For the very first time, MTU has performed its own tests on a hybrid train. Test runs on Deutsche Bahn’s VT 642 railcar were carried out between January and March 2015 on the Stauden railway line in Germany. The Staudenbahn is a stretch of track approximately 26 km long and fuel consumption was shown to be reduced by more than 15 percent compared to straightforward diesel mode. This was achieved even though the track does not provide the ideal profile for regenerative braking. The train’s sound level in motion could be reduced by a clearly noticeable five decibels. An even greater reduction was achieved when the train was stationary. In a station, the train’s sound level drops by a full 21 decibels, as the diesel engine is shut down and ancillary loads run on the batteries.

Test runs prove benefits of hybrid drives
“These test runs represent a milestone in this project as a whole,” said Bernd Krüper, Vice President Industrial Business at MTU. “A fuel saving of 15 percent is a fantastic result and means that under optimum conditions, 20 to 25 percent should be possible.” Considering that around 90 percent of the total costs for rail drive systems are attributable to fuel consumption, the huge savings potential becomes evident. Dr. Wintruff was present during one of the test runs and was visibly impressed by how mature the technology actually is.

The MTU engineers were very satisfied with the outstanding reliability of the hybrid PowerPack® during the tests. They succeeded in completing a test program covering over 2,300 km in just six weeks. In
doing so, they worked through some 70 different scenarios which they had previously simulated in order to determine how the system responds to different conditions and how it can be most efficiently operated. Pleasingly, the outcome also showed that the MTU simulations predicted the real results very accurately.

**MTU system solutions for hybrid drives**

Hybrid rail technology is the energy-saving combination of a conventional diesel plus electric drive system. The fundamental idea is that the kinetic energy initially generated by the diesel engine is recovered via an electric motor operating as an electric brake and chemically “stored” in a powerful battery for later use. The recovery of kinetic energy in braking mode (regenerative braking) is extremely energy- and cost-efficient in stop-and-go situations on local public transport lines with a large number of stops and inclined sections on “hilly” terrain.

The MTU PowerPack® is an innovative drive system that combines all the individual system elements into a single functional unit mounted on a supporting frame to maximise efficiency. MTU as turnkey supplier is thus responsible for all elements of the drive system, including the diesel engine, after-treatment, transmission (diesel-electric, diesel-mechanical, or diesel-hydraulic), auxiliaries, and cooling. MTU has already delivered more than 6,000 PowerPacks® to the rail industry, of which approximately 1,000 units are EU Stage IIIB compliant.

The MTU hybrid PowerPack® combines the benefits of a conventional PowerPack® with an electric propulsion module, an energy storage system and an outstanding propulsion control system. When time frames for electrification may be uncertain, it provides a sustainable solution due to its adaptability to a bi- or trimodal propulsion system by pantograph connection to the overhead lines. This versatility contributes greatly to the residual value of railcars equipped with these new systems.

At the heart of all MTU PowerPacks® are diesel engines equipped with SCR technology for reducing NOx emissions that comply with emissions legislation EU Stage IIIB. For underfloor installation, the product portfolio includes Series 1800 (428-530 hp / 315-390 kW) as well as Series 1600 (768-952 hp / 565-700 kW) diesel engines, which can be used in new and repowered vehicles. In addition, various engines are available for hybrid shunter locomotives.

**Hybrid PowerPack® is a pioneering project**

The hybrid PowerPack® is the result of five years of pioneering work by MTU. In the beginning, the focus was on the development of the crankshaft starter-generator, the battery and the convertor, with integration of all systems into a PowerPack®. In 2012, a railcar in Deutsche Bahn’s (DB) fleet was repowered using two hybrid drives. DB subsequently tested the train in order to prove it for traffic certification. MTU now had the opportunity to test the railcar itself. With its wide experience as a system solution supplier and after successful testing, MTU is now moving on to the next stage: The goal is for MTU hybrid PowerPacks® to achieve a firm foothold in the rail market.
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