

ZF Friedrichshafen AG

Save Up to 20% of Fuels with Repowering Solutions from ZF

If rail operators in local and regional transport want to remain on the road to success, their vehicles have to run economically over as long a period as possible.

Considering the fact that fuel is two-thirds of the overall vehicle operating cost, oil and fuel prices challenge cost effectiveness for many operators. Modern drive systems that contribute to saving fuel and increasing vehicle lifecycles are becoming more and more important. The ZF Repowering package is an economic solution to meet these requirements. But what is a repower?

Repowering for More Sustainability and Profitability

Repowering means to remove outdated transmissions from existing rail vehicles replacing them with

modern, more cost-effective and economic driveline components. The engine and the existing bogie with its axle drives are not affected. Optimised mechanical ratios ensure that the engine remains in the most economical speed range, especially when accelerating and driving at lower train speeds.

ZF's repowering solutions aim at reducing fuel consumption, thus lifecycle costs as well as at extending the service life of the rail vehicles. Furthermore, ZF drivelines also reduces waste heat significantly, improving the train cooling system capacity and at the same time generating substantially less CO2 emissions.

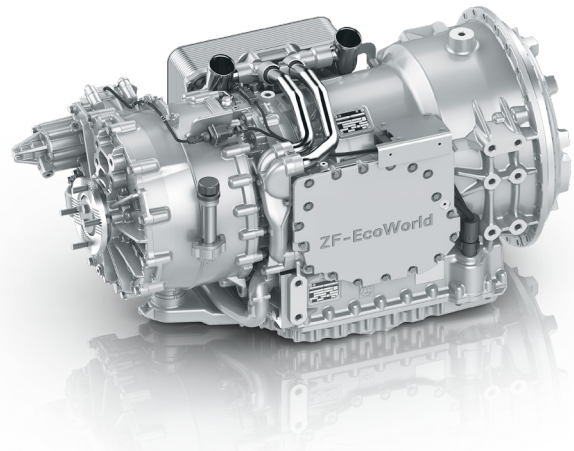
ZF's Solution: The EcoWorld Powershift Transmission

ZF's most recent development, the six-speed powershift transmission EcoWorld, features an integrated reversing function and is suitable for DMU (diesel multiple units) and MPV (multiple purpose vehicles)



applications. It can either be applied in new vehicles or also as a repower (retrofit) option. The six-speed powershift transmission is particularly economical and achieves up to 20 percent fuel savings in comparison to hydrodynamic transmissions. It provides a towing function as well as a coasting function which can save additional fuel depending on the route, engine type and load condition. Thus, the transmission achieves maximum efficiency and is equipped with a powerful torque converter.

ZF's EcoWorld powershift transmission achieves up to 20 percent fuel savings compared to hydrodynamic transmissions



Successful Repower Project in Ireland

With mounting pressure on the transport industry to move towards a greener future, which has been further heightened with the launch of the Transport Decarbonisation Plan in July 2021 in the UK, ZF is actively investing in its repowering technology to support rail operators.

savings across the entire Iarnród Éireann InterCity Fleet of approximately EUR 4 million, as well as fuel savings of 4,500,000 litres and not to mention CO2 emissions savings of 1,255 tons.

In a recent collaboration with Rolls-Royce and Irish Rail (Iarnród Éireann), the Republic of Ireland's state railroad, ZF has repowered several Class 22000 Hyundai Rotem DMUs with new EcoWorld transmissions to enable more efficient operation, improved acceleration and reduced noise. The intercity DMUs circulate on the entire network of Irish Rail, including the Dublin to Cork line. Following the replacement of the transmission, savings of up to 18 percent in fuel and CO2 were achieved. In total, the ZF EcoWorld will provide an 18 percent improvement on commuter routes and a 15 percent improvement on intercity routes, according to the trial data.

Calculations project that this would result in annual



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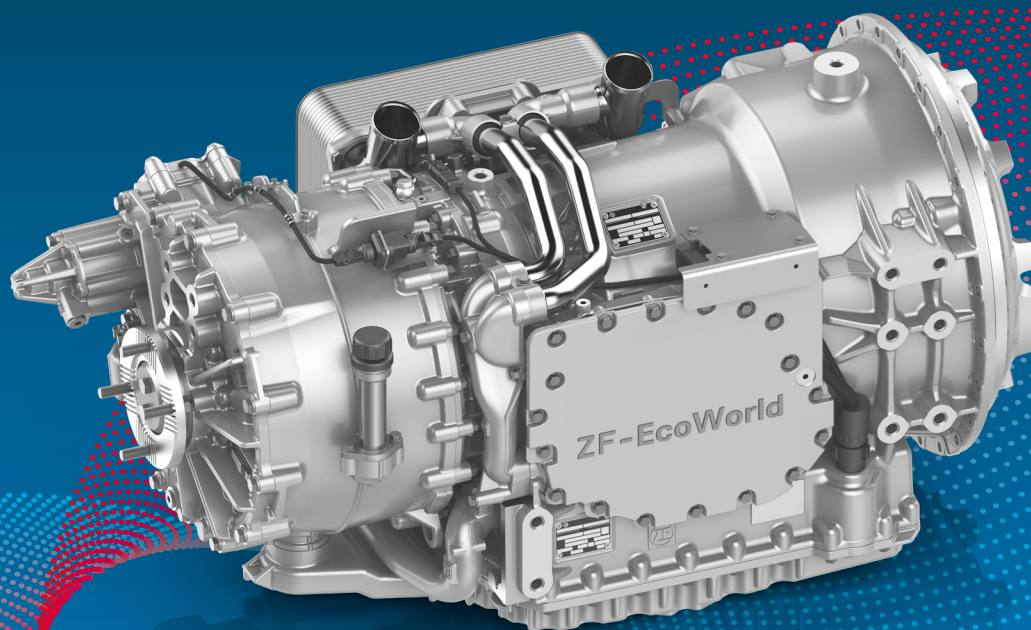


For a project with Irish Rail (Iarnród Éireann), ZF repowered Class 22000 Hyundai Rotem diesel multiple units (DMUs) with its EcoWorld transmission

Repowering with ZF EcoWorld for More Sustainability

The 6-speed powershift transmission is particularly economical: It achieves up to 20 percent fuel savings in comparison to hydrodynamic transmissions. The system maximizes efficiency and is equipped with a powerful torque converter as well as an integrated reversing function. It provides a towing function, as well as a coasting function which can save additional fuel depending on the route, engine type and load condition.

A new wheelset gearbox with drive shafts allows EcoWorld to be combined with various axle ratios, which opens further application fields. It's also perfectly suited for repowering in existing trains where it prolongs the vehicle's service life and reduces operating costs.



For more information please visit
www.zf.com/rail

