

Environmentally friendly ferry

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Diesel generators and electric motors are a successful combination for the Farge, a vehicle and passenger ferry that crosses the Weser river in Germany

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On the ferry Farge, which transports vehicles and people across the Weser near Bremen in Germany on a daily basis, a hybrid drive system ensures huge fuel savings, minimal emissions and improved maneuverability.

Tunnel or ferry? That is the question car and truck drivers near Bremen have to ask themselves every day. Traffic jams and construction work meant that more and more vehicles were crossing the Weser by ferry. For the operator Fährgesellschaft Bremen-Stedingen (FBS) it was one reason behind the construction of a new ferry for transport between Berne in Lower Saxony and the Bremen district of Farge.

The result is an efficient and environmentally friendly ship with an innovative drive system, meaning it not only meets current environmental requirements, but significantly exceeds them. It is the first hybrid passenger and vehicle ferry of this size class in Germany.

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1. Farge is a 59m (193ft) vehicle ferry with a top speed of 14km/h (7.5kts). It can carry 34 cars, six trucks and 249 passengers

2. The engine room of Farge showing the diesel motors working as generators

3. The batteries are housed in a separate room and have a total capacity of 80kWh

The FBS commissioned SET Schiffbau- und Entwicklungsgesellschaft in Tangermünde to construct the vessel. A specialist in electric drive technology, Baumüller, based in Nuremberg, was responsible for the propulsion system. In close cooperation with the shipyard, Baumüller subsidiary Anlagen-Systemtechnik took over the engineering of the propulsion system, which is a combination of Baumüller products and third-party components. In addition to the drives and control cabinets, Baumüller also supplied special software for onboard energy management.

The technology

Diesel generators and electric motors are combined in the Farge for maximum efficiency. Three diesel generators are fitted, of which two are regularly in operation and one is for emergency use. These generator power units provide a total capacity of over 1,300kVA.

The diesel units act only as generators and as such are not exposed to power peaks. As a result, they can always be operated in their optimum range, while also being smaller than traditional diesel propulsion engines.

Excess energy produced by the generators or returned to the system through feedback is stored in batteries instead of being lost as heat, as was previously the case. The batteries are housed in a separate battery room and have a total capacity of 80kWh. The batteries effectively act as an energy buffer, so peaks that are required by the drive are not transmitted to the generators, but rather absorbed with energy from the batteries.

The Farge ferry can even be driven completely electrically. “If necessary the entire system could even be converted to an alternative energy storage system if, for

4. The four Baumüller DS2-200 electric motors drive the propellers of the ferry directly

5. MD of FBS, Andreas Bettray (left), thanks Swen Jacob from Baumüller for the successful collaboration

6. The combination of diesel engines as generators and the direct-drive by electric motors lead to low emissions and particularly good maneuverability



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example, hydrogen fuel cell technology becomes available,” explains Swen Jacob, regional manager for the North and Scandinavia at Baumüller.

The ferry is driven by four drive propellers – two in the front and two in the rear – powered by four DS2-200 electric motors from Baumüller. These are water-cooled synchronous motors that offer a particularly high acceleration capacity and a very high power density.

The operator saves a considerable amount of fuel by combining the diesel and electric motors. Since less fuel is burned, the system emits fewer pollutants, further improved by state-of-the-art exhaust filters. The ferry therefore significantly exceeds all legal environmental requirements and is so environmentally friendly that the German Federal Ministry of Transport and Digital Infrastructure supports it financially.

Best maneuverability

In addition to its environmental credentials and low fuel costs, the Farge offers another advantage: the ship’s maneuverability is greatly improved by the properties of the electric

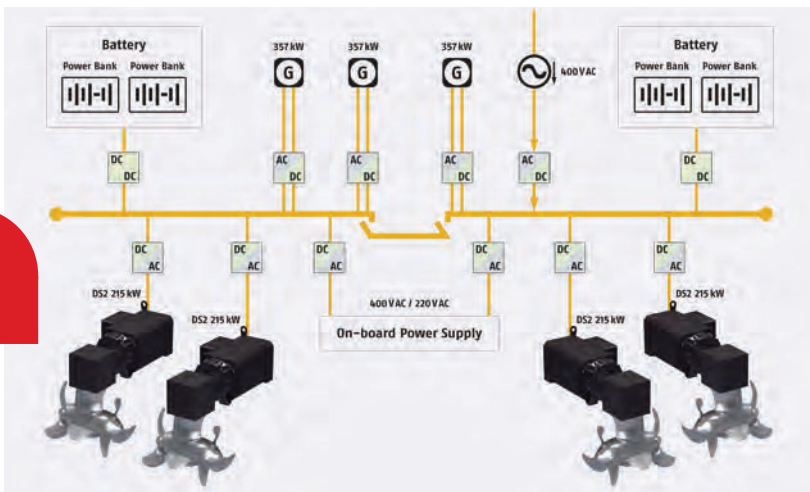
motors. The reason for this is that electric motors respond more immediately to adjustments in speed and torque, which improves the maneuverability of the ship. This is an important consideration as the Farge covers a distance of only 400m (1,300ft) from one bank of the Weser to the other, meaning it is constantly docking and casting off.

Another advantage can be clearly noticed by passengers on board. The reduction from six to just three diesel engines leads to significantly less noise, while the smooth running of the electric motors also positively affects the ride.

Energy and battery management

A technical highlight of the Farge’s drive concept is the battery and energy management system. The software programmed by Baumüller ensures that the drives always run as efficiently as possible. The system independently regulates how many diesel engines are in operation and how much energy is taken from the batteries. A monitor in the engine room and another on the control console clearly display information about the current operating status of all drives and batteries.

The developers believe that the ferry’s successful and innovative concept was made possible by the fact that Baumüller’s system company, Baumüller Anlagen-Systemtechnik, brought to this unique project many years of expertise – in drive technology, equipping ships, and programming energy management systems for industrial systems, as well as marine applications. +



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