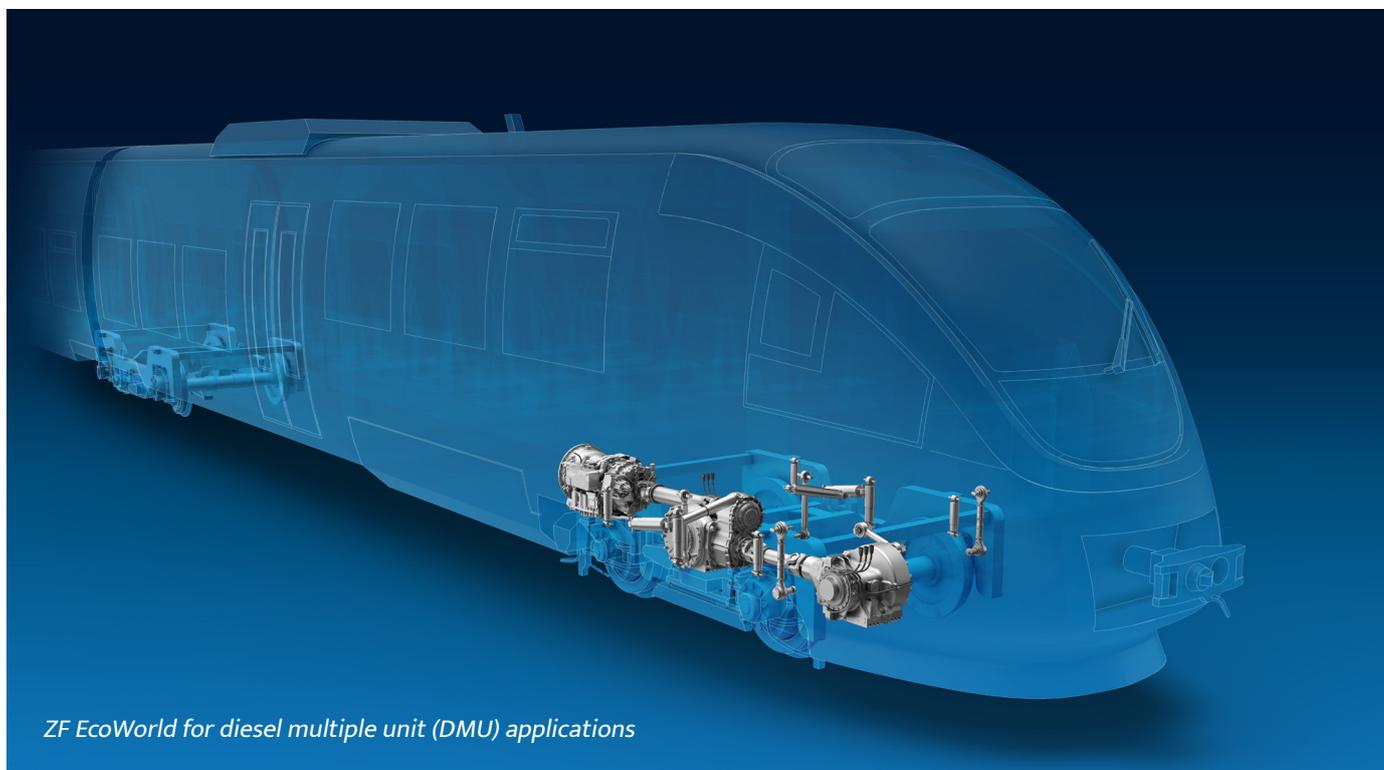


# ZF Friedrichshafen AG

## ZF EcoWorld – Powerful, Compact and Cost-Efficient



*ZF EcoWorld for diesel multiple unit (DMU) applications*

ZF is one of the world's technology leaders in the area of driveline, chassis and safety technology for rail. It offers components and systems that make railway traffic more powerful without neglecting passenger safety and comfort.

Based on over 90 years of the Group's experience, manufacturers and operators of rail vehicles can profit from innovative and sustainable solutions for the mobility of today and tomorrow.

### The Future of DMU Drive Systems

Modern drive systems that contribute to saving fuel and

increasing vehicles' life cycles while reducing maintenance cycles are becoming more and more important. With EcoWorld, ZF has now combined these important features: a cost-efficient and fuel-saving powershift transmission for DMUs.

The six-gear powershift transmission ZF EcoWorld features an integrated reversing function, which will be integrated directly in the transmission.

A newly developed wheelset gearbox completes ZF's drive solution. The result is a new drive system that can be combined with a range of axle ratios. This makes it suitable for slow-speed operations as well as for fast rail vehicles in long-distance transport. At higher ratios, EcoWorld also handles steep gradient routes without difficulty.

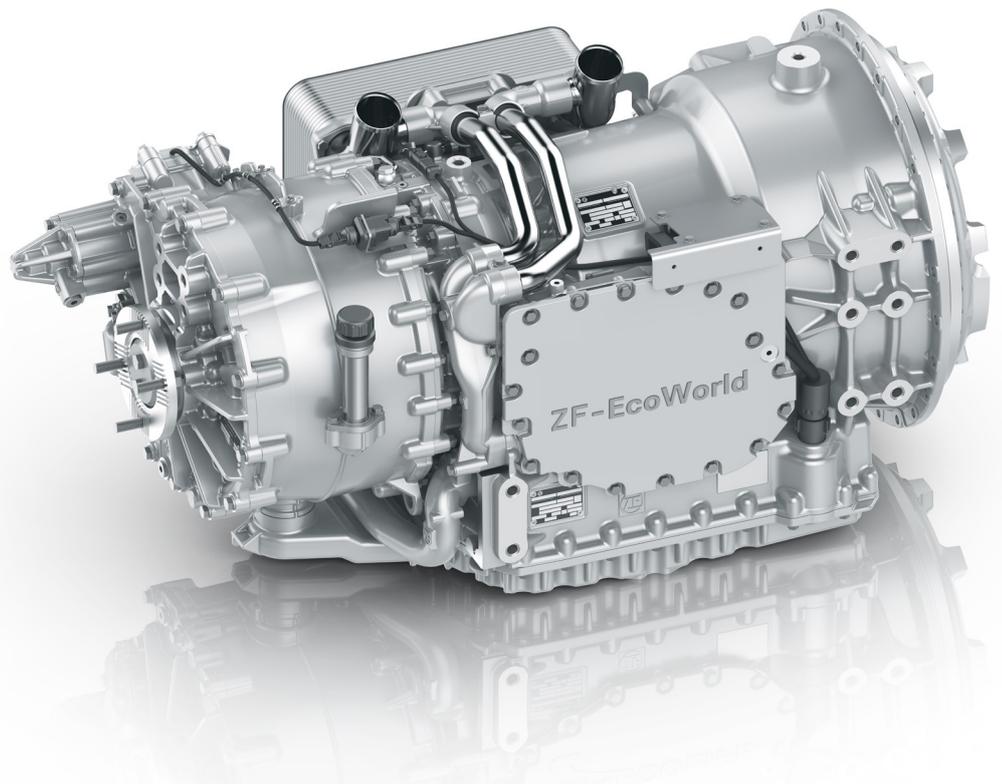
## Powerful, Compact and Cost-Efficient

EcoWorld is designed for a drive power maximum of 600kW and an input torque of 2,500Nm. It is also equipped with an optional advanced coasting function, which allows additional fuel savings of up to five percent depending on the route, engine type and load condition.

At the same time, travel comfort is improved for passengers, as there is less noise in the railcar's interior. This is made possible by its increased degree of efficiency and the transmission ratios of the hydromechanical transmission, which allows the compound to rotate at a significantly lower speed. In addition, the transmission is prepared for various optional condition monitoring functions.

## Repowering – Up to 20 Percent Fuel Savings Possible

ZF's EcoWorld can also be integrated into existing trains where it can deliver the previously



*Economical and efficient: up to 20 percent fuel savings in comparison to hydrodynamic transmissions.*

### ZF Friedrichshafen AG

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Marine & Special Driveline Technology

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mentioned benefits. Using this procedure, known as repowering, operators do not have to replace the entire driveline to extend the trains' usability. The engine and existing bogie with its axle drives are not affected. Prolonging the vehicles' service life significantly reduces operating costs.

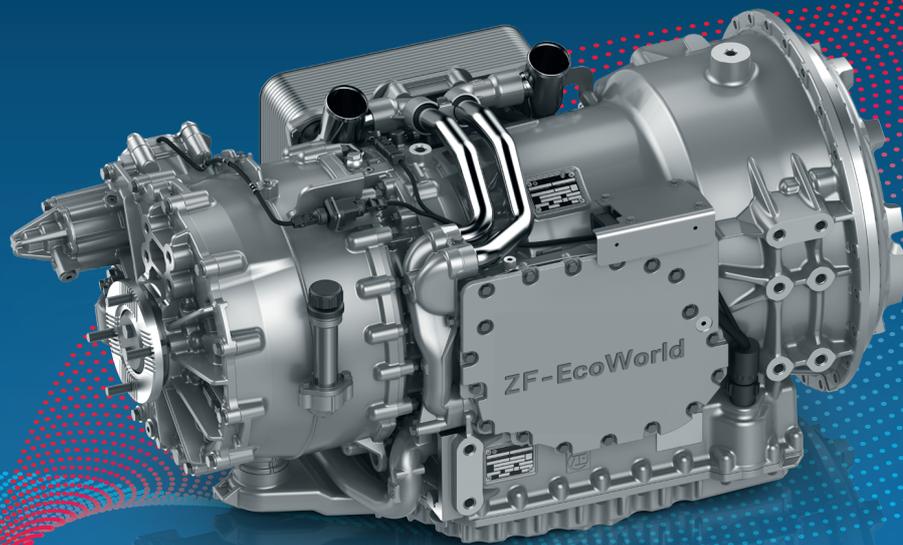
The ZF driveline also reduces waste heat, improving the train cooling system capacity and at the same time generating substantially less CO2 emissions.



# The Future of DMU Drive Systems with ZF EcoWorld

The new 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 enables an unrestricted towing and sailing function which can save an additional five percent in 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.



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