



Werner Rimmels is in charge
of Series 1163 development.

Prime time

Thirty years old and still in its prime. The Series 1163 engine has been part of the MTU range since 1983 – a real stayer that is in use in ships all over the world. Now an upgraded version of it is to be launched. It will be more economical, more eco-friendly but just as light and powerful as before.

Werner Rimmels, Wolfgang Mussotter and Werner Flesch could hardly be more different from each other. One of them spends his life at a desk designing engines, reads a lot in his spare time and plays sport. And that includes the extreme variety – bungee jumping and paragliding are some of his favorites. Another works on the test bench and is interested in luxury motor yachts. The third is a keen photographer and devotes much of his free time to his model railway. But they all have one thing in common – they are fans of the MTU Series 1163 engine. One of them likes it because he is involved in its design, another because he tests it, and the third because he can build it. But what actually fascinates them all about the Series 1163 is the same: it is lighter and more powerful than all other comparable engines.

An engine with a successful track record – and not just this century but for nearly thirty years. Until now, however, it did have one problem. It emits too much nitrogen oxide so that it can't comply with the IMO 2 and IMO 3 emission limits specified by the International Maritime Organization. Not yet, that is. Because, at 30,



Werner Rimmels discusses the progress of development work on the engine with his extended project team.

the engine is only just entering its prime – the upgraded design will be more economical and greener but still as light and powerful as ever. Something that all three – Werner Rimmels, Wolfgang Mussotter and Werner Flesch – are pleased about.

his everyday life as the evening news on the TV. He is certainly no newcomer to the work. Previously, the Series 4000-03 was successfully upgraded under his direction. That model too had to be made fit for the next stage of the emissions requirements. The development

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Werner Rimmels, Series 1163 development project manager

Something special

Werner Rimmels heads the project team for developing the engine. Charing meetings, coordinating the most diverse of tasks and running computer simulations are all as much a part of

process is a well-practiced routine. Albeit, the Series 1163 is something special for him. “Improving engines is always a tough challenge. But when the design is nearly 30 years old, it gets really interesting,” the engineer admits.

1 Two 16-cylinder Series 1163 engines propel the corvettes of the Venezuela Navy to a top speed of 22 knots. 2 The German Navy's K130 Class corvette is capable of 26 knots courtesy of two 20V 1163 power units. 3 As well as its two 20-cylinder Series 1163 engines, the German frigate “Sachsen” also has a 20,000-kilowatt gas turbine on board.



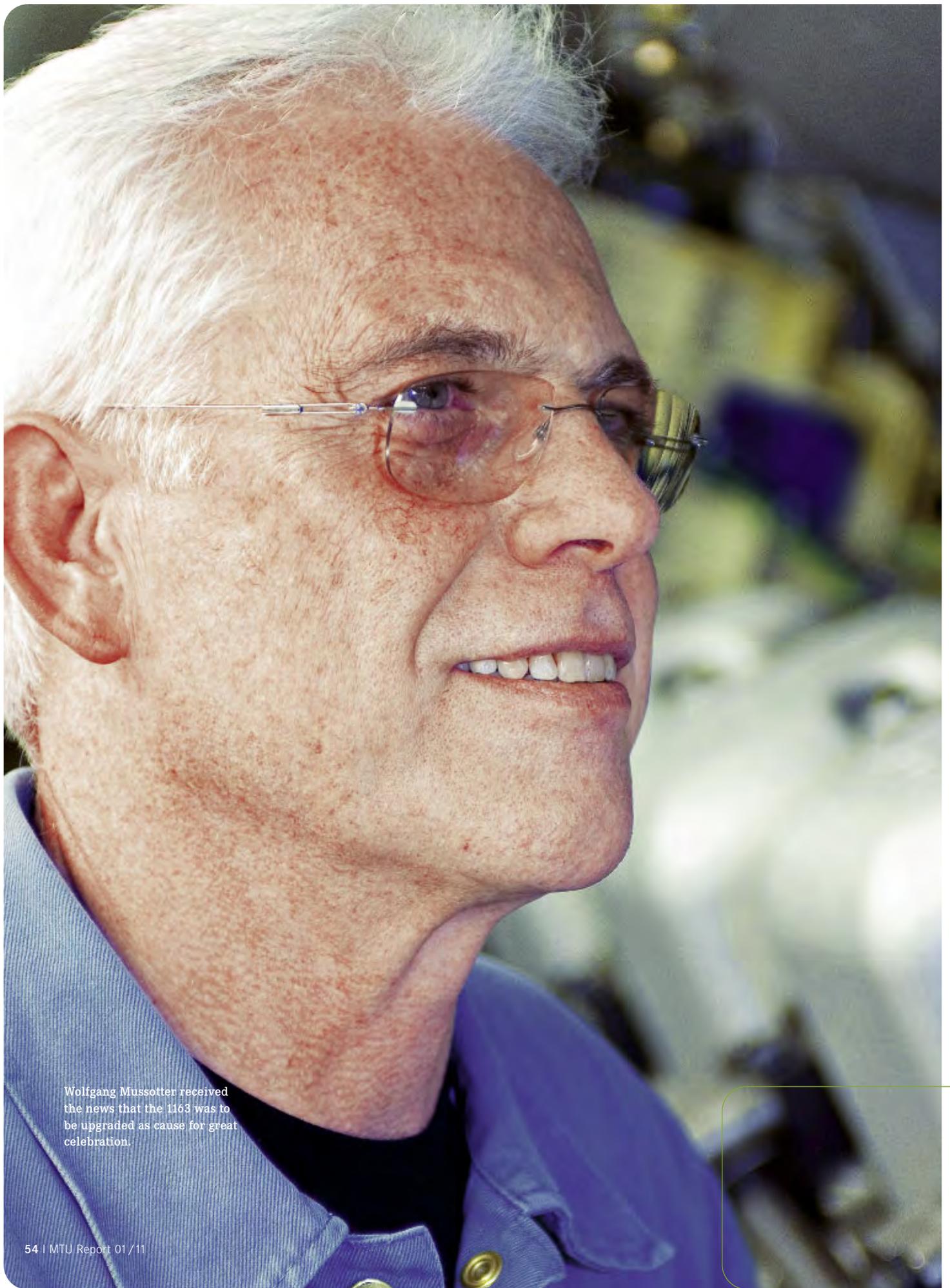
1



2



3



Wolfgang Mussotter received the news that the 1163 was to be upgraded as cause for great celebration.



A favorite for 30 years: the MTU Series 1163 engine. With its three configuration options of V12, V16 and V20, it covers a range of outputs from 4,440 to 7,400 kilowatts at 1,300 rpm.

For more than 30 years, Wolfgang Mussotter's workplace has been test bench no. 217 in Friedrichshafen Plant 2. There, he sets up the engines for their intended applications.

Let's not forget, 30 years ago engines were designed on a drawing board, not using simulation programs on a computer screen. Electronically controlled common-rail fuel injection systems hadn't been thought of. Even turbocharger boost pressures above 5.5 bar, as the upgraded engine will have, were technically inconceivable and beyond the design capabilities of the materials. Despite that, Werner Rimmels maintains that, "The 1163 was modern and is still modern today." It has fully integrated two-stage sequential turbocharging. The 20-cylinder version has five turbocharger groups that each have a low-pressure and a high-pressure stage. Those five turbocharger groups are what make sequential turbocharging possible. The engine starts in the low power band with two turbocharger groups. Gradually, as the engine accelerates, the three other turbocharger groups cut in. And that means ships can accelerate extremely quickly with this engine as there are large amounts of intake air available right from low power levels. And there is one more thing that makes the engine special: it is extremely light but still very powerful. The 7,400 kilowatt model weighs only 22.8 tonnes. That gives it a power-to-weight ratio of one kilowatt to 3.1 kilograms. Then there is the fact that the unit is extremely resilient in the low power band, in other words when it is under minimal load and the ship is traveling very slowly. Something that distinguishes it from many of its competitors.

Proven components carried over

So Werner Rimmels and his project team are now charged with upgrading an already successful engine. What do you change? "As little as possible," in the developer's words. "We will



keep the proven components from the existing engine." The engine will produce fewer emissions so that it is inside the IMO 2 limits. On top of that, it will need substantially less fuel. In practical terms, that means that the engine will have a modern common-rail fuel injection system, better turbocharging, and electronic engine management in the shape of the latest-generation ADEC. So injection timing, volume and pattern

booster boost pressures, the developers have brought the turbochargers into line with the latest advances. They are now more efficient and also help reduce fuel consumption. "So the engine will be very undemanding in its old age," Rimmels indicates. Something else that is important to him is that the engine will be capable of the same performance even in difficult conditions. Whether it is operating in the bitter cold of

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Wolfgang Mussotter, MTU test bench operator

can be controlled independently of engine speed and combustion tuning can be much more effectively improved. The results are lower emissions and more economical fuel consumption. To enable the engine to be within the IMO 2 limits for nitrogen oxide emissions, it will also make use of the Miller process. That involves closing the inlet valves sooner to keep the combustion temperature lower so that less nitrogen oxide is produced. Since the process requires higher tur-

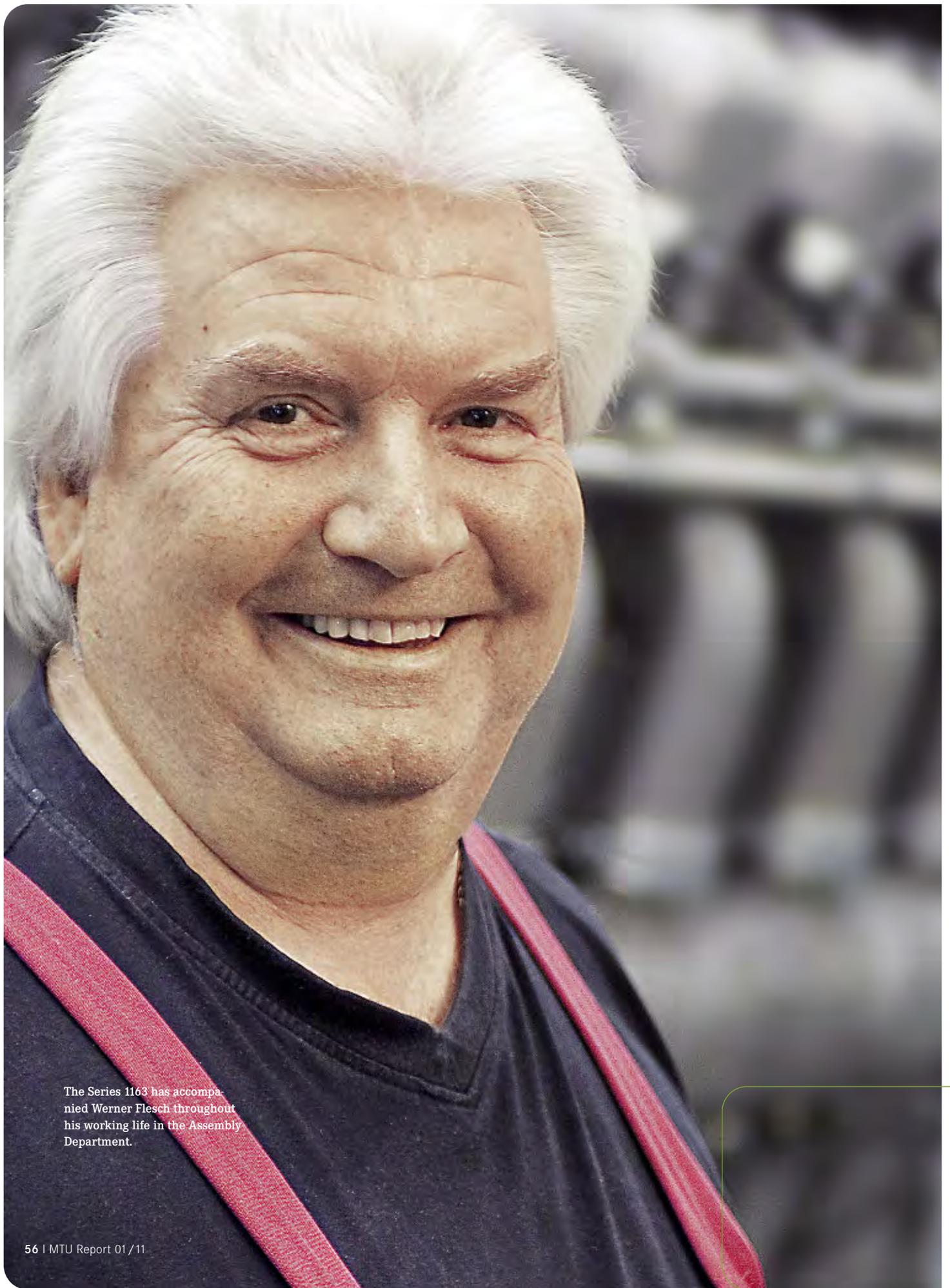
the North Sea or in sweltering outside temperatures of up to 45 degrees and water temperatures as high as 30 degrees.

The only one for him

Wolfgang Mussotter is pleased about that too. He sits behind a glass screen, his eyes focusing alternately on the engine on the other side of the screen and the monitor screens to his left and right. Using both hands, he adjusts the speed and

1 The Korean Coastguard also relies on the long-running MTU Series 1163. 2 The Spanish Navy's "Meteoro Class" is powered by 16-cylinder Series 1163 engines. 3 The "Shinas" was propelled to a world record by a Series 1163. With a top speed of 56.3 knots, she is the fastest diesel-powered passenger ferry in the world.





The Series 1163 has accompanied Werner Flesch throughout his working life in the Assembly Department.

power of the engine with the electronic controls. No, he isn't a sea captain on the bridge of his ship, he is an MTU mechanic sitting at a test bench. For 30 years there has only been space in his heart for one engine – the Series 1163. After completing his apprenticeship at MTU, he spent a number of years as a customer service engineer before becoming a test bench operator in 1972 – a job he has done ever since. After an engine has been assembled, he sets it up for its particular application. He has to consider questions such as what power rating it is to be configured for, or what conditions it is to be used in. And not just to prepare the engine perfectly for its purpose. Wolfgang Mussotter also takes a personal interest in what happens to "his engines". He is an absolute encyclopedia of knowledge when it comes to the applications of the Series 1163. Be it the fastest diesel-powered car ferry in the world, the "Shinas", or the multitude of corvettes and frigates serving in naval fleets all over the world. And not forgetting the two 20-cylinder Series 1163 units for the US Coast Guard which, together with a gas turbine, produce nearly 50,000 hp of propulsive power for the National Security Cutter ocean-going patrol boats. But his eyes only really light up

sign was to be upgraded, it was like a celebration because I hadn't expected it any longer," he recounts, admitting to having a tear in his eye at the time. Yes, Wolfgang Mussotter is very fond of the eternally youthful Series 1163.

An engine to love

It is an engine you can't help but love once you get to know it properly. And his colleague Werner Flesch can only second that sentiment. For him too, the Series 1163 played a decisive role in his professional career. He remembers the early days of the engine only too well. In those days it took over 500 hours to assemble the engine; today it takes 380. "Nowadays, assembly fitters specialize in just a few operations, whereas in the old days it was different," he recounts. But otherwise, little had changed in the assembly of the engines over the past 30 years. Nor will it do so now. Some components such as the turbochargers, common-rail injection parts and electronic components will be new, but three quarters of the parts will stay the same. "The engine interfaces are not changing and our clients will still be able to use them in existing ship layouts," Flesch relates.

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Werner Flesch, MTU assembly fitter

when he starts talking about the four engines painted in mother-of-pearl for a luxury yacht. "That was the absolute highlight," he grins. He also remembers the inauspicious start for the model when one of the four engines in a new frigate had problems on its way to the handover ceremony in Turkey. "It was terrible," the 59-year-old recalls.

His pride jumps out of every sentence. "The 20V 1163 was the first fast-running large-scale diesel engine in the entire world to develop more than 10,000 hp; we were very proud of that at the time. When the news came that the engine de-

From the outside, the changes will not be visible until 2016 when the IMO 3 emission limits come into force. An SCR catalytic converter mounted externally on the engine will then most likely be required to chemically render the nitrogen oxide emissions harmless. And then ships powered by the engine will be able to enter areas where the emission limits are particularly strict. Places such as the coastal waters of the USA, Hawaii and Canada.

The engine will then be fit for another 30 years. "Because 30 is no age at all," the three Series 1163 enthusiasts agree.



In the beginning it took over 500 hours to assemble the engine; today it takes 380. "We are more specialized now," Werner Flesch observes.

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1 to 3: For the US Coast Guard's National Security Cutter, MTU supplied the complete propulsion system consisting of two 20-cylinder Series 1163 diesel engines, one gas turbine, a complex transmission system, the propeller shafts and the propeller. In addition, the engines, turbines and transmission are controlled by the MTU "Callosum" ship automation system.

