Commercial Marine

FIRST FERRIES WITH SINGLE-FUEL GAS ENGINES COMMISSIONED IN DUTCH WADDEN SEA

For years, the maritime industry has been working hard to clean things up and minimize vessel emissions. Sustainable solutions are particularly in demand in sensitive ecosystems such as the Wadden Sea, which was declared a World Heritage Site in 2009. Dutch shipping company Doeksen is setting a good example by deploying two single-fuel, natural-gas-powered ferries in 2020, which will cut pollutant emissions by a significant margin. They will be powered by Rolls-Royce's new mobile MTU single-fuel gas engines.

Who	Shipping Company Doeksen
What	Mobile MTU 16-cylinder Series 4000 gas engines
Where	Harlingen, Netherlands

A Rolls-Royce solution

The Dutch shipping company Doeksen operates ferry services to the two islands Terschelling and Vlieland from its base in Harlingen. In 2020 two new ferries will complete the companys fleet. The company currently operates three ferries bringing both vehicles and passengers to the islands, plus two fast ferries, one catamaran for RoRo freight vehicles only, and a water taxi. The MS Midsland, one of the older ferries, is soon to be retired. “We were looking for a new ferry concept that was both sustainable and innovative,” explains Paul Melles, who used to be a seaman himself, later becoming Technical manager, and finally Managing Director of Doeksen in 2001. After a strategic study, those responsible decided to build two smaller catamarans instead of one large ferry, which not only makes the timetable more flexible, allowing more services to and from Terschelling, but ultimately also boosting efficiency, thereby also lowering operating cost. The study recommended single fuel LNG (liquefied natural gas) as the fuel of choice with the option of using BIO LNG or LBG (Liquified Bio Gas) in the future.

Newly-developed gas engine wins the day

It is of great concern to the managing director to minimize Doeksen’s environmental footprint. “Climate change cannot be denied, and we simply have to do something,” he stresses. “We have a wonderful landscape and seascape right here on our doorsteps – the Wadden Sea is a world natural heritage site. Most passengers who use our ferries come here because of the beautiful natural surroundings – the lovely islands and the clean, fresh sea air.” The shipping company plies these routes frequently, so it has to take care of the environment. “This is what sets us apart. And it’s why we should treat this place with care,” Melles continues. This includes things like using green electricity at all company sites, heating the terminal in Harlingen with a CO2-neutral pellet heating system, and reducing emissions given off by the fleet. Above all, however, it was clear from the outset that the two new vessels had to be equipped with environmentally-friendly propulsion systems. “Full Electric propulsion was not an option for us yet, given the battery systems currently available on the market,” explains Melles. “Terschelling is 21 nautical miles from Harlingen, meaning we would have to recharge the batteries after every trip. We just don’t have that amount of time, and it’s why LNG is the optimum solution for us right now.”

Compared with the gas oil normally used on the ships, liquefied natural gas has the advantage of giving off significantly less in the way of hazardous emissions. “When we started designing our new ferries, we knew Rolls-Royce was developing a gas engine,” says the Doeksen boss. “But it wasn’t quite ready, and the word was, initially, that it probably wouldn’t be finished in time.” As a result, the company’s managers began looking around for other options – while, at the same time, Rolls-Royce’s techies in Friedrichshafen were pressing ahead with the development work. Their rapid progress and enthusiasm finally tipped the scales for Paul Melles: “We know Rolls-Royce as a top-notch manufacturer of high-performance diesel engines by the brand MTU that are extremely reliable. And even though this is a completely new product that has yet to establish itself, we are entirely convinced of the merits of the new MTU gas engine.”

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Challenges along the way

The few LNG-powered vessels already operating in other waters are mostly equipped with dual-fuel engines – meaning they can operate on diesel or gas as required. "This is an option we don't need, because we have a fixed route from A to B and back again," says Melles. "Rolls-Royce has developed the first single-fuel high-speed gas engine that can directly and mechanically drive a fixed pitch propeller, with transient acceleration capabilities comparable to that of a typical high-speed diesel engine. On top of all the enthusiasm and zeal of those involved, this was a major argument that really won our hearts and minds." And so, Doeksen's two new 70-meter-long catamarans are to be fitted with new 16-cylinder Series 4000 gas engines from the Rolls-Royce brand MTU, each with an output of 1,492 kilowatts, and will soon be ferrying up to 600 passengers and 64 cars across the Wadden Sea at speeds of up to 14 knots.

In the meantime, it was not quite clear whether the pilot project would actually be brought to a successful conclusion. Initially, certification of the mobile gas engine by Lloyd's Register, the maritime classification society, took longer than originally thought. "That was a major challenge," says Melles, "but I have to take my hat off to Rolls-Royce. They managed to speed up the processes and obtain certification in good time. That really was a great job." Subsequently, the shipyard in Vietnam ran into financial difficulties and stopped work on the new ferries for three months. For Melles, who visited the site every six weeks or so during the entire construction period to check progress, this was a tough, exhausting time – until the banks finally agreed on new project financing, allowing it to continue.

The anticipation rises

It is now planned that the new additions to the fleet, the Willem Barentsz and the Willem de Vlamingh – named after two Frisian seafaring explorers – will arrive in Harlingen in spring 2019 and then, following commissioning and various tests, will commence initial trial sailings early 2020. After that they will both be included in the new timetable as the main car ferry service in Spring 2020. In the meantime the necessary infrastructure changes to Harlingen harbor will have been completed, including a new overnight berth for an additional vessel, minor adjustments to the pier for safe berthing and bunkering for weekly refueling. Paul Melles can

1 **Powerful propulsion**
Doeksen's two new catamarans are to be fitted with new 16-cylinder MTU Series 4000 gas engines.

2 **Willem Barentsz and Willem de Vlamingh**
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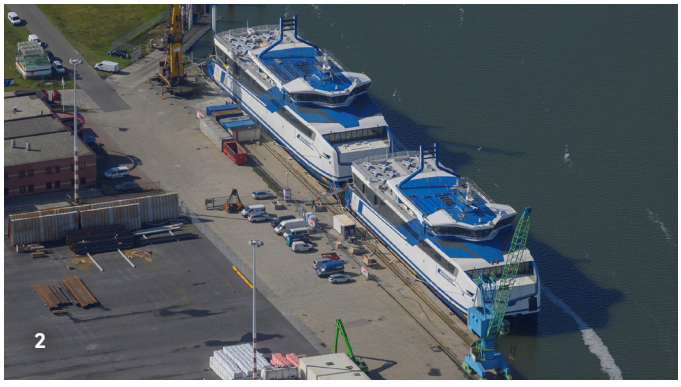
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hardly wait to take delivery of the new cats: “I’ve been working on this since the very beginning, these are my babies. It’s really exciting to see something that started out as an idea being taken through to implementation. We’ve waited so long for this, and now it’s all coming to fruition.”

For Melles there is no way he is going to miss the maiden voyage. As a former seafarer, he likes to be out on the water whenever he can – at weekends and during vacation time, preferably on his own sailboat. And during working hours, he will continue his efforts to keep the Doeksen fleet as clean as possible. He sees LNG very much as a transitional fuel. “This is a good, practical transition fuel, but a fossil fuel nonetheless, and thus finite,” he says definitively. At some point there will be working solutions for electric propulsion, perhaps also for hydrogen drive systems. But until then, he’s got another idea: bio-LNG – gas produced and liquefied in biogas plants. “This would enable another major reduction in CO2 emissions,” he says. “There is the potential to obtain this in the area. And that’s what we’re looking into now: that’s our next goal.”

Images: Doeksen

Rolls-Royce provides world-class power solutions and complete lifecycle support under our product and solution brand MTU. Through digitalization and electrification, we strive to develop drive and power generation solutions that are even cleaner and smarter and thus provide answers to the challenges posed by the rapidly growing societal demands for energy and mobility. We deliver and service comprehensive, powerful and reliable systems, based on both gas and diesel engines, as well as electrified hybrid systems. These clean and technologically advanced solutions serve our customers in the marine and infrastructure sectors worldwide.