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German marine equipment – leading in innovation

German marine equipment suppliers are world champions in innovation for international shipping and shipbuilding. In a challenging world market, the equipment industry focuses on the aims of its customers in the international shipping industry – on the one hand, improving economy, raising efficiency and reducing the environmental footprint whilst, at the same time, safeguarding safety and operational reliability on board. On the other hand, equipment suppliers are keen to support the global shipbuilding and repair sector with clever design and smart components and systems. This publication is intended to update international shipowners, shipyards and naval architects on current technologies and the latest developments in a number of important ship systems offered by German industry.

Main topics here are smart shipping and higher levels of automation, lower fuel consumption, alternative fuels, comprehensive on-board environmental protection and the reduction of ships' operating costs. With these things in mind, German suppliers are further optimising their product-related, flexible service networks worldwide and concluding forward-looking cooperation deals.

Over the decades, Germany has forged a highly qualified marine industry in which 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 11 billion.

German equipment suppliers are working consistently to mould their employees' work practices and way of thinking into a future-oriented form of co-operation. The fact that shipowners, as customers, along with capable technology partners at German universities and research institutions who are also closely involved in this process and cooperate within the "shipbuilding network", is a quite 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.



Hauke Schlegel, Managing Director
VDMA – Marine Equipment and Systems

› ABOUT 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 disciplines including mechanical engineering, electrical engineering and electronics.

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

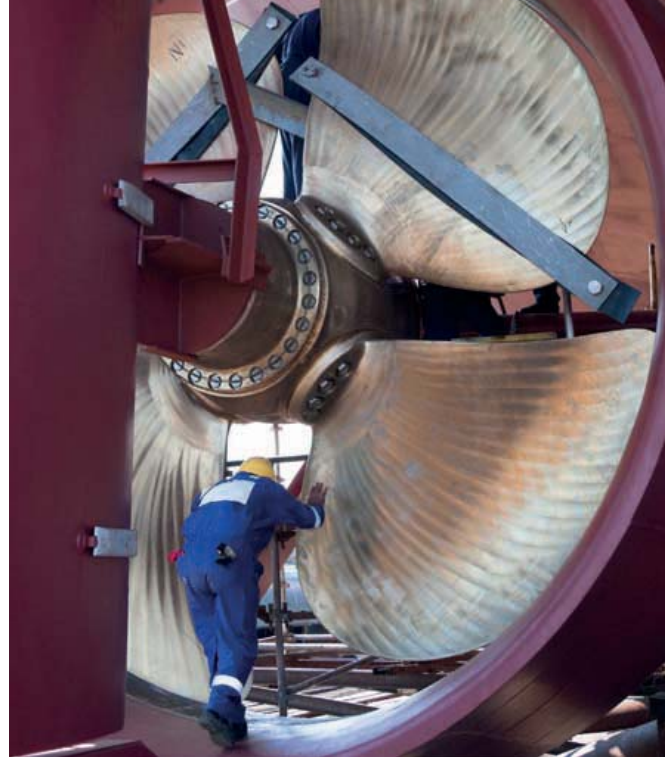
- › intensifying mutual cooperation with operators and yards in technological as well as commercial fields;
- › helping worldwide customers in arranging contacts with German marine equipment manufacturers;

› 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



Reduction of marine contamination/pollution



Greenhouse gas reduction



Sustainability/conservation of resources



Emission reduction of sulphur oxide



Noise reduction in the ocean



Emission reduction of nitrogen oxide



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MAN introduces ME-LGIP dual-fuel LPG engine and books orders

MAN ENERGY SOLUTIONS The latest addition to MAN Energy Solutions' two-stroke engine range is the dual-fuel MAN ME-LGIP engine designed to operate effectively on both diesel fuels and liquid petroleum gas (LPG)

MAN Energy Solutions unveiled its latest two-stroke engine type at a ceremony in Copenhagen in late-2018. The ME-LGIP (Liquid Gas Injection Propane) engine builds on the success the company has had with its ME-GI and ME-LGI dual-fuel engines, which have attracted more than 250 orders since their introduction to the market. Employing essentially the same proven technology, LPG has now been added to the expanding list of non-HFO and alternative fuels that MAN Energy Solutions' two-stroke technology can exploit.

At the launch, Bjarne Foldager – senior vice president, head of Two-Stroke Business at MAN Energy Solutions – said: “With 2020 and the new IMO emission regulations fast approaching, interest in using LPG as a fuel, within and outside of the LPG carrier segment, is growing due to its sulphur-free character, widespread availability and ease of bunkering. In gas mode, the ME-LGIP engine operates on just 3% pilot oil and down to 10% load. Ultimately, we expect the engine to operate without the need for pilot oil.”

Upon the engine's debut, MAN Energy Solutions stated that it expected a strong demand for the ME-LGIP engine in the very large gas carrier (VLGC) and coastal vessel sectors. The company also said that developing the world's first LPG-propelled dual-fuel engine would help reduce the environmental footprint of the maritime industry by using fuel that has a greener emissions profile, including an inherent compliance with all current and future sulphur-oxide emissions regulations.

Foldager subsequently added: “The ME-LGIP can also burn liquid volatile organic compounds, a deliberate move on our part since the IMO will inevita-



Rendering of the MAN B&W ME-LGIP engine, showing here a 6S50ME-LGIP type Source: MAN

bly turn its focus towards the reduction of volatile organic compounds in the future. Accordingly, we view the ME-LGIP as also ideally suited to the propulsion of shuttle tankers and very large crude carriers.”

Diesel principle

The diesel principle provides the ME-LGIP engine with high operational stability and efficiency, notably during load changes and fuel change-overs. The negligible gas slip of the ME-LGIP en- ➤



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engine makes it the most environmentally friendly, two-stroke technology available.

MAN Energy Solutions has also reported that the ME-LGIP engine has demonstrated a reduction of up to 18% in CO₂ emissions and an approximate reduction of 90% particulate matter when running on LPG, compared with HFO.

The ME-LGI concept

With a new injection concept, initially developed for methanol, the ME-LGI concept greatly expands MAN Energy Solutions' dual-fuel portfolio and enables the exploitation of more low-flash-point fuels such as ethanol, dimethyl ether and now LPG.

The engine's 'ME-' prefix indicates that the new engine benefits from

well-proven electronic control which means that fuel is injected by fuel booster injection valves (FBIV) ensuring that a low-pressure fuel-gas supply system can be employed, significantly reducing first-time costs and increasing reliability.

The ME-LGI came about due to interest from the shipping world in operating on alternatives to HFO. There are many specialised methanol and LPG carriers in operation today but many more are under construction as the world's LPG infrastructure grows. With a viable, convenient and comparatively cheap fuel already on board, it makes sense to use a fraction of the cargo to power the vessel with an important, side-benefit being its positive, environmental performance.



Design of the ME-LGIP cylinder cover with LPG injection valve (FBIV) and gas block Source: MAN



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New fuel emission reductions compared with Tier II engines on HFO

Source: MAN

ME-LGIP technology

The primary characteristics of ME-LGIP engines include:

- > a low-pressure supply system;
- > a fuel-injection system, the FBIV;
- > an injection pressure of 500-600 bar;
- > the ability to handle low-sulphur/low-flashpoint fuel types including methanol, ethanol, LPG, and dimethyl ether (DME).

The main components of the LGIP system are its LPG injector, gas-control blocks, pipes and accumulators. Of these, the innovative FBIV-P (propane) is fundamental to the concept and designed with two main functions:

1. To pressurise or boost the LPG to the desired injection pressure;
2. To ensure the correct timing and duration of the LPG injection.

Nitrogen is used to purge the FBIV-P of LPG. This is supplied through the LPG lines by making a change-over in the fuel valve train (FVT).

Furthermore, the safety concept requires that all LPG lines in the engine room are designed with double-wall piping with a ventilated outer pipe. Any leak from seals is accordingly vented to the outer pipe to avoid the risk of leakage to the engine room.

The MAN B&W ME-LGIP dual-fuel engines are designed to run equally as effectively on diesel or LPG. Furthermore, the ME-LGIP engine is flexible with regard to LPG composition and operates efficiently even with LPG fuels that contain significant amounts of ethane. The ME-LGI (Liquid Gas Injection) concept can be applied to all MAN Energy Solutions' low-speed engines from 50-bore and up, either ordered new or through retrofitting.

LPG installation

With the ME-LGIP engine, LPG joins the list of liquid, environmentally friendly fuels that can power MAN Energy Solutions' portfolio of two-stroke, dual-fuel engines which are available from all licensees. MAN Energy Solutions further reports that it expects ME-LGIP installation aboard merchant vessels to be price-competitive compared to other, dual-fuel-burning engine types.

LPG as fuel

Due to ever more stringent emission limits, many LPG carrier operators called for MAN Energy Solutions to develop an LPG-fuelled engine that could power LPG carriers in the most viable, convenient and economical way using a fraction of the cargo already on board.

LPG is an eminently environmentally-friendly fuel, in much the same class as liquefied natural gas (LNG), and an LPG-fuelled engine will significantly reduce emissions, enabling vessels to meet the stringent IMO SO_x emission regulations due to come into force globally in January 2020. The fuel also provides an important step forward towards reaching the IMO's 2050 greenhouse gas targets as well as offering benefits with respect to IMO EEDI compliance requirements.

LPG's future as a viable fuel for general marine transportation looks promising because it will not require the same level of investment in infrastructure – such as bunkering facilities, for example – compared with other gaseous fuels. As a widespread energy source, availability is high and LPG is easier to store and handle, compared with cryogenic gaseous fuels.



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Furthermore, LPG is traditionally a cheaper fuel than marine gas oil yet delivers the same performance and efficiency. Importantly, the ability to use LPG cargo as a supplemental fuel source provides significant cost savings for LPG tanker owners and charterers, including reduced time and fees for fuel bunkering.

The Maritime Energy Transition

The development of the ME-LGIP engine to burn LPG is part of the 'Maritime Energy Transition', an umbrella term that covers all MAN Energy Solutions' activities with regard to supporting a climate-neutral shipping industry.

The term stems from the German expression 'Energiewende' and encapsulates MAN Energy Solutions' call to action to reduce emissions and establish natural gases as the fuels of choice in global shipping. It promotes a global 'turn to gas', driven by the IMO, and a common approach by the shipping industry, bunker suppliers, port and terminal operators and regulators to invest in infrastructure development and retrofits.

Launched in 2016 after COP 21, the initiative has since found broad support within the shipping industry and in politics.

Orders

MAN Energy Solutions had already won the first order for the new engine – well prior to its official unveiling – early in 2018. At that time, Hanjin Heavy Industries announced that it would construct two very large gas carriers for Belgian integrated gas shipping company Exmar in its Hanjin Heavy Industries Construction Philippines facility. The 86,000m³ newbuildings will each be powered by an individual MAN B&W 6G60ME-LGIP Mk9.5 engine.

In September, MAN Energy Solutions announced the first retrofit orders for ME-LGIP engines when it signed a contract with Oslo-listed BWLPG for the world's first retro-fitting of four MAN B&W 6G60ME-C9.2 HFO-burning engines to 6G60ME-C9.5-LGIP dual-fuel engines. The order includes options for further retrofits in the future with work expected to begin during 2020.

Early in 2019, Jiangnan Shipyard, owned by China State Shipbuilding Corporation (CSSC), ordered an LPG-burning MAN B&W 6G60ME-LGIP engine for installation on an 86,000m³ very large gas carrier for Tianjin Southwest Maritime (TSM), a Chinese shipping company. The vessel is scheduled for delivery in the second half of 2021 and the contract includes an option for a second unit.

> ABOUT MAN ENERGY SOLUTIONS

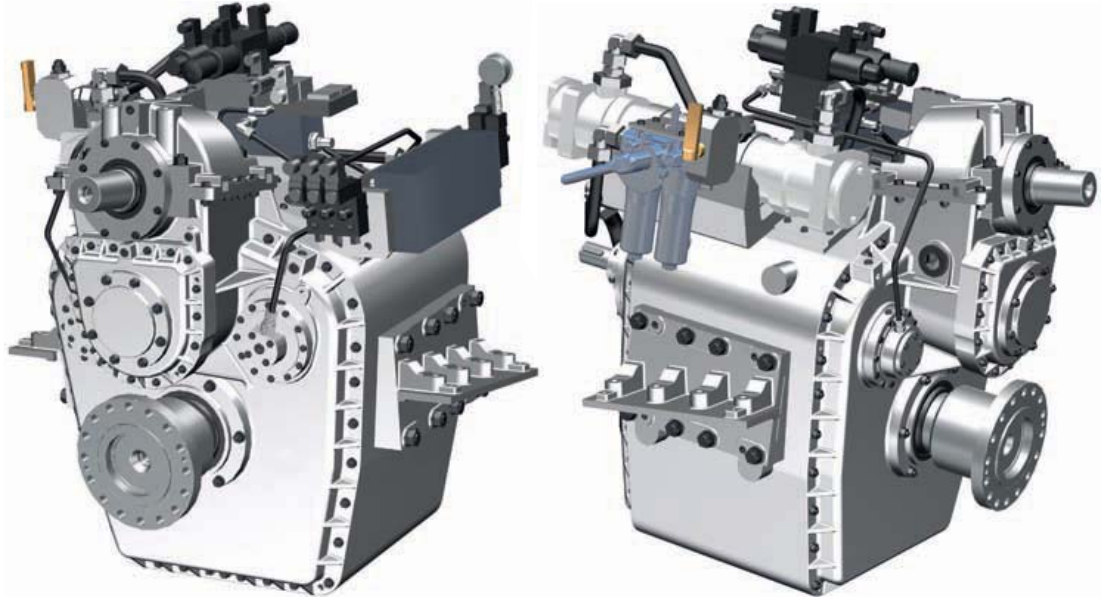
MAN Energy Solutions is a leading provider of large-bore diesel and gas engines and turbomachinery. The company's product portfolio includes two-stroke and four-stroke engines for marine and stationary applications, turbochargers and propellers. MAN Energy Solutions enables its customers – within the marine, energy and industrial sectors – to achieve sustainable value creation in the transition towards a carbon-neutral future, improving efficiency and performance at a systemic level. Leading the way in advanced engineering for more than 250 years, the company provides a unique portfolio of technologies and employs some 14,000 people at over 120 sites globally.



Improved Down Angle gearbox design

REINTJES | The specialist for marine gearboxes and transmission systems, Reintjes GmbH, has presented its Down Angle Gearbox series WVSA as a “developed to the next level” product. Reintjes says that it has improved its down-angle design, which allows horizontal installation of a diesel engine while the propeller shaft is tilted downwards. To save space and distribute weight, the engine arrangement can be accommodated where there is an angle between the propeller shaft axis and drive shaft axis.

For the small axis angle available in down-angle and V-drive transmissions, there is the possibility of gear production by means of gear hobbing as with conventional spur gears. To distinguish them from conventional bevel gears, these gears are called conical involute gears or beveloid gears. The design of beveloid gears has been developed by rolling a rack-shaped tool, which is tilted by the cone angle in the direction of feed. Usually, these gears show a point contact while the flanks roll on each other. In contrast, beveloid gears manufactured by Reintjes have line contact through a modified tool path of the gear hob, leading to ideal transmission performance. The axes of beveloid gears may be crossed or skewed. The drive shaft, which is coupled to the crankshaft of the engine, and the



Two-speed V-Drive reverse reduction gearbox ZWVSA 440 UP

Source: Reintjes

output shaft form an angle. The intermediate shaft runs parallel to the drive shaft and spur gears are used for the clutch housings. The first Reintjes gearboxes with beveloid gears went through extensive prototype testing and were successfully commissioned in May 2018.

These gearboxes are two-speed V-drive reverse reduction gearboxes for fast crew supply vessels. The design of these gearboxes is characterised by the use of a step-up gear stage, allowing the unit to be mounted close to the engine and therefore providing a very effective

space-saving arrangement. Due to the two-speed layout, propulsion systems with fixed-pitch propellers can be adapted to different operating conditions so that the diesel engine always operates within its optimum speed range.

In addition to the development of a series with V-drive arrangements, Reintjes is enhancing the design of the down-angle transmission series. The gearbox sizes WVSA 442, WVSA 742, WVSA 1542, WVSA 1942 and WVSA 2242 will be available, each with a maximum reduction ratio of up to approx. 4.2:1.

> ABOUT REINTJES

Reintjes, based in Hameln, was founded in 1879 and is one of the major independent manufacturers and suppliers of power train systems, in particular marine gearboxes for engine outputs ranging from 250 kW to 30 MW and transmission systems available worldwide.

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Becker claims that four wing sails will provide sufficient power to propel the vessel at speeds of up to ten knots in ideal conditions without engine support

Source: Becker Marine Systems

Harnessing the power of wind

BECKER MARINE SYSTEMS | By expanding its broad range of environmentally-friendly products and systems for the maritime industry, Becker Marine Systems is now focusing on wind-operated vessels and has introduced an innovative sail technology that will harness the power of the wind in a car carrier design.

„We will see different hybrid systems on board vessels in the future. There will be ships and services where sailing provides a real option for supporting propulsion,“ says Henning Kuhlmann, managing director of Becker Marine Systems.

The company is developing the highly efficient Becker Wing Sail which will generate significant forward thrust on commercial vessels. Becker believes that a ship’s operating profile may well have to be adapted to harness wind power and weather routing will play an important role. However, there is, nevertheless, significant potential for reducing a vessel’s fuel consumption.

The key partner for this development is Stockholm-based Wallenius Marine. The latest design of a modern car carrier contains four large Becker Wing Sails each with an area of more than 1,000m². In

› ABOUT BECKER MARINE SYSTEMS

Hamburg-based Becker Marine Systems is one of the market leaders in manoeuvring systems and energy-saving devices such as the Becker Flap Rudder, the Becker Twist Rudder and the Becker Mewis Duct®. These well-established products are optimised for large tankers, container vessels, passenger ferries, large cruise vessels and luxury yachts. Additionally, Becker offers a wide range of alternative energy systems for the marine industry.

www.becker-marine-systems.com

optimal conditions, the sails will be able to propel the vessel at speeds of up to ten knots without engine support, Becker Marine Systems claims.

The Becker Wing Sail will consist of two vertical sections, forming an aerodynamic foil. According to the company, it is a great advantage that the wing sails can be operated at a small angle towards the apparent wind, enabling the vessel to use the wing sails on most courses. In order to pass under bridges, provide safe operation in port and „reef“ the system in harsh conditions, Becker has developed a special lay-down device for the new technology.

The company’s high-end rudders and energy-saving devices are a benchmark for efficiency and performance of manoeuvring systems and energy-saving systems. As Becker continues to develop emission reducing initiatives in the maritime industry, the company also offers LNG-based cold-ironing systems (Becker LNG PowerPac®) and Compact Marine Battery Systems (COBRA).



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The four MaK dual-fuel engines of the M 46 DF series on board *AIDAnova* each have an output of 15.44 MW

Source: AIDA Cruises

Eco-friendly travel with LNG


ZEPPELIN POWER SYSTEMS Four MaK M 46 DF dual-fuel engines power the cruise ship *AIDAnova*. Since its commissioning, the ship has been operating with environmentally friendly liquefied natural gas (LNG) – a world first.

The *AIDAnova* cruise ship, built by Meyer Werft for Carnival Corporation, went into service with AIDA Cruises in December 2018. It is the world's first cruise ship to be powered by environmentally friendly liquefied natural gas

(LNG), both in harbour and at sea. The development is based on dual-fuel engines that can be powered using diesel as well as LNG.

For the *AIDAnova*, Zeppelin Power Systems provided a complete system com-





prising Caterpillar MaK dual-fuel engines. It consists of four 16-cylinder MaK M 46 DF dual-fuel engines, two Cat 3516C-HD emergency diesel generator sets, and a complete LNG processing system. The natural gas is stored at -162°C in three tanks



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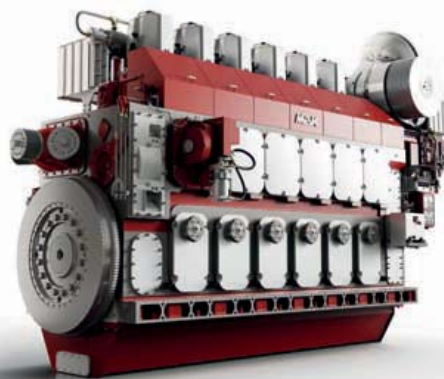
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and goes through several stages of filtering before liquefaction.

The MaK dual-fuel engines, which generate a total output of nearly 62 MW, weigh over 200 tonnes per unit. The M 46 DF engine achieves an output of 15.44 MW at 514 rpm, while meeting IMO Tier III emissions standards. The combination of low emissions with excellent efficiency and reliability makes this the ideal engine for operating within and outside environmentally sensitive areas, as well as in regions with heavy fuel oil constraints. The use of LNG almost completely eradicates the release of fine dust and sulphur oxide, with nitrogen oxide and CO₂ emissions reduced in the long run. Under current plans, Zeppelin Power Systems will equip eight more Carnival Corporation ships with LNG engines by 2024.



MaK M 46 DF dual-fuel engine Source: ZPS

projects. Engines can be converted to LNG in a number of ways, and operators can choose whether to replace entire engines or have them converted in situ, on the ship. LNG is stored on board, either in permanently installed tanks or easily swappable containers.

From main and auxiliary propulsion via propellers, bow thrusters, SCR and ballast water treatment systems, to integration of an entire LNG system, Zeppelin Power Systems offers a full range of services, and develops ship-specific systems in collaboration with the customer. If servicing is required, the worldwide Caterpillar dealer network guarantees rapid response and excellent spare part availability.

Dual-fuel portfolio

With the MaK M 34 DF and M 46 DF dual-fuel engines from Caterpillar, Zeppelin Power Systems offers medium-speed four-stroke engines that can be powered using diesel as well as gas or LNG. Both models meet the current IMO Tier III emissions standards when gas-powered, with no need for additional exhaust gas aftertreatment.

The M 34 DF generates output of up to 530 kW per cylinder at 720 or 750 rpm, while the M 46 DF produces up to 965 kW per cylinder at 500 or 514 rpm. Both engines offer long service lives and low running costs. Their compact design facilitates quick and easy access to systems and components, while also providing an exceptional degree of safety even accounting for diverse engine loads and variable gas quality.

Newbuilds and conversions

Zeppelin Power Systems takes on system integration for both newbuilds and retrofit



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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. The legal entity of the Zeppelin group offers comprehensive sales, engineering and service for industrial and marine applications, rail vehicles, oil and gas industry and power generation. www.zeppelin-powersystems.com

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Thanks to its twin MAN turbocharged engines, the pilot boat *Luna* has a top speed in excess of 30 knots

Source: MAN Engines/Andrew Chin

Selective catalytic reduction system successfully tested on pilot boat *Luna*

MAN ENGINES Two 12-cylinder MAN engines power the Dutch pilot vessel *Luna* in Rotterdam. First practical tests confirmed that MAN Engines' Compact selective catalytic reduction (SCR) system satisfies IMO Tier III.

Pilot boats are essential for maritime navigation. They transport pilots to their destinations in all winds and weathers so that incoming ships can be safely guided into harbour. To perform

their duties, the boats must be equipped with powerful and reliable engines. For its latest pilot vessel, the Dutch Pilot Association (DPA) has entrusted this duty to two MAN D2862 LE469 engines. These pow-

er units are distinguished not only by their unequalled power/weight ratio, but also by their modular exhaust gas aftertreatment system (EAT) from MAN Engines. This is the first time the SCR system, which en-

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ables working vessels to satisfy the IMO Tier III emission standard, has been tested in the field.

The field test was based at the Port of Rotterdam, where since end of 2017 the 23m-long *Luna* has been in operation for the Dutch Pilot Association (DPA) Loodswezen. Tjeerd de Vos, fleet manager for the DPA, explained: “For environmental reasons and to satisfy the tougher IMO Tier III emission standards which come into effect in 2021, we decided to collaborate with MAN Engines and test the EAT system on the twin MAN type D2862 engines in one of our boats.”

IMO Tier III compliant system

An exhaust gas aftertreatment system is installed for each cylinder bank of each engine; this system introduces a metered amount of urea solution (AdBlue©) which reduces nitrogen oxide levels. The 32.5% aqueous urea solution is metered via the SCR mixer which is incorporated in the exhaust gas system immediately upstream of the catalytic converter. This generates a homogeneous mixture of AdBlue© fluid and exhaust gas, which in the downstream SCR converter reacts with the nitrogen oxides (NOx) to form water (H₂O) and harmless nitrogen gas (N₂).

“Our engineers at MAN Engines have succeeded in developing a modern and compact SCR-only system. We can dispense with bulky and heavy components such as diesel particulate filters and oxidation catalytic converters,” explains Claus Benzler, head of marine sales, MAN Engines. De Vos also appreciates the system’s advantages: “The SCR system is very compact and lightweight, so it is ideal for our boats. A further advantage for us is that both the EAT and the engines come from a common source. That means we have one partner for both systems and an assurance that the systems are perfectly matched to each other.”

According to MAN Engines, it is not just the EAT that is impressively lightweight, but also the two turbocharged engines. These lightweight engines weigh in at just 2,270 kg each. The D2862 offers the best power/weight ratio in its class, delivering 1,029 kW (1,400 hp) at 2,100 rpm. The pilot boats need this power when transferring pilots because the pilot vessel must press itself hard against the hull of the incoming ship so that pilots can climb aboard using a ladder. Thanks to the wide torque plateau of the MAN



The compact and maintenance-free exhaust gas aftertreatment system from MAN Engines with selective catalytic reduction mixer, AdBlue© fluid metering unit and SCR catalytic converter (everything fully insulated). The selective catalytic reduction system enables compliance with the IMO Tier III and US Tier 4 emission standards. Source: MAN Engines/Andrew Chin

COMPACT BATTERY

COBRA is an advanced maritime battery system employing tried and tested 18650 lithium-ion cell technology. The lightweight battery system is designed for marine requirements, suited for seagoing and inland ships such as ferries, tugs, cruise ships, yachts, OSV and harbour/service vessels.

Any scale of power storage is possible due to modular battery units in standardised cabinets of up to 1,000 V DC including integrated cooling equipment. COBRA can be used for fully electric battery or hybrid drives, as emergency power source or as onboard energy supply, e.g. for peak shaving.

Manoeuvring Systems

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The *Luna* in service at the Port of Eemshaven. The pilot vessel has a three-man crew and can transport up to twelve pilots at a time. Source: Barkmeijer Shipyard

12-cylinder engines, the captain can keep the engine speed at its most efficient level without losing thrust. In addition, such a torque plateau permits smooth and powerful acceleration at the lowest specific fuel consumption.

Lightweight and powerful engines

The light weight brings particular advantages when manoeuvring the pilot boat. “These engines are about 1,000 kg lighter than others in its class,” notes Peter Nieuwveld, project manager at MAN Rollo. The long-term agent and importer of MAN engines was responsible for the installation of the engines and is providing support throughout the entire project. But the in-

stallation of the SCR system was a step into the unknown.

“The SCR system is highly compact. However, the installation was quite a challenge because at that early stage of development, there was no detailed instruction manual available for such an installation. Together with MAN, we are learning as we go along.” MAN Rollo is available to the DPA at all times as an expert local support partner. The company’s offices in Zoetermeer are just half an hour by car from the Port of Rotterdam.

That is where the *Luna* is based as one of the DPA’s four pilot vessels. If the weather is too bad for the boats, there is also a helicopter available. “The DPA is a 24/7

organisation which has to provide a high level of service,” De Vos explains. “Safety, availability and reliability are the principal requirements placed on us. The same is true of our boats. The *Luna* must be ready for service at all times and must operate under difficult conditions, such as a swell with waves up to three metres high,” The boat’s power unit must measure up to such requirements.

“The engines must perform reliably at high power for 3,000 operating hours a year,” he continues. Specifically, that means operation at full power for 50-60% of the duty cycle. The two engines each drive a waterjet and can accelerate a pilot boat weighing more than 50 metric tonnes to speeds in excess of 30 knots.

Successful first year leads to renewal

The field trial was agreed initially for one year with an option for a further twelve months; this option has now been exercised. De Vos draws a positive interim conclusion from this: “Overall, we are pleased with the performance of the SCR system, as well as with the engines. The crew particularly appreciate the low noise level and smooth running of the engines.” Benzler also expressed satisfaction with the experience to date: “The AdBlue© fluid needed is about what we had expected. We have reliably satisfied the new limit of 2 g/kWh for nitrogen oxides.” The previous IMO Tier II exhaust emissions standard permitted 7.7 g/kWh of nitrogen oxide emissions. From 2021, compliance with IMO Tier III will be mandatory, requiring around a 70% reduction in nitrogen oxides, depending on the maximum rotational speed of the engine.

The DPA has ordered two new pilot vessels to help renew its fleet. The first of these is expected to come into service in 2020 and will also be equipped with the EAT system from MAN Engines.



View of the engine room of the *Luna* with the twin MAN D2862 12-cylinder engines, each rated 1,029 kW in terms of power at 2,100 rpm Source: MAN Engines/Andrew Chin

> 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 1,471 kW (2,000 hp) for a wide range of applications in many industries including shipping, boats and special-purpose vehicles.

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Ymer Icebreaker in action without any trace of smoke from the funnel

Source: Staffan Ahlstrand, Sjöfärsverket Rederi, Sweden

Emissions down, efficiency up: retrofitting diesel engines with common-rail technology pays off

HEINZMANN As a specialist in engine and turbine management solutions, HEINZMANN offers common-rail (CR) retrofit conversions for a wide range of diesel engines whilst also providing all of the monitoring and safety features required for efficient marine applications.

Stricter requirements for a reduction in environmental pollution, as well as an increase in engine efficiency for marine applications, has necessitated advanced technical solutions for the Swedish icebreaker fleet. State-of-the-art electronic fuel injection (EFI) systems provide the key to prolonged,

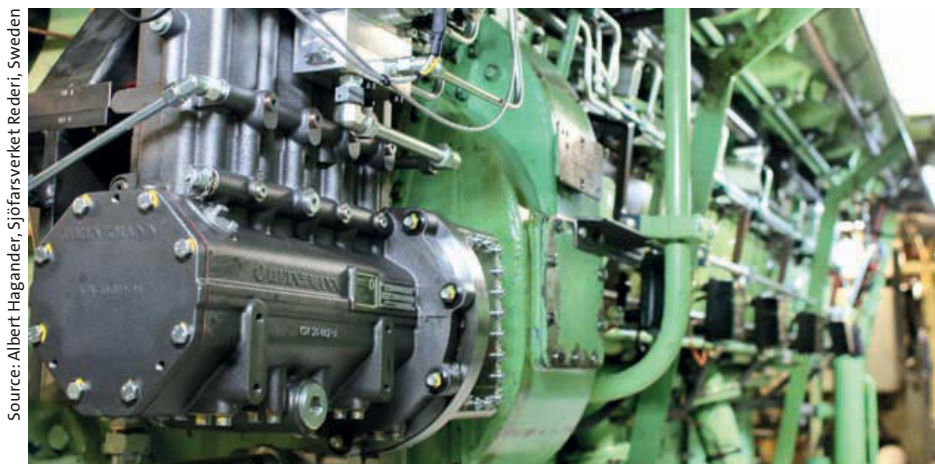
ecological and economical engine life whilst requiring only moderate capital investment in HEINZMANN's leading retrofit technology.

The Swedish Maritime Administration (SMA) operates a fleet of several icebreaking vessels. Considered as a role model within the governmental agency, SMA examined

the technical possibilities of an advanced fuel management system to meet environmental guidelines and to improve the efficiency of the SMA vessels.

The project started with the retrofit of the 40-year old icebreaker *Ymer*. During an on-site survey, HEINZMANN's experts re-

Manoeuvring Competence



HEINZMANN HDP-K4 high-pressure pump mounted on 2.2 Pielstick engine of the *Ymer* icebreaker

viewed the feasibility and the expected performance of implementing a common-rail (CR) retrofit system to the ship's five main Pielstick 2.2 engines generating 3.5 MW each. It turned out that any future challenges the vessel might experience could be met by this type of engine retrofit.

To develop a concept, specification data were obtained from original drawings. An on-site survey, including on-engine measurements, was performed and a mock-up of the high-pressure fuel piping and rail system was built. As a proof of concept, one of the five main engines was retrofitted with the HEINZMANN CR system in December 2013 to determine the impact on efficiency and emissions.

The system installation and commissioning was carried out without any major modification to the engine itself. It comprised the complete replacement of the fuel system, the mounting of a local operation panel and the integration of the HEINZMANN control, monitoring and safety units into the ship's automation system. A second main engine with original hydraulic governor-based configuration was operated under comparable conditions in order to rate the improvements.

After a two-year test period, it was shown that the targeted 5% fuel saving and emissions reduction (IMO Tier 1 level) could be met with the HEINZMANN CR system. A further improvement in fuel consumption of 2.5% was achieved with an additional turbocharger upgrade. In addition, visible smoke disappeared completely. According to HEINZMANN, the vibration level fell by 30% and the maintenance costs fell sharply.

The next stage was the retrofit of the remaining four main engines, carried out

late in 2016. Further fuel-saving potential was planned by reducing the engine speed in part load from 485 rpm fixed speed down to 360 rpm variable speed. As a so-called "Green Drive", this load-dependent speed mode was introduced successfully and found to generate a further fuel saving of more than 4%. As an extra benefit, consumption of lubrication oil fell by 50%. After all five engines were commissioned, the successful integration into the ship automation system was verified during sea trials.

During three seasons under challenging and harsh operating conditions, the HEINZMANN CR system has demonstrated excellent performance and reliability. According to HEINZMANN, all objectives have been met to the complete satisfaction of SMA. Further retrofits for the remaining sister vessels are now under consideration. During the measurements taken in service, a total fuel saving of 11% has been confirmed by SMA.

> ABOUT HEINZMANN

Established in 1897, HEINZMANN GmbH & Co. KG, Schönau, offers a product portfolio comprising engine management systems and exhaust gas aftertreatment 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



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Extension of hybrid transmission portfolio

ZF In light of ever-stricter regulations at sea and in ports, the future of shipping belongs to clean and sustainable propulsion technology. ZF can support shipbuilders and fleet operators who want to lower their emissions, improve fuel consumption and cut operating costs with a hybrid-capable transmission portfolio in many application segments.

Marine hybrid transmissions from ZF feature a robust design and the highest degree of reliability and flexibility for customer-oriented installations. The power range extends from about 600 kW conventional power (ZF 33X0 series) to a maximum of 10 MW (ZF 83700). Furthermore, the company expands its transmissions with an additional power take-in (PTI) that exerts force on the propeller shaft via an electric motor alone or in combination with the conventional engine.

In the lower power range, the hybrid-capable transmissions can be combined with electric motors and inverters between 150 kWe and 600 kWe. An exam-

ple is the electric central drive ZF CeTrax, an electric motor that was developed by the company in the power range up to a maximum of 300 kWe. The combination of these two innovative technologies in one driveline ensures a perfect interaction and ideal power development.

Large transmission portfolio

“The current market requirements for hybrid vessels prove that ZF’s decision to develop a wide range of hybrid transmissions was the right step made at the right time,” explains Wolfram Frei, Head of Global Sales Commercial and Fast Craft in Friedrichshafen, and adds: “ZF is working on a further extension of its hybrid trans-

mission portfolio, for example, and will be adding models in A and V versions”.

These versions are transmission models where the output shaft lays at an angle compared to the input shaft and therefore saves a lot of installation space. The hybrid A and V versions will have the same dimensions as the standard transmissions. This will be a big benefit especially for those yacht builders with specific model lines as they don’t need to redesign the foundation of the propulsion system. “The decision between a standard and a hybrid propulsion system can be taken without spending any thoughts on changes of the foundation,” says Wolfram Frei.



‘The Gas Experts’ for the Marine and Offshore Industry

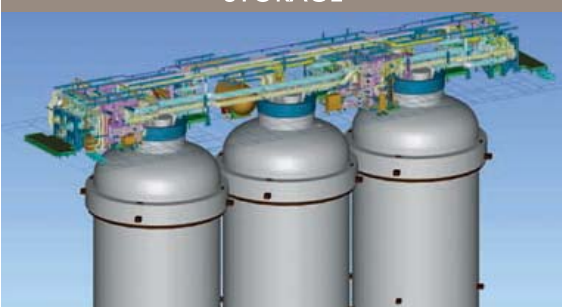
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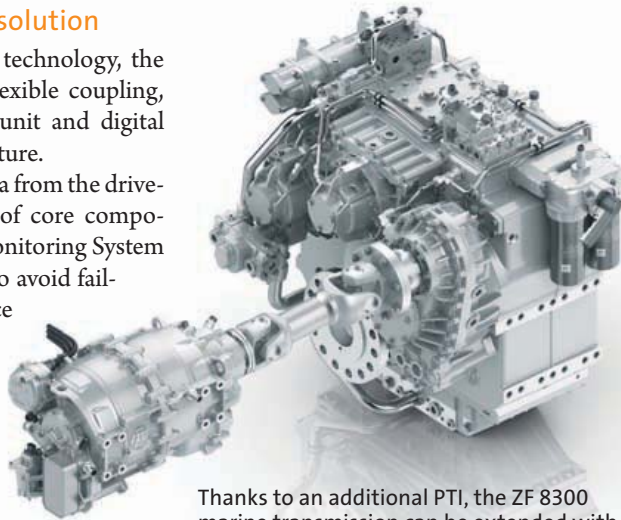


Expandable modular solution

In addition to the hybrid technology, the company can provide a flexible coupling, electronic pump, control unit and digital status monitoring in the future.

Monitoring current data from the drive-line as well as the status of core components with a Condition Monitoring System (CMS) makes it possible to avoid failures and plan maintenance work effectively. This shortens downtime, lowers operating costs, and increases safety on board and in port. Depending on customer requirements, the CMS can monitor the propulsion system at different levels.

In the standard version, the CMS determines typical parameters like oil pressure and temperature, both before and after the cooler, to monitor the cooler condition, clutch or filter condition or a sensor to check the state of the oil. The expanded monitoring version measures oscillation in the system and the actual transferred torque in the drive system using dynam-



Thanks to an additional PTI, the ZF 8300 marine transmission can be extended with hybrid functions, for example by combining it with the CeTrax electric drive, a ZF in-house development

Source: ZF

ic load monitoring (DLM). This makes it possible to detect changes in the performance of the components early on and the state of the oil with regard to particle and water content.

CMS is a further step which ZF is taking towards a smart marine propulsion system. This intelligent system bundles all important data to optimise ship operation, save costs, and provide critical information in emergency situations.

> ABOUT ZF FRIEDRICHSHAFEN AG

ZF Marine supplies propulsion systems and components for all types of vessels – motor yachts, watersports boats, high-speed ferries, workboats and commercial vessels, in a power range from 10 kW to 12 MW – to customers including major shipyards and engine manufacturers worldwide.

The product portfolio includes a comprehensive range of transmissions (reversing, non-reversing and hybrid), propellers, POD-drive systems, steering systems and CAN-bus-compatible, electronic control systems, azimuth thrusters, tunnel thrusters and sail drives.

zf.com/marine

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Customer-specific exhaust aftertreatment systems for emission reduction

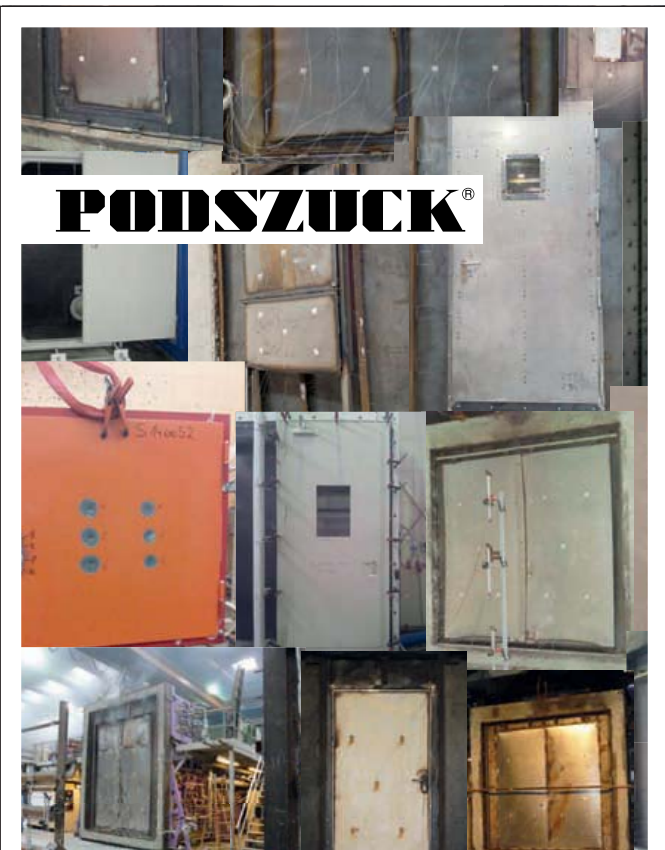
HJS EMISSION TECHNOLOGY Exhaust aftertreatment systems often have to be individually adapted to engines or large equipment. HJS Emission Technology offers solutions for emission reduction that are tailored to the respective requirements.

The tightening of emissions legislation poses major challenges for the shipping industry. Since January 1st, 2019, regulations require that only engines between 19 kW and 300 kW class IWA and IWP with the emission standard EU Stage V can be installed. The transition period for engines of more than 300 kW will also expire on January 1st, 2020. There is, therefore, an urgent demand for marine engines certified to meet these requirements.

At this point, HJS stands out with its experience as a long-standing original equipment supplier of exhaust aftertreatment technologies to well-known engine manufacturers with over 40 years of comprehensive systems expertise. As a Tier-1 original equipment manufacturer, HJS develops tailor-made systems for small auxiliary engines right up to large main engines with several megawatts of power.



HJS project example of an autarkic SCRT-upgrade for a stationary engine
Source: HJS



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Above all, the company relies on its expertise in turnkey product development. From conception and development, prototyping, certification and serial production, projects are implemented in close cooperation with the manufacturer. In addition to the technical implementation, HJS also takes care of the system certification and approval requirements.

HJS applies an innovative approach that does not require a new engine to meet the latest emission requirements. Through an autarkic Selective Catalytic Reduction Technology (SCRT®) upgrade, the exhaust specialist enables existing units to comply with the latest emission regulations – without having to intervene on the engine. Thanks to this technical sophistication, HJS customers benefit not only from significant cost savings but also from saving resources.

The core of the HJS systems is its own unique sintered metal filter technology (SMF®), for which HJS was awarded the „German Environmental Award“. Exhaust gas aftertreatment systems based on SMF® are particularly reliable, require very little maintenance and have a very long service life. The cleaning intervals are about four times longer due to the considerably higher ash storage capacity com-



pared to common ceramic filters. The cleaning itself also incurs no additional costs because operators can easily carry out the process themselves. Since the ash in sinter metal filters is freely accessible in large pockets, the ash can be sucked off, blown off or cleaned by means of a high-pressure washer. This can be performed without removing the complete filter unit. Damage caused by improper cleaning is almost impossible, which minimises the risk of downtime. Even larger ships with engines in the power range of several megawatts are equipped with exhaust aftertreatment systems such as SCR (Selective Catalytic Reduction) and DPF® (Diesel Particulate Filter). Regeneration and ash maintenance are especially important factors for high-performance medium-speed engines. The regeneration must be carried out safely and reliably at all engine loads, including full and rapidly changing loads. Ash maintenance must take place after as long a time interval as possible and then be carried out as quickly as possible.

HJS cooperates in this field with the company ETB Energietechnik Bremen GmbH. ETB is a proven supplier of maritime exhaust aftertreatment systems. The company specialises in the development of high-performance burners with over 2-MW burner output. Even with large engines, the filter regeneration can be performed at all load levels and specially adapted designs – including cubic standing units in the engine compartment up to cylindrical systems hanging in the funnel – can be installed so as to make the best use of the available space. Due to these benefits, the flexible and robust SMF® technology developed by HJS has proven to be the optimal solution to meet these requirements.



Source: HJS

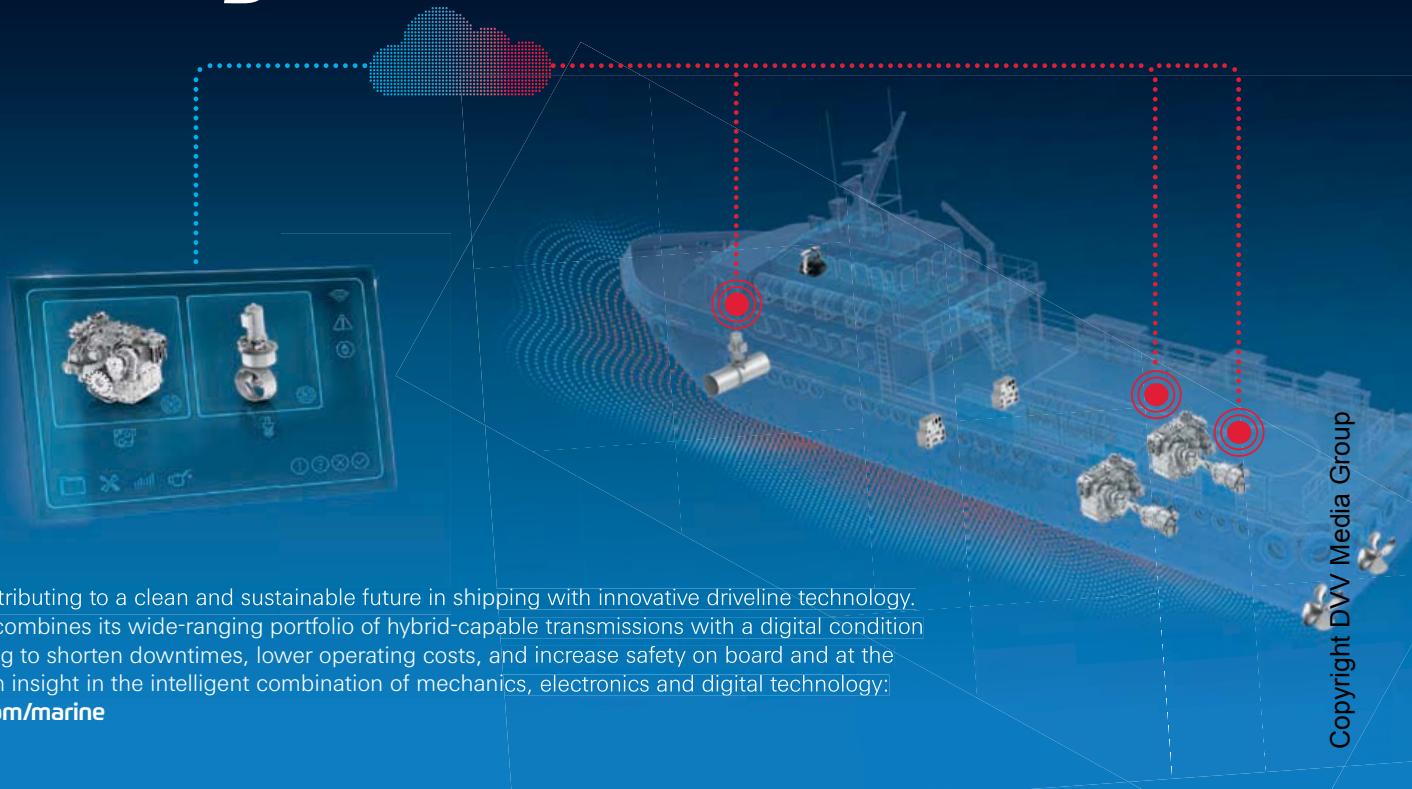
HJS - Sintered Metal Filter (SMF®) implemented in an ETB exhaust gas aftertreatment system for a high-powered marine engine

> HJS EMISSION TECHNOLOGY

As a family managed, medium-sized company with headquarters in Menden/Sauerland, Germany, HJS Emission Technology GmbH & Co. KG has long-standing experience and competence in the area of exhaust gas treatment. With approximately 450 employees, HJS develops, produces and markets systems for the reduction of harmful emissions.

www.hjs.com

Shaping Next Generation Mobility



ZF is contributing to a clean and sustainable future in shipping with innovative driveline technology. Thus ZF combines its wide-ranging portfolio of hybrid-capable transmissions with a digital condition monitoring to shorten downtimes, lower operating costs, and increase safety on board and at the port. Gain insight in the intelligent combination of mechanics, electronics and digital technology: Visit zf.com/marine

All-in-one package for SOLAS-compliant retrofit of marine engines

THERMAMAX With Tmax-Retrofit, Thermamax offers SOLAS-compliant high-temperature insulation for engines. The retrofit installations ensure safety on board at low overall costs.

The same is true for both older and younger vessels: safety on board is a top priority and compliance with safety regulations is essential regardless of the age of the engine. In the engine room, where temperatures are highest, the risk of overheating is at its most intense and reliable fire prevention is vital. As 3D details are often not available for older engines, retrofitting with SOLAS-compliant high-performance insulation systems has only been possible to a limited extent until now. With Tmax-Retrofit, however, older marine engines can now also be upgraded easily with high-temperature insulation systems which not only meet but actually exceed SOLAS guidelines.

The Tmax-Retrofit all-in-one package provides all services – from the preparation of the engine’s 3D profile to the thermography of the developed and installed insulation system – all from one

source. Of course, this also involves a thorough needs assessment and, if necessary, collaboration with the engine manufacturer.

The perfect fit of the exhaust gas and turbocharger cladding is a prerequisite for safety and efficiency. It is only possible to construct the right system when the engine’s 3D profile is available. This is why Thermamax’s first step involves the three-dimensional capture of the engine. The results of the scan are used as the basis for preparing digital 3D models.

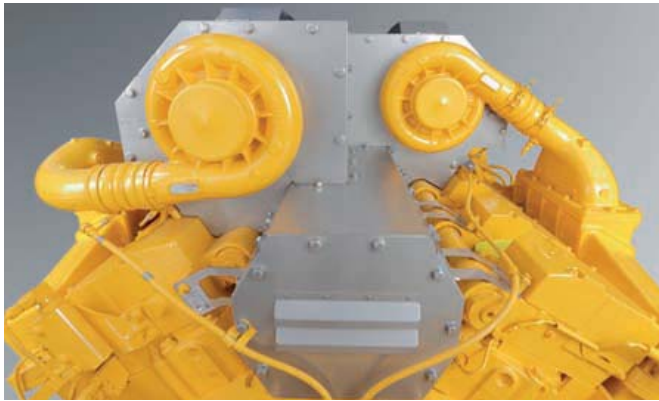
Based on the scanned 3D profile, the company develops a CAD model of the engine. From the available data, a polygon network in STL format is generated. This is converted into standard geometries and free-form surfaces. From these attributed surface models and own on-site photos, Thermamax can then create a CAD model in the STEP or IGES format. Once the virtual model



Voith propulsion package for challenging offshore applications

The Voith combination package consisting of Voith Schneider Propellers (VSP) as main propulsion and Voith Inline Thrusters (VIT) as side thrusters for efficient, comfortable and precise vessel operation. The fast response of the Voith products enhances the vessel’s dynamic positioning performance, even under rough conditions.

Contact details: marine@voith.com



Tmax-Insulation Cladding not only meets but actually exceeds SOLAS guidelines, thus providing safety without compromise in ships' engine rooms Source: Thermamax Hochtemperaturdämmungen GmbH

is complete, all the data to develop reliable exhaust gas or turbo-charger cladding for the engine is available.

In this phase, the classic design process starts. On the basis of a 0D/1D thermal calculation, the material and thickness of the insulation is defined. The detailed construction is made in Creo, a specialised software. This results in a durable exhaust gas/turbocharger cladding which reliably lowers the maximum surface temperature below 220°C and even below 100 °C, depending on requirements.

According to Thermamax, the use of simulation technology makes this process particularly economical as well. Through modal analysis, for example, the vibration behaviour of a virtual component can be simulated, enabling the design of an appropriate layout prior to producing a prototype. When the design is finished, production of the insulation system can start. Thanks to its production expertise, this step can also be undertaken entirely by Thermamax. First, a prototype is produced. Various tests on all materials and components are performed in the company's test laboratory to ensure its high quality in practical applications. Then, the individual Tmax-Insulation Cladding can be installed.

Its most important benefits are:

- › 100% compliance with SOLAS standard;
- › Temperatures up to 60°C are possible;
- › Efficient fire protection for people and machines;
- › Increased reliability;
- › Time-saving installation and dismantling due to modular design.

The exhaust gas/turbocharger cladding – first the prototype – is installed on the engine. From now on, the vessel will have a durable insulation system that is 100% compliant with SOLAS guidelines and – if desired – even exceeds them. Thermamax also provides specialists for the maintenance of the cladding.

To ensure that the new insulation system also has the required properties, a thermography test is performed to confirm that the ship is now equipped with effective and reliable insulation that more than meets the SOLAS standard.

› ABOUT THERMAMAX

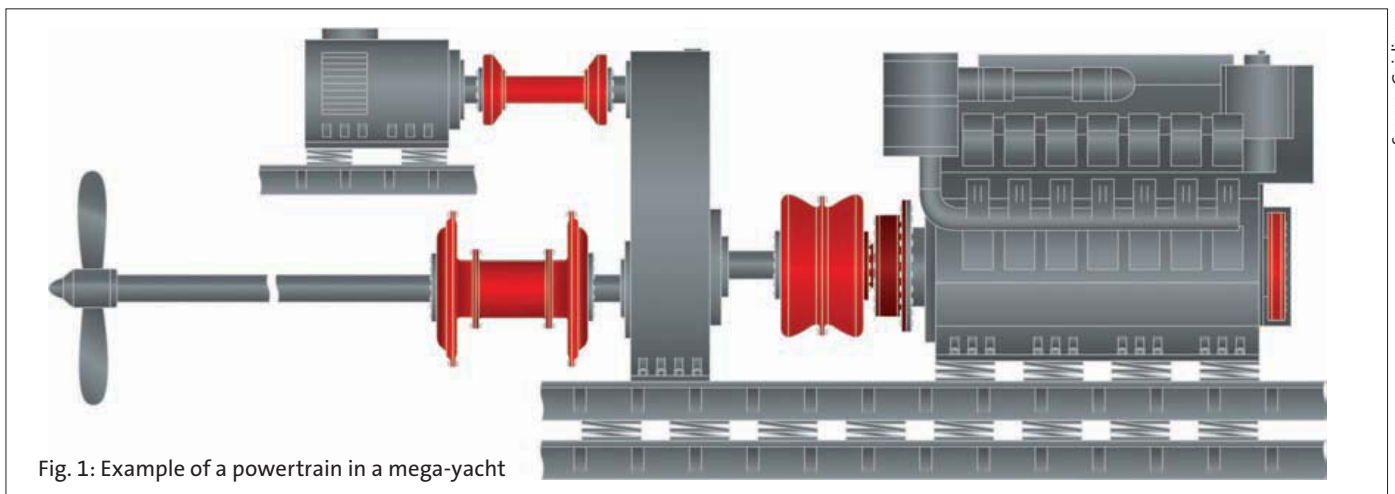
Thermamax is a worldwide renowned specialist for the design and manufacture of thermal and acoustic insulation systems for small, medium and large engines. www.thermax.com

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- C-DUCTS
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- REPAIR
- REFIT



Innovative coupling systems reduce ships' environmental impact

GEISLINGER To reduce engine noise on ships, Geislinger has developed the new Silenco® coupling, which reduces the transmission of structure-borne noise. The new coupling is particularly suitable for use on yachts and passenger ships.



Source: Geislinger

Fig. 1: Example of a powertrain in a mega-yacht

Modern couplings for ships and especially for mega-yachts have to fulfil various tasks. Over recent years, awareness of noise, fuel consumption and exhaust gases has increased significantly. Classification societies such as Lloyd's Register and DNV GL now also take a closer look at these issues, defining new, stricter noise and environmental requirements. Engine noise is mainly transferred via the engine mounts into the ship's hull, the bridge, the passenger cabins and also into the ocean where it can lead to sea life disturbance. Active mounts and bearings have been introduced over recent years and passive mounts have become much more efficient in reducing noise transfer of the "primary path".

Nowadays, however, the "secondary path" of the structure-borne noise is becoming increasingly important. The structure-borne sound originates from the engine and the gearbox and is transferred through the power train into the ship's structure and beyond. In many applications, the coupling between the gearbox and the propeller shaft is the most critical connection (Fig. 1). The engine and gearbox are mounted with an elastic or double-elastic frame against the ship's structure, therefore a broadband reduction in transferring structure-borne noise is essential. Geislinger's contribution to this environmental issue is the development of the new lightweight Silenco® Coupling, designed



Fig. 2: Geislinger Silenco® Coupling

to minimise the transfer of structure-borne sound. “Components with the best acoustical performance have been selected and further optimised for the modular system of the Geislinger Silenco® Coupling. Additionally, special flanges made out of a combination of composite material, rubber and steel have been developed. Designed to avoid the resonance effects of its components, the Silenco® Coupling ensures a broad-band reduction of structure-borne noise transfer while offering electric insulation properties”, explained Dr Lothar Kurtze, Manager of Acoustics at Geislinger.

The Geislinger Silenco® Coupling is available in three different sizes – the Geislinger Silenco® SC 63, SC 90 and the Geislinger Silenco® SC 140. Depending on the acoustical needs and the required torque, different versions of the components (flanges, membrane and shaft) are available. Therefore, the new acoustic coupling sets new standards for the acoustic attenuation of powertrain systems.

To summarise, the Geislinger Silenco® Coupling is designed both to transmit the torque and reduce structure-borne noise to a very low level. Furthermore, its acoustic couplings are ideal for hybrid systems. Specific noise of the electric drivetrain system (e.g. inverter frequencies) is taken care of and due to the low weight of the coupling, the ship can be manoeuvred more quickly and efficiently.

Geislinger not only develops and sells the couplings. Support for the customer starts with specifically adapted coupling systems in the early design phase of a new ship. Before delivery, the couplings are tested in-house on the unique Geislinger Acoustic Test Bed. And after installation on board, Geislinger helps to validate the acoustical performance of the couplings during sea trials.

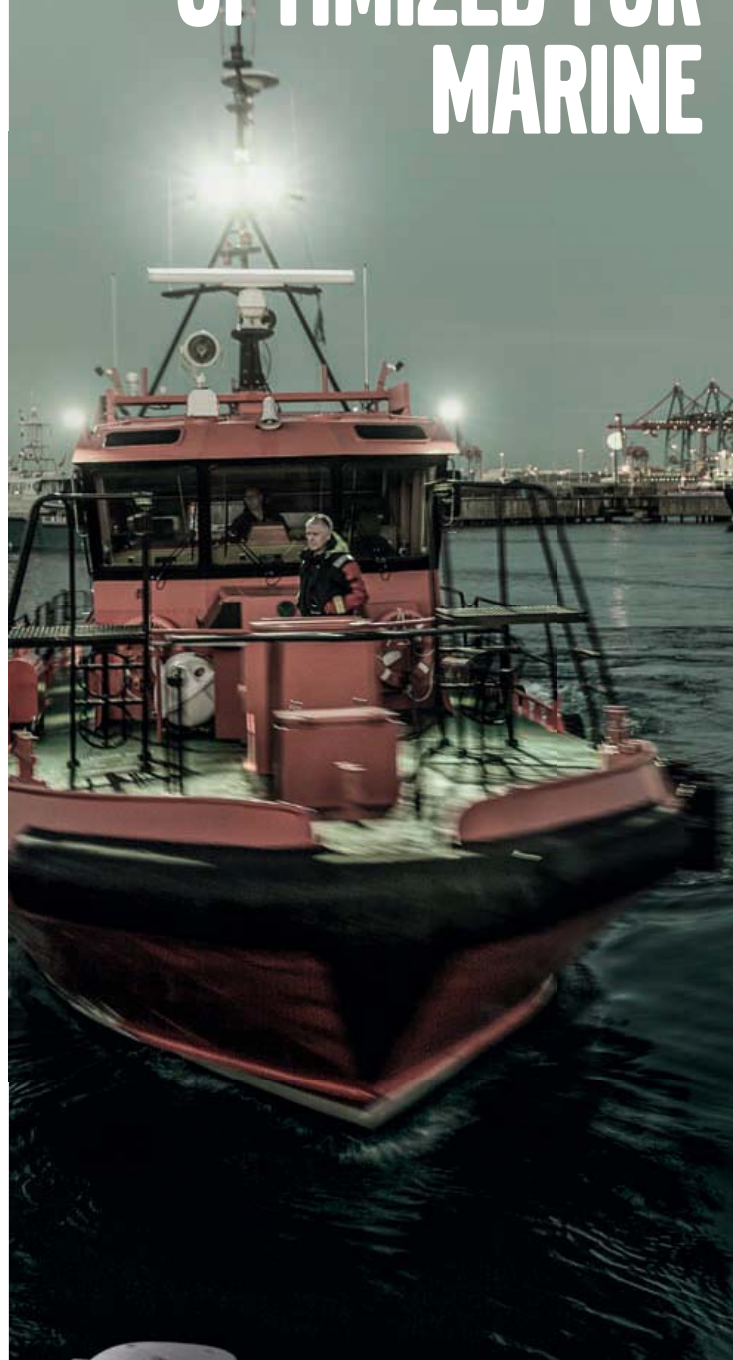
In the case of the Silenco® Coupling, tests were first carried out using the Geislinger Acoustic Test Bed. The next step was to test the coupling together with an electric drive. The new Geislinger Silenco® Coupling has recently been validated during sea trials of a mega-yacht in Europe when unusually low noise levels from the propulsion system were demonstrated. The coupling helped to reduce noise significantly, both in the ship’s cabins and outside, into the environment.

> ABOUT GEISLINGER

Geislinger, based in Hallwang/Salzburg, Austria, is a global market leader in torsional vibration dampers for large engines. Geislinger develops and produces torsional vibration dampers, torsional elastic, high-damping couplings, misalignment couplings, and torsional vibration monitoring systems for large engines and wind turbines.

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Elastic support for SCR and scrubber systems

SB BRONESKE | The designer and manufacturer of elastic support systems for exhaust pipes, SB Broneske, offers patented products and a free service portfolio which has become established as a design standard in the global market for exhaust systems. For more than 47 years, the company has been supplying unique vibration mounts for the elastic mounting of exhaust systems both for complex new-buildings as well as retrofit projects.

Each exhaust gas cleaning system has its own unique characteristics. For example, engines manufactured with a high-pressure selective catalytic reduction (SCR) system require reliable and functional elastic mounts for the innovative exhaust gas purification



Vibration mounts specially designed for heavy loads

Source: SB Broneske

systems. Moreover, vibration mounts have to meet very high requirements. In order to hold the exhaust pipe in position in the event of a fire, they must be shear-proof. In storms, they must withstand high and complex dynamic movements. SB Broneske works continuously

to offer optimal products and systems according to customer requirements.

The SB Broneske product and engineering package includes the following advantages for vibration mounts:

- > Designed for highest loads (>100 tonnes);
 - > Shear-proof and fire-proof;
 - > Vibration mount is heat resistant for installation of the exhaust pipe system;
 - > Elastomeric rubber reduces structure-borne noise very effectively;
- The design support includes:
- > Calculation with newest DIN standard;
 - > Technical offer with vibration analysis;
 - > SCR/scrubber: consideration of five maritime standard load cases and analysis for different ship types;
 - > Detailed manuals for installation and design support;
 - > Design support for detailed systems;
 - > Detailed design of brackets, frames and ship structure, production drawings (at additional cost);

> FEM analysis possible (at additional cost).

For square systems, SB Broneske selects four fixed points and four anchorage points for optimum elastic support. However, care must be taken to ensure that the lower fixed points have uniform spring travel so that structure-borne noise can be evenly reduced and vibrations prevented.

In retrofit applications, the effectiveness of the retrofit depends heavily on the longevity of the system. These measures are often costly and time-consuming for shipping companies. SB Broneske supports shipyards in these retrofit projects by calculating the loads and forces on the SCR/scrubber according to the DIN standard method.

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.



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> 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



The containerised power management system features an energy efficient plug-in solution for fish feed barges

Source: Bosch Rexroth

World's first plug-in hybrid power management system for fish feed barges

BOSCH REXROTH | Norway-based company Fjord Maritime has ordered ten hybrid power management systems from Bosch Rexroth for installation on fish feed barges. The plug-in systems significantly reduce generator running times, cutting fuel consumption by up to 60% and considerably reducing emission rates. Total cost of ownership will fall accordingly, said Bosch Rexroth.

Working closely together, Fjord Maritime and Bosch Rexroth have developed this innovative plug-in hybrid power system. Rexroth has provided the drive and control technology, software and expertise for development of the first complete systems that are now in operation, and has been asked by the Norwegian company to supply an additional ten integral systems, either containerised and mobile or vessel-integrated.

Mainly based on Rexroth's IndraDrive ML large electric drives and the XM embedded controls, the systems can re-

duce diesel generator running times by up to 80%, significantly cutting fuel consumption and emission rates, Bosch Rexroth stated. The generators' reduced running hours also results in less noise for people working on the barge, and in reduced service and maintenance costs. For new barges, "many diesel-driven micro grids, such as the fish feed systems in this application, are in essence over-dimensioned so that they can cope with start-up currents or so-called energy peaks," explained Arnold Krielen, Sales Manager at Bosch Rexroth in the Netherlands. By adding this power management system to an on-board power grid, the diesel generators will charge the batteries with their excess capacity. The diesel engine can then be shut down and the systems run entirely on battery power, thus significantly reducing fuel consumption and generator running hours, Krielen added. The batteries can also support peak power demands,

reduce the power demand on diesel generators, or even allow for less powerful generators. "These intelligent power management systems with energy storage can bring big advantages to other markets too," said

Bosch Rexroth Expert Engineer Sander Boeijen, "especially at facilities or in applications with irregular power demands, with critical processes where safety has priority or where a loss of power constitutes a major risk."

> ABOUT BOSCH REXROTH

Bosch Rexroth is one of the world's leading specialists in drive and control technology. The company offers its customers hydraulics, electric drive and control technology, gear technology and linear motion and assembly technology, including software and interfaces to the Internet of Things.

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High-performance shaft couplings, torque limiters and safety brakes for rough environments

MAYR Mayr offers a broad portfolio of safety clutches and brakes. The product range includes disk pack couplings, shaft couplings and torque limiters that have been optimised for use in the maritime sector.

Whether in the drives of ship propellers, mobile units such as drilling platforms for oil and gas extraction, or in tidal power plants, the applications for disk pack couplings in the maritime and offshore industries are diverse. For example, if the main drive of a ship's propeller is an electric motor, spring steel disk pack couplings such as the ROBA®-DS by Mayr provide clear advantages. The company says that these couplings are robust, reliable and temperature-resistant and are therefore particularly suitable for use in extreme environmental conditions at sea.

Furthermore, the ROBA®-DS couplings are wear-free, thereby reducing the maintenance effort to a minimum. Like the previous model ROBA®-D, Mayr has also received type approval from DNV GL for the even more compact and high performance density ROBA®-DS all-steel coupling up to construction size 2200. This certificate confirms the



The high-performance and robust ROBA®-DS disk pack couplings are especially suited for operations in extreme environmental conditions at sea

Source: Mayr

high quality and reliability of the coupling with customary safe dimensioning and design, and ensures the maximum possible operating and functional safety for use at sea.

Tailor-made, certified overload protection

In addition to shaft couplings, Mayr also provides application-optimised torque limiters

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for use at sea which have also been certified by DNV GL or by American Bureau of Shipping (ABS). As a result, the EAS® element clutches, for example, reliably protect against damage due to overload, amongst other things in azimuth thrusters (propeller pods) on drilling ships or drives on drilling platforms.

In order to integrate an overload coupling into the drive line correctly, the application must generally be considered as a complete component. In particular, in applications where difficult environmental conditions are likely, such as at sea, Mayr develops individual, tailor-made solutions to protect against overload, and has these products certified by recognised inspection authorities. The company can rely on many years of experience, extensive know-how in development and design, and on state-of-the-art testing possibilities for this purpose.

Robust outdoor safety brakes for harbour crane systems

In many large harbours around the globe, ROBA-stop®-S safety brakes prove their worth in the travel and hoist drives of harbour cranes. These brakes have been developed especially for outdoor applications in extreme ambient conditions, and have been well-received by customers through their simple assembly and handling as well as long maintenance intervals. The brakes in the travel and hoist drives of harbour cranes fulfil two functions. On the one hand, they function in normal operation as holding brakes. This means they have to hold the system safely in the approached position once the drives have been switched off – even in strong winds during a storm. On the other hand, in critical operating situations, during emergency stops or power failure, the ROBA-stop®-S safety brakes are dimensioned to absorb peaks in which extremely high friction loads may occur. For example, this is the case when loads moving downwards by hoist drives have to be braked whilst moving at full speed.

> ABOUT MAYR

The family-run company Mayr power transmission, which was founded in 1897, is a leading manufacturer of safety brakes, torque limiters and shaft couplings. These products are primarily designed for application in electrically-driven machines and systems. Currently, approximately 700 employees work at the headquarters in Mauerstetten. Worldwide, Mayr employs approximately 1,200 employees. www.mayr.com

Protected against harsh conditions

With the ROBA-stop®-S, Mayr has developed a safety brake especially for critical ambient conditions and outdoor applications. It complies with Protection IP 67 and is therefore completely dust-tight and waterproof. The compact and solid housing with an integrated terminal box and without any pockets and grooves ensures that the brake is resistant to damage caused by external influences. In addition, the high-quality primer on the brake body, the chrome or nickel coating of the inner components and the manufacture in rustproof stainless steel provide permanent protection against corrosion. A microswitch for release monitoring is integrated into the terminal box and is thus

protected effectively, which guarantees that the motor only starts up when the brake is released.

This terminal box also features sufficient space to hold a rectifier for the brake's magnetic coil. In addition, a further microswitch can be integrated which inspects the wear on the friction linings.

On the ROBA-stop®-S safety brake, it is possible to mount a speedometer on the brake body. If no speedometer is used, the coil carrier is sealed with a cover. If the brake is used at temperatures below zero, or in conditions of high humidity, an anti-condensation heating system is recommended. This system prevents the possibility of condensation forming within the brake interior.

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New water-lubricated sterntube systems

SKF An environmentally friendly water-lubricated sterntube system, Simplex BlueRun, which conforms to VGP 2013 and Polar Code requirements has been introduced by SKF. The system can be used for open and closed water-lubricated sterntube systems and can be combined with SKF's Simplex seal systems.

Simplex BlueRun, SKF's new water-lubricated sterntube system, offers customers an environmentally friendly product range that conforms to the latest environmental protection regulations. The SKF water-lubricated sterntube range includes Simplex BlueRun polymer bearing bushes, carrier bushes, a tail-shaft monitoring system and a water quality system. Using water lubrication, SKF's complete product range conforms to VGP 2013 and Polar Code regulations, enabling operators to sail in special protected areas and further promote their environmental credentials.

For inland and sea waters

The Simplex BlueRun sterntube bearing bushes made of thermoplastic polyurethane for water lubrication (TPW) are available in split and non-split versions. Both options can be used for open and closed water-lubricated sterntube systems, SKF says. In addition the company also offers carrier bushes which are fixed to the sterntube, made of bronze.



With Simplex BlueRun, SKF offers a new, water-lubricated product range for sterntubes Source: SKF



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They contain the water-lubricated Simplex BlueRun sterntube bearing bush, according to the so-called „bush in bush principle“.

SKF's Simplex BlueRun water quality system filters and treats sea water and then pumps it through the sterntube bushes for lubrication, cooling and flushing purposes. During this process, overheating is avoided and any solids, which might damage the system, are safely removed. Designed to operate on a stand-alone basis or as a fully integrated part of the ship's control and monitoring system, this SKF filtering set-up can be operated in an unmanned engine room.

Wear measuring system for predictive maintenance

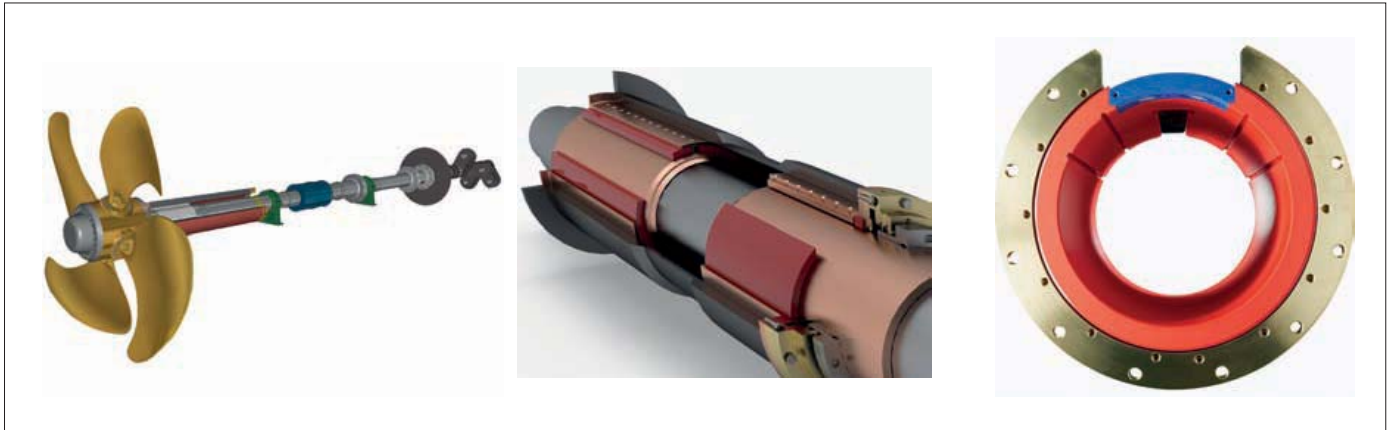
The Simplex BlueRun tailshaft monitoring system also provides continuous

and reliable information to enable the planned replacement of bearing bushes. Two identical eddy current sensors are installed in the bearing bush. The sensors are connected to an evaluation unit and measure, without contact, the position of the shaft. The measurement takes place with a non-rotating shaft, so that only the wall thickness of the shaft's bearing bush determines its position. The optimum performance of the bearing is ensured until the specific wear limit is reached.

The new range can be combined with SKF's Simplex seal systems such as the Simplex lip-type seal, Simplan face-type seal and Carboplan Surface axial face-type seal.

Extensive tests for practice

With over 70 years of sterntube experience, SKF's marine offering of con-



The new water-lubricated stern tube Simplex BlueRun from SKF is particularly environmentally friendly

Source: SKF

sultation, installation, retrofit servicing and global spare parts delivery ensures operators can rely on exactly the service that the require. Michael Zollenkopf, technical director Shaft Components at SKF comments: "With the introduction of SKF's Simplex BlueRun water-lubricated stern tube systems, operators can choose another environmentally friend-

ly Simplex solution. The new bearing bush material has been tested under real conditions for more than 11,000 hours. Thus, customers will get a reliable solution for all kinds of vessels." This also includes ships operating in coastal or special protected areas such as cruise liners, ferries, offshore supply vessels, container ships and fishing boats.

> 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 about 17,000 distributor locations worldwide.

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Figure 1: Walk-to-work (W2W) vessel *Kroonborg*: DP2; 2 x Voith Schneider Propellers and 2 x Voith Inline Thrusters; the VIT and the VSP are shown on the right
 Source: Voith

Digital data analysis proves the efficiency of various propulsion systems

VOITH Fast response times and the quick application of thrust make Voith Schneider Propellers and Voith Inline Thrusters particularly suitable for offshore support vessels (OSVs) which must often operate in challenging conditions. In a comparison exercise carried out in the northern North Sea, three OSVs equipped with Voith Schneider propellers were found to be capable of working in harsher sea conditions than other OSVs in the trial.

What influence does the propulsion system have on the effectiveness of an OSV? Modern data analysis of ship positioning, delivered by the Automatic Identification System (AIS), has been used for the first time to

demonstrate the performance of different OSVs using different propulsion systems whilst performing the same tasks.

Voith Schneider Propellers (VSP) and Voith Inline Thrusters (VIT) respond quickly and accurately because of their

unique working principle. They enable OSVs to work safely even under extreme conditions including high waves, strong winds and strong currents. The fast thrust allocation of Voith Schneider Propellers not only enables precise dynamic posi-



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tioning (DP) but also significantly reduces the ship's rolling movements.

Low fuel consumption is made possible because of the fast reaction times of the Voith propellers during DP operations. Further advantages of Voith propellers are their robustness and their associated low maintenance costs. Since 2007, Voith Schneider Propellers have been proving themselves in tough offshore applications. The first DP ship was the *Edda Fram*, owned by Ostensjö of Norway.

A very powerful DP2 OSV is the *Kroonborg*, shown in Figure 1. This ship is equipped with Voith Schneider Propellers as the main form of propulsion, combined with Voith Inline Thrusters (VITs). The VITs are used as very quiet bow thrusters with a high thrust relative to their propulsion power.

In order to prove to what extent ships with Voith Schneider Propellers – in comparison to ships with other propulsion systems – can still operate in higher sea states, an analysis of AIS data in the northern North Sea between October 2014 and October 2016 was carried out together

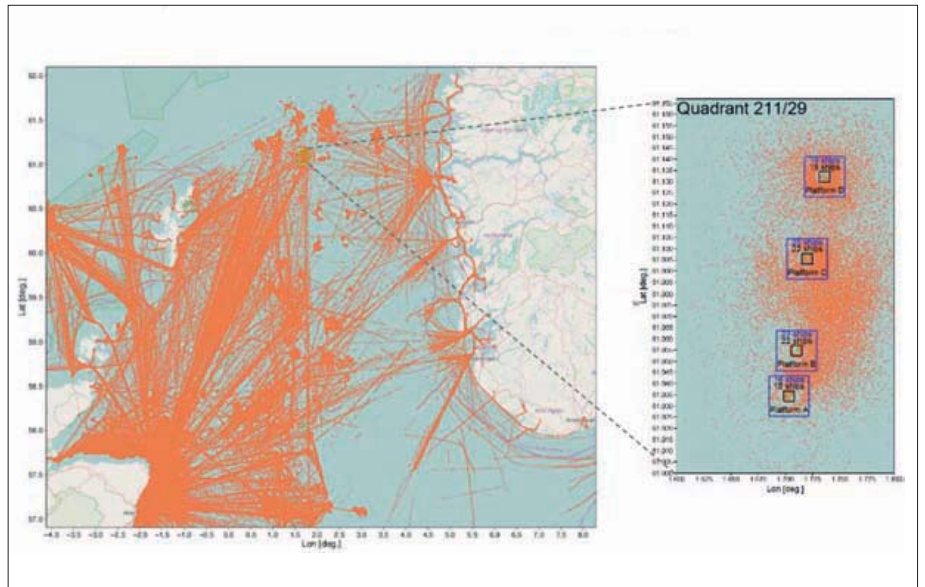


Figure 2: Movement of every vessel approaching the *Brent* oilfield during the period October 2014 to October 2016
Source: Voith

with the company Maritime Data Systems GmbH. The specific issue was the supply of four oil platforms on the *Brent* oilfield, which are shown in Figure 2.

AIS data clearly identifies eleven OSVs. These vessels fitted with different propulsion systems supplied the four platforms. Of these, three ships were



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powered by Voith Schneider Propellers, five by azimuth propellers and two by conventional variable pitch propellers and rudders.

The weather data for this period was recorded and obtained from the European Centre for Medium-range Weather Forecasts (ECMWF). An algorithm was developed which logically linked the AIS data (ship position), the weather data and the position of the platforms. As a result, it was possible to determine statistically the status of the ships. Differentiation was made after transit; on standby near the platforms; in dynamic positioning mode by the platforms; and docking in the harbour.

Figure 3 shows which ships had been working at the platforms and the corresponding wave heights recorded. Ships with conventional fixed shaft lines and rudders could work up to a maximum of 2.0m significant wave height. Ships fitted with azimuth propellers were able to work up to a maximum significant wave height of 3.5m. Noticeably, the best result was achieved with three ships powered by Voith Schneider Propellers which were capable of operating in significant wave heights of up to 5m.

The fast thrust allocation of the VSP, clearly recognised by offshore operators, was judged to be the main contributing success factor.

Through the digital analysis of data over the two-year period, linked with weather data, it was possible to obtain important information about the influence of the choice of ship propulsion on the OSVs' performance.

> ABOUT VOITH

With more than 90 years of experience, Voith Turbo offers custom-tailored propulsion systems that ensure precise, prompt and safe manoeuvring. The portfolio includes the Voith Schneider Propeller (VSP) with its stepless, precise and prompt generation of thrust in all directions, Voith Inline Thrusters (VIT) and Voith Inline Propulsors (VIP) that require neither axles nor shafts or gearing. The Voith Linear Jet (VLJ) combines the best properties of propellers with the best properties of waterjets. www.voith.com

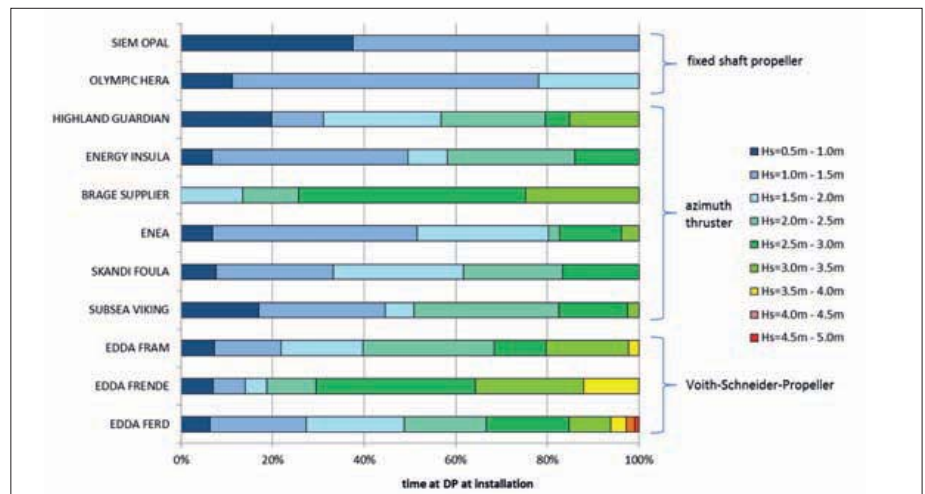


Figure 3: Time in DP mode at the platforms for different wave heights

Source: Voith

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Propulsion gearbox for polar expedition cruise vessel *Hondius*



Source: Keller

The propulsion gearbox, which has a weight of approximately 22.5 tonnes, has a length of 3.9m, a width of 2.6m and a height of 2.4m

KELLER | Gearbox specialist Keller will provide a propulsion gearbox for the cruise vessel *Hondius* – the world's first-registered Polar Class 6 cruise vessel. The expedition cruise vessel was ordered by the Dutch company Oceanwide Expedition and has been built at the shipyard Brodosplit in Croatia. Due for delivery in May, it will start operation in summer 2019.

When the order for the gearbox was placed by Schottel, the company that supplied the propulsion drive train for the ship, in December 2016, neither Keller nor Brodosplit knew exactly about the latest design criteria for Polar Class 6 (LR PC6) from Lloyd's Register. The *Hondius* is the first vessel in the world to be built according to LR PC6 class, meeting the latest and highest demands of Lloyd's Register for Polar Class 6.

Early in the design stage, it became clear to all parties involved that the design criteria for a polar cruise vessel strongly differed from earlier standards. The main engine had to be capable of starting and running

the controllable pitch propeller in full pitch. The propulsion gearbox also had to cover this issue.

The basic concept consists of a gearbox driven by two diesel engines of 2,130 kW each and one output shaft, to drive the propeller. To determine the size of the gearbox, the maximum torque on the input shafts

> ABOUT C.U.W. KELLER GMBH & CO.KG

In maritime operation – especially in the dredging and offshore sector – Keller gearboxes demonstrate their high quality on deck and in the engine room. Products include propeller transmissions with an output of 15 MW and more for dredge pumps, jet pumps, winches, generators and transfer case transmission units, as well as special cutter heads and cutter wheel gear units.

www.keller-getriebe.de

resulting from torsional vibration calculations had to be considered. This included the clutches, shrink fits and gearing.

Above the port-side drive shaft is a secondary PTO shaft to drive a generator. On each input drive there is one hydraulic multi-plate clutch, so it is possible to drive the gearbox with either one or both of the diesel engines. It is also possible to drive the PTO shaft with one or both diesel engines.

The thrust bearing had to be designed for operation with different loads. Furthermore, the thrust bearing of the gearbox has a special design to absorb the high axial thrust which comes from the ice-cutting operation of the propeller.

Two other aspects of the gearbox design address high efficiency and low sound emissions. Since Keller is well known for its silent and high efficiency gearboxes, an optimised gear design, fabricated on the latest state-of-the-art Keller gear-grinding machines, was completed and successfully tested on the company's test bench.

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Mechanical hybrid propulsion solution introduced

SCHOTTEL | In close collaboration with Svitzer of Denmark, Schottel has developed a new hybrid propulsion concept based on the recently developed Schottel Y-Hybrid thruster technology which connects a vessel's port and starboard mounted azimuth thrusters. This makes it possible to drive two thrusters with either one of the main engines.

The companies are now discussing a pilot project to retrofit an existing tug with the new mechanical hybrid technology. This will transform the direct-driven vessel, making it greener and more cost-efficient.

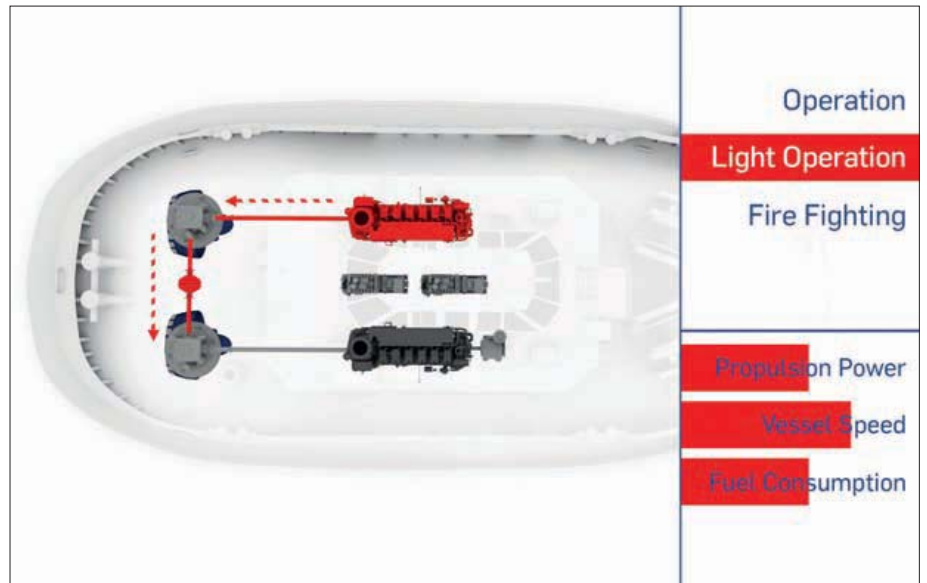
Svitzer runs a fleet of about 430 vessels in operations all over the world and has a high focus on innovation and initiatives for fleet modernisation. Thomas Bangslund, Group Head of Innovation at Svitzer, was closely involved in the development of the synchron-mechanic hybrid drive system. He states that Svitzer is convinced of the operational and environmental benefits of the new Schottel SYDRIVE-M in both retrofits and newbuilding projects.

The operating profiles of tugs and workboats can include operating with low engine loads for up to 90% of the time. To optimise propulsion systems for such operations, conventional hybrid propulsion systems come with two independent power sources per propeller, normally configured with a main engine and a smaller electric motor. The additional electric components make those hybrid concepts more complex and more expensive.

Based on the unique Schottel Y Hybrid upper gear module for azimuth thrusters, Schottel SYDRIVE-M is a new variable and purely mechanical hybrid propulsion system with no need for any additional electronical components or an additional gearbox. According to Schottel, this system comes with many advantages in its three main operating modes.

Light Operation or Free Sailing Mode

The core functionality of Schottel SYDRIVE-M is to connect mechanically two thrusters and one of the two main engines for all light operation activities which



SYDRIVE-M in Light Operation Mode

Source: Schottel

do not require full power from both main engines. In this synchronised Light Operation Mode, one of the two main propulsion engines is not required, raising fuel efficiency, reducing hours and cutting maintenance costs.

In addition, the main engine that is in use can operate more efficiently at near-optimal load and in a better specific fuel consumption range, leading to reduced fuel burn and emissions. This is in contrast to a conventional tug, operating with two engines running inefficiently at relatively low loads, using more fuel and generating higher emissions.

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. www.schottel.de

Full Thrust Operation Mode

For short periods when full propulsion power is needed, the connection between the two thrusters is disengaged and each engine is connected to each thruster. The system is now identical to any other directly-driven propulsion system.

FiFi-Mode

For any directly-driven vessel, Schottel's new SYDRIVE-M system provides a set-up to enable fire-fighting operation without the need for additional investment in components such as medium- or heavy-duty slipping clutches, CP propellers or dedicated engines to supply power to a FiFi pump. In the SYDRIVE-M FiFi mode, the disengaged main engine is used to drive the FiFi pump through its front PTO.

The SYDRIVE-M system can be integrated into most typical vessels with direct propulsion without a need for design changes, the company claims. It is available for the Schottel Rudderpropeller and Schottel EcoPeller series of azimuth thrusters from 1,000 kW up to 3,000 kW. Retrofit is possible upon request for specific Schottel azimuth thrusters and engine types. The system has been filed for patenting.

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Innovative separator technology slashes maintenance time

GEA | The new GEA marine separator met with great interest at the world's leading trade fair SMM in September 2018 in Hamburg and the first contracts have now been signed. A total of 20 GEA marine separators will be installed on two cruise ships. The innovative GEA technology collected the decisive plus points through the integrated direct drive, the simple service concept, the compact, space-saving design, the increased output per square metre of floor space and the intelligent connectivity. And the company's high ranking in the marine business has also led to great interest in GEA purifiers.

The new GEA marine separator offers great advantages for technical crews on board cruise ships, container ships and tankers, GEA said. The "modular exchange drive unit" only has to be replaced after a service interval of 16,000 operating hours, making it one of the most efficient units on the market. Unplanned maintenance is virtually eliminated. Maintenance time on board is thus reduced by up to 90%,



The new GEA marine Separator with integrated direct drive sustainably increases the efficiency on board (left), a cross section (right) Source: GEA

while maintenance costs are reduced and machine availability maximised. GEA customers also receive an OEM-certified, exchangeable drive unit worldwide at a location of their choice.

With a degree of efficiency of more than 96% and a savings potential of up to 30,000 kWh per year, the integrated direct drive is the heart of GEA's new

separator series. The direct drive with its synchronous motor requires no belt or clutch and the spindle and motor are available for the first time as modular exchange drive units. This greatly simplifies installation and maintenance of the machine. The separator is accessible from all sides and the space requirement on board is reduced by 50%.

Based on the CWE 15375 standard, the GEA marine separator offers full transparency and one of the best certified flow rates (CFR) currently available in the market. In addition, it is precisely tailored to the requirements of the vessel's main machine.

The advantages of the new GEA marine separator, at a glance, are as follows:

- Quick and easy installation;
- Small footprint and 360° accessibility;
- Cleaning in 20 minutes with separate GEA Effi-Clean system;
- One of the best certified flow rates in the marine market;
- Ready for smart connectivity;
- Adaptable to the latest fuel technologies;
- Hot separation add-on.

- Integrated direct drive for maximum energy efficiency;
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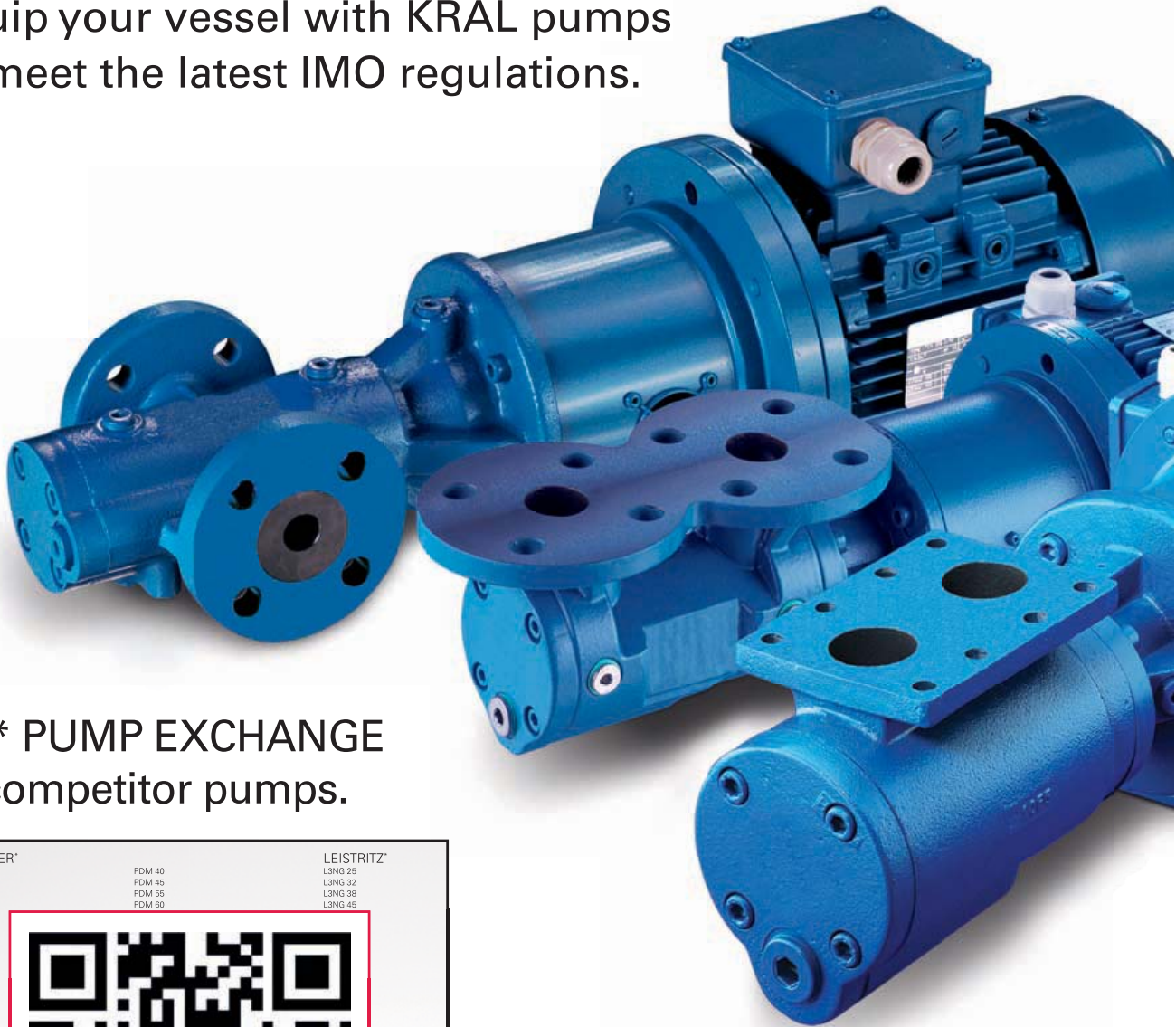
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SNF (H) 940		
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SPF 40		
S3P210		
S3P280		
AFI 10		
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Maximising efficiency and minimising process cost in sewage management

HAMANN Hamann AG has launched a new range of sewage treatment plants, the HL-CONT Plus OceanCruise, for cruise vessels operating in sensitive sea areas. Among other things the new systems are suitable for Alaskan waters, the Baltic Sea and southern waters.

Stricter regulation on sewage discharge requires more and better technology to achieve satisfactory compliance. As ships become ever bigger, especially cruise ships, this leads to more complex and often much larger plants and systems. For Hamann, compliance with the applicable standards has the same priority as maximising the overall efficiency of the systems. Performance results

from the optimal interaction of several factors including low space requirements, flexible installation, ease of operation, low maintenance and high reliability. Hamann's latest development, the HL-CONT Plus OceanCruise sewage treatment plant, is compliant with the highest standards for sewage discharge currently in force: IMO resolution MEPC.227(64) including

section 4.2 MARPOL Special Areas and US Code of Federal Regulations Title 33 Part 159 Subpart E (Alaska). The HL-CONT Plus OceanCruise can either be installed as a single plant with treatment capacity of up to 12,000 litres/hour or as a multi-plant system with whatever treatment capacity is required. The technology used is a combination of Hamann's unique Dissolved Air Flotation (DAF) sys-

tem, Moving Bed Bioreactors (MBBR) and UV radiation. The plant is designed in four modules, which can be installed separately from each other, even on different decks, thus maximising the use of space and flexibility. With the same capacity, a Hamann HL-CONT Plus OceanCruise system requires up to 70% less space than competing systems. Day-to-day operation is straightforward as routine

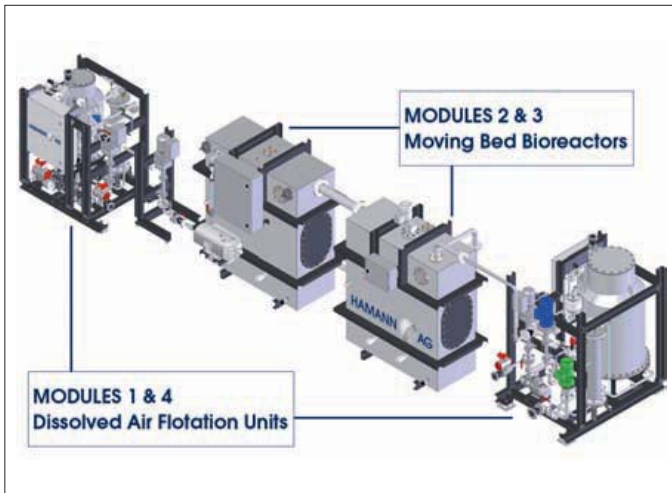
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The Hamann HL-CONT Plus OceanCruise sewage treatment system complies with the highest IMO, Alaska and Baltic requirements
Source: Hamann

functions are completely automated, the company states. Maintenance requirements are kept to a minimum, especially due to the absence of filters or membranes through-

out the system which would have to be regularly cleaned, serviced and replaced. Hamann sewage treatment systems are very reliable due to their design, proven technol-

ogy, high quality standards and low maintenance requirements. With multi-plant installations, a likely scenario for HL-CONT Plus OceanCruise systems, reliability is further enhanced by redundant modules for each process step, ensuring operation even if one module should fail. As an equipment provider, Hamann offers complete sewage management systems with optimally aligned components and high overall efficiency. These components include the collection of sewage, grease separators, tank management and transfer controls and sludge processing. The company also handles turnkey projects covering the entire waste stream as a general contractor in cooperation with network partners. Engineering consulting is an integral part of Hamann's services.

> ABOUT HAMANN AG

Hamann AG is a worldwide recognised supplier of sewage treatment technology for the maritime industry. Since delivery of the first sewage treatment plant in 1972, the company has installed more than 5,500 sewage treatment systems on all kinds of vessels including ferries and cruise ships, naval vessels and superyachts. All plants and systems are designed and manufactured at the company's headquarters in Hollenstedt, Germany, to the highest quality standards. Hamann AG maintains a global network of over 40 sales agents and service partners.

www.hamannag.com

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Universal cargo pump for unloading high and low viscosity cargos

LEISTRITZ | The pump specialist has introduced a highly efficient barge pump in a unique five-screw, single-flow design for high-capacity unloading. The system guarantees effective stripping of tanks and suction lines. Cargo of all viscosities – from kerosene to asphalt – can be unloaded at rates of up to 1,700 m³/h, Leistrizt reveals.

The Leistrizt LSNT / LSNG pump is specially designed for high-flow operations with minimum power requirements. For example, in pumping asphalt or #6 fuel oil, efficiency is approximately 40% better than with a cen-

trifugal pump. This results in lower installed engine power, reduced fuel consumption. Due to the available foot and end cover heating, this guarantees an optimised heat-distribution in the pump, Leistrizt says. The pump is especially suitable for asphalt and bitumen applications at temperatures ranging from 150–280°C.

As far as maintenance is concerned, the pump provides convenient accessibility. Both the bearing and the seal are installed on the drive side so that the pump does not have to be completely dis-mantled to replace or maintain com-

ponents. To ensure even heat distribution, the pump can be equipped both with foot and lid heating.

The pump can optionally be equipped with a variable speed control operation which for unfavourable suction conditions during discharge operations. As a result, the cargo pump achieves a very satisfactory emptying of the tanks and supply lines, the company states. The result is an optimal total discharge time.

Further advantages include:

- > thrust compensation of the spindles avoids wear and undesired bearing loads,;
- > suitable for a range of viscosities from kerosene to asphalt;
- > no forced drive of the idler rotor or separate lubrication of bearings required;
- > available in combination with various drives (e.g. e-motor, hydraulic motor, diesel engine);
- > available as a submerged or dry-mounted pump;
- > more than 90 different L5 pump variations and applications, operating on several vessels and ship terminals, especially for asphalt, fuels and/or lube oils in loading, offloading, transfer or blending jobs.



Operating data L5 pump:




Example of a Leistrizt L5 cargo pump
Source: Leistrizt

- > maximum differential pressure – 15 bar;
- > maximum pumping capacity: 1,700 m³/h (7,500 GPM);
- > maximum viscosity: 100,000 mm²/s;
- > maximum temperature: 280°C (536°F).

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> ABOUT LEISTRITZ

For more than 90 years, Nuremberg-based Leistrizt Pumpen GmbH has developed, constructed and sold screw pumps for a wide variety of industries, including the shipbuilding and marine sectors and the oil and gas industry. Leistrizt pumps have internal or external bearings with single- or double-volute design. The product portfolio includes the type series L2, L3, L4, L5 with two to five spindles and offers solutions for a wide range of applications. www.leistrizt.com

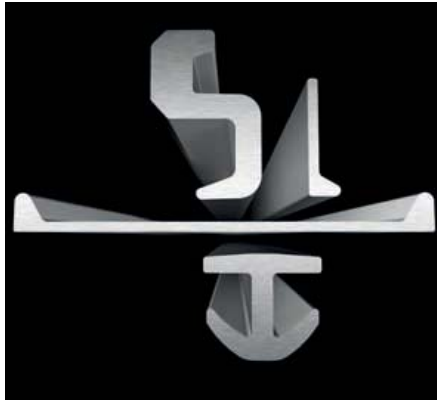


Special profiles for the shipbuilding industry

HOESCH | As a system supplier, Hoesch Schwerter Profile GmbH develops customised steel profiles across a broad range of industries including shipbuilding. The special profiles are delivered just in time for direct processing.

Bulb flats for the shipbuilding industry are used as an essential static construction element in the structure of a ship. They are welded with sheets to provide strength and stability. In collaboration with shipyard representatives, Hoesch has generated an optimised 2.0 bulb flat profile. The reduced internal stress of the supplier's Generation 2.0 bulb flat profiles enables them to be processed directly in automated production without the need for prior straightening.

A uniform weld gap is an important requirement for the reliable use of mechanical welding processes. Since welding variables including weld current, voltage and speed are set at fixed rates, any inconsistencies in the workpiece can result in irregularities



Hoesch offers tailor-made profiles for maritime purposes Source: Hoesch

such as seam over- or underfill. Time-consuming and costly re-work or a reduction in fatigue strength is the result, leading ultimately to a sub-optimal structure. The company also specialises in developing lightweight materials with a higher

strength than conventional steel, specifically for the shipbuilding sector. Hoesch Schwerter Profile GmbH is certified according to DIN EN ISO 9001, ISO/TS 16949, DIN EN ISO 14001 and DIN EN ISO 50001.

> ABOUT HOESCH

Hoesch Schwerter Profile GmbH develops specially tailored steel profiles which are developed in close cooperation with customers. The company offers a high level of engineering know-how and modern production facilities at its site in Schwerte, Germany. Two production processes are available: hot rolling and cold-drawing. Small quantities can also be manufactured economically. Additional processes such as milling, machining, induction hardening, kitting are also available on request.

www.hoesch-profile.de

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Sustainable and cost-efficient lighting systems for the high seas

WISKA Maritime lighting specialist WISKA offers a broad portfolio of lighting solutions that feature robust design and energy-efficiency across a wide range of applications.

When LED lighting is used in the maritime sector, strict and demanding requirements are expected of the products: high light output, minimum maintenance, a long service life and high weather resistance, especially when it comes to outdoor lighting. WISKA combines plastics expertise with knowledge of LEDs and offers robust lighting systems that meet all the requirements of the high seas.

Multipurpose luminaire 4000

The LED multipurpose luminaire 4000 is now a classic in the WISKA lighting series. It was the first LED luminaire produced for the maritime market to be made from plastic. It has since proven itself over thousands of operating hours worldwide.

What makes the DNV GL-certified luminaire special is that it consists of a minimum of system components and is maintenance-free. By dispensing with the usual light housing, there is less need to



The LED Ex 4200 – a modified design to ensure even more resistance to impact and vibration

Source: WISKA

procure and store spare parts and installation is also considerably simplified. The time-consuming screwing and un-

screwing of a housing to replace the light source is no longer necessary. The LED tube light is simply clicked into the holder

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without the need for any additional tools. Thanks to the breathable concept, the standard electrical system is more resistant to penetrating moisture and condensation, and therefore against short circuits and corrosion, which ultimately leads to increased operational safety.

New LED generation

LED lighting systems are the first choice among ship designers and builders when it comes to energy-efficiency and cost-efficiency. So it's no wonder that WISKA launched further LED in-house developments besides the 4000 – the LED floodlight 5000 and the LED Ex luminaire 4200, complete with extensive further developments that work even more efficiently to reduce energy consumption and costs.

LED Ex luminaire 4200

The success of the LED multi-purpose luminaire 4000 was a good reason for WISKA to expand its range. With this luminaire, WISKA has incorporated its many years of experience in the Ex and LED area to create an impressive lighting concept. Certification in accordance with ATEX and IECEx makes it suitable for use in Zone 1 hazardous areas.

It is also made of corrosion-free plastic and stainless steel. This makes it resistant to salt water, UV, vibration and shocks. The luminaire has an average life of 50,000 operating hours (L70/B10). Like the 4000, the 4200 unit does not incorporate any failure-prone drivers and



The housing design of the further developed LED floodlight 5000 will be slightly modified
Source: WISKA

the individual components are reduced to a minimum, making the LED Ex 4200 reliable and maintenance-free.

WISKA is currently working on further development of this product. The housing will be made even more compact by adapting mounting parts and brackets. This will reduce the weight of the light and make the junction box more accessible and easier to install. Furthermore, the modified design ensures that the product is even more resistant to impact and vibration.

LED floodlight 5000

The LED floodlight 5000 is the latest result of WISKA's in-house development department. Up to now, aluminium has been

the preferred material to transfer heat from the floodlight housing. However, aluminium is vulnerable to environmental and mechanical influences. To counter this, the new LED floodlight 5000 is the first of its kind to be thermally conductive and corrosion-resistant thanks to a special mixture of plastic and metal ingredients to produce the housing. According to WISKA, it is ideal for use in extreme weather conditions at sea.

The LED floodlight 5000 is also available in "narrow" and "wide beam" lens shapes to meet a broad range of lighting requirements. This results in an improved light pattern and, depending on the requirements, a spotlight or wide-angle light distribution. Further developments for the floodlight 5000 are currently in the pipeline, including refinements to the housing design to reduce weight. The new version has more compact dimensions to simplify assembly and make the product even more robust against the extreme environmental conditions often found at sea.

> ABOUT WISKA

WISKA Hoppmann GmbH is one of the world's leading single-source suppliers of maritime lighting systems, electrical equipment, reefer container sockets and CCTV video surveillance. Established in 1919, WISKA has been developing and manufacturing highly efficient and reliable products made in Germany for use in demanding maritime environments. www.wiska.com

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Life-saving equipment portfolio broadened

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

D-i davit international-hische's new model ALH.23 Automatic Release Hook can be used with davit-launched liferafts and is manufactured in accordance to the latest SOLAS and Marine Equipment Directive requirements. It supports a weight up to 2.3 tonnes (23kN) and can be handled easily by one person. For maximum ease of maintenance, all parts of the hook have been carefully chosen from the best marine environment-resistant non-corrosive materials, d-i states. Over recent years, the company has introduced a new generation of powerful winches for installation aboard large cruise vessel newbuildings. The winches have the capacity to hoist boats weighing up to 50 tonnes. Such lifting capacity is



Davit system for open lifeboats Source: d-i davit

now required by cruise customers because the size of lifeboats has increased so much on many of today's latest new cruise ves-

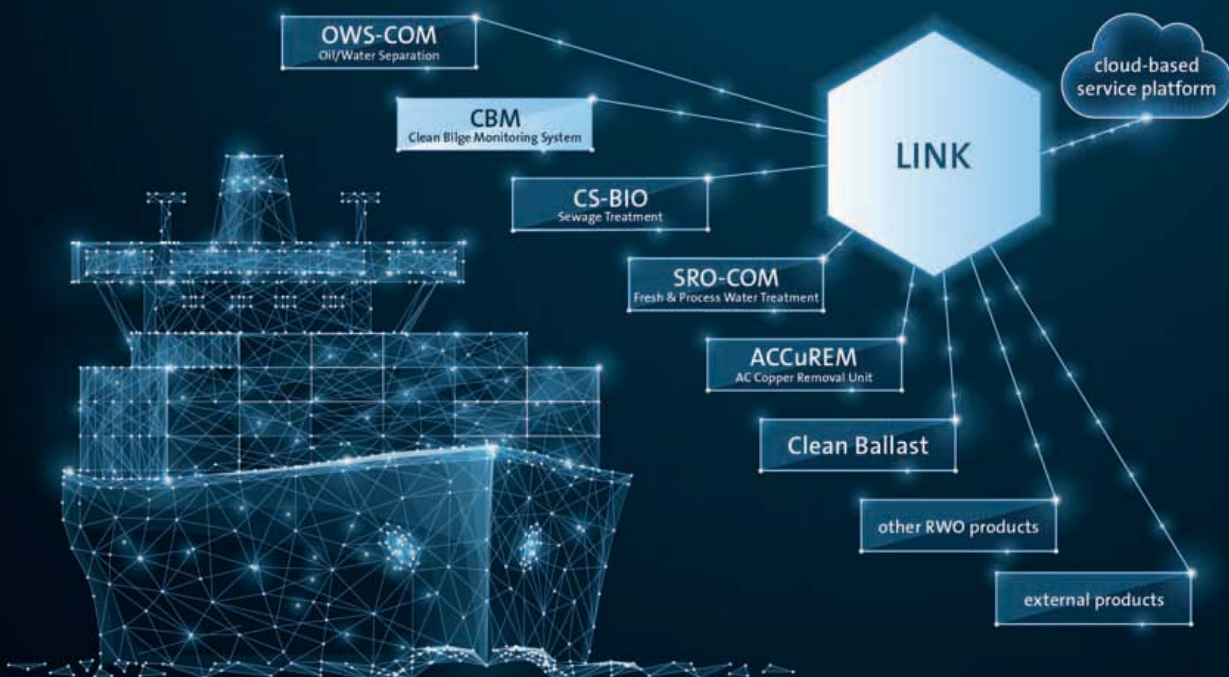
sels. Some lifeboats can carry up to 400 passengers each.

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 at STX France in St. Nazaire. The second vessel was delivered 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 100kg, 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 commenda-



Linking smart technologies with RWO





Service crane for liferafts

Source: d-i davit

tion. d-i emphasises that its experienced engineers, technicians and production specialists cooperate closely with customers in order to develop customised life-saving equipment.

tion reflects not only the system itself, but also the quality of service including flexible cooperation and effective project management. Similar customised systems have been successfully supplied by the company in other marine sectors

including commercial vessels, yachts, special-purpose vessels, navy ships and offshore platforms. d-i was also awarded „Partner of the Year” by the Meyer shipyard in Papenburg, Germany, in 2017 for outstanding coopera-

> ABOUT D-I DAVIT INTERNATIONAL-HISCHE GMBH

d-i davit 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.

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Turnkey fire protection at sea

MINIMAX | At sea, safety is of the utmost importance because in the event of fire, rapid escape is usually impossible, and the prompt arrival of outside help is often unlikely. A dependable fire protection system helps to save lives, valuable possessions and the environment.

Apart from many fire risks, panic and compromised manoeuvrability are further typical sources of danger after a fire and must be taken into consideration when choosing an extinguishing system. Full-service provider Minimax offers fire protection from planning through to realisation and takes

special requirements for the wide range of possible fire risks on ships into consideration.

Minimax practically provides the entire fire protection system supply chain, ensures systems are state-of-the-art and function dependably when needed, and constantly innovates. It begins with ongoing research and development work, risk analysis and technical design, extending to in-house production of key components, and planning and installation of bespoke fire protection systems by expert engineers. Then components need to be approved, documents submitted to clas-



Minifog marine XP series

Source: Minimax

sification societies and systems accepted during the commissioning of a ship. After-sales support includes regular inspections, maintenance and servicing of systems.

Expert teams design and develop appropriate tailor-made fire protection systems in accordance with the relevant safety regulations of national and international classification societies as well as SOLAS and IMO recommendations. Minimax's Minifog marine XP system, for example, can protect machinery spaces up to 8,235m³ in volume, with the new nozzle generation only requiring 0.077L/min/m³, which corresponds to water savings of up to 90%. As one nozzle can protect up to 32m² of cabin surface, significantly fewer sprinklers

are required compared with earlier traditional systems. The use of the Minifog marine XP water-mist system satisfies the demand for minimising space and weight on ships whilst also guaranteeing the highest safety requirements, Minimax says.

The company also offers alternative systems for use in engine rooms on ships and platforms – the MX 1230 marine extinguishing system with the proven and tested clean agent Novec™ 1230. As this extinguishant is neither corrosive nor electrically conductive, no damage can result in the engine room from short circuits or residue on sensitive components. This makes the MX 1230 marine system perfectly suited to protect sensitive components effectively and economically.



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> ABOUT MINIMAX

For more than 110 years, Minimax has been one of the leading brands in fire protection. The Minimax Viking Group employs more than 8,800 people worldwide. The group, headquartered in Bad Oldesloe, Germany, has several research, development and manufacturing facilities. Whether for automotive plants, power plants, logistics centres, office and administration buildings, data centres or on ships, Minimax provides tailored systems wherever there is a fire threat. A comprehensive range of after-installation services completes the company's offering. www.minimax.com



Lightweight doors for cruise vessels and ferries

PODSZUCK | Kiel-based Podszuck specialises in the manufacture of an extensive range of fire doors for the maritime sector. The doors can be used in interior and exterior areas of all types of vessels including yachts, cruise ships and commercial vessels as well as offshore energy platforms and other floating units. The flush internal lightweight A30/A60-door LMD-HSL 1(-30) has successfully completed testing and has been certified by DNV GL. The single-leaf hinged door is constructed with lighter and thinner insulation so that the door leaf thickness is only 42mm or 48mm including door-leaf U-profiles, making it suitable for vessels including ocean and river cruise vessels,

yachts and ferries. The maximum clear opening of the A30-type is 1357 x 2530mm with a maximum clear-opening area of 2.85m² (IMO MSC.1/Circ. 1319). The maximum dimensions of the A60-door amount to 1180 x 2200mm with a maximum clear-opening area of 2.59m². Like all Podszuck doors, the new unit is available with different sill and frame designs, including windows, magnets, door closers, different surfaces (galvanised and primed, stainless steel 304 and 316, laminated, foil-coated or painted), bridge indication, sealing, panic solutions and a vast selection of locks, handles and plates. All doors are 100% custom-made in Kiel, Germany.



As one of Europe's leading manufacturers of highly resistant doors for marine structures, Podszuck ensures the high quality of its products by extensive testing

Source: Podszuck

> ABOUT PODSZUCK

Podszuck GmbH, originally established in 1919 and headquartered in Kiel, specialises in the design, engineering and manufacture of highly resistant doors for ships and marine structures including container vessels, cruise ships, ferries and yachts as well as offshore platforms. All fire doors are certified by leading classification societies and regulatory authorities including ABS, BV, GL, LR, RINA, RRS, SBG, TC and USCG.

www.podszuck.eu



MASCHINEN



BAUER Maschinen Group is the world market leader in specialist foundation engineering equipment and in equipment for exploration, development and exploitation of natural resources.



Smart lifting point enhances safety

RUD | German-based specialist for sling and lashing technology, RUD, has launched a hoist ring with an innovative spring mechanism to enhance safety. The mechanics of the new RUD ACP-Tornado ensure that the lifting point always turns immediately in the direction of the load when it is raised, preventing the bracket from stopping suddenly with dangerously high shear forces. The system also prevents the risk of the load falling as a result of the sudden turning of the bracket. In addition, through its optimised design and special screw technology, the lifting point allows maximum working loads that are up to 30 % higher.

Apart from its improved safety, the RUD ACP-Tornado also offers handling benefits. As a result of abrasion lenses at the critical points of the load transfer, it is easy to determine whether the anchor point has already reached discard criteria. Furthermore, the combi-head screw is undetachable but changeable, a useful feature because it simplifies handling. The new RUD ACP-Tornado is currently available with screw diameters M12/1/2", M16/5/8", M20/3/4", M24/1" and M30/1 1/4".

„Our new lifting point will be welcomed everywhere where smart design, safety, high load capacities and efficient handling are the top priorities,“ said Hermann Kolb, head of Division Lifting and Lashing at RUD. The target markets include engineering, equipment manufacturing, tool construction, the automotive industry,



The RUD ACP-Tornado offers significant handling benefits Source: RUD

the plastics industry and companies engaged in oil and gas, and renewable energy.

Since extensive testing of lifting tackle and legally secure documentation are now required by many countries, RFID transponders are installed as standard. This allows the RUD ACP-Tornado's lifting point to be identified clearly by a factory-set ID number and to transfer this by laptop or mobile device to corresponding software tools. This process reduces inspection time and costs and ensures improved process reliability because faults can be avoided.

Users of lifting tackle can either manage test data and documents in their own databases, or they can use the cloud-based resource management tool Aye-D.Net. This is available from the RUD Partner Syfit.

Designed specially for marine and offshore applications, the RUD VIP Grade 100 Chain Slings (6-22mm) mecano system components, as well as the popular RUD lifting points ABA, VLBG and VLBS are now type-approved by DNV GL. The Type Approval certificate demonstrates compliance with DNV GL's latest standards for lifting appliances – DNV GL-ST-0377 for shipboard lifting and DNV GL-ST-0378 for offshore lifting. These lifting points are commonly used in marine equipment, machinery skids and other applications requiring lifting and installation in marine and offshore environments.

› 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

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Senior Product Manager at WISKA

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RC-S and RC-SP radio-controlled remote-control transmitters and receiver
Source: JDN

New radio remote controls for hoists and cranes

J D NEUHAUS | A leader in air hoists, cranes, trolleys and monorail hoists, J D Neuhaus (JDN) has further enhanced its remote-control capabilities. Three remote-controlled models are now available, RC-X, RC S and RC-SP, each comprising of a transmitter and receiver which can either be integrated in an existing JDN system or directly combined with a new JDN hoist.

One of the many advantages of the new JDN receiver is its rigid and extremely compact design. All components are housed in a space-saving, shock-resistant glass-reinforced plastic casing featuring protection class IP65 (dust and water protected). A breathable membrane guides any condensation away from the interior to the exterior. The design is also resistant to sea water for off-shore applications. The radio remote-controlled model RC-X is even suitable for use in potentially explosive environments rated up to ATEX zone 2/22.

Consideration has also been given to ease of installation, JDN says. Even existing JDN hoists and cranes can be retrofitted thanks to the standardised interface of the JDN remote-controlled units. The receiver can be mounted directly on the hoist or the trolley, or individually on site. The compact design of the receiver also makes it suitable for hoists with low carrying capacity.

Tailor-made systems to meet specific customer needs are also available. Up to 20 hours of use is possible before recharging the portable transmitter becomes necessary.

Perfect for covering long distances between hoist and operator, the JDN remote-controlled systems represent a sensitive alternative to applications with long control hoses. In addition, the units can also be used in hard-to-reach places and for simultaneous control of multiple hoists.

> ABOUT J D NEUHAUS (JDN)

JDN located in Witten, Germany, has over 200 employees worldwide and is a manufacturer of pneumatic and hydraulic hoisting devices and crane systems. The products are characterised by their ability to move loads of up to 115 tonnes steadily and reliably, even under the most extreme conditions. This also includes protection against explosion.

www.jdngroup.com

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Media Group

Durable switchgear for offshore and onshore applications

STEUTE Switching devices in the Steute 'Extreme' range are developed specially for use in rough environmental conditions, including damp, dirt, high or low temperatures, high pressure cleaning and the long-term impact of salt water.

Extrême temperatures, salt water, algae and barnacle growth, permanent vibration, explosive environments: in maritime applications, switching devices are exposed to high levels of wear and tear. However, laboratory tests are not always realistic enough to prove the suitability of devices for shipping applications. All switching devices in the Steute 'Extreme' range are developed especially for use in adverse environmental conditions. These conditions include damp, dirt, high or low temperatures, high pressure cleaning or, especially in maritime applications, the long-term impact of salt water and/or salt spray.



Extreme switching devices are tested in standardised laboratory conditions – e.g. for splash water protection and corrosion resistance
Source: Steute Technologies GmbH & Co. KG

Specially developed for extreme conditions

The sensors and electromechanical switching devices in this product range differ from „normal“ industrial switchgear in many constructional details – for example special sealing or the use of reinforced plastics and salt water-resistant aluminium with special coating for the housings. Screws and other fastening elements are made of stainless steel.

For some applications – including oil rigs, as well as tankers for oil, natural gas and other fuels – they also meet the requirements for explosion protection.

Extensive testing process

The Steute range of switchgear and sensors for these special environments is

extensive. During the development process, the suitability of these products for such adverse environments must of course be tested and proven. The tests take place in the Steute laboratory or on the premises of specialised third-party service providers – and always in standardised conditions that can be reproduced at

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any time. To name just one example, the salt spray tests to check the behaviour of the switching devices in corrosive atmospheres are performed to the DIN EN ISO 9227 standard.

Differences between laboratory and real life

However informative such standardised tests may be, they do not necessarily reproduce real-life situations, as has been proven scientifically, Steute says. This is partly due to the fact that corrosion tests take place in constant conditions, whereas in practice the level of wear and tear can change radically (temperature, humidity, currents and tides, pounding waves etc ...).

Because they are more realistic, corrosion tests in changing and yet defined real-life conditions are therefore desirable. This option is provided by IFAM (Fraunhofer Institute for Manufacturing Technology and Advanced Materials) at its external testing facility on the North Sea archipelago Helgoland. Here components can be tested in „real“ quayside conditions which are dynamic and subject to changes in the weather. Testing can also include additional factors such as fouling, including the growth of algae and barnacles.

Outdoor testing facilities

In order to investigate the suitability of its 'Extreme' switchgear for such applications, Steute commissioned IFAM in Bremen to conduct 12-month outdoor tests on Helgoland. Several examples each of selected Extreme product series – including position



Source: Steute Technologies GmbH & Co. KG

Laboratory tests are complemented by real-life tests: interim analysis after six months, during one-year outdoor testing of Extreme switchgear in maritime conditions

switches, foot switches and emergency pull wire switches – were mounted on the exposed South mole at splash water level for one year. Some devices were also installed in tidal waters where water levels are constantly changing, in order to assess their limitations in the real-life conditions of the North Sea at low and high tide.

Proven suitability for salt water

The tests were recently completed. After one year in saltwater and splash water, both the outward appearance of the switching devices and conducted performance tests demonstrated the salt-water resistance of all devices in the different product series. The reinforced plastic housings were in particularly good condition, Steute noted, whilst the coating system for the devices with metal housings also proved to be per-

fectly suited to maritime applications. Just a few minor points required improvement, and the improved devices, together with some new Extreme products, are now back on Helgoland for further testing.

> ABOUT STEUTE

Steute is a globally renowned specialist for the development and production of safe and reliable switchgear for complex and critical applications. The Steute product portfolio comprises a wide range of serial products, as well as numerous customised solutions, and is divided into four business fields, each with its own core area of competence: Wireless, Automation, Extreme and Meditec.

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Specialist machinery for deep-sea drilling

BAUER BAUER Maschinen designs and manufactures rotary drilling rigs, diaphragm wall equipment and all related tools. The company also provides equipment for exploration, mining and safeguarding of valuable natural resources on- and offshore.



The Dive Drill can dive into the pre-driven pile, clamp into it and drill out the material in the pile and/or drill through the obstacle under the pile

Source: Bauer

A specialist in foundation engineering machinery, Bauer Maschinen GmbH develops systems for the most varied projects both on- and offshore. The company has extensive experience in extraordinary construction projects and offers a broad equipment portfolio for the offshore sector including offshore foundations for renewable energy plant, exploration of the sea floor, and exploration for and exploitation of natural marine mineral resources.

Entering the market for renewable energy from the sea was a huge challenge, the company says. To undertake the foundation works for a turbine manufacturer who wanted to install a flow turbine in a test field off the Orkney Islands, Bauer had to develop a new type of rig that was set onto the sea floor by a special ship with a heavy-duty crane. The drilling and foundation works were then carried out via remote control from the ship.

With the company's experience in the development of underwater drilling rigs for flow turbines, Bauer also developed another new type of rig, the Dive Drill. Piling with underwater hydraulic hammers can quickly reach its limits if obstacles arise or the sea floor is too hard. The solution is not always bigger hydraulic hammers, which cause yet more underwater noise, but machines for drilling the piles and removing the obstacles.

QUALITY KEEPS HATCHES TIGHT

Example 10: Shipbuilding

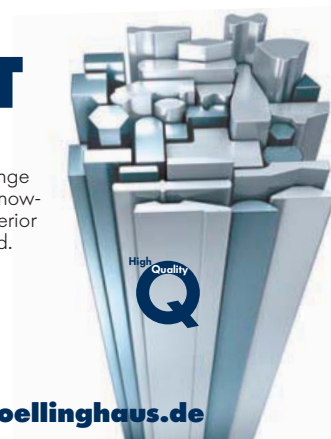
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The sea floor drill MeBo can work at a water depth of up to 2,500m and can drill cores up to 200m

As the name suggests, the Dive Drill can dive into the pre-driven pile, clamp into it and drill out the material in the pile and/or drill through the obstacle under the pile. This reduces piling resistance and the pile can then be driven to the previously calculated depth.

In addition to devices for foundation works, Bauer also has long experience in the manufacture of core hole drilling equipment. This technology can also be modified for applications on the sea floor, currently mostly for scientific applications, but increasingly for commercial applications in the future.

The sea floor drill MeBo is optimised for this market. It was developed together with the University of Bremen and has been successfully used in two different designs for years. It is designed for working at water depths of up to 2,500m and can drill cores up to 200m deep out of the sea floor. The cores obtained have a diameter of approximately 50mm and are stored in the drill in the barrel magazine until surfacing. The equipment is controlled from a unit on the ship and the data and power transmission is passed via a special cable with which the equipment is also set down and pulled up. At present, it is scientists that are using the MeBo, but the technology is also suitable

for mineral resource exploration, including huge underwater sulphide reserves. This ore can be extremely rich in copper, zinc and other industrial metals. The deposits are often located on the edge of continental shelves at water depths ranging from 1500m to 4000m, and their consistency is mostly rocky with a hardness of up to 40 MPa.

Together with the shipping company Harren & Partner from Bremen, Bauer has developed a new type of design for this purpose, which has been adapted for deep-sea drilling. This technology is operated with ships available from the Harren & Partner fleet.

> ABOUT BAUER

Bauer Maschinen GmbH designs and manufactures rotary drilling rigs, diaphragm wall equipment and all related tools and has been operating on the market as an independent entity within the Bauer Group since 2001. Together with its subsidiaries the group provides the full range of specialist foundation engineering equipment and equipment for exploration, mining and safeguarding of valuable natural resources.

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European shipbuilders need to launch a new digitalisation offensive focusing on the digital ship model as the basis for the digital twin Source: PROSTEP

CAD/PDM integration platform for shipbuilding

PROSTEP Product lifecycle management (PLM) specialist PROSTEP has developed an integrated platform concept which optimises processes in shipbuilding and operation and forms the basis for the creation of a digital twin.

European shipbuilders started digitalising their internal and cross-company business processes earlier than their competitors in the Far East, but the lead is narrowing. They therefore need to

launch a new digitalisation offensive that should focus on the digital product model, claims consulting and software company PROSTEP. The most important measure is the creation of a digital platform with in-

tegrations to all relevant IT systems. PROSTEP has developed a standard solution for this purpose.

The aim of digitalisation in shipbuilding is to create a digital product model that



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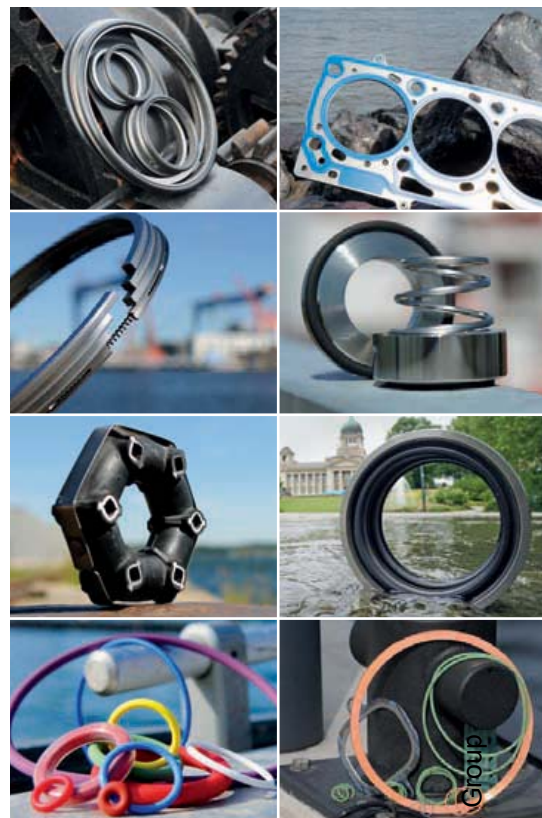
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When digital ship data is made available to classification societies and operators, the know-how and intellectual property of shipyards must be protected
Source: PROSTEP

can be used throughout the production cycle and reflects the exact construction status of the ship in all phases of its life cycle. This digital master, from which the later digital twin of the delivered product is derived, not only supports the optimisation of existing business processes, but also enables the development of new value-added services and service-oriented business models in conjunction with data from ongoing operations.

European shipyards, their suppliers and partners need to digitalise their business processes more consistently, PROSTEP emphasises. There are still gaps in the digital information flows, especially at the interface between development and production, but also when exchanging information with partners and suppliers and handing over ship documentation to owners and operators. A particular challenge here is the exchange between mechanical CAD systems and specific applications in shipbuilding such as AVEVA Marine, CADMATIC or NAPA, because these intent-driven systems do not record the explicit geometry, but only the way it was generated.

The different system philosophies not only make horizontal data exchange between the various CAD systems and downstream applications difficult, e.g. for production control, but also vertical integration with company-wide product data management and enterprise resource planning applications. The latter is a prerequisite for the consistent management of files, the comprehensible documentation of changes and the establishment of relationships with other information objects of the digital ship model.

Creating a digital platform

Where should European shipbuilders start with digitalisation measures in order to achieve quick benefits? PROSTEP sees three starting points for a sustainable digitalisation offensive: firstly, the creation of a digital platform; secondly, ensuring digital consistency; and thirdly, the digitalisation of business processes.

The integration of the various IT systems is the basis for efficient information flows and the continuous comparison of information statuses. PROSTEP has developed a data hub based on the OpenPDM integration platform to which many relevant shipbuilding-specific systems can be quickly connected in addition to standard CAD and PDM/PLM systems. The standard solution enables not only the administration of shipbuilding relevant data with common PDM/PLM systems like 3DEXperience, ARAS or Teamcenter, but also the transfer of models from mechanical to intent-driven CAD systems and vice versa.

Mechanical CAD data from CATIA V4, V5, V6 or Siemens NX can be prepared in such a way that they can be referenced and/or natively edited in intent-driven systems such as AVEVA Marine or CADMATIC. The converters developed by PROSTEP recognise the feature information contained in the geometry models and make the model available in any CAD system as native geometry. The solution supports both fully parametric and purely geometric conversion with the option of visually identifying the different quality of the results. Instead of converting geometry, it is also possible simply to reference the information in the component >

catalogues in the source and target systems and generate new geometry in the target system.

OpenPDM Ship makes a significant contribution to reducing the engineering effort. CAD data is easier to reuse, regardless of whether it was generated with mechanical or shipbuilding CAD systems. By retaining the design intent with all parameters, topological references, attributes or classification characteristics, maximum data quality is maintained during conversion. The conversion results are comprehensible and repeatable for the customer at any time, so that he can expand them step by step: from the exchange of reference geometry to the engineering roundtrip in a heterogeneous CAD landscape.

Digitalisation of business processes

The use of the integration platform is the prerequisite for a continuous, cross-system digitalisation of the processes in engineering, production, classification and operation, but does not automatically lead to the continuous use of the digital information objects. In addition, it must also be determined which information objects are required at which point by which process, who delivers them and where the transmission is currently hampered by media breaks. Based on value stream analysis, PROSTEP uses a standardised method to evaluate information flows and uncover redundancies, bottlenecks and interruptions. Improvement measures can be derived directly from the results of the analysis.

Based on the results of the information flow analysis, solutions for the digitalisation of business processes can be developed or implemented. PROSTEP has developed appropriate solutions for processes such as drawing-less



Based on its OpenPDM technology, Prostep has developed a standard solution for the end-to-end digitalisation of information flows in shipbuilding Source: PROSTEP

production, 3D assembly planning or the creation of electronic spare parts catalogues, which are also suitable for shipbuilding. There are also initial approaches to digitalising the paper-based process with the help of 3D PDF technology for ship classification (class approval).

Both classification societies and ship operators have a growing interest in the provision of digital ship data in order to process it further and enrich it with their own information. Of course, it must be ensured that the intellectual property of the shipyards is not endangered.

PROSTEP has the know-how and the technology to transfer only the information that the operator actually needs and to protect it with appropriate security measures.

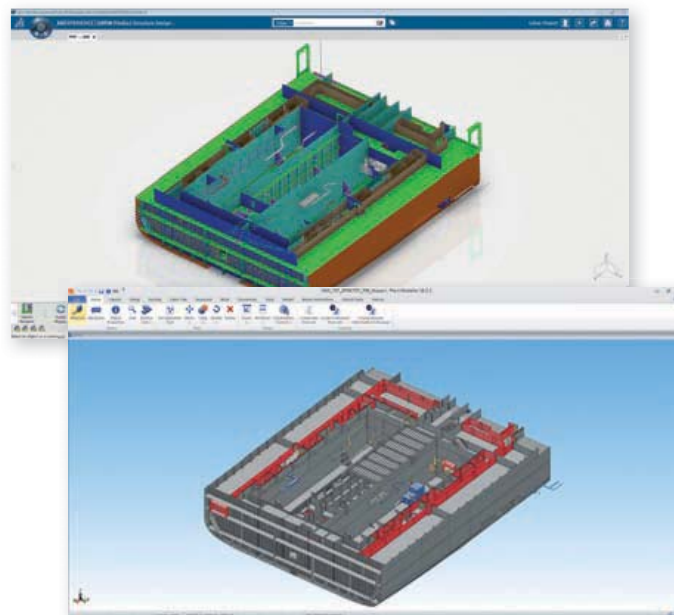
From digital ship model to digital twin

The digital models of the delivered ships form the basis for the construction of digital twins. Their use offers benefits to all stakeholders involved in the development, manufacturing, operation and use of ships, provided they are willing to share information. Digital twins enable:

- › more efficient operation and maintenance processes of vessels by operators;
- › new customer experiences for cruise line customers, e.g. through virtual tours;
- › development of new value-added services for spare parts logistics or predictive maintenance by classification societies;
- › optimisation of the next generation of ships, provided that vessel operators provide the shipyards with the operating data.

Shipbuilders, shipping companies and classification societies must therefore agree on how they can jointly master the challenges of digitalisation for the benefit of all. The technical solutions are available today.

PROSTEP not only offers companies in the marine industry a shipbuilding integration platform, but can also competently support them in defining their digitalisation strategy and implementing the necessary measures. The PLM consulting and software company is a recognised partner of the marine industry and counts renowned companies such as DNV GL, Lürssen, Meyer Group and thyssenkrupp Marine Systems (TKMS) among its customers.



One of the main obstacles for end-to-end digitalisation is the harmonisation of the different modeling philosophies of classical mechanical and shipbuilding-specific CAD systems Source: PROSTEP

› ABOUT PROSTEP

PROSTEP AG is a leading, vendor-neutral consulting and software company for any and every aspect of product life-cycle management (PLM). The company provides customers with support for their digital transformation and helps to prepare for Industry 4.0. The portfolio includes PLM strategy consulting and process optimisation, system selection and implementation, PLM integration and migration, as well as secure data exchange and conversion. www.prostep.com



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With Synapsis NX, Raytheon Anschutz unveils a new standard for integrated navigation systems
Source: Raytheon Anschutz

The innovative NX Generation of navigational software

RAYTHEON ANSCHÜTZ Navigation specialist Raytheon Anschutz unveils a new generation of navigational software. The new Radar NX and ECDIS NX software complete the Synapsis NX series of innovative, user-friendly, and safe bridge navigation systems that offer assistance for ships' crews in demanding situations.

At a time of unprecedented digitalisation aboard ship, navigators and ship operators still rank simple operation and intuitive, easy-to-use user interfaces at the top of their wish list. This is not surprising as "human error" – for example false situation assessment and wrong decision-making caused by poor or inconsistent presentation of data, confusing operation, or workload – has been named in many investigations as a main cause of accidents in global shipping.

The new ECDIS NX and Radar NX software was developed leveraging the expertise of experienced navigators and specialised user interface designers.

According to Raytheon Anschutz, the software stands out with its consistent user interfaces, its unparalleled intuitiveness in use, and its improved situational awareness. The operational concepts were developed to meet the expectations of operators and support their common interaction patterns with regard to daily tasks and use cases.

The software is flexible to adapt to new use cases or integrate new functions, without overloading the display or overwhelming the user – important prerequisites in times of wider digital functionality on the bridge.

ECDIS NX and Radar NX

ECDIS NX has earned valuable user feedback, noting its unparalleled intuitiveness in use following its introduction last year, the company said. ECDIS NX includes smart functionality to simplify routines.



For example, users can decide to hide panels with indications or operation controls to have a maximised chart window in support of route monitoring tasks. As another example, route planning is now a wizard-guided process and utilises intuitive principles such as drag-and-drop for waypoints.

Other feature enhancements include a self-explanatory route manager and comprehensive voyage planning tools including interfaces to ship-shore data exchange.

Radar NX delivers customers optimised performance in tracking and anti-clutter processing. It can also include an advanced, smart radar video merging function, which integrates the video of multiple radar transceivers into a single, unobstructed radar video.

The optimised grouping of data and current settings provides operators with clear situation awareness. They benefit from a superior non-distracted overview, accurate situation awareness and a fast interpretation of the radar picture.

The radar software is scalable to include additional functionality beyond basic IMO

standards to support special customer requirements such as helicopter tracking and guidance. The software can also be combined with solid-state surveillance radars.

Smart functionality beyond

Synopsis NX is based on modern and modular software technologies in order to become the platform for the digitalised bridge of the future. Many new helpful functions and services are made available for the navigation bridge, assisting the crew and leading to new levels of safety and efficiency. A

new kind of “artificial intelligence” ensures consistent use of data, targets, and consistent alert-handling throughout the system.

Sensor data, for example, is analysed, checked for integrity, bundled and distributed as the most reliable data set to any connected workstation. Targets are observed in the background and presented with a consistent designation on any radar or ECDIS display. And finally, a central bridge alert management system collects alerts in the network and determines, with regard to system configuration and status, whether the situation is sufficiently critical to set off an alarm, or whether the officer-on-watch should only receive an alert of lower priority.

These benefits must not be limited to new ships, states Raytheon Anschutz. Any of the new Synopsis NX applications – even if installed as a stand-alone version – already includes smart functionality and is well prepared to implement future digital features such as assistant functions for collision avoidance, route planning, harbour docking and much more.

> ABOUT RAYTHEON ANSCHÜTZ

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Source: Phoenix Contact

Boosting savings potential with performance monitoring

PHOENIX CONTACT With PSMnet, Phoenix Contact offers a performance monitoring system that supports cooperation between the crew on board and employees on shore through continuous online monitoring.

One essential criterion for economic fleet management is the fulfillment of all transport tasks with minimised operating costs. To achieve this goal, increasing the cargo capacity of new ships appears to be an obvious approach. But savings potential can also be leveraged aboard ships within the existing fleet. Determining such optimisation strategies requires the recording of hard technical data and the financial costs of

shipping operations, in addition to interdisciplinary expertise. Performance monitoring systems are a proven tool when it comes to supporting technical and commercial personnel in this task.

For recording and documenting measured values, conditions and events on board, various procedures and tools are usually available in individual areas of the ship. In the reports, basic data from the various sectors are compiled and then re-

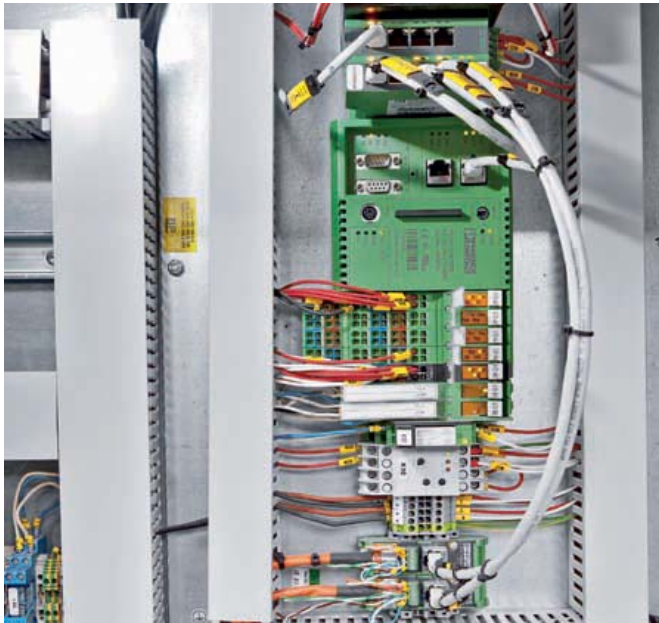
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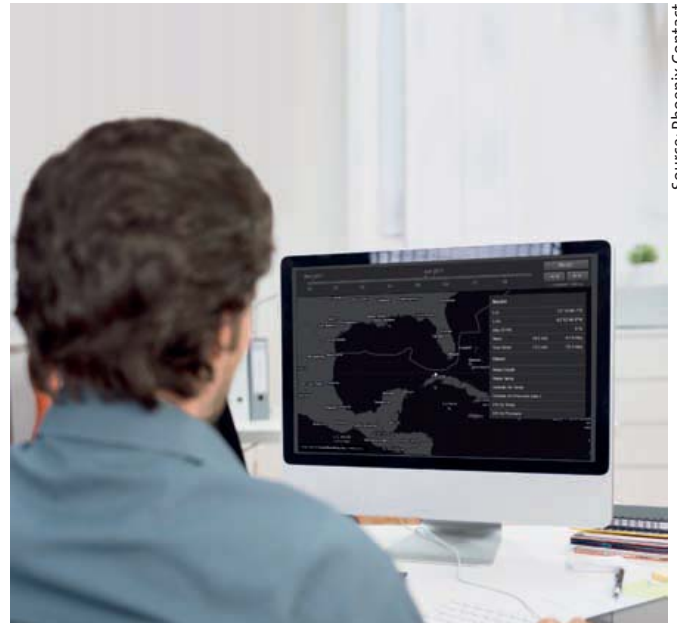
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Source: Phoenix Contact

Automatic measurements replace manual reading of the values



Source: Phoenix Contact

Monitoring the essential performance data over the entire fleet

ported on shore. This information already allows a rudimentary evaluation of the ship's performance. The options for digitalisation on board combined with powerful satellite connections provide the basis for fine-granular data acquisition. The options that new or optimised technologies bring are ideal for the transition to a digital performance monitoring system. This is mandatory for putting obligations for verification into practice and implementing in-house corporate efforts to produce greater transparency.

Manual or automated acquisition

Not all analogue or manual processes have been transferred to the digital world, however. The performance monitoring PMSnet from Phoenix Contact therefore provides the unique opportunity for a combined supply of relevant data through manual input via web-based user interfaces, as well as via the automated collection of measurement data. Whatever the source of data, all information is gathered in a data pool with unified time base and self-consistent data formats. This type of data recording forms the basis for all further calculations and is thus the prerequisite for ship analysis and comparability over whole fleets.

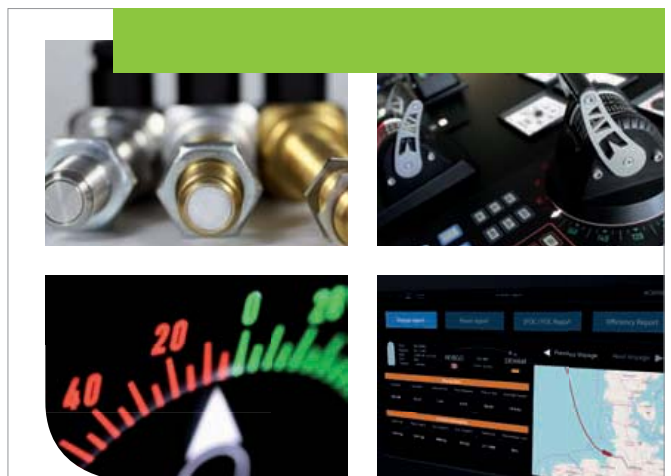
On board, PMSnet provides support for enhancing work sequences and implementing repetitive tasks. The automatic acquisition of the values saves crew members from tracking data on locally installed displays. The data is displayed in the daily reporting templates to be completed by the crew, which minimises manual mistakes and saves working time.

Daily updated fuel/lubricant stocks

With PMSnet, employees on shore also have a powerful tool. All essential operating data, status information, parameters of the ship, calculations and saved documents are available for evaluation in a single environment. The system permits both the detailed individual consideration of a ship and the assessment of the entire fleet.

Moreover, there are also other benefits. In the shipping industry, fuels and lubricants represent a significant cost factor. How-

ever, differences between target and actual values occur frequently during the bunkering process. With PSMnet, the stocks of the various fuels stored on board are available daily on shore and can be checked if necessary.



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Source: Phoenix Contact

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In addition, the consumption of fuels and lubricants proves to be an important parameter for evaluating a ship's efficiency and is therefore important in contractual arrangements between ship operator and charterer. In the charterparty, the estimated consumption of fuel during a sea voyage is defined in the context of certain framework conditions. If disputes occur, PMSnet brings clarity by providing a consistent collection of all parameters that can then be reviewed in one evaluation process.

Relevant and meaningful before-and-after evaluation

Ships' fuel consumption and greenhouse gas emissions are directly related. To fulfill the regulatory demands of the European MRV (Measuring, Reporting and Verification) and IMO-DCS (International Maritime Organization Data Collection System), all shipping lines are obligated to record their complete emission-relevant data. As an alternative to direct measurement of emissions, they can transmit data on consumption, the distances travelled with the associated events, and the cargo transported, to the authorities. As a reporting tool, PMSnet provides these data free-of-charge and thus takes the burden for collecting the necessary information away from fleet managers.

The users of performance monitoring systems can also use the data recorded to evaluate constructional measures and

modifications performed by carrying out a before-and-after evaluation of an external coating, the modification of engine parameters or the accounting of electrical consumers. The Hull Inspection function records the relevant data (fouling, cleaning, painting) subdivided into the individual ship areas such as hull or propeller, including photo documentation. PMSnet thus makes an important contribution to increasing efficiency. If an individual compilation of the data is required, the system provides customer-specific reports in various data formats - for example as a pdf or an email.

> ABOUT PHOENIX CONTACT

Phoenix Contact is a worldwide market leader of components, systems and solutions in the areas of electrical engineering, electronics and automation. Founded in 1923, the company's product range includes terminal blocks and plug connectors, cable connection technology and installation accessories. Electronic interfaces and power supplies, automation systems on the basis of ethernet and wireless, safety solutions, surge protection systems as well as software programs and tools provide installers, system operators and device manufacturers with comprehensive systems. www.phoenixcontact.com



Increasing passenger comfort and energy efficiency through smart cabin control

BECKHOFF | Smart cabin control requires that exceptional passenger comfort, simple operation and energy efficiency all go hand-in-hand. Beckhoff's compact BC9191 single room controller is a cost-effective device for individual cabin control. It features pre-installed standard functionalities covering all the requirements for individual cabin control, thereby simplifying commissioning and maintenance. It directly integrates with input/output components and cabin control units.

An affordable CP6606 Panel PC from Beckhoff with seven-inch touchscreen serves as an all-in-one human-machine interface and control unit that communicates, for example, via BACnet or Modbus. The openness of PC-based control facilitates the integration of third-party devices and the integration of cabin management with higher-level control systems to enable, for example, synchronised control of all HVAC systems on a ship. This ensures optimum comfort while at the same time significantly reducing the energy consumed by climate control systems. This can constitute up to 30% of total energy consumption on a passenger ship.

Since PC-based control supports such diverse standards as BACnet, Modbus, KNX, and SMI or DALL, DMX, sACN, OCA, and PJLink, it not only provides



Smart cabin control offers the combined benefits of passenger comfort, simple operation and energy efficiency

Source: Cunard Cruise Line

connectivity for HVAC and cabin automation, but also for integrated control of AV and multimedia systems, or even entertainment systems in stage shows and media staging on cruise ships, for example.

IoT cloud connectivity for data storage and analysis purposes and convenient speech-based control are easy to implement with the comprehensive TwinCAT automation software suite. For an easy engineering process, the TwinCAT Building Automation software offers system integrators a complete solution that significantly reduces engineering time while offering maximum flexibility.

> 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 on passenger ships, PC control also facilitates the flexible and cost-efficient implementation of measurement technology, engine monitoring and condition monitoring.

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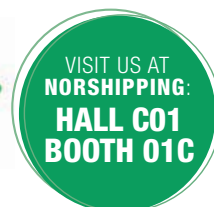
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Wireless sensor system for condition monitoring

NORIS The smart solution provider in the fields of sensors, signal processing, automation and suitable visualisation regarding propulsion control and ship technology has unveiled its new sensor technology NORIFID. The system is an innovative wireless measurement transmission system suitable for condition monitoring and predictive maintenance.

In 2018, Noris Group GmbH presented its concept of a new wireless sensor system: NORIFID. The name itself refers to the RFID technology that has been integrated into this innovative product.

The telemetry system includes a reader and transponder designed to transmit measured values from moving parts wirelessly. The measuring elements operate independently and have their own wireless energy supplies. NORIFID therefore opens up new perspectives for condition monitoring as well as for measuring wear in predictive maintenance applications. Measurements can thus be taken from moving parts which had previously been impossible or possible only with great effort using conventional methods. Last year, NORIS also expanded the sensor system to measure torsion.

Ready for series production

Suppliers of wind, marine and offshore systems showed particular interest in the technology. Several joint projects were established which have resulted in the sensor system now being ready for market and series production. By working together with renowned gear manufacturers, the sensor system

was successfully tested for measuring bearing temperatures such as those in planetary gears. Bearing loads were measured during operation to deliver information about the condition of gears and maintenance cycles.

Excessive bearing loads can also be reliably detected and corrective action initiated. This enables bearing sizes to be reduced without the risk of operational failure. In addition to measuring temperatures in big-end bearings and planetary gears, the sensor system can also be used to measure rotor winding temperatures in electric motors. This enables precise determination of operating points so that rated powers can rise significantly without increasing the size of the unit.

Functionality

NORIFID's operation is as simple as it is innovative, the company says. Wireless energy and data transmission is achieved by inductive coupling via an alternating magnetic HF field (13.56 MHz RFID). The reader consists of a transformer, electronics for analysis, and a signal converter. Voltage is supplied from an external source. The transponder is fitted with a transformer, an integrated circuit, and a measuring component



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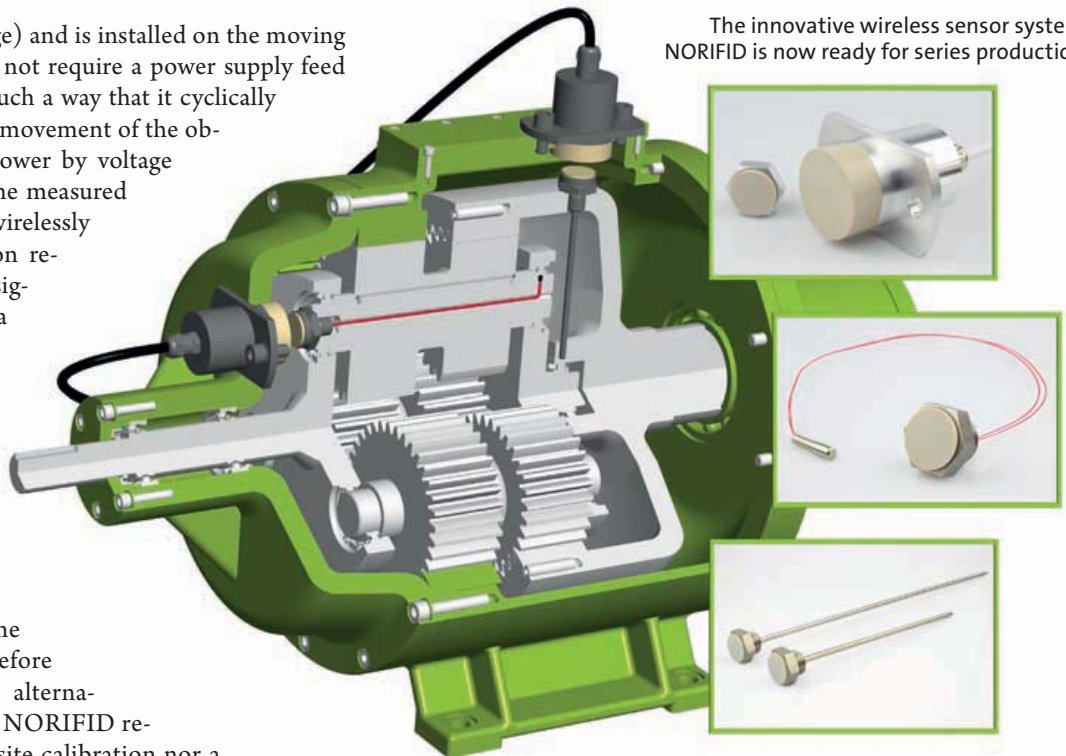
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(e.g. a Pt100 or a strain gauge) and is installed on the moving part. The transponder does not require a power supply feed because it is positioned in such a way that it cyclically passes the reader due to the movement of the object and is supplied with power by voltage induction. It then records the measured values and transmits them wirelessly to the reader. Depending on requirements, measurement signals can be converted into a voltage or current signal and output by the reader.

User-friendly range of variants

The benefits of the innovative sensor system lie in its compactness as well as in the application of proven technologies. The telemetry system is therefore also a more cost-effective alternative to radar-based systems. NORIFID requires neither complex on-site calibration nor a downstream evaluation unit. The reader's size and design are very similar to a conventional sensor and can therefore be placed on engines and gears in a space-saving and easy way. The compact transponder and sensors are simple to adapt to the circumstances of the measuring object and NORIS can already provide many variants for different types of application. Versatile options to extend the product also make the telemetry system highly flexible. For example, several transponders can be evaluated using one reader, and measured values can be continuously recorded in almost real time by attaching antenna bands to shafts.



The innovative wireless sensor system NORIFID is now ready for series production

Source: Noris

> ABOUT NORIS

Since 1925 the Noris Group, Nuremberg, has been one of the leading manufacturers in the field of measurement and automation for shipbuilding and transport technology. Its product range includes sensors for the measurement of speed, temperature, acceleration and pressure, using devices for signal processing and visualisation. The company also provides complete automation systems for remote control and monitoring of ship propulsion and auxiliary systems. www.noris-group.com

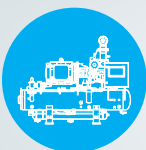
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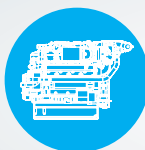
Gear Pumps, Valves and Flow Measurement for

Compressors



- Lubricating oil gear pumps
- Oil pressure control valves

Engines



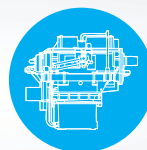
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- Fuel pumps
- Pressure relief and regulation valves
- Flow meters for lubricating oil and fuel measurement

Fuel and Oil handling Systems



- Fuel pumps and valves
 - Flow meters for fuel measurement
- (for boosters, burners and separators)

Gearboxes



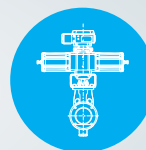
- Lubricating oil gear pumps
- Pressure relief valves for lube oil monitoring
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CBM: tamper-proof for maximum security

Source: RWO Veolia



Link's easy to read interface

Source: RWO Veolia

Intelligent bilge water monitoring system

RWO VEOLIA | Shipping 4.0 offers vast opportunities for systems maintenance. Live data communications will enable the current status of the ship to be reported and the future status to be accurately predicted. The key term here is predictive maintenance which will enable shipping companies to operate their fleets safely, cost effectively and especially sustainably.

Since 1973, the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78) aims to protect the oceans and seas from harmful substances. Annex I was introduced in 1983 and deals with discharge of oil overboard, not only in the context of accidents but also with regard to the treatment of engine room bilge water. However, with the help of digitalisation, it is now easier than ever for ship owners and operators, as well as crew members, to ensure that the regulations for environmental protection are met.

RWO's contribution to greener shipping in the area of bilge water is the addition of a new Oily Water Separator (OWS) Controller and an intelligent Clean Bilge Monitoring System, CBM-Link. The new OWS Controller enables real-time monitoring of the system's data. The crew now has access via a LAN interface and can provide information to authorities and classification societies in the form of data

logs. This allows easy documentation as to whether the systems have been operating in compliance with legal requirements. Additionally, the crew on board can use the data to improve workflows and working conditions. An easy-to-use touchscreen gives a simple, real-time overview of the system information, such as parts per million (ppm) value of the

bilge water and valve position, allowing for timely adjustments and maintenance. To complete the bilge water management offer, RWO has introduced CBM-Link. CBM acts as the final level of control before bilge water is discharged. The compact system has a three-way valve which allows the inflow of treated bilge water and clean drains. The system independently monitors whether the maximum oil content of, for example, 0.5 or 15 ppm in the water being discharged is complied with and automatically discharges it either directly overboard or to the bilge water tank for further treatment.

All modes of operation, valve positions, system configurations and ppm levels can be visualised and read via digital and analogue interfaces. The system is tamper-proof and prevents the unlawful discharge of oil-contaminated water, protecting ship operators from major fines.

LINK is a software system which provides and stores detailed information about the operation of the system as well as the composition of the bilge water. The information can be visualised in real time, enabling timely adjustment of system modes. Link is also able to send the information ashore where it can be analysed and used to predict when maintenance or spare parts are needed. This enables the staff to plan ahead to optimise the supply chain.

> ABOUT RWO VEOLIA

Bremen-based RWO, the technology brand of Veolia Water Technologies for marine water treatment, is a leading supplier of systems for water and waste water treatment aboard ships and offshore rigs. The product portfolio includes the treatment of drinking and process water, oily water, ballast and waste water, as well as a comprehensive range of after sales services.

www.rwo.de

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Flexible power electronics for maritime applications

LIEBHERR The Liduro Marine LCM 300 is a new low-voltage frequency converter and can be used in applications with a drive power range from 110 kW to 5 MW and voltages from 380 V to 690 V. The company claims that the system can cut energy consumption and emissions, increase manoeuvrability in ports, and through various different configurations, enable more operational flexibility.

A new frequency converter system developed by Liebherr offers improved efficiency and high flexibility. The low-voltage frequency converter system, Liduro Marine of the LCM 300 series, was unveiled at SMM 2018. It features a power range from 110 kW up to 5,000 kW and a voltage range of 380 V to 690 V. The system is ideal for use in main drives and manoeuvring thrusters on ships, as well as in winches and drives on maritime cranes, the supplier says.

The benefits of an electric drive system lie particularly in partial-load operation as a result of its improved efficiency compared to traditional systems. This is a significant advantage



Low-voltage frequency converter Liduro Marine for application in the maritime industry Source: Liebherr

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Liebherr Liduro power modules of the LCU 300 series are available in two different sizes Source: Liebherr

as electrification is playing an increasingly important role in the maritime industry today. Manufacturers and operators of drive systems are under growing pressure to cut operating costs and reduce emissions. Moreover, a further advantage of an electric drive is its higher manoeuvrability, particularly for docking operations in ports due to its variable-speed and stepless operation.

The core components of Liebherr's new system are the high-power electronic modules of the new LCU 300 series. The high-efficiency, liquid-cooled modules provide remarkable performance due to their exceptional power density of up to 13.5 MW/m³ and an extensive power range from 110 kW to 2,000 kW in just two sizes. According to

Liebherr, fast and reliable protection functions ensure a secure and long service life. The power modules can be configured as drive or regeneration units.

A considerable benefit of this system is the high flexibility offered by individual drive solutions, even in compact installation spaces. This offers a wide range of possibilities for integration and layout within a control room or distribution station. Liebherr energy storage systems, motors and generators can easily be connected to frequency converter cabinets, thereby increasing system efficiency.

The frequency converter systems fulfil the requirements of the International Association of Classification Societies (IACS).

> ABOUT LIEBHERR

The Liebherr Group comprises eleven product divisions that help shape technological advances in numerous industries. One of them, the Liebherr-Component Technologies AG, headquartered in Bulle, Switzerland, specialises in the development, design, production and reconditioning of high-performance components for mechanical, hydraulic and electrical drive and control technology.

www.liebherr.com/frequency-converter-system

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By using pioneering cloud technology, ship operations and operating procedures in harbours can be optimised and secured

Source: WAGO

The cloud for smart ocean routes

WAGO Deliver, collect, analyse and use data. In addition to the PFC100 and PFC200 IoT Controllers, WAGO is expanding its digital performance portfolio with the new WAGO Cloud, pioneering technology that will enable the shipping sector to function more efficiently.

Using cloud communication opens up new networking opportunities for the shipping industry. This offers potential for optimising performance, for example, through fuel consumption monitoring or predictive maintenance applications. These allow users to detect faults and to initiate repairs before malfunctions can lead to serious damage or failures, potentially affecting ship operation, with possible off-hire, for example. In any case, shipping companies have been obligated to monitor a number of key figures since the EU “Measuring, Reporting and Verification” regulation came into effect in 2018.

For ship operators, WAGO Cloud, which manages and monitors all WAGO PFC Controllers as well as their applications and data, at any time and from any location, serves this purpose. A web portal functions as a user interface for the cloud service hosted by Microsoft Azure. A dashboard displays texts, tables, diagrams, display elements and command buttons for convenient and intuitive operation. The OPC UA protocol is provided for direct communication between the automation

and the higher-level control systems. The encrypted MQTT protocol is also included for communication with the cloud solutions.

A cloud Solution in just a few steps

Both the WAGO I/O-SYSTEM 750 and 750 XTR connect to sensors, and a PFC Controller transmits the data. The newest PFC generation is IoT-ready out of the box and has all the necessary maritime certifications, as well as approvals for use in hazardous areas. IEC programming of one application transforms the controllers into IoT devices in just a few simple steps. These allow status information such as Run/ Stop, connection status, device information and variables defined in the IEC program to be transmitted to the cloud and visualised. This means that sensitive data does not leave the company.

Thus, the WAGO PFC100 and PFC200 Controllers form the platform that links elements from the real and digital worlds. These modular and scalable controllers collect every



Everything at a glance – the effect of digitalisation is clearly visible in ship control centres. Cloud connectivity provides new opportunities for networking in the shipping industry. Source: WAGO



Wago considers cybersecurity to be a mandatory criterion for digitalisation. The PFC100 and PFC200 IoT Controllers comply with the highest security requirements. Source: WAGO

field signal, communicate in all common industrial protocols and even enable cloud connection of sensors and actuators that themselves have no internet interface.

One requirement for having data available globally and around the clock using cloud technology is stable internet access. What happens if this is interrupted while a ship is at sea? Or if a power failure occurs? Then even the data cached in RAM memory is lost. Therefore, WAGO offers an option to back up data in unstable situations: the information can be buffered on an SD card and sent to the cloud later, once a connection has been established again.


Secure protection from hackers

The ability to view process data from anywhere in the world – it sounds practical, but is it secure? WAGO considers cybersecurity a mandatory criterion for digitalisation. The PFC100 and PFC200 IoT Controllers therefore comply with the highest security standards, as they encrypt data via SSL/TLS 1.2 security protocols directly in the controller. They also optionally transmit data securely to higher-level systems via OpenVPN tunnel. The Linux®-based WAGO Controllers have integrated security mechanisms to prevent cyber crime. Security is an important prerequisite for ship-to-land communication, and also for data recording, controlling, monitoring and networking in subsystems on board ship.


> ABOUT WAGO

The WAGO Group is an international, standard-setting supplier of electrical interconnection and automation products and interface electronics. The family-run company is a market leader in spring pressure connection technology. WAGO has continued to grow since being founded in 1951, with a current worldwide workforce of around 8,000, with more than 3,500 of these in Germany at its headquarters in Minden (North Rhine-Westphalia) and in Sondershausen (Thuringia). The company achieved sales of EUR 862 million in 2017. www.wago.com






As a member of the WAGO Group, the software developer M&M also serves as a partner in industrial and technical software systems. M&M collaborates closely with Microsoft on digital topics, like the cloud and the internet of things. However, customers are not limited to Microsoft Azure; the WAGO Controllers can transmit data to other platforms too.


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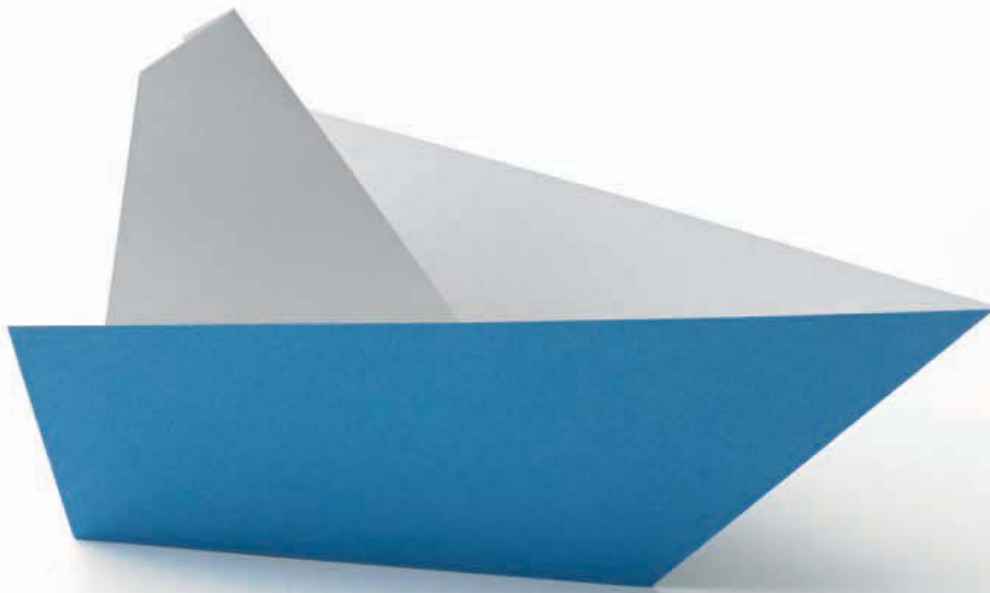
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