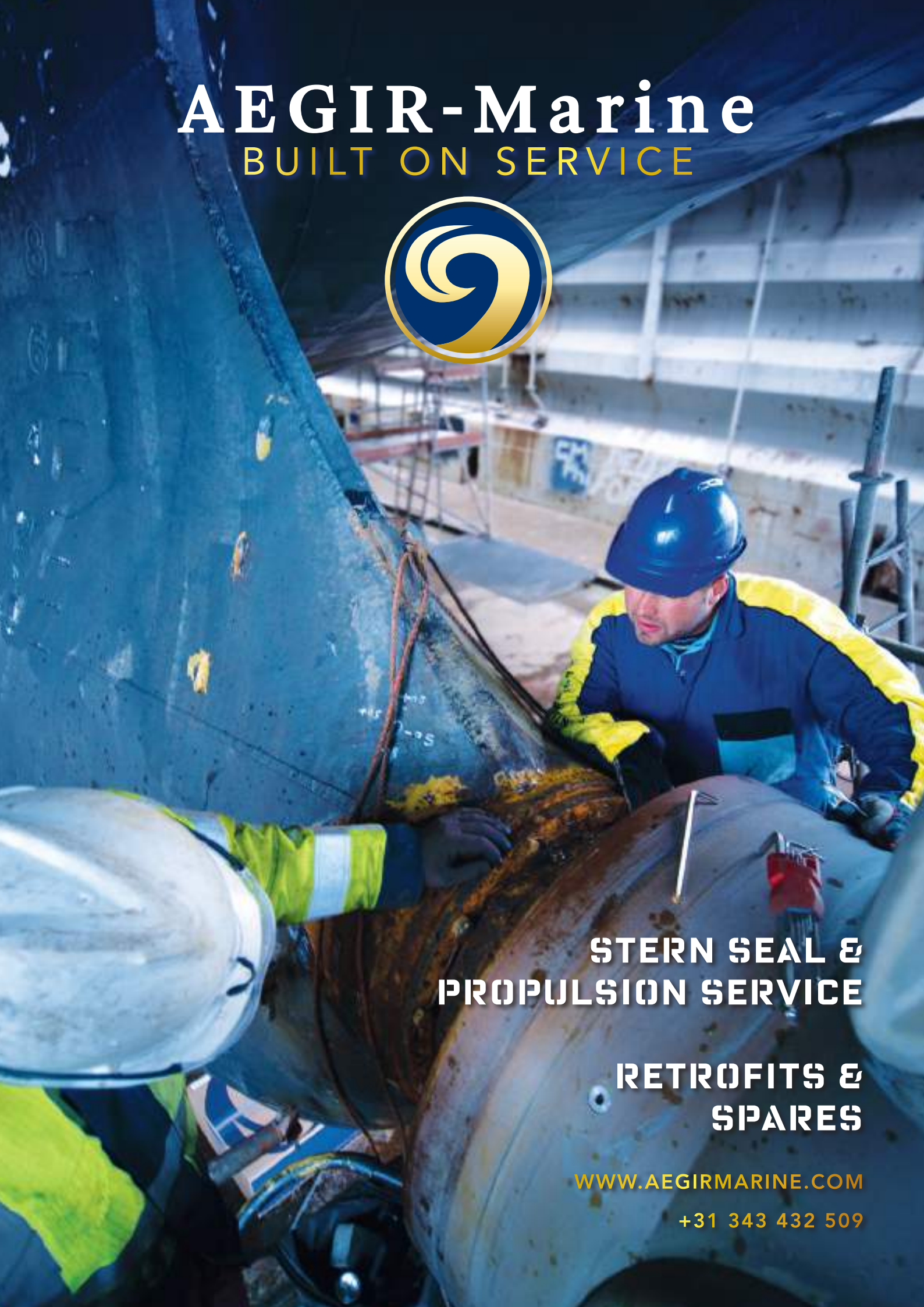
In another part of the centre, a development project is running for large burners and boilers involving comprehensive tests with both gas and diesel flames. The GCU will be subjected to test flame and heat flow characteristics in different conditions as a means of identifying the possibilities for improving performance even further.

The GCU is a good example of the sheer scale of Alfa Laval's investment as far as the expansion of the centre is concerned. Designed to deal with LNG boil-off gas in a safe, reliable and environmentally responsible manner, the GCU is 23m in height and can burn up to 4.5 tonnes of LNG per hour – the rough equivalent of 60MW. To enable indoor work with the unit, an extensive amount of preparation was needed.

The GCU fans are capable of moving 458m^3 of air per hour at full load. Automatic systems connect its control with the large doors of the facility, which must be open during operation.

The cost of investing in the centre is, however, far outweighed by the benefits, claims Mr Leifland. "After just three years of operation, we can point to many areas where the Alfa Laval Test & Training Centre has accelerated our research and development and improved its quality," he said. "Exhaust gas cleaning, where our PureSOx platform is fully ready for the 2020 global sulphur cap, is just one example."

Both in meeting new regulations and in paving the way for gas, the centre's technological edge will be vital in bringing customers the most environmental and energy-efficient solutions. "The rate of change in marine legislation is increasing, and shipowners and operators are forced to keep in step," Mr Leifland concluded. "With the expanded capabilities of the Alfa Laval Test & Training Centre, we will ensure that onboard technologies are ready to meet their technical challenges, whether the fuel is diesel, gas or something else altogether." *MP*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Torque transducer enables Wärtsilä to use natural gas

Test and measurement specialist HBM's expertise was crucial in the development of Wärtsila's dual-fuel engines

Dual-fuel engines operating on natural gas require highly accurate torque measurement in order to function. This is because in order to use the dual-fuel engines in marine installations with direct driven propulsion, a precise load signal is required from the engine's propeller shaft.

In the case of Wärtsilä's dual-fuel engines, a T40MAR torque transducer from leading test and measurement company HBM was crucial in achieving this, being accurate enough to offer the data Wärtsilä needed in shipbuilding.

The dual-fuel engines developed by Wärtsilä run on natural gas (LNG), marine diesel oil or heavy fuel oil. This means that the engine has to be switched from operating in gas mode to oil mode and vice versa while it is running. All of these modes present different challenges in terms of torque measurement.

For instance, when the engine runs in gas mode, a precise load signal is needed from the output shaft, providing data on how much power the engine produces in order that it can be controlled. To produce a precise load signal, the torque transducer needs to provide highly accurate measurement.

HBM and Wärtsilä worked together to find a solution. The most suitable option was HBM's T40MAR torque transducer. Wärtsilä installed the T40MAR to its engine between the engine flexible coupling and the gearbox hub.

When the engine operates on gas, the fuel injection system needs the precise load signal in order for the engine to work correctly. The T40MAR measures the output shaft's torque, which creates the load signal. This is why the torque transducer needs to have a high accuracy level. While other methods were not accurate enough, the T40MAR fulfilled the accuracy requirements with an accuracy class of only 0.15. This provides the best possible operating conditions for the engine to run and move the ship.

Guy Beaho, business development manager at HBM, explained: "The main contribution to this remarkable accuracy class is made by the documented unbroken chain of comparisons tracing back the HBM torque transducers to the reference transducer of the German national standard."

Wärtsilä's dual-fuel engines are compliant with IMO Tier III regulations when the engine uses gas, and with IMO Tier II regulations when the engine uses liquid fuel oil. If the user wants to operate in compliance with today's IMO Tier III requirements, they need to use natural gas or liquid fuels in combination with exhaust gas cleaning. When operating on natural gas, exhaust gas cleaning is not required. As the market for natural gas powered ship engines is growing, it is very important to be able to meet this new demand.

"However, using the dual-fuel engines with direct driven propulsion would not be possible without the T40MAR, so we are very pleased with the solution we reached with HBM," said Viktor Häggblom, development engineer at Wärtsilä Marine Solutions.

A T40MAR torque transducer from test and measurement company HBM

Components for LNG piping systems gain approvals

LNG piping presents particular difficulties. Here, Dr Dirk Broneske, managing partner of SB Broneske, outlines the options

SB Broneske has designed certified LNG components with its development engineers

Since 2015, IMO and the European Union have been requiring ship operators to use low-emissions fuels with a maximum sulphur content of 0.1 per cent when navigating the North Sea and the Baltic Sea.

Globally, a massive tightening of exhaust gas limits by 2020 is planned. Shipping is the most important international means of transport for goods, and ships require an alternative fuel that complies with current and future emissions regulations (IMO Regulation 14). In the shipping industry, liquefied natural gas (LNG) is considered to be a low emissions and environmentally friendly fuel, which contributes to a considerable reduction in pollutant emissions in ports and on waterways.

LNG is an environment-friendly alternative to the particulate matter and soot emitting diesel or heavy oil fuels and offers great potential as an alternative fuel for the shipping industry. SB Broneske wants to exploit this potential for its customers and has designed certified LNG components with its development engineers. SB Broneske's objective is to provide expert assistance to ship operators in the upgrade and conversion of ships to LNG propulsion and thus to contribute to the global reduction of sulphur, particulate matter and nitrogen oxide emissions.

With this in view, the company now produces special pipe openings for extreme temperatures. They are certified for bulkhead and deck and can withstand temperatures of 1,000°C for 60 minutes (A60) and are waterproof for at least 30 minutes (6m, 0.6 bar). The pipe openings have been designed for pipes that can transport media between -200°C and +600°C. Hundreds of them have already been installed on cruise ships, ferries, passenger ships, offshore ships and other ship types. The SB Broneske LNG pipe openings for LNG piping systems have type approvals from the major classification societies.

Heat expansion and shrinkage takes place in LNG lines and has to be compensated for through heat expansion elements. The most suitable thermal expansion elements are LNG expansion joints which absorb expansion in axial and lateral directions. One of SB Broneske's core activities is the calculation of the heat expansion in high or low-pressure pipes and in very hot (up to +600°C) or very cold (up to -200°C) exhaust pipes. The SB Broneske LNG expansion joints for LNG piping systems have type approvals from various classification societies, including Lloyd's Register.

On board a ship, the LNG fuel is transported via pipelines from the LNG tank to the engine. These pressurised LNG pipes have to meet various requirements. For example, they have to allow thermal expansion. In addition, they must have redundant safety systems and must be made of specific materials. To meet the requirements for maritime LNG technology, SB Broneske has developed special LNG pipes for shipbuilding which, like the pipe openings and expansion joints, have been tested and certified.

LNG pipes have to be stored in a particular way to keep the pressurised lines in their position and protect the pipes against tearing under extreme conditions, including worst case scenarios such as capsizing. Furthermore, the mounts must allow thermal expansion. SB Broneske has developed LNG mounts for these special requirements, too. *MP*


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WASTE HEAT RECOVERY PROJECT COULD HELP TO CUT EMISSIONS AND FUEL CONSUMPTION IN SHIPPING

UK public-private partnership the Energy Technologies Institute (ETI) has launched a new project that aims to develop and demonstrate a waste heat recovery system for ships that could deliver fuel efficiency savings of at least 8 per cent.

The project will be led by Avid Technology which is based in Cramlington in the north east of England.

It will work alongside RED Engineering (formerly RED Marine) and Royston, both also in the north east, and Enogia based in Marseille, France, to deliver a cost effective waste heat recovery system for use across all types of ships.

The 26-month project should see the waste heat recovery system installed on an offshore support vessel by the end of 2018, for a further six months of testing.

The ETI said in a statement that, unlike the power and heat sectors and other forms of transport there does not seem to be a credible alternative to fossil fuels to power vessels, so in the medium to long term, the best potential to achieve substantial CO_2 reductions is by reducing fuel consumption.

Fuel efficiency in shipping can be improved by reducing the electrical load provided by the ship's generators, by recovering heat energy from the exhaust stream and by substantially reducing the temperature of the exhaust gas by converting the heat to electricity.

The technology being developed in the ETI's project should be capable of being deployed on a range of marine vessels, including chemical tankers, general cargo vessels, container feeders, offshore support vessels and roll on roll off passenger ships.

Project manager Paul Trinick said: "The ETI has recently published an insight report which analyses the UK shipping fleet and the potential opportunities for shipowners and operators, and identifies the most promising technologies that could reduce fuel consumption economically.

"We have established that a 30 per cent reduction in fleet fuel consumption can be achieved by using a combination of innovative technologies, including waste heat recovery systems, with an approximate payback period of just two years.

"It is important that we now develop and demonstrate this technology to provide confidence to shipping owners and operators that it can deliver tangible efficiencies and savings under real world conditions."

Ryan Maughan, founder and managing director of Avid Technology, which specialises in the design and manufacture of electrically powered systems for low emissions vehicles said: "Unlike other forms of transport, the marine industry has yet to establish a credible alternative to fossil fuels so the immediate priority is to achieve substantial CO_2 reductions by reducing fuel consumption.

"The technology solution we are targeting with our partners is based on improving fuel efficiency by recovering heat energy from the exhaust stream, therefore reducing the electrical load provided by the ship's generators, and by lowering the temperature of the exhaust gas by converting heat to electricity."

This project is one of a number of demonstrations currently being commissioned by the ETI that will seek to reduce emissions and increase the efficiency of shipping fleets. *MP*

Ryan Maugham, managing director of Avid Technology: "Unlike other forms of transport, the marine industry has yet to establish a credible alternative to fossil fuels"

Kelvion offers cooling innovations

Germany headquartered Kelvion has developed a new type of heat exchanger plate that provides even better heat exchange. The new NX80M plate rounds off the NX series, which comprises the NX25M, NX100X, NX150X and NX250L plates.

The design of the NX plates enables temperature differences between media of just 1K. This means that the plates are optimal for applications for which only a slight logarithmic temperature difference and, in turn, a higher NTU value, are required. Although they meet the same performance requirements as other plates, they enable the design of highly compact, gasketed heat exchangers. These are useful for a range of applications and in particular demanding, climate controlled applications.

Thanks to a design pressure of up to 30 bar(g) (test pressure of 39 bar(g)), heat exchangers with NX plates can also be connected to networks with high riser piping – for example, in skyscrapers and in district cooling networks.

The NX series offers characteristics that are familiar from the N-series models, such as the NT plate, including the OptiWave design, EcoLoc gasketing, and PosLoc installation.

OptiWave features optimised corrugation of the plates, which ensures ideal flow over the entire width of the plates, counters ineffective flow distribution, and reduces the surface area required. The EcoLoc system allows the exchange of non-adhesive seals without special tools, and the PosLoc system ensures that the plates automatically align properly during installation. These two benefits lead to considerable time savings during installation, and to a perfectly sealed plate pack.

Also from Kelvion, The PF cooler range is designed especially to cool oil. These coolers are shell-and-tube heat exchangers in which not every individual tube is provided with cooling fins. Instead, all tubes mutually use a common bundle of cooling fins for enhanced heat exchange. PF coolers achieve considerably better heat transfer than non-finned shell-and-tube heat exchangers, with the result that they offer the same cooling ability with a unit that is approximately 25 per cent smaller and lighter than conventional models. The oil flows through the fine finned structure with low pressure drops and transfers its heat to the cooling medium that flows through the heat exchanger tubes.

Double O ring seals ensure reliable separation of the medium with this design. The cylindrical form and the inner configuration of the coolers enable great stability and only slight susceptibility to vibration. PF coolers are designed for operations at a maximum of 120°C and up to 10 bar(g) in the interior of the tube bundle, and up to 16 bar(g) on the oil side.

Four different diameters from 95mm to 273mm, and various lengths from 250mm to 3,600mm, are available to match the coolers to the cooling requirement and mass flow required. As a result, they are effective for cooling both lubricating and transmission oils, for example, and fuels such as marine diesel oil and marine gas oil.

The largest model can cool up to 2,500l of oil per minute. To allow for various installation situations, the water entry and the outlet can be arranged on the same face, or on opposite sides. For applications with sea or river water as the cooling medium, the marine versions are fitted with sacrificial anodes for corrosion protection. For cleaning, the tube bundle is simply lifted out of the shell from both sides.

Dismantling and assembly are simple, as each cooler is fitted with only four O rings and only a few threaded connections. *MP*

The design of the NX plates enables temperature differences between media of just 1K

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Value calculator tool estimates cost savings

In November last year, Alfa Laval announced the launch of a new cost estimator tool, the Value calculator. The tool quantifies operating costs for decanters, air heat exchangers and gasketed plate heat exchangers and helps determine actions to reduce these costs.

The Value calculator consists of two critical operating parameters. First, it provides customers with a clear and easy-to-understand overview of their current operating costs for decanters, air heat exchangers and gasketed plate heat exchangers. Second, it shows customers how to reduce these operating costs by implementing services available in the Alfa Laval 360° Service Portfolio.

"Succeeding in today's competitive business environment puts enormous pressure on our customers. So we have put ourselves in our customers' shoes and asked: What can we do to help them save more money?" said Peter Norrby, Alfa Laval general manager for process technology service. "With the Value calculator, we can show customers how they can reduce costs and realise measurable savings by using our services."

The tool quantifies operating costs for decanters, air heat exchangers and gasketed plate heat exchangers

To be able to calculate the savings, customers supply Alfa Laval with actual operating data, such as energy costs, flow rate and pressure. The Value calculator can compare those operating costs with future operating costs when using Alfa Laval's services. It shows customers how much money they can save by using one or more of Alfa Laval's services.

An Alfa Laval condition audit, for example, evaluates the mechanical condition of the equipment, while a performance audit assesses the actual performance of the equipment. Both services provide fact-based insights and indications on how to improve current operations.

"It is important for customers to understand their current operating costs in order to understand how to reduce costs," Mr Norrby continued. "The Value calculator helps our customers realise measurable savings on their decanters, air heat exchangers and gasketed plate heat exchangers."

In addition to the condition and performance audits, the Alfa Laval 360° Service Portfolio offers a broad range of services to address every phase of the equipment life cycle, including start-up, maintenance, support, improvements and monitoring services.

Norwegian collaboration cuts energy costs

Green Technology of Norway is a new collaboration between four companies with a shared vision of making a major difference in how energy is utilised.

The collaborators have a clear goal of increasing sales and strengthening their position as Norway's leaders in sustainable technology for the maritime market.

"The cost of energy is high, especially in terms of negative environmental impact. The world is facing huge challenges related to emissions from fossil fuel. More than ever, green technology is needed," said sales and marketing director of Ulmatec Jon Åge Eidem, representing the co-operation partners.

Green Technology of Norway is a collaboration between Ulmatec Pyro (waste energy management systems), Sperre Coolers (heat exchangers), Anda-Olsen (hybrid power solutions) and Climeon (power generation from waste energy).

The four companies have a clear environmental focus, both through each company's technology, and in terms of the integration of technology between the parties.

Together they offer technology that utilises waste energy from engine cooling and exhaust systems, used for a variety of purposes to enable substantial fuel and cost savings to be made in addition to the major environmental benefits.

Among the developments is a system for generating clean, emissions-free electricity from waste heat recovery, and hybrid power solutions for energy storage and peak operations.

"We believe that shipping companies are genuinely interested in reducing their carbon footprint and installing environment friendly equipment, but reducing emissions is not just a technologically challenging task," said Mr Eidem. "Normally changes of this kind increase the client's capital expenditure. The fact that charterers carry the cost of fuel can also be an obstacle to shipowners investing in environmentally friendly equipment."

"Laws and regulations will probably help to force new solutions into the market, but we have already met these challenges and opportunities by developing an environment friendly system package with a low installation cost and a short payback time – typically less than two years," he concluded. *MP*

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Martek Marine named on world's biggest ever maritime drone contract

UK-headquartered Martek Marine has been awarded a ground-breaking two-year remotely piloted aircraft systems (RPAS) contract from the European Maritime Safety Agency (EMSA). The services offered by Martek will help fulfil the world's largest ever maritime drone contract.

Part of a five-year EMSA strategy of improving coastguard monitoring and surveillance of maritime activity valued at €67 million, the service provision from Martek includes not only the RPAS (drones), but also the pilots, long-range antennae, mission control vehicles and ground crew. Video and drone sensor data will be streamed live to a control centre, to enable EU member states to make prompt decisions about intervention actions.

RPAS will be used to perform BVLOS (beyond visual line of sight) operations and will assist with border control activities, search and rescue operations and monitoring pollution, as well as the detection of illegal fishing and drug and people trafficking.

The services offered by Martek will help fulfil the world's largest ever maritime drone contract

A typical surveillance task involves the deployment of a drone from the deck of a ship to a specified area of interest. The drone then collects the requested surveillance information before sending it, in addition to payload data, to the users.

The drones that have been specified under the EMSA contract are of compact design, making them extremely manoeuvrable in addition to having the ability to start and land vertically both from shore and from a vessel. Focusing on short range operations, the drones will be equipped with the latest sensors designed for maritime surveillance. To operate effectively in the harsh maritime environment, the technology has been developed to withstand storm force wind and heavy rain, snow and salt spray.

Paul Luen, Martek Group chief executive, says: "This contract sets us up for major expansion as the maritime drone experts.More world firsts will be delivered by us in this exciting technology field during 2017, as we launch further disruptive drone services."

Martek's continued contractual success follows the company previously being awarded a €10 million contract by EMSA for ship engine emissions monitoring using RPAS in November 2016. Martek's sister company Coptrz provided consultancy on both contracts.

Enginei wins key environmental award

The beneficial impact of UK diesel power specialist Royston's fuel monitoring technology has been formally recognised with an important maritime industry award.

At this year's Annual *Offshore Support Journal* Awards Royston was named as winner of the Environmental Award for its advanced technology enginei fuel management system.

The achievement recognises the product or project that has made a significant contribution to a reduction in the environmental footprint of the offshore support industry and marks the successful introduction of the new enginei auto mode detection system which optimises offshore support vessel fuel consumption across different vessel operating phases.

The automatic detection of different operational modes enables more reliable vessel and engine performance data to be produced and analysed. This means that onboard engineers and offshore fleet management staff have the ability to make more informed and accurate decisions based on trusted information about fuel consumption, with consequent improvements in vessel efficiency and emissions control.

Damian McCann, enginei product manager at Royston, said: "With the marine sector moving inexorably towards the greater use of intelligent onboard data, the successful ability of the enginei system to accurately monitor and manage fuel consumption is essential to improving a vessel's operating efficiency.

"The *Offshore Support Journal* Award is a real mark of maritime industry quality and we are delighted to have been recognised in this way."

The enginei system uses volumetric and mass flow measurement for enhanced fuel data analysis and engine reporting options that give vessel owners and operators detailed performance data, fuel optimisation rates and mission critical information.

Successful enginei systems are now installed in vessels of all types operating across the globe, helping vessel owners and charterers to maintain high standards of operational performance and demonstrate compliance with environmental controls. MP

Langh Tech water treatment to be used in EGR systems

Already established in the market for supplying scrubbers and water treatment systems, Finland's Langh Tech is now expanding its water treatment technology to new areas.

The company has been working in close co-operation with MAN Diesel & Turbo to develop a water treatment system to be used for cleaning the process water of exhaust gas recirculation (EGR) systems. EGR is a method of reducing NOx emissions to meet IMO Tier III requirements.

In the EGR process, approximately one third of the exhaust gas is recycled back into the engine, after the particles from the redirected gases have been removed with a small scrubber. The process water from exhaust gas washing is continuously cleaned during EGR operation and this is where Langh Tech's water treatment technology is applied. The technology is based on membrane filtration, which means that the operational costs are kept low and the waste consists only of small amounts of compact dry sludge.

The first test runs of the system were performed in December 2015 at MAN Diesel & Turbo's testing facility in Copenhagen, Denmark, using a small-scale prototype built into a container. The results were good, leading to a continuation of the co-operation between the companies. The process has been fine-tuned over time, and MAN Diesel & Turbo has granted approval for the Langh Tech water treatment system to be used in combination with the EGR process. The approval process includes a long-term testing period in co-operation with MAN Diesel & Turbo.

EGCS scrubbers installed on 60 per cent of Carnival fleet

Carnival Corp has completed the installation and certification of its exhaust gas cleaning system (EGCS) on 60 ships across its brands. Representing a US$400 million investment to date, the company is on track to develop and deploy these systems on more than 85 vessels across its global fleet by 2020 – significantly improving the quality of air emissions from its ships and reinforcing its environmental commitment.

First announced in 2013, the company broke new ground in engineering a technology that would function successfully in the confined spaces of a cruise ship to reduce sulphur compounds and particulate matter from a ship's engine exhaust at any operating state of a ship – at sea, during manoeuvring and in port. The systems enable Carnival to meet international regulations that place a cap on the sulphur contentof fuel oil at 0.1 per cent.

According to Carnival, in addition to mitigating costs for low-sulphur fuel, the systems further the company's sustainability goals of reducing the intensity of carbon emissions while improving the overall quality of emissions.

In addition to mitigating costs for low-sulphur fuel, the systems further Carnival's sustainability goals

"Our exhaust gas cleaning systems represent advanced environmental technology, and underscore our company's strong commitment to responsible sustainability practices," said Mike Kaczmarek, vice president of corporate marine technology for Carnival Corp. "Due to the success we have had in improving air quality with our systems, we have expanded our commitment to install and deploy this technology from an original 32 vessels to over 85 through to the end of 2020. This is part of our ongoing focus on evaluating new technologies, employing new shipbuilding techniques and implementing energy saving initiatives throughout our fleet to protect the health and vitality of the oceans, seas and communities in which we operate."

The sulphur reduction programme is in line with other proactive steps Carnival has taken to reduce its carbon footprint, including the adoption of liquefied natural gas (LNG) – the world's cleanest burning fossil fuel. In 2015, AidaSol from the company's AIDA Cruises brand was the first cruise ship in the world to be supplied with power by an LNG hybrid barge. Last year, newly delivered AidaPrima became the first cruise ship to routinely use LNG with a dual-fuel powered engine while in port.

By 2019, with the introduction of the first of seven fully LNG-powered vessels, Carnival Corp will be the first cruise company in the world to use LNG to power cruise ships both while they are in port and on the open sea. MP

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HIGH-EFFICIENCY PROPULSION PROJECT **AIMS AT RADICAL SAVINGS**

An initiative to develop a high efficiency propulsion system could result in a solution that cuts fuel consumption by as much as 8 per cent

Ever increasing pressure on major energy consumers to reduce carbon emissions, coupled with rising energy costs, is driving innovation in the shipping industry and, specifically, improvements in propulsion efficiency.

The UK's Energy Technologies Institute (ETI) – a public-private partnership between global energy and engineering companies and the UK Government – has recently published a report in its Insights series which analyses the UK's heavy duty shipping fleet and the potential opportunities for shipowners and operators. It also identifies the most promising technologies, including high efficiency propulsion systems (HEPS), that have the potential to reduce fuel consumption and so drive a reduction in carbon emissions.

This is part of the ETI's heavy-duty vehicle programme and is one of a number of marine technology demonstration projects that the ETI has commissioned. The two-year heavy duty vehicle HEPS project aims to develop a commercially viable system that can be retrofitted to a variety of vessel types. The technology has an ambitious fuel efficiency improvement target of greater than 8 per cent on the UK heavy duty vessel fleet.

Based on system level analysis of ship power paths, the ETI identified credible options to deliver greater than 30 per cent fuel efficiency improvements across the UK fleet. The development opportunities that could produce the most benefit were judged to be Flettner rotors, waste heat recovery (see page 77) and high-efficiency propulsion systems.

The last of these has led to a project the overall aims of which are to design, develop and demonstrate a high efficiency propeller based propulsion system and from that provide a commercially viable, retrofittable HEPS.

The project began in February this year, with a view to completion by February 2019, when it is intended that the results will be demonstrated in independent full size ship trials with the ETI representative UK heavy-duty marine fleet vessels. At this point, it will be possible to inform ship operators and owners of actual fuel saving benefits and to deliver a platform technology to provide benefit across the marine market.

In this project, the ETI is partnering with

Teignbridge Propellers International to develop a HEPS for ships which aims to reduce fuel consumption by around 8 per cent.

Teignbridge is a marine propeller and propulsion equipment designer and manufacturer. The company specialises in the design and manufacture of high performance custom designed propellers.

It is ideally placed to carry out the research project because it has a complete propeller design and manufacturing facility, including a foundry. It is one of the few propeller companies that actually designs and manufactures propellers, with a particular specialism in fast boat trials. The research project will enable the company to develop a high efficiency ship's propeller.

The two year project aims to develop a commercially-viable system that can be retrofitted to a variety of vessel types. Based in Newton Abbot, in the south west of England, Teignbridge is the largest propeller and stern gear producer of its kind in Europe. Deborah Stubbs, the ETI's HEPS project manager, said: "Unlike other forms of transport it is difficult to replace fossil fuels in marine vessels with low carbon alternatives, so increasing fuel efficiency will become progressively more important if emissions and costs are to be reduced for the shipping industry.

"This project will develop a commercially viable product suitable for a wide range of vessel types and capable of being retrofitted to ensure it is attractive to shipowners and operators. It is one of a number of demonstration projects the ETI is running which, when used in combination, could reduce fuel consumption by up to 30 per cent and cut the carbon emissions from shipping in a cost effective manner."

David Duncan, chairman of Teignbridge Propellers International, said: "We are delighted to have been selected for this technology development and demonstration project. It fits very well with the company's research and development strategy and plans. Teignbridge Propellers has an excellent engineering design team and a background of design development. The project will be helped by the use of the dedicated research test vessel presently under construction for Teignbridge. Selection by the ETI is a recognition and endorsement of the company's abilities."

The vessel itself is being provided by Duncan Research & Development, a company associated with Teignbridge. The craft is a floating hydrodynamic laboratory and workshop, where innovations in propellers and propulsion equipment can be developed and tested in full sized and true operating conditions. The vessel is a catamaran configuration with clear undisturbed water between the hulls where low and high speed testing can be carried out under observation.

The vessel is capable of speeds of 40 knots and more, and offers a range of shaft speeds that utilise the full engine power at different speeds. At the lower speed range it can test for bollard pull performance, and at the higher speed ranges it can test for efficiency and cavitation avoidance. Propellers up to 1.5m in diameter will be developed and tested, which in many cases will be full size models. This will provide more accurate results than using small scale models in test tanks.

The vessel is to be equipped with a full range of instrumentation for testing and recording all necessary aspects of performance. The company plans to optimise its highly efficient C-Foil propeller design further, and to produce a new propeller design series.

The innovative high performance C-Foil propeller, developed by Teignbridge, has an improved, anti-cavitation blade section shape which increases thrust and improves propeller efficiency. Independent computer modelling and numerous comparative sea trials have shown that this ground-breaking design generates greater thrust and efficiency over standard propeller designs. When fitted with C-Foil propellers, vessel operators have noted significant improvement in performance and fuel economy. *MP*

"This project will develop a commercially viable product suitable for a wide range of vessel types and capable of being retrofitted to ensure it is attractive to shipowners and operators"

About the ETI

The ETI is a public-private partnership between the UK Government and global energy and engineering companies BP, Caterpillar, EDF Energy, Rolls-Royce and Shell.

The role of the ETI is to act as a conduit between academia, industry and the Government to accelerate the development of low carbon technologies. It brings together engineering projects that develop affordable, secure and sustainable technologies to help the UK address its long-term emissions reductions targets as well as delivering nearer-term benefits. It makes targeted commercial investments in nine technology programmes across heat, power and transport and the infrastructure that links them.

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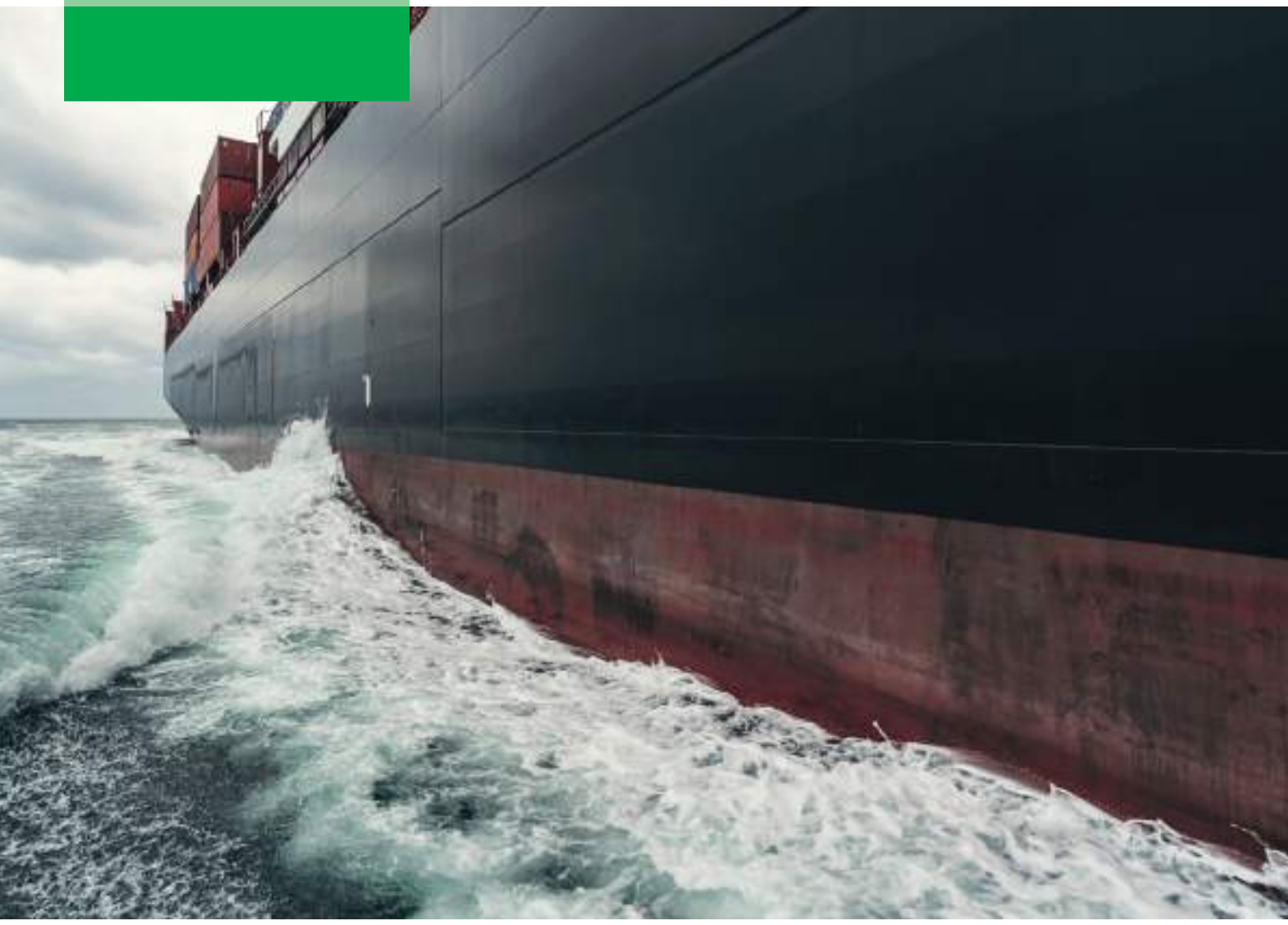

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SHELL MARINE ACQUIRES IMPA ACCREDITATION

Jan Toschka, general manager, Shell Marine Products

Shell Marine has become the first company involved in the development, supply and support of marine lubricants to receive accreditation under the International Marine Purchasing Association's IMPA ACT sustainable maritime suppliers scheme. The preferred supplier status is conferred within the IMPA responsible supply chain management (RSCM) initiative which seeks to improve the economic, social and environmental sustainability of international shipping and marine industries.

"We, at Shell Marine, are delighted to be the first in our sector to secure accreditation under the scheme," said Jan Toschka, Shell Marine executive director. As a global supplier with more than 30 blending plants and a maritime supply network of more than 700 ports in 58 countries, anyone visiting or working with Shell Marine will know how seriously we take our responsibilities as a world citizen.

"However, we also realise it is imperative that our own strict code of ethics is fit to stand up to the scrutiny of external parties. That is why we see this recognition under the IMPA ACT scheme as particularly important. Our customers also confirm that the IMPA ACT preferred supplier status is being used as a benchmark for quality throughout the supply chain."

Members are leading shipowning and management companies with a commitment to implementing the IMPA ACT Supplier Code of Conduct both within their company and through their supply chain. Preferred supplier accreditation is awarded to organisations that meet the IMPA ACT standards or reach agreed milestones, in a process that is fully audited by IMPA and may be subject to spot checks.

"IMPA ACT is an exclusive community of ship purchasers and suppliers working to become sustainability frontrunners by working towards compliance with internationally endorsed standards," said Stephen Alexander, IMPA secretary general and chief operating officer. "It is an independent initiative representing international best practice and is aligned with UN principles."

Babcock LGE Process presented with LR Approval in Principle

Babcock International Group subsidiary Babcock LGE Process received Approval in Principle (AiP) from Lloyd's Register (LR) at this year's Gastech conference and exhibition for its liquefied natural gas (LNG) mixed refrigerant reliquefaction system, ecoSMRT.

> "It is an exciting time for Babcock, as we introduce new technological solutions for LNG carriers as well as shuttle tankers"

With innovation at the heart of its market-leading philosophy, Babcock said that it was delighted to receive AiP for its new technology, which recognises its successful assessment against demanding industry codes and standards.

Designed in response to the growing requirement for a solution to the problem of excess boil-off gas resulting from the introduction of dual-fuel propulsion engines with high efficiency, the ecoSMRT LNG reliquefaction plant is designed for application on LNG carriers to save excess boil-off gas by means of its reliquefaction.

"We are pleased to present the AiP certificate to representatives of Babcock here today at Gastech," commented Jose Navarro, principal gas technology specialist for LR. He continued: "There is lots of discussion at the show around efficiency, so it is very fitting to be able to recognise Babcock's LNG reliquefaction system, ecoSMRT."

The scalable ecoSMRT system, optimised for LNG carriers, uses the well-proven and reliable technology of mixed refrigerant refrigeration, but is based on a novel arrangement of these components. The improved single mixed refrigerant LNG reliquefaction system reduces complexity, minimises overall footprint and reduces cost in terms of initial investment as well as during operation.

Alan Duckett, technical and sales director for Babcock LGE Process, said: "As innovators in the field of LNG technologies it is a real privilege for Babcock to be recognised in this way and to be presented with an AiP from LR.

"Our ecoSMRT technology can provide significant operational benefits to LNG carriers and is testament to our ground-breaking design capabilities, developed along with long standing partner Hyundai Heavy Industries and with valuable input from LR.

"It is an exciting time for Babcock, as we introduce new technological solutions for LNG carriers as well as shuttle tankers – ecoVOCC – and LNG gas supply vessels – FGSVo."

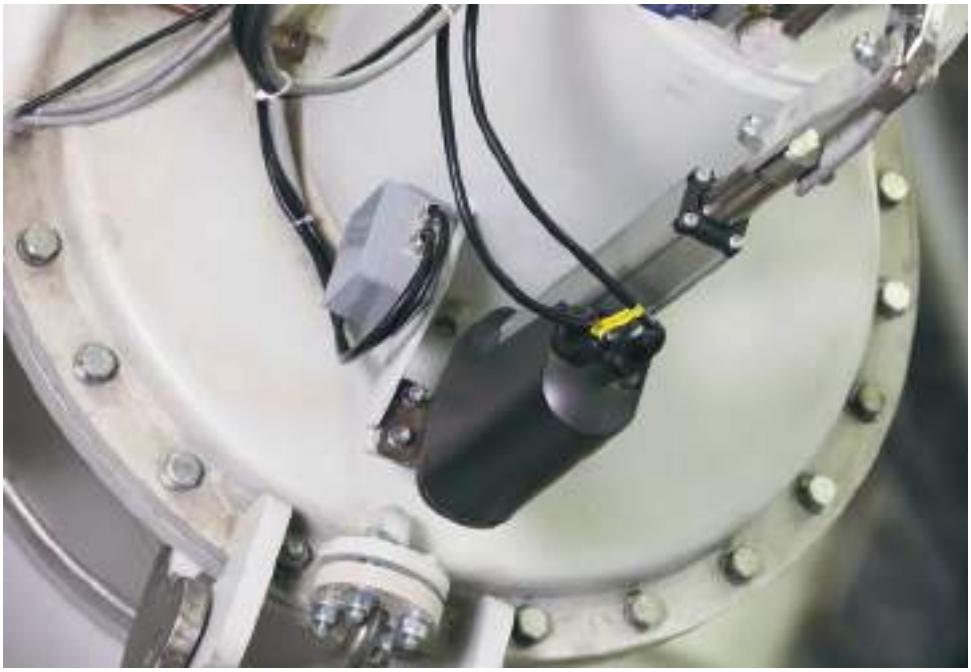
The presentation by LR closely followed the announcement that Babcock LGE Process would bring its award-winning innovation and extensive international experience to bear in a collaboration with ExxonMobil, Bernhard Schulte Shipmanagement, Calor Gas and Orkney Islands Council in the Caledonia LNG project, that will explore the provision of LNG for northern UK and North Sea customers.

With a track record of success in Asian markets, where Babcock has developed cutting edge solutions for its clients – including ecoSMRT and its patented Vent Gas Cooler, SuperCooler and FGSVotechnology – the company brings an unrivalled depth of knowledge and skill to LNG operations. *MP*

Alfa Laval AFEM produces significant fuel savings

The Alfa Laval Automatic Fuel Efficiency Module (AFEM) is a new modification for reducing the fuel consumption of Alfa Laval Smit Combustion inert gas systems. It does so by ensuring the inert gas that keeps cargo safe during offloading is only generated in the exact amounts required. In a two-year pilot project, the AFEM enabled Italian shipping company Navigazione Montanari to achieve an average fuel saving of 30 per cent.

Valle di Navarra, a 40,000 dwt product carrier built in 2002, was selected as the test vessel for the project. The ship generally sails in the Mediterranean, with gas oil and gasoline cargo. Compared with similar vessels with Smit Combustion systems, *Valle di Navarra* discharges frequently – up to three times per week.



Alfa Laval Equipment Upgrade AFEM for Smit inert gas systems

This provided Alfa Laval with ample statistical information on the AFEM's performance and reliability.

Data collection was one reason that Alfa Laval decided on a particularly long pilot programme, but guaranteeing the cargo's safety and reliable availability was even more crucial.

"The AFEM modification is part of the inert gas generator's combustion control circuitry," said Mart Blankert, inert gas systems customer support manager at Alfa Laval. "A failed module could prevent cargo from being discharged, meaning expensive delays in port. Working with potentially volatile cargo, we took our time with the pilot to ensure that everything functioned as intended."

"The AFEM was designed with capabilities for full override in case of any such problems," added Alessandro Federico, Navigazione Montanari technical director. "And although you expect some issues with any pilot project, we are glad to say that we never lost a minute of commercial operation with the AFEM."

Chevron expands oil analysis into China

Chevron Marine Lubricants has cemented its commitment to the Asian market by expanding its FAST used oil analysis service into a new laboratory in mainland China. This offers the ability to analyse FAST and drip oil analysis DOT.FAST samples with a faster turn-around for vessels visiting Chinese ports.

"The introduction of FAST testing facilities in China will significantly reduce the time taken for samples to be delivered to existing laboratories, meaning faster results and improved onboard monitoring."

Testing is conducted by SGS, Chevron's lubricants analysis partner, in a state-of-the-art laboratory in Shanghai, with the same test procedures and operational excellence standards that Chevron's customers have come to expect, according to the company. The new location provides the same format of testing, reporting and commenting while using a common database that ensures access to Chevron's FASTWeb for historical trends and results, no matter where the sample was tested.

"We continue to grow our world class lubrication services, designed to help our customers maximise efficiency on board," said Chia Yoo Soon, general manager of Chevron Marine Lubricants. "This demonstrates our focus on customer requirements and our ability to adapt to their needs quickly. The introduction of FAST testing facilities in China will significantly reduce the time taken for samples to be delivered to existing laboratories, meaning faster results and improved onboard monitoring." MP

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Estimates differ for cost of 2020 sulphur cap

Global bunker fuel costs could rise by up to US$60 billion annually from 2020, according to a recent report.

Analyst Wood Mackenzie shows that a combination of higher crude prices and tight availability of marine gas oil (MGO) could take the price of the product up to almost four times that of current fuel and eventually cost the entire industry the additional US$60 billion.

Research director for Asia refining at Wood Mackenzie Sushant Gupta said: "Despite attractive returns, the penetration rate for scrubbers could be limited by access to finance, scrubber manufacturing capacity, drydock space and technological uncertainties. The shipping industry is traditionally slow to move, but in this case early adopters may benefit hugely," he added.

Mr Gupta made the point that switching to MGO is a more costly solution. When the IMO regulation is in force and vessels are in full compliance, shippers are expected to try to pass the cost on to consumers and freight rates, which could increase by up to US$1 a barrel.

In response, the International Bunker Industry Association (IBIA) said that the headline figure in the report assumed the majority of the world fleet switching from high sulphur fuel oil to MGO. It has been provided with details from another analysis of the potential cost of the 2020 sulphur regulation based on modelling assuming a higher uptake of scrubbers. IBIA said: "Combining the bunker cost differentials with the prices and the uptake in scrubbing results in an average annual cost to the shipping community of US$24 billion over the decade starting in 2020. These costs would subsequently decrease." *MP*

World bunker prices (Bunker price Indications – Wednesday 5 April 2017)

LATEST PRICES	BRENT	WTI	MGO	NOTES
Settle	$54.17 +$1.05	$51.03 +$0.79	$477.75 $7.25	
EUROPE	**IFO-380 3.5%**	**IFO-180**	**MGO 0.1%**	
Rotterdam MTD	$295-$299		$464-$470	
Antwerp MTD	$298-$303		$464-$470	
Falmouth MTW	$307-$312		$501-$506	
Gibraltar MTD	$305-$310		$499-$505	
Gothenburg MTD	$300-$310		$495-$505	
Las Palmas MTD	$315-$320		$505-$510	
Malta MTD	$303-$308		$485-$495	
Piraeus MTW	$305-$309		$491-$495	
St Petersburg MTD	$265-$275		$460-$470	
Lisbon MTW	$327-$333		$531-$536	
MIDDLE EAST, SOUTH AFRICA				
Fujairah MTD	$310-$316		$560-$565	
Durban MTW		$352-$355	Subject Enquiry	Barging $11.50pmt
Dammam-Ras Tanura MTD	$287		$530	PPDD
Jeddah- Yanbu- Rabigh MTD	$321		$530	PPDD
Richards Bay MTW		Subject Enquiry	Subject Enquiry	Barging $14.00pmt
AMERICAS				
New York MTW	$325-$332		$490-$505	
Houston MTW	$305-$312		$485-$505	
New Orleans MTW	$310-$320		$475-$485	
Vancouver MTW	$340-$345		$565-$585	
Panama MTW	$319-$330		$505-$520	
Santos MTD	$320-$312		$668.50-$669.50	DMA
FAR EAST				
Hong Kong MTD	$314-$319		$495-$500	
Singapore MTD	$316-$321		$490-$500	
Busan MTD	$338-$343		$530-$535	
Tokyo Bay MTD	$344-$350		$450-$460	Diesel LSDDMB
Shanghai MTW	$333-$336		$595-$600	
Qingdao MTW*	$335-$338		$600-$605	

MTD = delivered
MTW = ex-wharf
PP = posted price

Information supplied by Dave Reid - Broker @ WMF
e: dareid@wfscorp.com
Wilhelmsen Premier Marine Fuels Ltd

All prices listed are in US Dollars. These are indicative prices only to be used as a guide, subject to change depending on market conditions, quantity & supply date.

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FUTURE-PROOFING THE FLEET

A new container ship design intended to enable shipowners to adapt to future circumstances has been unveiled by Rolls-Royce

Rolls-Royce has unveiled a new modular concept in ship design to provide smart future shipping.

Speaking at the company's London, UK offices, Oskar Levander, vice president for concepts and innovation, showed its concept design for a future-proof container-carrying ship featuring modular components that can be swapped out or renewed to adapt to changing requirements.

Called *Electric Blue*, the proposed vessel is based on a 1,000 teu feeder vessel and represents Rolls-Royce's response to the challenges of low charter rates, changing environmental regulations, fuel diversity and emerging technologies.

This is achieved by offering a flexible design based on the concept of 'everything in a container,' whereby alternative gensets, batteries, accommodation areas, fuel tanks and so on are containerised and can simply be swapped out as required.

The ship also has wider dimensions than current container ships, with a slightly arched hull design and a deeper, sharper bow design to minimise the effects of wave slamming when out at sea. Dual propellers have been specified for ballast and also propeller redundancy. They have been set as low as possible to ensure they always remain below the waterline.

An additional advantage of the wide steel hull is that there is no need for water ballast on board to stabilise the ship, and therefore no need for ballast water management. Mr Levander said: "This way, we avoid having to invest millions in a ballast water treatment system."

Because so much on the vessel is based around containers, it becomes a relatively simple task to use a crane to replace or upgrade various elements depending on market conditions, the voyage, and so on.

"By using the 'everything in a container' concept, the vessel can

Containerisation will allow huge changes to take place in port

be tailored for specific routes and local emissions regulations, as well as adapting to various political and economic situations," said Mr Levander. "Meanwhile, through the use of standard interfaces, we can minimise the number of systems that are needed. There would be no fixed engines, no fixed fuel tanks, no ballast water system, no water production and no sewage treatment plant."

In fact, even the control bridge is housed in a container. While this would obviously not be compatible with current regulations on design, it is intended in part to ensure that the vessel is ready should fully unmanned container ships ever come into service. Should that be the case, the owner would be able to remove the bridge entirely from the ship and relocate it on shore to control the vessel remotely from dry land. For now, however, the bridge is on board the ship, housed below the containers at the rear of the ship rather than above, thus freeing valuable space for additional cargo payload – although, as Mr Levander made clear, this aspect would require approval from regulators before it could be built.

Overall, Rolls-Royce estimates that *Electric Blue* has the potential to save €2.5 million compared to an equivalently capable newbuild, in terms of capital expenditure. However, this saving would be offset to some extent by the increased operating costs incurred in swapping out individual pieces of equipment. Mr Levander said: "Yes, there will be additional opex costs related to these things. There is an impact, yes. However, cost plans will be based on individual charters and the ability to adapt will bring its own cost benefits. Equally, if you are operating a fleet, it may be the case that you have kit that you can chop and change between vessels, thus minimising any such costs."

Another effect of such a design, of course, would be to increase the lifespan of a modular vessel to its hull life, since any equipment could easily be replaced or upgraded.

The modularity of this design is part of a wider picture, as far as Rolls-Royce is concerned. It feels that the various pressures on shipping mean that the decision to invest in vessels for the long term is more risky and uncertain than ever before. Its response has been to offer a design with low building costs, low maintenance and new adaptive possibilities.

"The compliance options, fuel diversity, fuel price uncertainty, low freight rates and possible future environmental regulations mean that, in terms of investment, the picture has never been more complicated," said Mr Levander. "To some extent, any decision about equipment is going to be a gamble because you simply cannot know what may be forthcoming over the lifetime of the vessel. This is why a flexible solution that allows shipowners to chop and change according to circumstances makes so much sense."

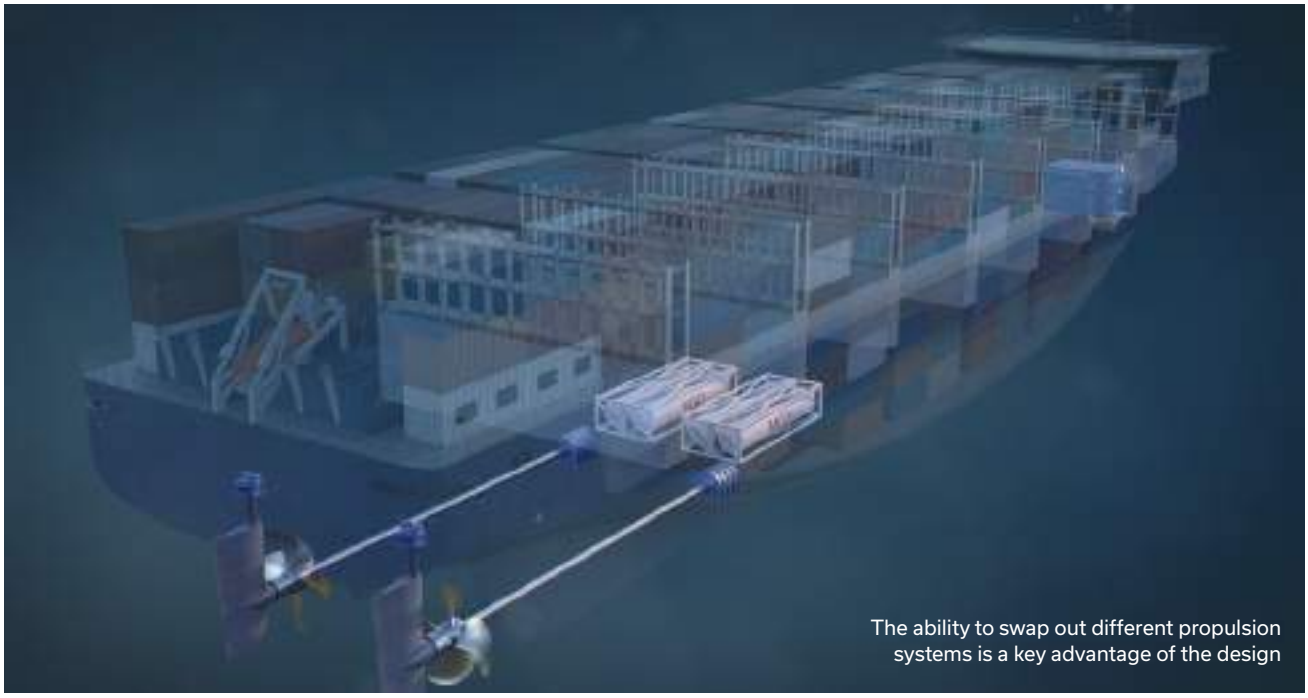
Rolls-Royce believes the new conditions, and the responses to them, will see a variety of seismic changes to the market. The idea of low-cost smart shipping, it believes, will see new players emerging who will want flexible, adaptable and remote-ready vessels such as *Electric Blue*, in order to exploit the market.

Mr Levander used the phrase 'Uber of the seas' to describe the possible future of the market, in which global retailers may seek to control their own means of distribution by chartering or even owning vessels. This would make access to a low-cost, high-capability vessel such as this one invaluable.

Inspiration has in part come from Rolls-Royce's experiences in the aviation sector, where low-cost airlines have transformed the market by focusing on standardised fleets and high asset utilisation. This, it believes, may also be the future for the shipping industry.

Mr Levander said: "I think the standardisation of vessels is something that will become a shipping trend. All ships today are effectively prototypes, but it makes much more sense going forward that they should become standardised, modular designs able to adapt to a variety of needs."

The design of *Electric Blue* can be scaled down or up and Rolls-Royce is already talking to potential customers. MP



The ability to swap out different propulsion systems is a key advantage of the design

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Erma First applies for USCG type-approval

Another ballast water management system (BWMS) maker has applied for US Coast Guard (USCG) type-approval. It is Erma First of Greece, which submitted its approval last Tuesday (11 April) but only made its application public yesterday (18 April). At the time of writing, its application had not yet been included in USCG's online list of applications it has received.

It is now planning to be one of the first – perhaps the first – to apply for type-approval to IMO's revised G8 Guidelines, which set out testing requirements under the Ballast Water Management Convention.

http://bit.ly/Ermaballast

Wärtsilä scoops waterjets contract for Virtu Ferries' new catamaran

Malta-based Virtu Ferries' new high-speed ferry – set to be the largest high-speed catamaran in the Mediterranean Sea – will deploy Wärtsilä waterjets.

The scope of supply covers four Wärtsilä LJX1500SRI waterjets and a Lipstronic control system. The equipment is scheduled to be delivered to Incat Tasmania yard – which is building the ferry – in April 2018 and the ship is to be delivered to the owners at the end of 2018.

bit.ly/Virtu12

AkzoNobel coatings applied to 1,000th vessel

AkzoNobel's ongoing efforts to make shipping more sustainable reached another landmark recently with the 1,000th application of Intersleek 1100SR, the biocide-free fouling control coating, part of the International range. The milestone was achieved with the Al Gattara LNG tanker operated by Nakilat Shipping Qatar.

Delivering outstanding macro and micro fouling control with improved static resistance, even in warm waters, the product enables vessels to reduce drag and achieve fuel efficiency and emissions savings of 9 per cent on average.

http://bit.ly/AkzoCoat

Yara to deliver scrubbers to Toll

Yara Marine Technologies has been awarded a contract for the supply of hybrid scrubber systems on two roro vessels to global logistics company Toll. Work is underway on the first vessel at Jinling Shipyard in Nanjing, China.

With both vessels operating on the environmentally sensitive Australian coast, the exhaust gas cleaning system from Yara Marine Technologies has been carefully designed with technology to minimise the vessels' environmental footprint.

http://bit.ly/YaraToll

The world's LNG-fuelled fleet in 2017

As of March, the in-service and on-order fleet of LNG-powered seagoing ships has reached the 200 mark. The fleet hit its double century on 20 March 2017 when Sovcomflot confirmed orders for four ice-class Aframax tankers of 114,000 dwt at Hyundai Samho Heavy Industries.

bit.ly/lngfleet1

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Editor's comment:

This paper addresses the maritime industry's progression towards more proactive strategies and tools to monitor the health of shipboard machinery.

Editor's selection:

Recognising the Value of Data in the Maritime Space

Rapidly developing technologies are transforming the way major trans- portation assets are managed. Innovations such as the cloud, cognitive analytics, the industrial internet of things (IIoT), and advanced cyberse- curity are showing emergent signs of improving operations of a oat, ashore, subsurface, and aloft transportation assets.

The Nordics: the home of disruption?

Birgit Liodden, director of Nor-Shipping, argues that the Nordic countries will drive shipping's digital transformation

The world is not standing still, and shipping cannot afford to. The pace of change in society is accelerating every day, enabled by digitalisation and facilitated by individuals and firms that see potential rather than challenges. New business models can be born overnight, efficiencies unlocked with the tap of a screen, and resources utilised as never before.

So where do we, as an industry, fit in? How can we ensure we keep up with developments and, where possible, push them forward?

I believe we have to look to the Nordics.

Before any readers accuse me of bias – yes, I'm Norwegian, and proud of it – I will back up this opinion with some hard facts. Denmark, Norway, Finland and Sweden fill the first four positions, in that order, in the latest European Commission Digital Economy and Society Index. This ranks nations within the continent according to connectivity, human capital (digital competency), internet use, integration of digital technology and digital public services.

The Nordics lead the way, defined by sophisticated skills, business digitalisation and near universal access to high speed services and connections.

What is more, when compared with leading non-European nations – including the United States, South Korea and Japan – the quartet retain their positions, based on the judging criteria, emerging as undisputed world leaders.

There is no other place where digital technology is as well integrated as it is here, in the Nordics. It has emerged as a natural part of our collective culture.

This understanding, in combination with our distinct maritime heritage and expertise, gives us – and the industry as a whole – a unique opportunity. We can be a global centre of excellence for advanced digital maritime solutions.

My home country's decision to take the lead in autonomous vessel research provides a case in point.

In October last year the Norwegian Maritime Authority and the Norwegian Coastal Administration signed an agreement allowing the testing of autonomous ships in the Trondheim fjord in central Norway. With collaborators from across the maritime and technology spectrum – including the Norwegian University of Science and Technology (NTNU), Kongsberg Seatex, Kongsberg Maritime, the Norwegian Marine Technology Research Institute (MARINTEK), Trondheim Harbour and Maritime Robotics – this project is a world first, bringing innovative partners together in what is effectively a huge natural laboratory to develop and pilot ideas that could transform the very nature of shipping.

And, have no doubt, this endeavour is underpinned by digital expertise. The sharing of information, seamless connectivity between assets and teams at sea and on shore, and collaborative technological solutions are what will bring this project into being.

Shipping is facing a series of challenges – from unpredictable and hugely damaging cyclical shifts to environmental concerns, geopolitical threats, economic macro-trends, and more. We need new solutions, new technology and new ways of working together, as we are seeing in the Trondheim fjord, to tackle these challenges and chart a course to a sustainable future.

In short, we need to disrupt. We need to question convention and embrace innovation.

That is why at Nor-Shipping 2017 we are dedicating the whole of Hall A to the concept of disruptive sustainability. This will see innovative exhibitors from the maritime industry rubbing shoulders with leading players from the wider business and technology and digital industry arenas, enabling the sharing of insights and a cross fertilisation of potentially disruptive ideas.

By opening the doors to the best minds from outside the industry we can help push maritime forward in new directions that would not have been possible working in isolation. Inspiration can come from anywhere, and anyone, and shipping needs to accept that if it is to realise its true potential.

There is no doubt that digital technology will be at the heart of not just our exhibition hall, but also the next generation of shipping solutions.

It therefore makes perfect sense to look to the most digitally advanced countries in the world to seek. *MP*

Nor-Shipping 2017 takes place in Oslo and Lillestrøm, Norway, from 30 May to 2 June 2017

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