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German marine equipment – always a step ahead in innovation

Germany is successfully defending its position as a world champion in supplying high-quality marine equipment and systems. In a challenging world market, the equipment industry is focusing on the aims and objectives of their customers in international shipping – improving both economy and environmental footprints significantly whilst also simultaneously ensuring safety and operational reliability on board.

This publication is intended to bring international shipowners, shipyards and naval architects up to date on current technology and the latest developments in a number of important ship systems offered by German industry.

Main topics under discussion are smart shipping and “Maritim 4.0”, a higher degree of automation, lower fuel consumption, alternative fuels, comprehensive onboard environmental protection and the reduction of ships’ operational costs. With these imperatives in mind, German suppliers are further optimising their product-related, flexible service networks worldwide and concluding forward-looking cooperation deals.

On board modern commercial ships, more than 30 equipment systems have to be dovetailed into a single, complex “floating plant” and must operate with a very high degree of reliability. These equipment systems – ranging from propulsion, energy supply, automation and intelligent cargo handling systems to navigation and communication equipment as well as safety systems – need to work perfectly around the clock. This is the job of a highly capable and specialised shipbuilding equipment industry which works closely with national and international shipyards and ship owners when products and systems are being developed.

Over the decades, Germany has forged a highly qualified marine industry and its globally recognised competence stems largely from a combination of experience and innovation. More than 400 companies make up the German equipment supply industry.

They have succeeded in boosting their exports to more than 75% of their production, with an annual turnover of EUR 12 billion. German equipment suppliers are striving consistently to mould their employees’ work practices and way of thinking into a future-oriented form of co-operation. The fact that ship owners, as customers, together with capable technology partners at German universities and research institutions, are also closely involved in this process and cooperate within the “shipbuilding network” is a unique and important competitive advantage for the German shipbuilding industry.

I am convinced that this publication will provide readers with interesting, practical and cutting-edge information, and arouse interest in seeking or deepening contacts with Germany’s highly skilled marine equipment companies.

VDMA – MARINE EQUIPMENT AND SYSTEMS

The association is a special division of the well-known German non-profit organisation VDMA (Mechanical Engineering Industry Association). VDMA – Marine Equipment and Systems represents Germany’s entire maritime supply industry with member companies from all branches, including mechanical engineering, electrical engineering and electronics.

VDMA supports its member companies with a wide range of activities and services including:

- intensifying mutual cooperation with operators and yards in technological as well as commercial fields;
- helping worldwide customers in arranging contacts with German marine equipment manufacturers;
- fostering free and fair market principles in the global marine market by means of close contacts with various international organisations;
- sponsoring important international exhibitions and conferences in the shipbuilding sector.

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**GREEN GUIDE**

The protection of the environment and the reduction of emissions have become a focal point of the marine industry’s interest. This edition is featuring a “GreenGuide” that emphasises the environmentally friendly characteristics of the presented technologies.

- **Efficiency**
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- **Greenhouse gas reduction**
- **Sustainability/conservation of resources**
- **Emission reduction of sulphur oxide**
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Series production of first high-speed pure-gas marine engine

**MTU** Engine specialist MTU continues to develop new propulsion systems for commercial and offshore applications. The company’s first high-speed pure-gas engine will go into series production in 2018 whilst the fuel consumption of the series 4000 diesel engines for IMO III and EPA Tier 4 has been reduced by 5%, with power output up by 45%.

The new MTU gas marine engine, which has already successfully completed 3,600 hours on the test bench, is generating considerable interest amongst commercial operators and next year will see delivery of the first certified series production units.

“The engine is well-suited to the requirements of our customers, as its performance and acceleration are similar to a modern diesel engine. It is economical, reliable and clean. This engine has already created a lot of interest in the commercial marine sector,” said Knut Müller, Head of Marine and Defense Business at MTU.

Tighter future emission regulations will demand even more environmentally friendly propulsion systems than are currently available. In the case of the gas engine, toxic substances in the exhaust gas have been reduced by 80-100% compared with the diesel engine, while carbon dioxide emissions have been cut by up to 11%. The new MTU gas engine will meet IMO Tier III, as well as the 2020 EU Stage V emission standards in force since 2016, with no additional exhaust gas treatment required. A compact, built on oxidising catalytic converter (oxi-cat) is used to achieve EPA Tier 4 standards.

**Gas engine portfolio as of 2018**

The 16-cylinder gas engine will cover a power range from 1,500 to 2,000 kW and will be based on MTU’s proven 16V 4000 M63 diesel engine for workboats. As of the end of 2017, the first test engines will be used to power a tug built by Damen Shipyards for Svitzer. The two companies have entered into collaboration with MTU to commission the world’s first tug powered by high-speed gas engines. It will provide high performance in addition to reduced fuel costs and emissions.

Dynamic acceleration, low environmental impact, reliability and economy make the new MTU gas engines very suitable installations for tugboats, ferries, push boats and special purpose vessels such as research vessels. MTU 16V 4000 engines will also be used to power two catamaran ferries for shipping company Doeksen, which will deploy them in the Dutch Wadden Sea.

The gas engine portfolio will initially be supplemented by an 8-cylinder engine which will be available across a power range between 750 and 1,000 kW from 2020 onwards. As of 2019, this MTU gas engine is to provide the propulsion for a new Lake Constance ferry operated by the local public utility, Stadtwerke Konstanz, which will ply between the two Lake Constance towns of Constance and Meersburg on Europe’s largest drinking water reservoir.

The new MTU gas engines will be equipped with a multipoint gas injection system, a dynamic motor management system and an advanced turbocharger. The multipoint gas injection system is designed to provide dynamic acceleration, increased performance, and reduced emissions. The combustion concept ensures that the IMO III emission standards are met without the need for additional exhaust gas treatment. Controlled combustion ensures that fuel is used efficiently. Safety features, which have been optimised for gas operation, include double-walled gas supply lines which allow the engine room to be fitted out in...
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the same way as for a diesel engine (inherently gas-safe machinery space). On the test bench, real-life manoeuvres were simulated, corresponding to the dynamic acceleration behaviour of a diesel engine. Satisfactory completion of the 3,600-hour test has demonstrated that the gas engine’s reliability compares well with the MTU Series 4000 diesel units.

Diesel marine engines for IMO III and EPA Tier 4

At SMM 2016 in Hamburg, MTU presented its advanced design Series 4000 diesel engines for IMO III and EPA Tier 4 emissions compliance. The engines have already successfully completed over 4,000 hours on MTU’s test benches in Friedrichshafen, Germany and Aiken, USA. MTU will be offering these engines as the main propulsion units for tug boats, ferries, crew supply vessels, displacement hull yachts, governmental vessels, and as gensets for ships and offshore platforms. With various technical advances in the turbocharging system, the combustion process and the injection system of the engines combined with MTU’s new SCR system, NOx emissions have been reduced by 75% compared with IMO II, and particulate emissions by 65% compared with EPA Tier 3. An additional diesel particulate filter is not required.

The advanced design Series 4000 diesel engines will be available on the market as 12- and 16-cylinder versions and also as a completely new 20-cylinder version. The power range will extend from 1,380 to 3,220 kW and will thus offer a 45% increase in output compared with its predecessor. MTU will thus be presenting the only high-speed work boat engine in the engine class < 5 l/cyl delivering an output of up to 3,220 kW.

In addition to output and environmental compatibility, life-cycle costs were also a key focus in the development of the new MTU engines in order to provide operators with significant benefits. As a result of the technical advances made to improve the operating efficiency of the turbocharger, fuel consumption has also been reduced by further a 5% compared with the preceding model.

New SCR system

With the integrated system for IMO Tier III and EPA Tier 4 consisting of the engine and the SCR exhaust gas after-treatment system, the customer will benefit from an optimally matched set-up. It requires a minimum of installation space and features an excellent power-to-weight ratio. The exhaust gas after-treatment system is extremely compact due to the integration of the reactant preparation section in the SCR box. MTU is offering two different configurations:

- Two aluminium catamarans are to operate ferry services by Doeksen from 2018 on the Dutch Wadden Sea. The ferries will be built by Strategic Marine and powered by the new MTU gas engines.
customer can choose between a cubic or flat box depending on his specific requirements. MTU development engineers have designed the engine and the exhaust gas after-treatment box so that, depending on the available space, they can be installed either next to, or apart from each other.

In terms of flexibility, vessel operators will benefit from being able to switch the SCR system on and off, as required, when ships travel from one emission-controlled area into another. MTU's SCR system is not preset as is usually the case, but is adjustable. Emissions are measured upstream and downstream of the system and the precise amount of reactant required is then introduced. To simplify maintenance, MTU's SCR system is fitted with flaps so that the catalyst elements can be easily exchanged.

**IMO III compliant engines for yachts and patrol boats**

The high-performance Series 4000 engines for yachts and patrol boats will be modified slightly to meet IMO Tier III and launched on the market with MTU's SCR system. The engines will be available in 12-, 16- and 20-cylinder versions covering a power range from 1,920 to 3,900 kW. The turbocharger technology has been technically upgraded and both the engine control system and the engine package are new compared with preceding models.

> **ABOUT MTU**

MTU is part of Rolls-Royce Power Systems, headquartered in Friedrichshafen, Germany, and employs about 10,000 people. The product portfolio includes MTU-brand high-speed engines and propulsion systems for ships; power generation; heavy land, rail and defence vehicles; and the oil and gas industry. Available in numerous cylinder configurations, engine series bearing the MTU brand cover a wide performance spectrum up to 10,000 kW.

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Low-speed portfolio introduces new Mk10 product platform

**MAN DIESEL & TURBO |** Engines and power generation specialist MAN Diesel & Turbo recently added three new engines to its large-bore engine programme. Weight-optimised and lighter compared with their Mk9 counterparts, the engines form the new design platform for a new Mk10 portfolio. Key to the new platform is the development of the TCEV (Top Controlled Exhaust Valve) and FBIV (Fuel Booster Injection Valve) components.

The new units are:
- a MAN B&W G90ME-C10 type (developing 6,240 kW per cylinder),
- a MAN B&W S60ME-C10 type (developing 2,490 kW per cylinder),
- a MAN B&W S70ME-C10 type (developing 3,430 kW per cylinder).

These are the first engines of a new generation that will ultimately involve the upgrading of all S- and G-engines to the Mk10 platform, the company says. For some years now, MAN Diesel & Turbo’s primary R&D target has been to develop the next generation of its ME platform. During this time, the goal has been to utilise the full potential of the ME engine concept by reducing the complexity of the hydraulic system and increase system performance – the new TCEV and FBIV technologies have been developed within this scope.

The design initiative delivers a specific weight reduction of up to 10% per kW, MAN claims, and also accommodates a higher $P_{\text{max}}$, which also contributes to a reduction in fuel consumption. The company is confident that the market will embrace the benefits of the new platform as it represents a simpler design with fewer components, a reduced total weight, and lower fuel consumption.

The new platform is based on a much more mass-optimised design platform that results in lighter engines with reduced overall length, width and height compared to its Mk9 counterpart. The purpose of the TCEV is to integrate the exhaust actuator, the hydraulic push rod, and the HCU block into the exhaust valve. By doing so, the dynamic behaviour is improved because there is no longer a need for a long hydraulic push rod. The FBIV and the TCEV technologies are well-suited for integration on the cylinder cover of the engine, as the control of the valves for fuel injection is separated from the control of the exhaust valve by the use of the well-known electronic fuel injection valve (ELFI) and the new proportional exhaust valve actuator (PEVA). Integration of FBIV and TCEV leads to a considerable weight reduction, allowing for the elimination of the baseplate, HCU, pressure booster, high-pressure fuel-oil pipes and exhaust actuator. In combination, these two technologies also offer improved hydraulic dynamics and flexibility.

MAN Diesel & Turbo reports that the TCEV/FBIV system is entering its final confirmation stage and has already operated in service for more than 2,000 hours as a system, and the FBIVs separately for more than 10,000 hours – both on a 50cm bore engine.

Figure 1 juxtaposes the traditional top-engine solution from older engine marks with traditional HCU, actuator and exhaust valve (right) and with the new Mk10’s integrated TCEV/FBIV concept. As an example, it has been estimated that a G95 Mk10 type (which will be added to the Mk10 programme in the future) will save about 2 tonnes per cylinder in weight going from the traditional HCU setup to the TCEV/FBIV concept.
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dnvgl.com/maritime
Environmentally friendly LNG propulsion system for Helgoland

**MAN ENGINES** The first ever newly built, LNG-fuelled German seagoing vessel, Helgoland entered service in 2015 featuring a propulsion solution based on an environmentally friendly gas engine from MAN Engines. The new ferry exceeds all of latest regulations and has an extremely low environmental footprint.

At the end of 2015, the first German ferry with an environmentally friendly and innovative liquefied natural gas (LNG) engine, the Helgoland, was commissioned. MAN Engines provided the basis for the modern propulsion solution for the ferry and delivered three powerful, 12-cylinder gas engines to MAN Rollo. From the MAN E3262 LE222 engines, the Dutch partner created three 480-ekW generator sets which play a major role in the ship’s LNG propulsion system.

MAN Rollo delivered the generator sets to the Fassmer shipyard in Berne, northern Germany. It was here that the ferry was built for the Cassen Eils shipping company. For over a year, the passenger ship has provided an environmentally friendly alterna-
tive for the voyage between Cuxhaven and the North Sea island, Helgoland. The 83m-long ferry can carry 1,060 passengers and was built strictly in accordance with the environmental standards of the German Blue Angel certification. This is also the reason why the Helgoland is the first new ship in Germany to be powered by LNG.

The innovative passenger ferry with the feel of a cruise ship cost around EUR 30.5 million to build, and received a subsidy from the European Union of EUR 4.175 million due to its environmentally friendly LNG propulsion system. It is not only the propulsion system that is new to the Cassen Eils shipping company, but also the potential that the new ship brings with it. The Helgoland has its own crane which can load and transport up to ten 10ft containers of freight in addition to the passengers.

“Our generator sets serve as auxiliary generators and can also be used to boost power for the main propulsion system,” commented MAN Rollo Sales Manager Karel Schuurman. “We have used the new factory-developed MAN E3262 LE222 gas engines for the sets, which are perfectly in line with the environmental objectives of the client. They were developed on the basis of the lean-burn combustion process and are 100% gas-powered. The generator sets are also fully compliant with the requirements of the classification society DNVGL,” added the sales manager.

The 480-ekW MAN auxiliary generators are not just a source of electricity, but also play a key role in the modern propulsion system.

Alongside the auxiliary generators, the propulsion system mainly consists of two dual-fuel engines, each with 1,664 kW (2,262 hp). Each unit powers a separate propeller and shaft generator. The generators each provide 350 kW, which can either be used for extra power or as an additional drive to support the dual-fuel engines. Thanks to these options available to the ferry, the Helgoland can rely on different propulsion arrangements. The dual-fuel drive can either directly power the propeller shafts via the gearbox using either gas or diesel power, or it can draw more power from the shaft generator or from a proportion of the MAN auxiliary gas generators. The Helgoland therefore has approximately 5,000 kW (around 6,800 hp) of propulsion power at its disposal, providing the two-propeller ship with enough power to maintain constant speeds of up to 21 knots (37 km/h). The auxiliary generators provide the ship with the required onboard electricity for the galley, hotel power loads, nautical and technical instruments and devices, as well as LED lighting and the transverse rudders.

Thanks to the MAN Rollo generator sets, MAN Engines played a major role in the highly successful first year of operation for the vessel. “The customer is especially pleased with the load response of our engines,” Schuurman said.

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ABOUT MAN ENGINES

MAN Engines – a division of MAN Truck & Bus – develops, produces and sells a wide range of efficient high-speed diesel and gas engines producing of up to 1,397 kW (1,900hp) for a wide range of applications in many industries including ships, boats and special-purpose vehicles.

www.man-engines.com
A hybrid solution for two-stroke diesel engines

RENK  Redundancy, reducing exhaust emissions and fuel consumption, and raising the Energy Efficiency Design Index (EEDI) are important objectives in any new ship design. To support these aims, Renk has launched the new MARHY (maritime hybrid) system. By using well-known and proven standard components, this reliable hybrid system is suitable for many applications, the drive technology specialist says.

Two-stroke diesel engines have a relatively high efficiency of up to 55% and have a simple and reliable operating process. This means that the engine will be hard to replace in the future, according to Renk, although the MARHY package can easily be added to enhance the operation and functionality of a propulsion system. The result is that a vessel has a fully redundant propulsion system that fulfils classification requirements and meets the “safe return to port” requirement for passenger vessels. Hazardous cargoes in chemical carriers, other tankers, or containers can also be shipped in restricted areas.

Renk MARHY system consisting of tunnel gearbox, propeller shaft clutch (PSC), electric motor, frequency converter, and couplings

Three propulsion modes are available:

› Propulsion mode and simultaneous production of electric current, power take-off (PTO): In this scenario the two-stroke diesel engine drives the propeller, the PSC is engaged and the generator produces electrical power. The benefits include high propulsive efficiency at medium and full speed, high efficiency in generating electricity, low operating costs by using heavy fuel oil or liquefied natural gas (LNG), and a reduction in the size and number of generating sets;

› Propulsion mode and simultaneous power boosting by electric motor, power take-in (PTI):
In this arrangement the two-stroke diesel engine also drives the propeller, the PSC is engaged, and the electric motor provides a power boost. The benefits are high propulsive efficiency at full speed while the electric motor can be used to boost output, even with a small main engine, if additional power is needed. Also, energy derived from waste heat recovery can be used to supplement propulsion requirements.

Electric propulsion mode, power take home (PTH):
In this mode the two-stroke diesel engine is switched off, the PSC is disengaged, and the electric motor drives the propeller via the tunnel gearbox. The benefits of this set-up are improved manoeuvring capabilities, reduced emissions due to diesel- or LNG-driven generating sets, scope to use electrical power in restricted areas, redundancy and compliance with “safe return to port” requirements.

A key component is the PSC which enables the main engine to be disconnected. It is hydraulically actuated and conical-patented toothing from Renk prevents backlash. PSC units ranging from 300-8,000 kNm are available with propeller shafts from 250-850mm in diameter. High power-density is required to limit weight within the propeller shaft line and, when disengaged, inner radial bearings prevent any impact from the PSC on the bending curve of the propeller shaft.

The two-step tunnel gearbox increases propeller shaft speed to the common 1500 or 1800 rpm e-motor/generator speed. This means that electrical components can be smaller and cheaper as compared with direct-driven low-speed electric machines (inline shaft generators). Maintaining or replacing components can therefore be carried out without drydocking and demounting the whole propeller shaft line.

Standard asynchronous electric motors of 690V are chosen for the package at 1800 rpm for the 60Hz grid. The asynchronous machine is the most spread type of e-motor in industrial applications due to the simplicity and low costs. A forced induction of the rotor, and hence the shaft end exciter, is not needed. High short circuit shock loads are not possible.

Standard, well-known frequency converters are implemented in the package. The 690V e-machine reduces the maximum current needed compared to a 450V machine which brings a smaller size of FC, e-machine and connecting cables. A FC with an active front end is needed for a four-quadrant drive (4Q drive, converting in both directions motor and generator mode). Furthermore, this kind of FC has the benefit of low harmonic distortion in the grid (<5 or even < 3% THDi).

ABB ASC880-17, Vacon NX Ch64 and Leroy Somer MD3 F2RL are the pre-selected FCs for the package. Other FC types may be considered if necessary. A further advantage of the “active front end” FC is the possibility of supplying active and reactive power, thereby a synchronous condenser can be skipped.
The FC can be used like a remote-controlled turning drive, so that the separate turning device can be omitted for the package. A turning device is needed to ensure the correct tooth position of the PSC for the engaging procedure. A FC with a direct torque (DTC) control does not need a decoder for the e-machine. The DTC technique was developed by ABB. The direct torque control system allows an AC machine to drive like a DC machine which has the advantage of providing both a fast reaction time and high precision for driving even at low speed. In a DC motor, the magnetic field is created by the current through the field winding in the stator. This field is always at right angles to the field created by the armature winding. This condition, known as field orientation, is needed to generate maximum torque. The commutator-brush assembly ensures this condition is maintained regardless of the rotor position. Once field orientation is achieved, the DC motor’s torque is easily controlled by varying the armature current and by keeping the magnetising current constant. The advantage of DC drives is that speed and torque, the two main concerns of the end-users, are controlled directly through armature current [1]. The FC with DTC is similar in direct torque control like a DC machine but the simple and robust AC-asynchronous machine can be used.

Implementation of MARHY in a drive concept

The MARHY system can be applied to a two-stroke diesel engine with either a fixed or controllable pitch propeller. It is usually possible to reduce the number of generating sets. Modern vessels with fixed pitch propellers must be able to generate sufficient power even when the propeller and ship speed are reduced. This slow-steaming mode is an important way of saving fuel and can still achieve high efficiency when the main engine is driving the power take-off unit.

When operating in power-take-home-mode, the frequency converter is used to cut propeller and ship speed. Due to the cubic relationship between power and speed, significantly less power is needed even for a small speed reduction. For example, only 5% of power is required for a speed of 7 knots on a ship designed for a speed of 22 knots at maximum continuous rating (MCR).

For controllable pitch propellers, high efficiency can be achieved over a broad range of speeds by using a combinator curve. This controls the propeller speed and pitch simultaneously to ensure maximum efficiency in all running conditions.

The frequency converter is an essential component in the system because a propeller running at zero speed and full pitch would consume about 20-25% of MCR power. Therefore the propeller speed must be reduced by using the frequency converter while operating in power-take-home-mode.

Future applications

There are many new power options and design considerations for new ships today. EEDI, redundancy, hybrid power systems, energy storage, electrical power, flexible drive modes, and combinator curves are just some of the possibilities which require evaluation during the design phase of a new vessel or the refurbishment of an existing ship. The MARHY system offers real and measurable benefits for ship operators.

ABOUT RENK

For over 140 years, Renk has established itself as a leading innovator and manufacturer of power transmission technology. This includes propulsion of tracked vehicles, advanced naval ships, and industrial applications such as power generation and wind energy. Renk is also a market leader in slide bearings and naval gear units.

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Modern generation of efficient diesel power packages

HATZ | The latest generation of Hatz industrial engines in the power range 18-62 kW features compact dimensions, low weight and good reliability. The liquid-cooled diesel engines in the new Hatz H-series are designed with iHACS technology (intelligent Hatz Advanced Combustion Strategy), providing sophisticated combustion chamber geometry, Bosch common-rail technology, minimised friction, and a charge air pressure of 1.7 bar. All mechanical components have been designed and developed using a conservative but innovative approach, the company says. The Hatz H-series engines are equipped with two valves per cylinder which provide high efficiency and functional simplicity with a mechanically robust design. This is demonstrated by a typically long service life and a generous maintenance interval of 500 hours.

Whether for barges or pleasure craft, the company’s H-series diesel engines comply fully with global emission regulations and the engines are noted for their reliable low-emission operation. The Hatz 4H50TIC achieved second place at the 2015 GreenTec Awards, regarded as one of Europe’s leading environmental award events.

With various options for exhaust after-treatment including external exhaust gas recirculation (EGR), diesel oxidation catalyst (DOC) and diesel particulate filtration (DPF), the Hatz H-series has been designed to meet all current and imminent regulatory requirements, the company says. Together with the already existing Hatz 4H50 engines there will be three-cylinders available from 2018. Thanks to the turbocharger and the intercooler, the new Hatz 3H50 engines have a maximum torque of 200 Nm and a maximum power of 46 kW. All this can be achieved in an installation space of less than one fifth of a cubic meter.

Features of the Hatz 3H50TIC (from 2018) / 4H50TIC engines include:
- shut-off sensor system to avoid major damage,
- hydraulic valve adjustment,
- gear wheel-driven camshaft,
- engine-mounted diesel oxidation catalyst (DOC),
- external exhaust gas recirculation (EGR) to ensure exhaust gas quality,
- EPA Tier 4 final and EU Stage IIIB compliance,
- electric start 12/24 V.

Features of the Hatz 3H50TI (from 2018) / 4H50TI engines include:
- developed from the TIC engine design,
- no requirement for sulphur treating components such as EGR or DOC,
- fuel with a sulphur content of up to 5000 ppm can be used,
- a 10% increase in output and torque as compared with TIC models,
- higher ambient temperatures possible,
- complies with EPA Tier 2/EU Stage II emissions regulations.

ABOUT HATZ MARINE COMPETENCE CENTRE

Over more than 135 years of operations, Hatz has become a specialist in one- to four-cylinder diesel engines rated up to 62 kW for both marine and industrial applications. For more than 30 years, Hatz Systems has also designed and manufactured tailor-made components for power supply and the pump and compressor sectors. The company has more than 500 service centres around the world, 13 of them with their own subsidiaries. There are also 114 Hatz agents in 120 countries guaranteeing full coverage and a responsive after-sales service network for repairs and spare parts supply.

www.hatz-diesel.com
Sleek and elegant

Large and practical

Fast and strong

SOLAS crafts by Fassmer
Tailor-made system components for successful dual-fuel conversions

**HEINZMANN** As a specialist in engine and turbine management solutions, Heinzmann offers dual-fuel retrofit conversions for a wide range of diesel engines whilst also providing all of the safety features required for efficient marine applications.

NG is becoming more widely used in marine applications and offers a range of benefits including lower operating costs and reduced emissions. Diesel engine conversions to dual-fuel also show significantly lower emissions.

Depending on the emission standard required, the favourable emissions profile of dual-fuel engines can often render expensive and unwieldy exhaust after-treatment systems unnecessary or significantly lower their implementation requirements and associated costs. Performance, meanwhile, is comparable to gas engines.

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In a project led by Fred. Olsen S.A, tests were run on the world’s first dual-fuel conversion on a marine high-speed propulsion engine, a Caterpillar 3618, targeting...
improvements in fuel economy and emissions reduction. Heinzmann was chosen as a competent and innovative dual-fuel system supplier.

Due to the need for comprehensive simulation, system engineering works and project management, AVL, a specialist in development of complete powertrain systems, was acquired as a partner for executing engine design, simulation, test bed planning, as well as for performance and emission development. As part of the Gainn4Ship Innovation project, the dual-fuel conversion was co-financed by the European Commission.

The project was undertaken without modifying the diesel injection system. The engine should be capable of switching to unrestricted diesel operation at any time, if necessary. The precise multi-point gas admission system was installed as a cost-effective “add-on” feature and is based on type approved components in a double-walled configuration. For this project, Heinzmann specially developed the gas admission valve MEGASOL 200 II Marine to meet the safety requirements of marine applications.

The complete dual-fuel system is operated by the latest version of Heinzmann’s EFI controller, MVC 01-24 which offers very flexible system configuration in many applications. Together with an intelligent air path management controlled by Heinzmann’s wastegate valve WG 70, it was possible to operate the engine with a conversion ratio up to 90% gas. As a result the calculations from the comprehensive simulation works executed by AVL were met exactly. The reliable Heinzmann knock-control system Ariadne was installed to operate the converted engine at the highest efficiency limits. Special attention was paid to the transient behaviour of the engine, and the switch between diesel and gas and back occurs smoothly and quickly. In case of gas system failure the system returns to diesel immediately.

In extensive emission and reliability bench tests successfully carried out by AVL followed by DNV-GL approval testing, fuel consumption was significantly lower as a result of improved engine efficiency in dual-fuel operation. Carbon dioxide emissions were cut by 30%; NOx by 50%; and SOx by 90% at a conversion rate of 90% LNG and 10% MGO, Heinzmann says. Following the tests, the dual-fuel retrofitted engine is now ready for field operation.

At the beginning of 2018, all four engines of the ferry Bencomo Express running between Tenerife and Gran Canaria are expected to be converted to LNG. Further vessels are to follow.

ABOUT HEINZMANN

Established in 1897 Heinzmann GmbH & Co. KG, Schönau, offers a product portfolio comprising engine management systems and exhaust gas after-treatment solutions for industrial combustion engines and turbines. It also encompasses automation systems, primarily for the shipping industry. For decades, Heinzmann has been developing and producing sturdy, powerful electric drives up to 25 kW, which have proven their worth in numerous applications, particularly in harsh industrial environments.

www.heinzmann.com
L’ORANGE | Stuttgart-based L’Orange has introduced a new product family of turbochargers in addition to injection systems and exhaust gas after-treatment systems. Key components for large diesel engines are now available from a single source, it says, adding that the product range is specifically targeted at off-highway applications and power plants with high-speed diesel engines.

The new turbocharger family is the result of a collaborative effort between L’Orange and MTU Friedrichshafen. With its new product range, L’Orange says it is filling a gap in the market and offering compelling benefits for current and future customers. Of special note is the exceptionally high system compatibility with harmoniously matched components, which L’Orange says saves its customers time and money in engine development and operation. “High performance, low consumption, reduced emissions and good interaction between all units – the requirements placed on engines are almost identical everywhere and they’re increasing steadily,” Olav Altmann, L’Orange head of sales remarked. “A single component cannot entirely address them, whereas harmonised systems can. This is why L’Orange opted for this business model expansion. Thanks to the turbocharger’s diverse product family, we can meet different customers’ needs without compromising on performance or efficiency.”

Since the turbochargers and other L’Orange components are perfectly matched, the company says, they can be efficiently integrated into the engine’s overall package. The turbocharger is powered by exhaust gas, which makes turbocharged diesel engines extremely efficient. They compress air so that more oxygen flows into the combustion chamber. This enables more fuel to be burned, therefore increasing engine performance while decreasing specific fuel consumption.

The challenge in recent years has been the fact that the world market for turbochargers has been dominated by car and commercial vehicle applications, L’Orange says. By comparison, the number of turbochargers built into industrial engines is quite small. This gap has now been closed with the ZR Series of turbochargers from L’Orange.

The differences between the turbochargers result from the size of the compressor and turbine wheel, as well as the performance class in terms of pressure ratio and volume flow. Depending on requirements, L’Orange offers high-performance turbochargers for small, medium and large diesel engines. The performance class is sufficient for volume flows from 0.2 m³/second to 3.5 m³/second.

At the same time, the company says, customer needs for engines with very high dynamics and performance can be met. The turbocharger is matched to the engine so that it safely delivers its performance over the entire range of engine specifications: at sea as well as at altitudes of 4,000 m, and at low and at extremely high exterior temperatures. Accordingly, the sealing and bearing points are thermally isolated and, as needed, water-cooled. In order to limit the surface temperature, a water-cooled compressor spiral is used with supercharged engines, thereby lightening the intercooler’s workload.

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A subsidiary of Rolls-Royce Power Systems AG, L’Orange has been manufacturing and marketing pioneering fuel injection systems for large engines from 1,000 to 40,000 kW worldwide for over 80 years. It currently employs more than 1,000 people at its German sites in Stuttgart, Glatten, Wolfhau- sen and Rellingen as well as in Suzhou and Ningbo in China. The company’s offering encompasses the entire range of products in injection technology including common-rail technology for diesel and heavy fuel oil engines in the off-highway sector.

www.lorange.com

CREATE A NEW WORLD OF ENGINEERING.
ZF Friedrichshafen AG is a worldwide leader in marine propulsion systems, supplying components and systems for all types of ships such as motor boats, sail boats and superyachts, as well as commercial and port and terminal authority vessels. The product portfolio is subject to continuous development and adjustment to market requirements.

Having introduced its first hybrid-ready marine transmission more than ten years ago, ZF has continued to innovate and develop highly efficient and environmentally sound propulsion systems for marine applications. The recently introduced ZF 83700 model is an outstanding example of latest generation marine transmissions, matching advanced modular design with high efficiency allowing for multiple operating modes in numerous fast craft applications such as ferries, OSVs, superyachts, and naval ships.

Following the general dictum of ample modularity, ZF’s marine transmissions – including the ZF 83700 – feature a basic structure with the option of adding numerous accessory drives, such as trailing and oil pumps, power take-off (PTO) and power take-in (PTI) drives. This facilitates combined diesel-diesel and/or diesel-electric propulsion configurations, as well as CAN bus compatible interfaces for system communication and data logging.

Moreover, as fleet operators increasingly strive for monitoring of equipment on board, ZF offers condition monitoring options for many of its marine transmissions. The advanced condition monitoring concept from ZF combines both current and next generation monitoring technology which identifies both the nature of the service required on the transmission, as well as appropriate timing, all based on the specific operating conditions for that unit. Condition information and service actions required are displayed via a user friendly interface.

ZF 83700

World-class piston ring technology

Federal-Mogul's high quality large bore piston rings help to achieve better fuel efficiency, lower emissions and longer overhaul intervals for engines up to 980 millimeters bore size. Day by day, our rings prove their reliability in a large range of different applications around the globe.

Driving Innovation
The Preferred Powertrain Solutions Provider
www.federalmogul.com
KBB | Latest developments in medium-speed engine technology are being driven by performance targets, lifetime costs and emission regulations. This is leading to a new generation of engines incorporating several new technologies.

On the one hand, a trend in gas engine development sees the installation of two-stage turbocharging systems to use intercooling for better performance. On the other hand, diesel engines must incorporate technologies such as exhaust gas recirculation (EGR) or exhaust gas after-treatment systems to manage the trade-off between emissions and specific fuel oil consumption. Dual-fuel engines are characterised by much higher compression ratios when running on diesel as compared with gas operation. This implies new challenges for single-stage turbocharging. In many cases, the efficiency of these new technologies depends on optimised or even customised turbocharger solutions.

KBB’s product portfolio reflects the requirements of next-generation engines. The company offers an upgraded version of the popular single-stage turbocharger series ST27 to meet the latest engines’ special requirements. The new ST27-EP series is characterised by an extended pressure ratio up to 6.0, an adapted lifetime of highly stressed components including the compressor wheel, better performance and optimised thermodynamics, improved rotor dynamics, and modified thermal management of turbocharger components. The ST27-EP meets the higher boost pressures of some engines with single stage high-pressure turbocharging, and KBB claims that these turbochargers can be used for dual-fuel engines as well as other engine applications.

For higher boost pressures of up to 10 bar, KBB’s two-stage turbocharging system K2B can be used. Since their launch in 2014, K2B turbochargers have successfully completed several thousand running hours on different engines and applications. Furthermore, KBB is engaged in the development of EGR turbochargers for single- and two-stage turbocharged engines. The main challenge here is matching the compressor to the turbine design; a challenge derived from the unusual turbocharger operating conditions in a high-pressure EGR system. Additional requirements are high durability at EGR specific entry conditions with intake temperatures of up to 140°C at the compressor side, and sufficient wear resistance against condensate and particle impact.

For this, KBB has designed a specially adapted EGR turbocharger to provide an effective way of bridging the pressure difference between the exhaust manifold and air receiver on large diesel engines. Apart from maximising turbocharger efficiency, KBB continues to focus primarily on reasonable costs and an acceptable service life of components.

ABOUT KBB

KBB produces turbochargers for medium-speed and high-speed diesel and gas engines in the performance range of 500 to 4,800 kW. www.kbb-turbo.de
Design study for an engine enclosure with stealth design

THERMAMAX | Thermal and acoustic insulation specialist Thermamax has developed a new engine enclosure design study embodying “stealth-design” principles. The individual and attractive aesthetics of the study set a new standard and enable to achieve a clear competitive differentiation. Alongside the safety aspect that is inherent in Thermamax’s products, the question of design has a particular importance, the company states. Design does not just mean an attractive appearance, but can reflect brand image, convey innovation, capability and quality, and with it a clear competitive advantage. The T max-Design Study for an engine enclosure embodying “stealth design” principles is a result of this philosophy, says Thermamax. The design style deliberately avoids an elegant, soft-contoured approach in favour of a more aggressive appearance, expressing dynamism, manoeuvrability and speed.

The characteristic of a stealth design is large surface areas with 2D triangular features ensuring strong reflections. This design form was developed in the 1980s for bomber aircraft in order that they would be invisible to radar – the so-called stealth technology. Due to the angular shapes, radar or light waves were only intermittently reflected by the object’s movements. That led to the desired stealth technology and to the reflections of the design objects. Stylistically, the uniqueness of the stealth design was so attractive that after several years many designers adopted it for their products. The T max-Design Study for an engine enclosure with stealth design offers several benefits. The dynamic appearance attracts owners who want something different, as well as complementing the general aura associated with sport boats. Additional styling features are possible by using different surface finishes. Sheet components can be supplied with a brushed matt surface or combined with a highly polished finish, or coated in any desired colour, meaning that the enclosure can be easily tailored to meet individual preferences.

Thermamax uses neatly profiled corrugations, flat recesses, and raised points in the manufacture of the sheet material, and this in turn increases the stiffness of the enclosure. This saves the use of additional material and ensures minimum weight. Combining these design elements with the stealth-design gives an even finer, more delicate structure guaranteed to attract attention. Stealth design is transferable to all 100% SOLAS-conforming T max-Insulation Enclosures, fulfilling all safety requirements for marine engine rooms.

> ABOUT THERMAMAX

Thermamax Hochtemperaturdämmungen GmbH is a specialist in the design and manufacture of thermal and acoustic insulation systems for engine compartments and exhaust lines for diesel and gasoline engines, fuel cells, and electric drive systems. Thermamax serves customers around the world and operates two manufacturing facilities (Mannheim, Germany and Aurora, IL, USA), several sales & marketing offices in the US and Italy as well as a corporation in Taicang, China. The company was founded 40 years ago and supplies complete systems from concept, detailed design and prototypes, for low volume requirements through to series production.

www.thermamax.com
Smarter ship-emission measurements

Sick | The development of intelligent emission-measurement technology, providing reliable accuracy under the conditions found on board ships, now plays an essential part in the successful reduction of emissions in the shipping industry. A manufacturer of continuous emission monitoring systems, Sick AG, has developed the emission-monitoring device MARSIC, characterised by reliable measuring results, high flexibility of application and low maintenance requirements. The measuring range and accuracy of MARSIC already exceeds the requirements of MARPOL Annex VI, NOx Technical Code, and MEPC.259(68) Exhaust Gas Cleaning Guidelines. The system has been specifically developed for use on board ships, providing long maintenance intervals and simple service procedures, Sick claims.

The company’s new ship emission-measuring devices are available in two versions, each using a different technology: MARSIC200 performs cold-extractive measurements, while MARSIC300 uses the hot-extractive measurement principle. Both gas analysers are DNV GL and ABS type-approved for SOx and CO2 upstream and downstream of the scrubber, as well as for NOx upstream and downstream of selective catalytic reduction (SCR) systems. A single gas analyser is sufficient to manage several measurement points and monitor up to nine components at the same time, including SO2, CO2, CO, NO, NO2, CH4, H2O and O2.

Both systems, MARSIC200 and MARSIC300, are capable of optimising processes on board ships as they can measure CH4 slip from LNG and dual-fuel engines, or CO2, O2, CO and NOx to optimise fuel oil consumption of the main and auxiliary engines. According to the manufacturer, the results are documented quickly and the measured values are consistently reliable and accurate. Current MARPOL regulations stipulate a maximum drift of ±2% per hour. The MARSIC300 system, featuring a convenient drift monitor, is guaranteed to be much more stable in the long term, says Sick, referring to the DNV GL type-approval. The drift has to be checked with calibration gas only after replacement of the system’s optical parts in case of servicing, requiring neither manpower nor time. Stockpiling expensive calibration gases and expired test gas certificates is no longer a problem thanks to the innovative calibration set-up, and the system allows the operator to show compliance with the regulations of the flag state, class or Port State Control at any time. According to Sick, minimal maintenance is needed and there is little wear because moving parts have deliberately not been used. Maintenance and servicing can easily be carried out by an engineer on board. Sick says that modules can be easily replaced, and the company offers remote servicing whenever an operator needs external help. Additionally, the global Sick network ensures the availability of service and spare parts anytime all over the world.

ABOUT SICK

Sick is a leading producer of sensors and sensor systems for industrial applications. Founded in 1946 by Dr.-Ing. h.c. Erwin Sick, the company is headquartered in Waldkirch, Germany, and ranks as one of the leaders in this technological field. With more than 50 subsidiaries and equity investments as well as numerous agencies, Sick maintains a presence all around the world. In 2016, Sick had more than 7,600 employees worldwide and achieved group sales of more than EUR 1.3 billion.

www.sick.de
Cryogenic insulation for LNG fuel tanks

RÖCHLING ENGINEERING PLASTICS | As emission regulations continue to tighten and LNG is more widely adopted as a marine fuel, safe technologies for liquid gas bunkering have become a focus. With the laminated densified wood branded Ligno stone® cryogenic, Röchling Engineering Plastics offers a reliable construction material to provide cryogenic insulation of LNG fuel tanks from ships’ structures.

For decades the material has been used in LNG and LPG carriers to insulate the large-dimensioned tanks from ships’ hulls, carrying cargo volumes of up to 165,000 m³. Proven for large-dimension applications, the material also offers the required properties for the insulation of LNG fuel tanks.

A leading manufacturer of cryogenic insulations in the field of LNG and LPG vessels, Röchling Engineering Plastics has extensive experience in the reliable insulation of LNG. Rainer Sanders, General Manager Sales, explains: “To insulate LNG at -164 °C you need a material that offers outstanding temperature resistance and at the same time the highest mechanical strength. Under the brand name Lignostone® cryogenic, we offer a laminated densified wood specially designed for cryogenic insulation that is used by many leading companies like IHI, JMU for their 165k LNG vessel (hull 5070-5073). Based on this reputation Lignostone® cryogenic is the best solution to insulate LNG fuel tanks.”

The company claims that the material offers excellent thermal insulation properties, outstanding temperature resistance from -196 °C to +90 °C, high mechanical strength and high wear resistance.

NEVER A BLACK SHIP

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VOLVO PENTA D13

The Esvagt Froude, a state-of-the-art Service Operation Vessel, is on duty all year round and in all weathers. Its emergency genset is powered by a Volvo Penta D13 engine, famous for its great load acceptance, to secure electricity supply at all times. www.volvopenta.com

© ABOUT RÖCHLING

Röchling Engineering Plastics SE & Co. KG., located in Haren, is part of the Mannheim-based Röchling Group. The Industrial division of Röchling has a broad product range offering thermoplastics and composite materials as well as high-performance plastics. The Automotive division designs and engineers components and system solutions in the fields of aerodynamics, powertrain and new mobility. The Medical division offers customers a wide range of standard and tailored plastic products in the fields of pharmaceuticals, diagnostics, surgery and life sciences.

www.roechling.com
To meet IMO Tier III emission regulations, one possible strategy is to install selective catalytic reduction (SCR) exhaust gas purification systems. Finding the best possible match between exhaust gas after-treatment and engine technology is a key requirement. Specialising in exhaust gas purification systems, Hug Engineering AG has already assisted a number of customers in their successful efforts to gain IMO Tier III certification. This is a tribute not only to the company’s intelligent SCR system but also to the high-end support provided by Hug for its customers and its expertise in coordinating the entire certification process.

A Tier II engine can achieve a Tier III rating if the engine and the exhaust after-treatment system are seen as an integral unit, i.e., they have to be certified as a single component. One of the essential prerequisites for certification is that all individual components have been approved by a specific classification society.

IMO Tier III certification encompasses not only the actual emission tests but also significant administrative procedures such as the preparation of technical documentation in accordance with MARPOL 73/78 Annex VI, NTC 2008, MEPC Resolution, and IACS Unified Interpretations. The so-called technical file is submitted by the certification holder to the classification society for assessment and approval. The certification holder can be either the engine manufacturer or the maker of the exhaust after-treatment system, the shipyard, or indeed a third party. Ultimately, it is the certification holder who is responsible for aspects such as change management and the conformity of production.

The emissions test, to be performed either on a test rig or on board ship – as an exception – has to meet the standards specified under MARPOL 73/78 Annex VI Reg.13 Pr.5.1.1:

- \[3.4 \text{ g/kWh for } n < 130 \text{ rpm (n= speed of revolution),}\]
- \[9 n(-0.2) \text{ g/kWh for } 130 \text{ rpm} \leq n < 2,000 \text{ rpm};\]
- \[2.0 \text{ g/kWh for } n \geq 2,000 \text{ rpm}.\]

The test cycles (E2, E3, D2, C1) depend on the subsequent field of application of the engine, e.g., as a power generator or as a main propulsion system, in dynamic or stationary operation.

The certification holder can apply to the classification society for additional Engine International Air Pollution Prevention certification for the same engine or, where applicable, for engines within the established engine family. On this basis, engines equipped with the appropriate Hug SCR system can meet the IMO Tier III standard (and be deployed accordingly) without an additional test procedure.

Alongside technical know-how, one of the essential prerequisites for IMO Tier III certification is close collaboration with the customer and the classification society. Building on these specific competencies, Hug Engineering has already successfully completed a number of certification projects for a wide range of engines. Hug offers solutions for almost any type of engine and any requirement – not only SCR systems for compliance with IMO Tier III but also solutions in combination with a diesel particulate filter for the purpose of achieving EPA Tier 4.

HUG ENGINEERING

Established in 1983, Hug Engineering AG is based in Elsau, Switzerland and is one of the leading manufacturers of exhaust gas purification systems for diesel- and gas-powered engines in both stationary and mobile applications. The company provides efficient solutions and customised systems in the field of exhaust gas purification. Hug Engineering AG is a subsidiary of ElringKlinger AG, a global development partner and volume supplier to the automotive industry.

www.hug-engineering.com

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Powerful high pressure starters (30 bars) to start engines up to 7.000kw and more.

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Immediate emergency stop of the engine in case of safety reason.

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For engine build up and service work.

**Hydraulic Starters**
For special application and emergency sets.

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MWB POWER | As a member of the German Dry Docks Group (GDD Group) in Bremerhaven, MWB Power specialises in engine repairs and maintenance, as well as complete installation of new engines or conversions to alternative fuels. The repair, servicing, and maintenance of all motor brands include 2- and 4-stroke engines, gearboxes, speed governors, turbochargers, injection systems, dual-fuel/gas engines, and reconditioning of all components where possible.

MWB Power is officially authorised by engine manufacturer MTU for the overhaul and repair of MTU gearboxes. In addition, MWB Power maintains special gearboxes. As service partner of ZF Friedrichshafen, the company repairs all ZF marine gearboxes and offers sales of gearboxes and spare parts.

MWB’s governor services include Woodward governors for engines and turbine applications, a worldwide service on ships and shore-based equipment, an authorised workshop with three test beds, sales of new governor equipment and spare parts for all applications, and conversion from mechanical governor to electronic control systems. As a Woodward Business Partner, MWB offers spare parts for mechanical controls as well as almost the entire product range for engines and turbines.

A specialist on marine engines and components, MWB Power can offer solutions for filtration and drying operating fluids, which can be customised to engine type, fuel and emission requirements:

› VARIO Automatic Filter System
The compact VARIO Filter System supports highly efficient, economical and non-stop operation due to automatic fine- and micro-filtration and cleaning of low-viscosity fluids. The VARIO is an optimal alternative to purifiers.

› COMPLUS Automatic Filter System
The effective COMPLUS Automatic Filter System supports highly efficient, economical non-stop operation due to innovative self-cleaning filter procedures and safe hydraulic-mechanical cleaning technology. The fuel filter is distinguished by its compact design, simple handling and ease of maintenance.

› VACUDRY Drying and Cleaning System
The VACUDRY is a new concept for detecting and removing water from operating fluids like luboil or hydraulic oil, consisting of a turbidity sensor and vacuum dryers extending the lifetime of the entire operating system.

Combined heat and power units (CHP) represents a new era for MWB Power. The company recently became the premium sales and service partner of 2G Energy AG, ensuring a high-quality and comprehensive 24/7 service for maximum availability and efficiency of CHP installations. MWB is responsible for the maintenance and repair work for 2G cogeneration modules and is a regional contact for all 2G isales enquiries.

MWB Power is specialised in engine repairs and maintenance as well as complete fittings of new engines or the conversion of existing units to alternative fuels.
Big data analytics support smart propeller design methods

MMG Optimising ship operation is more important than ever in today’s over-tonnaged markets. Propeller specialist MMG has developed a data analysing tool that can directly compare the CFD outcomes with full-scale data to ensure that real-life experience corresponds with new design criteria. Actual physical data can then be used to evaluate certain operating profiles such as different trim criteria or hull conditions.

Recent improvements in ship design and performance improvements arising from retrofits, have encouraged ship owners to examine their needs and corresponding technical boundaries in more detail.

This has resulted in complex technical specifications, including a more detailed picture of vessel operation and profile which is derived either from noon data or continuous performance monitoring. The aim is to raise operating efficiency and enhance future vessel performance.

MMG embraced CFD-based propeller design at an early stage and started retrofitting propellers at the beginning of the slow-steaming period. The MMG research team was able to use experience and data from numerous sources to bring the virtual CFD-based towing tank together with the performance data derived from real vessel operation.

Optimising ship operation is more important than ever in today’s over-tonnaged markets. Tough competition and an increase in regulations are changing the requirements for newbuildings and require a new holistic design approach for existing vessels too.

Gathering relevant operational data is not new for well-known ship operators but collecting the data does not guarantee a successful outcome if it is not processed effectively. Comprehensive data filtering is a vital tool for informed decision-making.

In propeller design, the averaging of performance data can lead to inaccurate conclusions and there is a need to prove that collected data is actually in line with physical propeller performance.

MMG has developed a data analysing tool which allows the filtering necessary to generate an accurate database. Actual physical data can then be used to evaluate certain
operating profiles such as different trim criteria or hull conditions.

MMG can directly compare the CFD outcomes with full-scale data to ensure that real-life experience corresponds with new design criteria. This procedure minimizes the uncertainties arising from scaling, which can generate inaccuracies when based only on model tests.

In some of today’s ship operating profiles, for example, such as slow speeds, low engine power and reduced propeller revolutions, scaling from model tests can misrepresent laminar flow effects. The correction of these effects is still a topic under discussion between test facilities around the world, and this process could lead to different interpretations of modern scaling procedures.

Secondly, the condition of the vessel can be assessed and compared with the corresponding data. Are there significant differences in power consumption since model testing or sea trials? Is there a sufficient light running margin to ensure optimal fuel efficiency and acceleration capability?

This closes the loop between designing and verifying, as modern CFD methods and high-performance computers are able to cover full-scale simulations of even non-standard propulsion situations in reasonable calculation times. This has enabled MMG to offer well-validated full-scale predictions to its customers.

The result is that new smart data can successfully correspond with existing design methods including MMG’s Multidata Design Concept (MDC) and Numerical Propulsion Simulation (NPS), both of which are key components in MMG’s established 5D propulsion standard.
The US Environmental Protection Agency (EPA) published its final “Vessel General Permit” (VGP) in March 2013. The reworked permit authorisation regulates the use of commercial watercraft in US waterways and has been in force since that year. This regulation means that all tugs, ferries and other commercial vessels must now use Environmentally Acceptable Lubricants (EAL) at all oil-to-sea interfaces such as gears in marine propulsion systems – unless this is "technically infeasible". This regulation was introduced because leakages at oil-to-sea interfaces can never be completely prevented. However, mandating the expensive biodegradable oils means not only higher costs for shipowners but also poses quite a challenge when it comes to maintenance. Compared to mineral oils, organic oils absorb more water, which adversely affects lubricating properties. This happens with lower water content than with mineral oils and also happens faster and is more pronounced. Moreover, not all

**SCHOTTEL** Schottel’s leakage control chamber for marine propulsion systems, Leacon, which has been thoroughly tried and tested since its introduction to the market in 2009, has recently been certified by DNV GL as a leak-free sealing system for seawater. This means that vessels with Leacon systems can operate in US waters without being required to use more expensive biodegradable oil.

Schottel production site in Dörth, Germany: check of the pipe unions on the compact tank of the Leacon system

www.schottel.de
sealing materials can handle so-called EALs.

While such incompatibility is actually considered "technically infeasible" according to the VGP and could be exempt, shipowners must provide corresponding paperwork to support their claim. This further adds bureaucracy to the additional costs and maintenance expenditures.

The sealing system Leacon (LEAkage CONtrol) has been on the market since 2009 as optional equipment for Schottel propulsion systems. What makes this system design different is the intermediate chamber between the propeller drive and the water, featuring different sealing solutions for the lubricants. If lubricant escapes from the gearbox, it ends up in the Leacon chamber and not in the water. The same applies to penetrating seawater, which is kept away from the gearbox thanks to this chamber.

Even though the Leacon principle prevents virtually all leakages into the sea, the revised VGP of the US Environmental Protection Agency would have mandated all vessels with Leacon to use biodegradable lubricants. This prompted Schottel to revise the system and present it to the leading classification society DNV GL for testing in 2016. Leakages were simulated in order to determine whether the redundant control system would immediately recognise them and automatically empty the Leacon chamber by means of underpressure. No lubricant escaped into the water in any of the simulated leakages.

The Leacon system is also equipped with a control and alarm unit which reduces the maintenance load thanks to another advantage of the system: Leacon is able to monitor the condition of the seals. An automated system registers the quantities of leaked fluids collected, thereby determining the condition of the sealing system. This enables ship operators to identify looming seal damage early on and schedule maintenance in time.

In June 2016 DNV GL certified Schottel’s marine propulsion systems using Leacon as “non-oil-to-sea interfaces” and as absolutely leak-free sealing systems for seawater. This means that Schottel systems with Leacon are now exempt from the current VGP regulations of the US Environmental Protection Agency. Vessels with Leacon systems can operate in US waters without being required to use biodegradable oil.

Side view of the Rudderpropeller detailing the Leacon sealing principle

ABOUT SCHOTTEL

Since 1921, the Schottel Group based in Spay is a world leader in developing and manufacturing azimuth propulsion and manoeuvring systems, complete propulsion systems with power ratings of up to 30 MW, and steering systems for vessels of all sizes and types. Around 100 sales and service locations help ensure worldwide customer proximity.

propulsion & energy systems for marine applications

MARINE ENGINES, YOU CAN COUNT ON.
Propulsion and manoeuvring technology portfolio extended

ZEPPLEIN POWER SYSTEMS | The supplier of propulsion and energy systems has broadened its portfolio as a Caterpillar Propulsion sales and service partner for propeller and control systems. In late 2016, the company was awarded with the highest level of recognition by Caterpillar for the sales of propulsion equipment.

Zeppelin Power Systems now provides the full range of Caterpillar marine propulsion systems from one source – including sales and consulting, project planning, construction, customising, commissioning and worldwide after-sales service. The portfolio covers all drive systems and energy applications based on Caterpillar engines and systems. The Caterpillar Propulsion components are manufactured in high-tech production facilities in Sweden and Singapore, and are optimised for maximum availability and cost-efficient operation.

“Zeppelin Power Systems offers its customers complete propulsion concepts, including all components. Design, engineering, commissioning and all services are of course an integral part of these concepts,” explained Klaus Dammann, Marine Sales Director at Zeppelin Power Systems. “With the Caterpillar Propulsion systems, we also offer an optimised thruster package with worldwide service.”

New propeller options include marine pitch propellers (MPP), marine thruster azimuths (MTA), marine transverse thrusters (MTT) and marine propulsion controls (MPC).

Caterpillar Propulsion controllable-pitch propellers are available for high-power applications, with and without nozzles, in a diameter range of up to 8.5m, and for power outputs of up to 20 MW. The patented feathering mode improves operational flexibility and efficiency in ships with twin propeller systems. In feathering mode, the blades run parallel to the current, minimising resistance. MTA systems are available with horizontal and vertical drives. The fixed-pitch and controllable-pitch propeller systems have diameters of up to 3.4m, and are available with power outputs of up to 4 MW. Transverse thrusters are available with a selection of different controllable-pitch or fixed-pitch propellers. The MTT is available in two configurations, as high-power transverse thrusters (suitable for DP applications) and as auxiliary transverse thrusters for manoeuvring in port. MTTs have a diameter range of up to 3.2m and are available with power outputs of up to 3.6 MW. The MPC 800 Remote Control System enables operators to control and monitor all types of propeller application – and delivers clear information based on graphic displays. It uses cutting-edge microprocessor technology and is a special development from Caterpillar Propulsion. A range of operating modes can be individually configured, using various combinator curves or constant speed.

The company portfolio also includes diesel, gas, and dual-fuel engines from the Cat, MaK and EMD brands as main and auxiliary propulsion, emergency generators, propellers, complete drive trains, and corresponding systems. Solutions can be diesel-mechanical, diesel-electric, gas-electric, or hybrid drive systems. Each project is individually customised to meet the customer’s requirements, Zeppelin Power Systems says.

In addition, the company is a partner of Norway’s Optimarin in the field of ballast water treatment and operates as an authorised Napier Service Center, performing repairs for Cat, Napier, KBB and KKK and other manufacturer’s turbochargers.

ABOUT ZEPPELIN POWER SYSTEMS

Zeppelin Power Systems is the official partner of Caterpillar for Cat and MaK engines and a leading provider of drive, propulsion, traction and energy systems. It is a legal entity of the Zeppelin group with around 7,700 employees and a turnover of more than EUR 2.3 billion. The company has been a Caterpillar partner for more than 60 years. With about 800 employees, Zeppelin Power Systems offers customers individual, highly efficient systems and comprehensive service in industrial and marine applications, the oil and gas sector, rail vehicles and power generation.

www.zeppelin-powersystems.com

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A pair of stabiliser fins below the waterline helps to reduce roll in heavy seas. These stabilisers – which retract into the az of the ship when not in use – are used on vessel types including cruise ships, ferries and az cruise vessels. However, they have a downside. The recess in the hull can cause considerable drag when the ship is in motion. Reducing this drag would not only cut fuel consumption and save money but it could also boost a company’s environmental credentials.

With this in mind, Hamburg-based SKF Marine GmbH has developed an inflatable cover for hull openings which eliminates most of the drag. The Dynamic Stabilizer Cover (DSC) is a “cushion” that inflates to fill the recess in the hull and form a smooth surface. It covers the opening whether the fin is extended or retracted and reduces local drag by around 90%. On a cruise liner, this could reduce daily fuel consumption by up to 2%, SKF claims.

The DSC is made from a Kevlar mesh covered with neoprene rubber and is inflated using compressed air from a ship’s existing pneumatic systems. The materials are already well proven in applications such as amphibious military vehicles and inflatable dams. They must withstand tough conditions – and this is tested to the maximum when a ship is travelling at 22 knots.

The first iteration of the design was installed on a cruise liner and tested over a two-month period. This flagged up a problem: while the covers worked effectively during normal operations, extending or retracting the fins while sailing at full speed (tested up to 22 knots) could harm the DSC. The ship owner therefore had to reduce the vessel’s speed.

So although the prototype worked, it didn’t meet the high standards required by SKF engineers. The next step was therefore to raise the safe speed of operation – or better still, to eliminate any such constraint entirely.

So SKF began work on a second, more robust design by dividing the single-chamber system to one in which multiple chambers can now all be filled with air. The result is greater stability, enabling higher vessel speeds while extending or retracting the fins. The new version has been successfully tested in a tank in Hamburg, and will now be fitted to a cruise liner for field testing. If successful, SKF expects to launch the full version in mid-2017.

Previous industry attempts to design a cover for the hull opening used a solid metal plate, but if this were damaged then it would render the fins unusable. For this reason, SKF’s inflatable solution is actually a far safer approach. In the event of the cushion failing, a diver could be dispatched to remove it with relative
ease – and ensure that the fin remains in operation. SKF believes that the DSC has huge potential: there are hundreds of retractable stabiliser fins installed on cruise ships, and currently no effective way of covering the necessary hull openings to reduce drag. SKF’s system can be retrofitted to existing vessels with minimal time and maximum ease: the DSC can be welded into place in around one week.

All fin stabilisers produced by the company from now on will come with built-in compatibility for DSCs. However, this does not mean a ship owner has to use the covers. Should he decide to retrofit DSCs, he can do so without docking the vessel. Divers install the cushions, then the controls are integrated with those of the existing fin stabiliser. Stabilisers already in use can be retrofitted, too. The DSC was originally developed for cruise liners. Variants for ferries and expedition cruisers will also be available in 2017, the company says.

> ABOUT SKF MARINE

SKF is a leading global supplier of bearings, seals, mechatronics, lubrication systems, and services which include technical support, maintenance and reliability services, engineering consulting and training. SKF is represented in more than 130 countries and has around 17,000 distributor locations worldwide.

www.skf.com
Unique pump portfolio for broad range of applications

LEISTRITZ. The pump specialist has been producing a wide range of screw pumps and complete systems for the shipbuilding industry for decades. Recently, however, three particular products have come into focus – the LSFO pump, the anti-cavitation system and the universal cargo pump.

International regulations on ship safety, requirements for the operational reliability of vessels and their components, and steadily tightening rules on energy efficiency and emissions pose a major challenge for global shipping. German screw pump manufacturer Leistritz is playing its part in meeting these requirements by providing a unique range of various screw pump designs which have been developed with maximum sustainability in mind.

LSFO screw pumps
Stricter rules on the sulphur content in fuel oils poses many challenges for screw pump suppliers. A reduction in sulphur content reduces viscosity and decreases lubricity of the fuel and this is particularly evident when engines burn low-sulphur diesel fuels (MDO/MGO).

The combination of lower viscosity and lubricity has a negative impact on the effective operation of triple-screw pumps in a fuel system. If the viscosity is too low, the lubricating fluid film between the spindles and the pump housing is inadequate and the risk of metallic contact between spindles and housing greatly increases the risk of jamming.

To meet these challenges, Leistritz has developed and tested a new surface treatment for pump housings and a customised finish of the spindles in its triple-screw pump series. With this special treatment, the lubricated parts operate effectively with heavy fuel oil (HFO), low-sulphur diesel oils and in dual-fuel applications.

Anti-cavitation system
A wide range of specialised vessels are deployed in the carriage of liquid freight on both international routes and regional inland waterway voyages. To guarantee the safe handling of cargoes, ships must be adapted for specific storage and transport features and this also applies to cargo pumps. They must provide safe and reliable operation over a wide range of viscosities, temperatures and other specific cargo characteristics. Optimised loading and discharging of tankers is a particular strength of Leistritz pumps which use a sophisticated piping system to ensure that cargo tanks can be emptied efficiently.

The automatic system comprises a Leistritz L2 or L5 screw pump (depending on the flow rate) driven by an electric motor with variable frequencies. Leistritz L2/L5 pumps – with medium-lubricated, epicycloidal, self-gearing profiles –...
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have no external timing gears and are therefore four times more reliable thanks to just one double-acting shaft seal and one ball bearing instead of four each, compared to a twin-screw pump. Since there are no power transmission losses, a cooled oil bath is not necessary.

The pump and motor have a misalignment-tolerant coupling allowing easy maintenance and replacement of the mechanical seal and bearing. Monitoring is carried out automatically and the system can identify critical developments such as an overheated mechanical seal or bearing. The system also monitors operating parameters such as pump in/outlet pressure and vibrations. The anti-cavitation system automatically adjusts pump speed to the above mentioned measured values, ensuring safe operation.

Universal cargo pump for unloading
Another Leistritz development is the submerged cargo pump series L2NT/L5NT that allows continuous, almost pulsation-free pumping of cargo liquids using only low power. Deck installations of cargo screw pumps are not usually able to unload the full range of cargo viscosities effectively in tanks with depths of more than 8m. Such installations cannot provide suction conditions.
necessary to avoid cavitation effects during unloading and stripping. Furthermore, other standard submerged pump types are not normally able to provide proper stripping and draining.

The special submerged pump series L2NT/L5NT, which can be installed in a separate barrel, hangs from the deck with suction piping between the cargo tanks. The barrel works as a large suction chamber providing the pump with additional suction power. The pumps have only one shaft seal (stuffing box or mechanical seal) to the atmosphere. They are suitable for handling hydrocarbon products and other viscous liquids including slightly abrasive and corrosive fluids. Special profiled screws provide continuous, almost pulsation-free pumping of cargo liquids at low power consumption.

As the flange of the barrel connection is placed above the inlet of the pump, the entire pump is flooded by the pumped liquid. Therefore, the pump handles trapped air and gases without vapour-locking or losing prime. Pumps used in asphalt operations should have heating coils in the suction area of the barrel as well as a heating jacket for the stuffing box. Usually at least two pumps are installed and each pump is designed with full unloading capacity, thereby guaranteeing full system redundancy.

The layout of the suction piping system means that any pump can service any of the cargo tanks. The pumps can be driven either by a diesel engine with a right angle gear connected to the vertical driveshaft, or by an electric motor with an optional variable frequency drive. This helps to strip the lines and tanks in order to minimise the total cargo discharge time.
HERBORNER PUMPENFABRIK | Based on its modular system for coated pump types, Herborner Pumpentechnik has developed a self-priming fire-extinguishing pump – the herborner.S. The stimulus for the new development came from a customer in the shipping industry who needed a pump which could offer discharge heads of up to 12 bar with capacities of up to 100m³/h. It was also important for the pump to have a very good NPSH value and suction performance. Further criteria were high efficiency and an optional bronze version.

“We quickly realised that we would not have to start at square one to meet the customer’s requirements,” says Technical Director Sascha Korupp. First, a suitable pump was selected from the available modular set of coated pump types in the Herborner range. Then the existing “replacement kit”, made up of motor, pump rear wall and impeller, was tailored to meet the customer’s requirements with a new pump body including a suction cover. This allowed a completely new product with optimum performance characteristics to be developed – the herborner.S.

“A major advantage of the new modular system is that the pumps can be assembled, dismantled and serviced very efficiently thanks to the thick-layer coating,” explains Korupp. With the smooth coating surface, virtually no adhesion of the liquid occurs in the pump which means that pump components can be easily separated from each other even after longer periods in operation.

The combination of standard V4A fittings and the patent-pending impeller protector, as well as the mechanical seal protector and the “X-Lock-System”, guarantee these pumps a long life. One particularly effective factor in extending the product life is the optional Seal-Guard-System, or “SGS” for short, which prevents dry running of the mechanical seals.

It was a special challenge to find a coating material which could cope with the challenges of pumping aggressive liquids such as sea water using centrifugal pumps while, at the same time, ensuring a long service life. In addition, the unit had to prove its resistance to abrasion and cavitation, the company says.

To achieve this, and in collaboration with the Mittelhessen University of Applied Sciences, the HPC Coating (Herborner Pump Coating) was developed, with which all specified goals were ultimately reached and actually exceeded. From now on, the convenient grey cast iron can be used for pumping aggressive liquids, as corrosion and chemical reactions are permanently prevented by the thick-layer coating. Furthermore, the efficiency of the pump is improved by the coating.

The new pumps are supplied with highly efficient permanent-magnet motors, which are controlled using frequency converters, in addition to the standard IE2 and IE3 motors.
Components for LNG piping systems

**SB BRONESKE** | Thus far, SB Broneske, the developer and manufacturer of elastic bearings in exhaust pipe systems, has mainly focused on minimising noise on board ships. The company’s patented products and the free service portfolio have even established themselves as a design standard in the global market for exhaust pipe systems. However, in response to stricter emissions regulations and the worldwide trend towards LNG-fuelled ships, SB Broneske has extended its portfolio, offering certified components for LNG piping systems. This new product range comprises LNG pipe penetrations, LNG expansion bellows, LNG pipes and LNG mounts.

SB Broneske’s pipe penetrations are designed for extreme temperatures and certified for bulkheads and decks, capable of withstanding temperatures of 1000°C for 60 minutes (A-60) and waterproof for at least 30 minutes (6m, 0.6bar). The pipe penetrations are designed for pipes that can transport media between -200°C and +600°C. The company says that its pipe penetrations have already been installed on cruise ships, ferries, passenger ships, offshore ships and other ship types and have type approvals from all major classification societies. Heat expansion/shrinkage takes place in LNG lines and must be compensated through heat expansion elements. The most suitable thermal expansion elements are LNG expansion bellows which absorb expansion in axial and lateral directions. One of the core activities of SB Broneske is the calculation of heat expansion in high or low pressure pipes and in very hot or very cold exhaust pipes in the temperature range from +600°C to -200°C. These expansion bellows for LNG piping systems are also type-approved by various classification societies including Lloyd’s Register.

Aboard ship, LNG fuel is piped from the LNG tank to the engine. These pressurised LNG pipes must meet various requirements and be capable of allowing for thermal expansion. In addition, they must have redundant safety systems and must be made of special materials. To meet these requirements for maritime LNG technology, SB Broneske has developed special LNG pipes for shipbuilding, which have also been tested and certified.

LNG pipes must be stored in a specific manner to keep the pressurised lines in position and protect the pipes against tearing under extreme conditions. Furthermore, the mounts must allow thermal expansion. SB Broneske has developed LNG mounts for these special requirements.

The company provides specialised and highly qualified engineers, customised products and internal business processes, proven to meet international quality management standards, and aims to exceed customer expectations in the market for LNG-powered ships.

ABOUT SB BRONESKE

SB Broneske (Schwingungstechnik-Broneske GmbH) is an internationally operating specialist in the elastic support of exhaust pipe systems and manufactures its products (vibration mounts, deck and bulkhead penetrations, expansion bellows, rain caps and exhaust flaps) in Quickborn near Hamburg. [www.broneske.de](http://www.broneske.de)
HVAC control solution for the cruise cabin of the future

The eXtendable Room Box (XRB) including BC9191 Room Controller is used in the cabins of the Queen Mary II for the efficient control of heating, ventilation and air conditioning systems. BECKHOFF | Heating, ventilation and air conditioning (HVAC) control systems developed by Beckhoff Automation and Danfoss were installed in 80 cabins on Cunard’s luxury cruise vessel Queen Mary II during her 2016 refurbishment. The Beckhoff control system reduces energy consumption in the cabins and ensures continuing passenger comfort. The energy-efficient solution is achieved by combining the AB-QM pressure-independent balancing and control valves supplied by Danfoss with a Beckhoff room automation system comprising the eXtendable Room Box (XRB) including a BC9191 Room Controller and the TwinCAT Building Automation software. The successful cruise ship installation has demonstrated the degree to which optimised HVAC systems in conjunction with advanced automation systems can reduce energy consumption and maintenance requirements. As a result, costs can be saved while at the same time enhancing passenger comfort. The XRB enables the configuration of all room control functions and combines the automated composition of the hardware subassemblies into one tool. This solution significantly shortens engineering time while at the same time offering the system integrator the greatest possible design leeway in the implementation of various room functions, from lighting to shading and from HVAC to access control. At the same time, the Room Controller also acts as an interface for the ship’s maintenance crew and land-based monitoring. Due to the openness of the PC-based controller it is simple to integrate the NovoCon® digital actuator for the control, monitoring and hydraulic balancing of the HVAC system into the onboard building management system. Precise temperature control and an optimum pump speed achieve higher efficiency of the cooling system and provide for air conditioning that is in accordance with the actual cooling requirements. Comfort is thus increased while at the same time reducing the use of energy. A further advantage is the possibility of remote commissioning and monitoring of the valves. Where flow control or volumetric flow rate have traditionally been controlled mechanically, this now takes place on the PC via fieldbus – virtually with a mouse click. Integrated alarms signal errors to the controller. The Beckhoff energy monitoring software collects the consumption data and transmits it for remote analysis. After six months of operation on the Queen Mary II, the advantages of variable, modulating, pressure-independent systems over traditional systems with a constant flow rate or on/off switching were clearly evident.

ABOUT BECKHOFF
With its openness, modularity and scalability, PC-based control technology from Beckhoff Automation GmbH & Co. KG, Verl, can be used for a wide range of control applications in vessels such as yachts, cargo ships and cruise liners. Apart from lighting control, HVAC and cabin control in passenger ships, PC Control also facilitates the flexible and cost-efficient implementation of measurement technology, engine monitoring and condition monitoring.

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Efficient filtration systems for cruise ships

FREUDENBERG FILTRATION TECHNOLOGIES | Today’s cruise vessels are equipped as standard with the most modern high-tech equipment. To ensure safe and comfortable operation, Freudenberg provides modern onboard filtration systems for both passenger areas and the engine room.

Combining different filter types and classes into multi-stage systems tailored to specific environmental conditions and customer requirements is one of the core competences of Freudenberg Filtration Technologies. The filtration systems combine well-adapted functionality with a long service life and low pressure losses to provide long-term operational reliability.

The biggest challenge on board these ships is the humid, salty air. One of the greatest dangers this presents to the technical equipment is corrosion. This means that water and salt must be reliably kept out by carefully coordinated filter stages. Unlike a traditional pocket filter, water is not retained by the filter but forms into droplets and rolls off, washing away the dust at the same time. This self-cleaning feature is an additional benefit that increases the performance and service life of the filter. Thanks to this innovative design and carefully chosen materials, dust and saline water are spatially separated and significantly dissipated before reaching the downstream fine filter stage.

Viledon hydroMaxx pre-filters can be installed in existing filter walls without any great space or labour requirements. In terms of handling and flexibility, the new modular clip-on system is a true innovation. The Viledon hydroMaxx prefilters can be used individually or they are connected to the downstream filter stages to form a single unit by simply plugging them in.

The new Viledon hydroMaxx premium product line meets the extreme requirements at sea in a special way using innovative pocket filters with an excellent droplet separation capacity. The permanently water-repellent filter medium causes the water to form into droplets and simply drip away. To this is added the reverse flow concept. This means that the individual filter pockets face forward with the closed side facing in the direction of airflow, enabling optimum drainage with additional deposition of dust particles. Unlike a traditional pocket filter, water is not retained by the filter but forms into droplets and rolls off, washing away the dust at the same time. This self-cleaning feature is an additional benefit that increases the performance and service life of the filter. Thanks to this innovative design and carefully chosen materials, dust and saline water are spatially separated and significantly dissipated before reaching the downstream fine filter stage.

Viledon hydroMaxx pre-filters have been rated according to the new ISO 16890 test standard. Their good separation efficiency puts them in the filter class ISO ePM10 50%.

ABOUT FREUDENBERG FILTRATION TECHNOLOGIES

Freudenberg Filtration Technologies, Weinheim, is a leading manufacturer in high-performance and energy-efficient liquid and air filtration technologies. With its Viledon and micronAir global brands, Freudenberg Filtration Technologies offers customers innovative filter elements and systems for the energy, health, and transport sectors, general ventilation and clean-room technology, and for highly specialised applications.

www.freudenberg-filter.com
PODSZUCK | Kiel-based Pods-zuck specialises in the manufac-ture of an extensive range of fire doors for the maritime sector. The doors can be used in inte-rior and exterior areas of all ty-pes of vessels including yachts, cruise ships and merchant ships, as well as offshore plat-forms and other floating units. The company successfully completed pressure testing of a new light-weight, single-leaf hinged A60 door with a ma-ximum width of 1.18m and height 2.2m. The thickness of the door is only 44mm with a weight of 33 kg/m²/door leaf, making it suitable for vessels in-cluding yachts, ferries, and oce-an and river cruise vessels. The company is also offering a new A-30 door with maximum dimensions of 1.357m and height 2.53m. The notations are a measure of the insulati-on properties of the door and the speed with which heat can spread from one side, exposed to fire, to the other.

All door types are available with different sill and frame designs, including windows, magnets, door closers, different surfaces (galvanised and primed, stain-less steel 304 and 316, lamina-ted, foil-coated or painted) and a vast selection of locks, handles and plates. All doors are 100% custom-made in Kiel, Germany.

ABOUT PODSZUCK

Podszuck GmbH, originally es-tablished in 1919 and head-quartered in Kiel, specialises in the design, engineering and manufacture of high-quality doors for all kinds of ships – including container vessels, ferries and yachts – as well as for offshore platforms. All fire doors are certified by leading classification socie-ties and regulatory authori-ties including ABS, BV, GL, LR, RINA, RRS, SBG, TC and USCG.

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Schwepper’s aluminium-based handrail and stairway system

Lock and hardware concepts for ships

SCHWEPPER | In addition to offering a wide range of traditional marine products, Schwepper is now offering its customers a range of diversified products. The Velbert-based company produces locks, handles, furniture and door hardware, hinges, handrail and skirting systems, and cylinders. Recently the company has launched a new system in which locks can be integrated into electronic board systems via a solenoid component, be it for a system bus or a stand-alone set-up. Based on the standard stainless steel Schwepper lock series, the company identified demand for flexible product line integration and introduced a variety of stainless back-sets with emergency mechanical override functionality and appropriate electronic integration. Schwepper’s attention to customers’ concerns has paved the way for various important product developments. These relate not only to yacht building, which is one of the most innovative sectors within the maritime industry, but also to conventional shipbuilding. Here, for example, Schwepper tweaked its stainless steel products to target the offshore industry. The main components of its products were upgraded by using higher-grade material of AISI 316L. These 316L lock and hardware products are now available.

An important development is the upgraded portfolio of aluminium-based handrail and stairway systems. This new product range is complemented by skirting systems to complete the interior joinery – optionally with LED lighting for escape route marking – and a carpet skirting system. These systems can be customised with a variety of wooden finishes or RAL colours using powder coatings.

ABOUT SCHWEPPER

Founded in 1872 and with headquarters in Velbert, Germany, Schwepper Beschlag GmbH & Co has more than 130 years of experience in the production of locks and hardware for the shipbuilding industry. Now in its fifth generation of owners, the company, certified according to DIN ISO 9001, continues to pursue its ancestral objective of providing the best solution possible, based on tradition, innovation, flexibility and craftsmanship.

www.schwepper.com
Field tests of LED floodlights exceeds expectations

R. STAHL | The cost-saving potential of eco-friendly, highly efficient LED lighting solutions compared to conventional light bulbs has come to be universally acknowledged and appreciated. But there is some uncertainty around the performance of LED lights in real-life situations. For this reason R. Stahl surveyed LED, HST and HIT lighting setups in a true-to-life experimental test field.

A series of tests was conducted to determine the illuminance provided by the various lighting solutions. In each of the three setups, the lighting rigs were mounted on a 4.3m-high scaffold above the ground, with measurements taken over an area below of 10m by 13.7m. R. Stahl compared expected values using R. Stahl ezyLum light planning software with the actual measured values with the aim of ascertaining how dependable such calculations really are for light planning, i.e. whether all lighting systems – and especially LED floodlights – truly perform as effectively as predicted by light planning software tools.

The results turned out to be illuminating. When measured at ground level, the mean and maximum illuminance of HST high-pressure sodium discharge light was found to be roughly equivalent to software calculations based on the real luminous flux of the lamps. The HIT metal halide light, meanwhile, surpassed expectations by 12% and 18% for mean and maximum illumination, respectively.

However, the LED floodlights clearly led the field and performed on the safe side by a considerable margin, R. Stahl says, achieving 15% more mean illuminance and 25% more maximum illuminance than calculated by light planning software. Using these products, light planners and end users can therefore be assured that a lighting solution designed to comply with applicable standards for lighting in the workplace, e.g. EN 12464-1 or EN 12464-2, will meet the requirements and deliver as expected.

The LED products surveyed in the tests were latest generation R. Stahl 6125 series floodlights, designed for use in zone 1 hazardous areas. Available for installation as pendant lights or used for spot and wide-angle lighting, their high-quality TIR lenses minimise scattered light and glare effects and enable focussed light distribution angles of 10°, 40° or 120°. The 210-W floodlights achieve a high luminous flux of 21,000 lm, which corresponds to 100 lm/W luminaire efficiency.

However, 6125 products are not only economical to operate, but are also significantly simpler to maintain than gas discharge lamps, the company adds. The lens covers of the floodlights are equipped with hinges for easy installation, servicing and repair of spare parts. Even under extreme conditions, the service life of the product is specified at 50,000 hours of operation at maximum of +60°C with a lower limit of -40°C, a standout feature in this product class, R. Stahl says. Meanwhile, robust powder-coated sheet steel or stainless steel enclosures provide IP66/67 ingress protection and very high IK10 shock and impact resistance.

R. Stahl also offers 6525 series floodlights for zone 2 areas as well as 120-W models. Featuring a corrosion-resistant body and comparatively low weight, each floodlight is eminently suitable for both onshore and offshore applications.

ABOUT R. STAHL

R. Stahl, Waldenburg, is one of the world’s leading suppliers of explosion-protected automation, control and distribution, installation, operating and monitoring, lighting, signalling and alarm devices. The company offers comprehensive customer-specific systems solutions for industrial and hazardous areas.

www.stahl.de

UNICUT-V, UNIPUMP-V

Economical compact units with dual function

Compact units are preferred for operating vacuum drainage systems on ships and used in landside systems. The combination of a waste water block and vacuum pump guarantees secure ongoing operation with low control requirements. Due to the central location of the motor, which drives both the vacuum and the waste water pumps, the compact units not only have low space requirements, but also low energy consumption.

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Herborner pumps - Number 1 when it comes to marine pumps.

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Focusing on safety and security

Even though crews are getting smaller, safety and surveillance requirements are increasing due to the operational requirements of larger ships. This trend poses significant challenges. CCTV camera systems enable above- and below-deck areas with zero visibility, or those that are difficult to reach, to be effectively and reliably monitored at all times.

Shipbuilding supplier Wiska’s most recent development is an IP network-enabled pan-tilt-zoom dome camera, designed specifically for use in hazardous areas. With this product, Wiska is one of the few manufacturers to offer a dome camera with an IECEx certificate for Zone 1 and Zone 2. The camera features include:

- pan-tilt-zoom and preset function
- no external cabling
- stainless steel construction
- vandal-resistant dome
- full HD resolution
- IP-network camera
- IP 68

CCTV camera systems ensure that risks to people and machines are identified at an early stage and therefore minimised. They provide a constant overview of dangerous and isolated areas, such as passageways and mooring areas, as well as swift detection of malfunctions such as smoke developing in the engine room, and false alarms can also be identified more quickly.

In addition, Wiska CCTV systems feature software that is intuitive to use and facilitates extensive alarm management, the company says, enabling the prevention of unauthorised persons from accessing sensitive areas without being noticed. Furthermore, the cameras provide proof in the event of loading damage or accidents.

Wiska has been developing and manufacturing high-quality CCTV camera systems for vessels, oil rigs and wind parks for more than ten years. The company offers comprehensive expertise for a wide range of indoor and outdoor marine applications. Wiska outdoor cameras are specially designed for rough maritime conditions, manufactured using high-quality materials (e.g. stainless steel) to ensure their resistance to sea water and heavy vibration. They are also resistant to extreme temperatures, and fulfil the protection classes of IP 68/69.

Wiska’s comprehensive service of customised solutions from a single source includes extensive consulting services for the individual challenges of each project, detailed engineering for tailored camera surveillance systems, in-house design and production in Germany, as well as product tests and optional factory acceptance tests (FAT) in the in-house laboratory. Wiska also offers onsite installation and a worldwide commissioning service.

ABOUT WISKA

Wiska Hoppmann GmbH is one of the world’s leading single-source suppliers of maritime lighting solutions, electrical equipment, reefer container sockets and CCTV camera surveillance. Established in 1919, Wiska has been developing and manufacturing highly efficient and reliable products made in Germany for use in demanding maritime environments.
Life-saving equipment portfolio extended

D-I DAVID INTERNATIONAL-HISCHE | The manufacturer of lifeboat davit systems has recently broadened its life-saving equipment portfolio which consists of winches, davits and cranes for the maritime industry.

Heavy hoisting winches for the cruise industry
The company has recently delivered its new generation of powerful winches for installation aboard several large cruise vessel newbuildings. The winches have the capacity to hoist boats weighing up to 50 tonnes. Such lifting capacity is now required by cruise customers because the size of lifeboats has increased so much on the latest generation of new cruise vessels. Some lifeboats can carry up to 400 passengers each. There are plans for even larger lifeboats. The first of two units in the Oasis-class for Royal Caribbean International, the Harmony of the Seas, was equipped with 18 of these winches last year at STX France in St. Nazaire. The second vessel is scheduled for delivery in 2018.

The special safety feature of these winches is the automatic retraction system. When the boat is afloat and the boat-hooks release the blocks, each of which weighs well over 100 kg, the retraction system immediately lifts the empty blocks by about three metres to provide operational safety for crew and materials.

Following the supply of these units, d-i was awarded the annual STX prize for top quality supply. This commendation reflects not only the system itself, but also the quality of service including flexible cooperation and fair project management.

Electratically driven boat davits
Recently the company has launched a new electrically driven boat davit. This development, featuring electric drives, offers many advantages compared with hydraulic systems. These include: no risk of oil leakage; no change of hydraulic hoses for at least five years; no exchange of oil and no hydraulic accumulators; less maintenance; completely free solar energy to recharge batteries; arctic-capable functionality.

Lightweight cranes
When possible, d-i makes use of lightweight materials to improve the ratio of crane weight to safe working load. High-tensile steels and aluminium are used or combined in davits and cranes to meet specific needs for load capacity, corrosion resistance, acceptable weight and cost. All designs and material compositions meet the applicable class rules. Typical applications are small waterplane area twin-hull (SWATH) vessels, yachts, small- to medium-sized customs/police vessels and naval vessels.

Cranes for the German Navy
A couple of years ago, the company supplied two marine cranes for the German Navy’s auxiliary vessel, Bonn. Operation of the cranes was so successful that the Navy decided to order four more cranes for installation on board the vessels Frankfurt and Berlin. Two of these cranes are presently under construction and all of the units will be performance-tested at the company’s own test facility.

D-I DAVID INTERNATIONAL-HISCHE GmbH is a leading global manufacturer of innovative life-saving equipment and lifting appliances for the maritime industry and has cranes that are potentially suitable for all types of seagoing and inland waterway vessels, as well as the offshore energy industry. Established in 1985 in Sulingen, the company has a worldwide network of agencies and service stations providing technical know-how and comprehensive assistance to customers. Products have been tested and certified by all major classification societies. In 2015, d-i davit international GmbH merged with hische GmbH stahlbau und industrieaenagen to establish the company as it is known today, d-i davit international-hische GmbH.

www.di-hische.de

18 heavy-hoisting d-i davit winches have been installed on board Royal Caribbean International’s Harmony of the Seas

vessels, yachts, special-purpose vessels, navy ships and offshore platforms.
The SIMATIC automation portfolio offers impressive scalability and integrated functionality. It is optimized for maritime control applications with a particular focus on robustness and long-term availability. It also fulfills relevant classifications.

Contact: thomas.lauenstein@siemens.com

siemens.com/simatic
A leading supplier of water and wastewater treatment systems on board ships and offshore installations for more than 40 years, RWO develops, designs, manufactures and services innovative and cost efficient water treatment technologies for new-buildings as well as retrofits. RWO is specialised in technologies for treating ballast water, wastewater (sewage), process water (boiler feed water, air-condition condensate), fresh water (desalination, mineralisers, softeners), and in oily water separation.

RWO’s oily water separator OWS-COM is a suction type model and reliably reaches the 5ppm limit, the company says. To underline the good performance of the bilge water treatment system, RWO has optimised the two-step filtration process which is a combination of a highly effective open permeable original RWO coalescer together with a second stage hydrocarbon polisher. The bilge water passes through the first stage, where it is first filtered and then separated from the oil by a combination of gravity and a specially developed and optimised open permeable coalescer. Only after that stage it passes the pump, sparing it from attrition by particles and dirt, which have already been removed in the first stage.

A sensor, which is safe from manipulation and placed behind the pump, measures the remaining oil content. If below a set limit, the water goes directly overboard. If emulsions and further oil particles are left, the bilge water is led to a second stage where absorber cartridges remove the remaining contaminants. The activated carbon absorbs the hydrocarbons, rapidly bonding to the oil. The water flows radially into the cartridge and the absorption media instantly encapsulates and solidifies the oil. Original spare parts can now be more easily identified based on colours: red coalescer and grey cap of the absorber cartridge. The OWS-COM is certified by all necessary institutions and according to MEPC.107(49). DNV GL and Lloyd’s Register have confirmed that it reliably reaches the 5ppm limit.

Based on decades of experience and the excellent performance of its oily water separators, RWO has created optimised Consumable Kits that meet operational requirements more effectively. With these kits, the operator now not only has the certainty of obtaining original RWO consumable parts, but can also receive them bundled in a set to be safe and to minimise risks during the whole lifetime of the system.

Veolia/RWO offers complete water management solutions for ships.
EQUIPPED TO SERVE THE DEMANDS OF THE OFFSHORE ENERGY INDUSTRY

Fleet operators and ship owners want highly efficient and reliable vessels. Equipment onboard must be easy to maintain, have low through-life costs and perform around the clock in the most demanding conditions. With continual research and development ZF provides customers with a wide-ranging line of products – marine transmissions, jack-up and swing gearboxes, control systems, propellers and steerable thrusters – specifically designed for workboat applications. www.zf.com/marine
Heavy-duty hoist solutions

J. D. NEUHAUS | The manufacturer of high quality hoists, winches and cranes, J.D. Neuhaus (JDN), has launched the innovative Profi 75 TI and Profi 100 TI with safe working loads (SWL) of 75 and 100 tonnes respectively. The company has also completed the redesign of its Profi range of air-operated hoists.

Existing relaunched products in the Profi range cover lift capacities from 250 kg to 60 tonnes, ideally suited to engineering environments, the company says. The latest additions, featuring reduced energy requirements, weight and size, meet the high demands of heavy engineering. The key component of the hoists is a new air motor unit based on the well-proven J.D. Neuhaus motor-brake concept and incorporating a patented integrated brake system with a stepped brake piston and reliable self-lubricating rotor.

In the standard configuration of a 6-bar air pressure supply, the motor has a power output of 9 kW, adequate for the operation of either hoist while still providing significant energy reductions. At full nominal lift capacities (75 or 100 tonnes), 7.6 m$^3$ of compressed air is consumed per minute, which represents more than 30% in savings over the hoists being replaced.

On lowering full loads, the air consumed is 6 m$^3$/min, an impressive 50% in savings, JDN says.

The new hoists are designed to meet ISO 4301/FEM 9.5 II, which is good for 400 hours of full-load operation. Although the overall air consumption has been reduced significantly, the lifting and lowering speeds with/without loads have been increased compared with the previous hoist models, which helps to reduce handling and increase production output over a full working day.

Lifting speeds at full load have increased from 0.45 to 0.53 m/min (Profi 75 TI) and from 0.35 to 0.4 m/min (Profi 100 TI). Lifting speeds without a load have increased from 0.85 to 1.33 m/min (Profi 75 TI) and from 0.7 to 1.0 m/min (Profi 100 TI).

The lowering speeds at full load have also improved, increasing from 1 to 1.25 m/min (Profi 75 TI) and from 0.8 to 0.95 m/min (Profi 100 TI). Computer simulations such as CFD were used throughout the development process, with all simulation results validated in various practical tests to achieve energy savings of up to 50%, depending on the operating conditions. The combination of optimised material selection and modern design methods has also achieved significant weight reductions for the new hoists. This ensures that the relation between hoist unit weight and safe working loads is much better than was the case with the earlier hoist designs, JDN points out.

Overall weight savings of 750 kg have been achieved for the Profi 75 TI, and 640 kg for the Profi 100 TI. There have also been reductions in size, particularly between the load-bearing surfaces and suspension hooks, and significant reductions in sound levels during operation. The new hoists register 77 dB(A) at full-load lifting and 83 dB(A) during lowering. Lifting and lowering motor limiters incorporating a pneumatic pin valve design are optional for both hoists.

ABOUT J.D. NEUHAUS
A privately owned company founded in 1745, J.D. Neuhaus GmbH & Co KG is based in Witten. For over 270 years, it has been using its expertise and experience to manufacture the highest quality hoists, winches and cranes. Its products offer solutions for almost every material-handling problem irrespective of the driving medium: from air, manual and hydraulic hoists to complete explosion-proof crane installations.
RUD | Safe and reliable lifting procedures are essential throughout the shipbuilding, marine supply and ship operating sectors. During production, assembly and loading processes, heavy loads often need to be rotated, turned, lifted and transported accurately and safely. For these applications RUD offers more than 600 tested and approved modern lifting lugs and attachments, all fulfilling the European Machine Directive 2006/42/EC. By using these safe lifting points, greater safety and efficiency ensures that all types of loads can be handled effectively.

In conjunction with its high-quality chains portfolio – VIP (Grade 100) and ICE (Grade 120) – RUD provides standard and tailored applications to meet the highest demands in all aspects of future-oriented lashing and lifting equipment from 80 kg to 200 tonnes working load limit (WLL).

For the lightest ICE sling chains of highest quality class 12 with a comprehensive Meccano system, RUD now offers new crossbars and spreaders in lightweight design. Made of extruded, high-tensile plastic and glued with profile-stiffening composite parts, RUD supplies crossbars and spreaders offered up to 3m long and 3 tonnes WLL. Pink-coloured, rust-proof and “noticeably different”, these products are proof-loaded and tested at two million cycles, seven-fold breaking strength, and in operating temperatures ranging between -40°C and 65°C. Using these innovative technologies, loads can be lifted safely and effectively by only one man using a truck to the unloading location. The techniques also avoid possible harm to spinal discs and fingers.

The ICE sling chains in quality class 12, which are one size smaller than quality class 8, are designed to fit the light-design crossbars with the appropriate chains, hooks and suspensions, allowing for easy and simple handling. RUD claims that these are the lightest chain and crossbar combinations available worldwide.

ABOUT RUD
RUD Ketten, Aalen, is a leading manufacturer of round steel chains. Its production includes premium quality chain slings and components, lifting points and lashing systems for a wide variety of markets and industry applications. As an innovative technological trendsetter, RUD has succeeded in developing new technologies, introducing new product features and setting new standards which have become industry benchmarks in the key industries and market segments in which the company operates.

www.rud.com
Extensive product portfolio for offshore energy market

MACGREGOR HATLAPA  Global investment in renewable energy has reached new heights and with a pipeline of long-term power-generation potential, MacGregor Hatlapa is well-positioned to support this burgeoning market.

MacGregor Hatlapa recently announced its participation in a pilot project pioneering the use of Nemos, an innovative system that generates electricity from waves. The system is ideally suited to work in combination with offshore wind farms, where it can share electrical infrastructure. This lowers the levelised cost of energy (LCOE) and lessens the fluctuations in power-generation, thereby supporting greater commercial viability of renewable energy capture. For its part, MacGregor Hatlapa will supply highly-specialised winches.

Winches for innovative wave energy project

Nemos employs specially shaped floating structures that move in a controlled trajectory to capture up to 80% of available wave energy, compared to 50% achieved by conventional rise-and-fall systems. Their associated generators and mooring winches can be located on any suitable offshore structure, such as a wind turbine, where they will be protected from seawater and offer easy access for maintenance.

The Nemos mooring system employs two fibre ropes for each approximately 20m-long floating structure. These ropes are controlled by the MacGregor Hatlapa winches which deliver the optimum degree of movement to maximise energy capture. Orientation of the floating structures can also be adjusted by the winches when wave direction changes. In extreme conditions, the winches can haul them down well below the surface to avoid storm damage. The first commercial Nemos pilot project will be located in the North Sea and should be fully operational in 2017.

Substructure mooring connection system for offshore wind farm

The Nemos project is one of many pioneering new approaches to the capture of renewable energy. At the end of 2015 MacGregor won an order for substructure connection mooring systems for the world's first floating offshore wind farm; Statoil’s Hywind pilot park in Scotland, UK. Hywind will cover an area of just over 4km² near Buchan Deep, 25km off Peterhead in Aberdeenshire.

MacGregor has developed a subsea crane that has a full three-axis active heave-compensation system so that it can keep a suspended load fixed in position relative to the seabed.
on Scotland’s North Sea coast. It is designed to demonstrate cost-efficient solutions that will enable the commercial capture of wind energy in deep-water environments.

MacGregor is contracted to deliver a Pusnes substructure mooring connection system to each of the pilot project’s five new floating wind turbines. The ballast-stabilised turbine structures will each be equipped with a three-point mooring system employing site-specific anchors. Deliveries were completed by the end of 2016 and installation of the wind turbines is scheduled for 2017.

The 6-MW wind turbines will have a total power-generation capacity of 30 MW and provide enough electricity for 20,000 UK homes. They will operate in waters over 100m deep which experience an average wave height of 1.8m.

**Offshore crane with heave-compensation system**

Regardless of the difficulties imposed by their height and exposed positions, all wind turbines require regular inspection and maintenance. MacGregor is at the forefront of developing technology to deliver this vital service in a safe and efficient manner. A notable example is a first-of-its-kind offshore crane that has a full three-axis (x, y and z) heave-compensation system that can keep a suspended load fixed in position relative to the seabed. The crane was specifically developed to be able to land containers of tools and equipment onto small platforms at the top of offshore wind turbine foundations with little margin for error. The crane is also ideally suited for maintenance work on wind turbines and other fixed installations.

The landing platforms are about 20m above the water and have an area of only a few square metres, so precise load handling is necessary. Although MacGregor Hatlapa’s standard active heave compensation (AHC) system, supplied through a crane’s winch, compensates for a vessel’s vertical movements, a greater degree of precision was required in this case. In addition to compensating for vertical motions with the winch, MacGregor developed new technology which could also compensate for pitch and roll movements.

The crane has a safe working load of five tonnes at a 25m outreach and features a telescopic jib, operated by a hydraulic cylinder system, to achieve the required combination of lifting height and compactness when not in use.

**3D motion compensator**

In November 2016, the company introduced a 3D motion compensator (3DMC), a retrofit device designed to enhance the load-handling precision of offshore cranes. The 3DMC compensates for roll, pitch and heave motions and minimises any movement of a crane load in relation to a fixed point in space.

The 3DMC can be fitted to the knuckle jib of a broad spectrum of new or existing MacGregor subsea and offshore cranes. It has been designed for easy installation and makes use of the crane’s existing hydraulic power unit and control system. The interface between the unit and the crane is designed so that the 3DMC can be swiftly mobilised to a crane with the relevant fittings. This allows for flexibility within a fleet of vessels, so that one or several 3DMCs can be shared between them. When not required, the 3DMC simply remains fixed to the side of the crane’s main knuckle jib without interfering with the normal lifting capabilities of the main and whip winches.
Next generation motion-compensated ganway

**BOSCH REXROTH |** Netherlands motion-compensating system specialist Barge Master, in close collaboration with Bosch Rexroth, has recently launched a motion-compensated ganway for the safe and efficient transfer of personnel and cargo from ships to drilling and offshore production platforms, wind turbines and other marine installations, assessed and approved by DNV GL.

Development of the ganway proved quite a challenge, according to Ron van den Oetelaar, general manager at Bosch Rexroth Benelux, "due to the simultaneous linear and rotary motions along several axes occurring under large forces. The active motion-control technology applied in the system is extremely complex," says van den Oetelaar. The ganway is placed on a small diameter pedestal with a hinge and a luffing cylinder to compensate the roll motions of the vessel. The ganway can translate and rotate (surge and yaw) in the horizontal plane around the pedestal by using hydraulic motors.

Telescopic sections with winches in the bridge ensure smooth translation in sway direction. Extremely fast sensors and control engineering were used for the Barge Master Gangway which could translate the ship's movements into “counter-movements” for the ganway. The system can compensate for vessel motions up to a significant wave height of more than 3m. In addition to the ganway system customers can choose for additional modules such as a height adjustable pedestal with an integrated elevator. This option ensures a “step less” transhipment of pallet trolleys as well as fast and safe integrated logistics between vessel and platform.

In a radical departure from the traditional client-supplier relationship, Barge Master has formed a fully fledged partnership with Bosch Rexroth, with specialists from both companies working together in an integrated project team. The team takes care of the design, fabrication and timely delivery of the system, working with a view to incorporating clients’ feedback into a perfect working ganway.

The ganway’s small footprint, light weight and the modular design with hoisting, elevator and other options have led to a next generation design, Barge Master claims. In order to keep that ganway price competitive, Bosch Rexroth made maximum use of standard components from its wide product range and while some parts have still been custom-built for this project, the end result has become “lean and mean”, according to the company. The first unit was sold in July 2016 and will be delivered in the second quarter of 2017.

**ABOUT BOSCH REXROTH**

Bosch Rexroth is one of the world’s leading specialists in drive and control technology. The company offers a comprehensive portfolio to the marine and offshore industry, ranging from standard products to engineered-to-order solutions. www.boschrexroth.com
Explosion-proof pneumatic or hydraulic hoists and crane systems from J.D. Neuhaus are reliable in the extreme. Our equipment performs when used to build massive sea vessels or in any one of 70 additional industrial sectors across 90 countries world-wide. [www.jdngroup.com](http://www.jdngroup.com)
Automated leg force measurement on jack-up ships

Condition monitoring is increasingly important in the offshore sector. In addition to wind farms, ships increasingly rely on intelligent data analysis in order to monitor the condition of components, to improve safety and to avoid failures.

It is, of course, most important that all systems on board a ship or offshore facility operate reliably and do not suffer unexpected breakdown or failure. The maintenance crew may be far away and the cost of downtime can rapidly spiral out of control. Therefore, more shipping companies and owners of offshore plants now rely on modern automation technology that has already proved its worth in shore-based industrial facilities.

Demand for the condition monitoring of components is increasing steadily. Wind farms, for example, already use the technology to monitor their drive systems and to identify the risk of a potential component at an early stage. This is based on intelligent analysis of oscillations: through a Fourier analysis, the vibrations of the components are dissected into individual frequencies that result in a type of “fingerprint” of the component’s current state. For the diagnostics, the system analyses the frequency spectrum and can thus determine that everything is in order or that a future failure is likely and appropriate preventative steps taken.

The basis for predictive maintenance is formed by automation solutions that detect the oscillations, digitise them and then mathematically analyse them. This also includes the Condition Monitoring System SIPLUS CMS 1200 from Siemens that consists of a SIMATIC S7-1200 CPU and the Condition Monitoring signal module SM 1281. A maximum of four vibration sensors can be connected to each SM 1281, together with a sensor for tracking rotational speed. Data from these sensors can be stored and analysed directly in the module.

Up to seven SM 1281 modules can be connected to each S7-1200 CPU – in total the CMS 1200 can therefore detect, store, evaluate and visualise data from vibration sensors. This means that the high standards of Industry 4.0 can also be applied to the maritime field without any problems.

High demands on special ships

In addition to vibration, other mechanical issues may have a significant impact on safety at sea. Currently one of the most complex offshore challenges for ships and their crews is the erection of wind turbines in the North Sea and Baltic: The individual turbines have to be secured in turbulent seas by means of special foundations such as tripods, jackets or monopiles, requiring the deployment of special ships.

One such vessel is the Innovation, owned by HGO InfraSea Solutions GmbH & Co. KG, based in Bremerhaven. The 22,000-tonne crane jack-up vessel can ship a payload of up to 8,000 tonnes – for example three tripods as well as the required necessary piles for turbine installations. The ship has a 1,500-tonne crane for turbine installation and the Innovation’s stability is ensured by its four jack-up legs which comprise of a steel lattice structure that are each 89m long. A total of 96 electric motors drive the jack-up systems. These transfer power through gears to the rack-and-pinion jacking system.
Before starting erection work at the site of the offshore wind farm, the *Innovation* lowers its four legs onto the seabed and first determines the load-bearing capacity of the subsoil. It is particularly important to avoid the so-called punch-through – a sudden break through a hard subsoil layer into a softer one. This can result in a severe tilt of the ship which can lead to the buckling of jack-up legs and significant danger for the crew.

To avoid this, a so-called preloading is carried out. All four legs are lowered to the seabed first until they make contact. Then the ship is lifted slightly out of the water to increase the load on the seabed. Subsequently two of the four legs are retracted so that the load rests only on two preloaded legs – which sink in and compact the seabed. This is followed by the other pair of legs. The cycle is repeated until the complete ship has been lifted out of the water.

For successful preloading and the dynamic ship-raising process, the forces acting on the four legs have to be measured precisely. For this purpose, the *Innovation* has 48 strain gauges on the load-bearing components of the lifting system. A SIPLUS CMS 4000 condition monitoring system continuously monitors and records relevant measurements including static and dynamic leg force, rotary speeds and motor currents, and displays them on a monitor. It is now also possible to establish a real-time remote link with shore via satellite and the Siemens Common Remote Service-Platform (cRSP).

Whereas the SIPLUS CMS 1200 is a specialist predictive maintenance tool for the analysis of oscillations and has the appropriate algorithms already integrated for data analysis, the CMS 4000 installed on the *Innovation* is much more versatile. It not only enables the evaluation of up to 180 channels, but it also allows specific models and algorithms to be programmed into the system. This means that the CMS 4000 can monitor individual components as well as complex overall systems.

**Jack-up system of the *Innovation***

In its fully-loaded state, the jack-up system has to lift 30,000 tonnes. The 96 pinions for the racks of the four legs of the ship have an outer diameter of almost one metre and a width of 32cm. During a standstill such as a major storm, for example, the legs must each be capable of bearing a load of up to 866 tonnes each.

The gearing consists of a two-stage planetary gear and a four-stage spur, resulting in an overall ratio of 1:3330. At a maximum motor speed of 3,000 l/min this results in a rotary speed of 0.9 l/min at the output pinion. This means that the ship can be jacked up or down by up to two meters per minute – a rate that cannot be attained by using the alternative pin-and-hole jack-up system.

Water-cooled frequency inverters supply the motors with power. They are interconnected in four levels with each other so that even during a partial failure of the electrical drive technology the ship can still be lowered safely onto the water.

The operator can control each leg of the jack-up system separately and the Siemens automation system displays the leg loads, raised height, air clearance under the ship, raising speed, the inclination of the ship platform and the rack-phase difference (RPD) which allows conclusions to be drawn about bent legs or excessive lateral forces.

The SIPLUS CMS 1200 has the following features:

- early detection of mechanical damage (predictive maintenance);
integrated software for configurable or frequency-selective data analysis FFT and HFT;
> trend analysis;
> monitoring of frequency bandwidths;
> archiving on-board 800MB memory;
> maximum of four vibration sensors per SM 1281;
> one sensor for rotation speed per SM 1281.

Features of the SIPLUS CMS 4000 include:
> monitoring of individual components or complete systems;
> easy integration into new or existing automation systems;
> connections for a maximum of 30 interface nNodes (vibration and analog signals);
> up to 180 sensors with sampling rates of a maximum of 192 KHz per channel;
> detailed analysis, diagnostics, visualisation and data archiving;
> analysis with Siemens CMS X-Tools software.

Trend toward central data evaluation offshore
Predictive maintenance systems on board the Innovation demonstrate that these technologies have an important role to play, both offshore as well as in traditional shore-based applications. The central acquisition and representation of measured values in modern systems such as Siemens’ CMS 1200 or CMS 4000 have a growing number of maritime and offshore applications. Companies from both of these sectors can rely on products that have proven their reliability in demanding land-based industrial environments.

ABOUT SIEMENS
For more than 130 years, Siemens Navy & Commercial Vessels, a subsidiary of Berlin and Munich-based Siemens AG, has been delivering electrical products, systems and services for the efficient and reliable operation of commercial and naval vessels over their entire life cycle. This includes turnkey projects and conversions. Furthermore, Siemens provides Green Ship systems such as low-emission electric propulsion including EcoMAIN waste heat recovery installations.

Raytheon Anschütz supports global maritime industry with state-of-the-art and reliable navigation sensors and systems, backed by superior worldwide service.

Raytheon-Anschütz.com
Bridging the gap between power technology and automation

**BACHMANN ELECTRONIC** The plug-in options of the Bachmann GMP232/x family provide a comprehensive solution for instrumentation and monitoring of three-phase electrical grids integrated into the M1 automation system. This enables effective integration of genset or drive control and grid technology in a single device.

Conventional automation technology for control and monitoring of power systems is currently dominated by low-cost programmable logic controller (PLC) devices. However, in many cases grid instrumentation, protection and fault analysis are still performed by dedicated devices originating from a completely different domain. That’s because the past product portfolios of controller manufacturers were not especially interesting for real grid experts – modules designed for data acquisition in low-voltage power grids are not suitable for professional use in generation plants or transmission components.

As a result, until now, power technicians have preferred conventional, proven special products and avoided attempts to integrate their functions into controllers. Nevertheless, integration of these previously discrete functions into a single device is worthwhile. Along with boosting efficiency by sharing hardware, it reduces cost and effort for integration, training, troubleshooting, spare parts stock, and so on.

**Integrating a power unit into automation**

The new modules in the GMP232/x family from Bachmann Electronic provide a solution which bridges the gap between power technology and control technology. These modules enable easy integration of instrumentation and monitoring functions for three-phase electrical grids into the M1 automation system.

All commonly used instrumentation parameters – voltage, current, phase shift, power and frequency – are directly available in the control program. Voltage measurement with direct connection is possible up to 690V, and a 100/120V converter interface is available for medium voltage applications. Conventional 1 A and 5 A converters are available for current measurement.

Specifically for use in connection with high-power variable frequency drives, the module also provides both true RMS data and precision fundamental frequency data. The especially wide measuring and overload ranges provide enhanced deployment security in weak onboard grid environments. The degree of harmonic distortion from variable frequency drives can be seen from the internal Fourier analysis with an amplitude spectrum extending to the 50th harmonic and THD factors for each phase. Flexible monitoring functions

Users can easily define their own monitoring profiles for intrinsic onboard grid and genset protection using 40 monitoring functions with configurable parameters. The range of options includes multi-level, time-independent voltage and frequency protection functions, Q(U) and phase shift monitoring. Time-dependent functions for low-voltage and high-voltage ride-through

**SUMMARY OF APPROVALS**

- **Electrical safety**
  - CE
  - UL50, cUL
  - CCC

- **Grid protection for generating plants**
  - BDEW Guideline (06/2008)
  - FGW TR 3 (Rev. 23)
  - FGW TR 8 (Rev. 6)

- **Maritime component certificates**
  - DNV GL
  - American Bureau of Shipping (ABS)
  - Lloyds Register (LR)
  - Bureau Veritas (BV)

Matthias Schagginger, Senior Manager Product Line Management at Bachmann, showing the GMP module
(LVRT and HVRT) are available for distinguishing between serious faults and transient voltage dropouts for which the genset should remain in service.

All protection system status data is constantly available for user programs on the PLC. The relay outputs integrated into the module enable direct switching of two trip circuits. When a protection function trips, the integrated real-time data recorder automatically logs the histories of selected grid quantities with a resolution of up to 10 kHz. All monitoring events are recorded in an event log.

Certified protection and communication
Integration into the alarm and monitoring system and communication with the bridge or other systems is possible through Modbus (TCP, UDP, RTU), OPC, Profinet, Profrbus, CANopen, or the M1 bluecom protocol. With genset integrated solutions or higher level power management, links via J1939, CAN2.0b, RS232/422/485 or discrete signal interfaces (24 VDC, 4–20 mA) can be implemented easily through the M1 system. In conformance with the rest of the M1 automation system, type certificates from the classification societies DNV-GL, LR, BV and ABS are also available for the new GMP232/x modules. For parallel mains applications intended to be used both at sea and on land, component certificates issued by TÜV Nord simplify unit certification: BDEW Guideline, FGW TR 3, FGW TR 8, ENA ER GS9/3, IEEE C37.90.

Benefits beyond the onboard grid
The modules in the GMP232/x family provide a comprehensive and mature solution for controller integrated grid technology. Together with the M1 automation system platform, they allow impressive performance and broad functional scope to be combined with high flexibility and cost-effective design. As a result, a broad deployment spectrum previously reserved for special systems can now be covered with a single plug-in module for the PLC.

Merging the two worlds gives the grid domain access to many benefits already commonly available in the control world, including remote maintenance, built-in security with modern user management, modern parameter management, and many more. Thanks to high data transparency and shared access to the controller’s communication channels, the module is able to convey a wealth of additional data to control stations or global service portals. This detailed data can also be made available to other user groups, possibly creating even more added value in the sense of big data.
When monitoring the condition of operating components in the predictive maintenance of engines, bench testing for optimisation of raw materials and lubricants, for example, or analysing thermal stress limits in piston rod bearings, precise temperature measures are required. But it can be difficult to access the points where such exact measurements can be made in engines or sometimes, these points cannot be reached at all with conventional sensors. Often, measurements can only be taken further away, which can lead to damage to the bearings not being detected in time or not being detected accurately. In the worst case, this can lead to engine damage, expensive repairs and costly system downtime. For this reason, one of the biggest challenges in measurement technology is the recording of measurement values on moveable objects.

For these applications, Noris has developed a new patented inductive wireless transmission system, which can record, save and send measurement data to a receiver as part of a cycle, all without its own energy source. In comparison to radar-based systems, this concept can be used with just a few robust components in a space-saving construction without the need for an additional analysis unit, making it a smart, attractive and, above all, cost-effective alternative.

A coil is mounted on a moveable part (e.g. on a flywheel or piston rod) and is used as a transmitter for the measurement data. Through the movement of the flywheel or piston rod, the transmitter constantly passes the sensor element, and thus, is supplied with energy by an electromagnetic induction. This energy is sufficient to detect the measurement data from a measuring element on the piston rod bearing (e.g. Pt100) and save it in a transponder. Every time the transmitter passes the sensor element, the measurement data is retrieved from the transponder and is transmitted to the sensor element with a frequency of 13.56 MHz (ISM-Band).

A supplier of large engines which has been searching the market for a suitable solution for monitoring the temperature of moving engine components for the past few years has shown great interest in the concept. With this new technology, accurate monitoring of the condition and wear of operating components is now possible.
Automation raises energy-efficiency on ferries and cruise ships

WAGO | Together with the Swedish company CATC, the German provider of electrical connection and automation technology Wago has modernised the heating, ventilation and air-conditioning (HVAC) control systems on a Stena Line ferry. The WAGO-I/O-SYSTEM 750 is used to synchronise and control the systems and contributes to significant energy savings on board. The project comprised a complete system upgrade from electrical design through to programming, project management, commissioning and after-sales service.

As early as 2005, Stena Line introduced an Energy-saving Program (ESP) across its fleet. Its goal was to cut annual fuel consumption by 2.5%, a margin exceeded in 2015 with a reduction of 2.8%. “By 2030, we aim to reduce our CO₂ emissions by 35%,” explains Erik Lewenhaupt, Stena Line’s head of sustainability. “Within the context of ESP, we assess various points for saving energy. We rely on digital solutions for our fuel management systems so that we can optimise on-board operations using the data recorded from our ferries.”

In applications like these, CATC systems prove their worth. On cruise ships and ferries, they optimise pressure and temperature from fans, air-conditioning devices, and boilers so that, “energy costs can be reduced by up to 40%” explains Jens Stjärna, one of the founders of CATC.

The need for electrical power can be substantially reduced by monitoring hotel requirements in passenger and crew quarters with the WAGO-I/O-SYSTEM 750, synchronising and controlling systems simultaneously. Energy consumed is generated on board and efficiency gains not only reduce fuel consumption but also particulate and CO₂ emissions. This means lower costs per tonne mile.

The Swedish firm combines experience in air-conditioning technology and ship automation with class-approved products from Wago. Jens Stjärna explains: “The Wago systems comply with relevant maritime standards. This was a key driver when we were selecting systems, in addition to the compact design of Wago’s products. Class-approved components mean that new customers can have complete confidence in the products we offer.”

Projects at CATC include upgrades of HVAC control systems and, if a system replacement is required, work usually begins in the engine room. There, touch screens are installed so that engineering staff can monitor temperature and air pressure, and control them individually. Comparable operating and visualisation solutions are also used in areas where passengers congregate. “Our goal is to increase efficiency without compromising passenger and crew comfort,” explains Stjärna. Since upgrades are carried out while ships are in operation at sea, CATC technicians frequently travel on board.

CATC recently completed a Stena Line project on a vessel sailing between Gothenburg, Sweden, and Kiel, Germany. A completely new system was installed in both crew and passenger quarters, from the car deck to the engine room. On the car deck, more effective ventilation reduced noxious exhaust gases. CATC’s retrofit improved the climate both in- and outside the ship. This also makes financial sense. “A system change can pay back in one or two years,” Stjärna claims. This is due to energy savings and improved operational efficiency on board resulting from the new software. “In the long-term, our customers save money,” he says.

Wago Kontakttechnik GmbH & Co. KG is a family-owned company headquartered in Minden. It is a market leader in spring clamp technology and ranks among the leading suppliers of connection and automation technology. Its products are used in sectors including vehicle construction, building services and other demanding applications.

The WAGO-I/O-SYSTEM 750 is approved for maritime use
Busbar systems for maritime applications: designed and built to withstand vibrations

The design of Rittal’s Flat-PLS allows busbar systems for various panel types — such as incoming or outgoing feeders, or fuse panels — to be planned and built by a similar method. Standardisation ensures safe and efficient installation.

RITTAL | Vibrations can loosen the strongest screw connections and even cause steel plates to fracture. To eliminate this problem in low-voltage switchgear and control systems on ships and offshore platforms, classification societies have set out defined design requirements and test conditions. Rittal’s busbar systems, key components of switch-and control gear in maritime applications, have been thoroughly tested and type-approved, simplifying the vessel inspection process.

Electrical switchgear and control systems on ships and offshore platforms do not differ significantly from those used in industry generally. However, environmental requirements do impose greater demands. For example, clearances and creepage distances may have to be increased due to high air humidity, and it may be necessary to verify that ship vibrations cannot loosen screw connections. International standard IEC 61439 defines general requirements for these systems and classification societies usually require application of this standard for marine equipment, in addition to their own more specific demands.

Design modifications, such as increased clearances and creepage distances, are relatively easy to implement. However, it is less straightforward to verify the strength of screw connections subject to vibrations — especially when the purpose of a connection is to enable a busbar to conduct electricity reliably. There are several reasons.

Firstly, screw connections are often subject to vibrations for many years. Secondly, the frequency and acceleration of vibrations change constantly. Furthermore, the position of connections within the switchgear or control system — and the masses they hold — vary. As a result, there can be multiple resonant frequencies — another factor in the challenge of verifying the reliability of screw connections.

Classification societies have defined an appropriate test procedure. A control gear assembly is subjected to vibrations in a frequency range of 5-13.2 Hz and an amplitude of +/- 1mm, and in a range of 13.2-100 Hz with an acceleration of 0.7g. The amplitude of the response must not exceed the excitation amplitude by more than a specified order of magnitude.

If this threshold is exceeded, the assembly has failed. If one or multiple resonance points are found where the threshold is not exceeded, the test must be applied to each of the points for 90 minutes in order to stress the screw connection. Alternatively, if there are several resonance points close together, a test lasting 120 minutes should be performed across the corresponding frequency range, moving continuously from one resonance point to another.

In some cases, this test can take several hours and the screw connections and the equipment installation subjected to immense stresses. Components that pass this test prove extremely reliable when used on ships. For this reason, manufacturers are issued with type approval certificates. Classification societies enter approved products in their databases, plus all related documentation, instructions and technical data. This means that surveyors can easily access the documentation and issue approvals faster during ship construction. They no longer need to review diverse product characteristics that have already been verified during type approval. Surveyors only need to check that equipment is being used in accordance with the manufacturer’s specification. This speeds up the documentation and system approval process.

Rittal’s modular systems are compliant with IEC 61439 and can be used on ship and offshore structures. The company has conducted comprehensive vibration testing under conditions which match those on board where control and switchgear are generally installed. The results prove that the screw and clamp connections of Rittal busbar systems withstand such conditions without becoming loose.

Rittal applied for type approvals for its RiLine, Maxi-PLS and Flat-PLS busbar systems. Classification societies American Bureau of Shipping (ABS), DNV GL and Lloyd’s Register reviewed the corresponding IEC 61439 test reports, material data, instructions, data sheets and the findings of the recently conducted vibration tests. Type approvals were then issued by these leading classification societies.

ABOUT RITTAL

Rittal GmbH & Co KG, headquartered in Herborn, is a leading system supplier of enclosures, power distribution, climate control, IT infrastructure and software and services. The company’s customers span many industry sectors including shipping, mechanical and plant engineering, and the IT and telecommunications market.

www.rittal.com
Digitalisation of the integrated bridge

RAYTHEON ANSCHÜTZ | Digitalisation is transforming operations on ships’ bridges. The wheelhouse has turned into a digital ship control centre, at least on newbuildings. Navigation devices are frequently linked by networks and the integration of data allows many new useful functions. The new developments have one target: to make bridge operation safer and easier.

Consistent presentation of data through self-explanatory and intuitive controls are not only key to preventing accidents but also to improving efficiency. When it comes to the “integrated bridge”, navigators and ship operators name standardisation and simplification of indicators and operation right at the top of their wish lists.

During the past two years bridge navigation systems have gone through massive modernisation. A major trigger was the INS performance standard MSC 252(83). Raytheon Anschütz claims to be the first company to launch a new system compliant with this standard under the name “Synapsis”.

Now, the second generation “Synapsis NX” is available, built on a holistic system concept. Sensor data are fed into the system centrally via LAN converters and made available (together with charts and the radar video) for navigation in a redundant LAN network. All nautical applications run on standardised marine PCs. The function is defined later using the software, so that the entire INS becomes a software-defined system – with each workplace being able to carry out any desired system function or be available to do so.

This principle is evident from ‘multifunctional displays’, but with assistance from all-over data availability on LAN and LAN converters as ‘translators’, this can be taken a step further. NAVTEX and AIS messaging are now part of the multifunctional displays, and many auxiliary controls – such as doors, wipers, lights or horn – can be integrated and controlled through software.

Now, the customer has far more control and flexibility over design of the bridge system. Work stations can be planned before their installation, and each workplace can be centralised.

This way, the BIP ensures an entirely consistent presentation and handling of data and alarms which is a major development from the ‘console’ and ‘equipment thinking’ of the past. Nautical applications receive data bundles through the network and present data to the operator in accordance with the prevalent nautical tasks – for example route monitoring on ECDIS and collision avoidance on radar.

From this point the operator interacts with only one system with a unified operating philosophy, gaining access to all applications simultaneously via multifunctional displays and has the ability to handle any task or attend to any situation from any display. For example, alerts can be acknowledged from any task-related display or they can be centralised.

Further evolution will increase hardware independence – up to the point of a customer-loaned shared computing environment for all onboard systems. Increasing interconnectivity enables additional services, but will also lead to additional data, which can be evaluated, processed and presented in a new context to offer navigational assistance or situation-specific decision support.

Functionality makes all the difference – and the INS is able to provide better integration, easier operation, user-defined functionality, and higher navigational safety.

Today, Raytheon Anschütz delivers this functionality as part of each ECDIS or radar – even if not installed as part of an INS, customers benefit from advanced functions such as CCRS or alert management and can easily get an entry ticket for the e-navigational future.

Synapsis NX forms the basis for bridge system digitalisation

ABOUT RAYTHEON ANSCHÜTZ

Raytheon Anschütz GmbH is a leading integrator of navigation and bridge systems for all kinds of commercial vessels, specialised vessels, mega-yachts, and naval ships. With a global network of its own subsidiaries and 200 specialised service stations, Raytheon Anschütz now oversees the effective operation of navigational equipment aboard some 30,000 ships.

www.raytheon-anschuetz.com
Next generation navigation

**WÄRTSILÄ** The navigation system is one of the most crucial systems on board a vessel. With its recent upgrade, Wärtsilä SAM Electronics’s new version of its state-of-the-art navigation system, NACOS Platinum 2.1, makes it even more valuable than before.

NACOS Platinum was launched in 2011. With more than 500 installations now in operation, the company gave the system its first major overhaul in 2015 with the release of NACOS Platinum 2.0. In mid-2016, it was upgraded again and is now available in its most up-to-the-minute version, NACOS Platinum 2.1.

NACOS Platinum 2.0 was designed to fulfil the requirements of the international standards for Integrated Navigation Systems (INS) and Bridge Alert Management (BAM). With NACOS Platinum 2.1, Wärtsilä took this development a step further, adding functionality related to the new Electronic Chart Display and Information System (ECDIS) performance standard. Parts of the radar, as well as the ECDIS and conning application have also been redesigned.

“The new ECDIS performance standard has addressed ECDIS anomalies and safety-critical issues from the past. Furthermore, the demands on alert management and standardised presentation of objects in the electronic sea chart have been increased,” says Eberhard Maass, Wärtsilä’s Product Manager for Navigation Products.

While regulatory compliance may be the most essential feature, Maass admits that what customers will probably notice first in the new Wärtsilä NACOS Platinum is the simplified user-interface. It was designed specifically to simplify effective operation.

“It has a user-centric design that ensures easy, safe operation across all systems and applications,” he said, adding that the improved usability will make crew training and maintenance even simpler than before. Furthermore, the design facilitates the quick, easy introduction of new products and features.

Another new feature of the Wärtsilä NACOS Platinum 2.1 is its advanced cyber-security protection. Jan Lausch is the product manager for cyber-security in Automation, Navigation & Communication at Wärtsilä. He explained that there are various reasons why navigation systems need to be protected from cyber threats. These include possible in-
Infection with virus or malware via illegally connected storage media such as USB sticks or service equipment. Integration with third-party systems, as well as any ship-to-shore connections for data exchange, also have security implications.

“As we head into a future with ever-increasing connectivity and complexity, the importance of cyber-security will continue to grow,” he said. “We see a growing demand to connect to more and more sub-systems, for energy efficiency evaluation, for example. Data exchange with shore-based fleet operation centres is also in strong demand. This requires a state-of-the-art security concept.”

To ensure that no intruder can endanger the operation of the vessel, and only explicitly permitted processes are run, the design of the NACOS Platinum system prevents malware from challenging the integrity of the system.

With its innovative features and user-friendly interface, NACOS Platinum is suitable for cruise vessels as well as merchant ships. In 2016 Maersk Line decided to install the NACOS Platinum-integrated navigation, automation, and propulsion control systems on 27 container vessels in three newbuilding projects. Including these orders, the latest 47 newbuilds in the Maersk Line fleet will all be fitted with the NACOS Platinum system.

The integration of the navigation, automation, power and propulsion functions into one single system enables Wärtsilä NACOS Platinum to offer customers like Maersk Line flexibility and convenience, as the vessel can be navigated, controlled and monitored from various onboard positions.

Wärtsilä NACOS Platinum on board the cruise liner Harmony of the Seas

ABOUT WÄRTSILÄ SAM ELECTRONICS
Hamburg-based Wärtsilä SAM Electronics GmbH is one of the world’s leading manufacturers and suppliers of maritime electrical and electronic systems. The company’s portfolio includes electrical power packages, electrical drive systems, automation systems, navigation and communication equipment as well as safety, security and entertainment systems.

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With capacities ranging from 120 tonnes to 600 tonnes, the Liebherr CBB cranes cover all the main area of the heavy lift segment. Above that range the delivery program includes new developments up to 1250 tonnes SWL. One of the main advantages of CBB cranes is their low self-weight. This has a positive effect on the stability of the vessel as well as cargo handling – simultaneously increasing safety and performance.