



The new gearbox generation EcoLife 2 for MAN city and intercity buses hits the road

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They are now a standard feature of MAN city and intercity buses: convenient torque converter automatic gearboxes that provide maximum relief for the driver. And now, with the launch of the EcoLife 2, a new and even more efficient generation is heading out on the road.

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- **New generation of EcoLife 2 automatic gearboxes launched for MAN city and intercity buses**
- **This will be followed by an EcoLife 2 version of the MAN Lion's Coach, NEOPLAN Tourliner and NEOPLAN Cityliner coaches in the near future**
- **Significant efficiency advantages due to hardware optimisation and downspeeding**
- **EcoLife 2 has a positive impact on the MAN EfficientHybrid system thanks to automatic stop/start feature**

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They have long been part of the standard repertoire of the vast majority of city buses, are becoming increasingly popular in the intercity bus segment and, since 2017, have even been a hit in the coach segment: highly efficient torque converter automatic gearboxes that relieve the driver of as much of the strenuous work as possible, optimally preserve the highly sophisticated drive technology and also optimally reduce fuel consumption depending on the application. MAN EfficientHybrid with stop/start function was only introduced across all Lion's City models with diesel and gas-powered drive systems when the new city bus generation was launched. At the very least, the hybrid system ensures a fuel saving of around twelve percent and receives substantial support from the EcoLife gearbox. With this new gearbox generation, the efficiency of the EfficientHybrid system is further enhanced by extended recuperation phases. Quite an accomplishment!

MAN Truck & Bus is one of Europe's leading commercial vehicle manufacturers and transport solution providers, with an annual revenue of some 11 billion euros (2019). The company's product portfolio includes vans, trucks, buses/coaches and diesel and gas engines along with services related to passenger and cargo transport. MAN Truck & Bus is a company of TRATON SE and employs more than 37,000 people worldwide.



The new gearboxes will be available for all models of the new MAN Lion's City that feature the 9-litre diesel engines of the new D15 series with its power stages from 280 hp (206 kW) to 360 hp (265 kW), or the 280 hp (206 kW) and 320 hp (235 kW), 9.5-litre E18 natural gas engine, which has also been newly developed. Both variants are, of course, equipped with MAN EfficientHybrid including stop/start function. The intercity bus "MAN Lion's Intercity", which is now also available with the new D15 engine and its three power stages from 280 hp (206 kW) to 360 hp (265 kW) in addition to the tried-and-tested 290 hp (213 kW) D08 engine, can also be equipped with the new gearbox, thus offering a total of four gearbox alternatives. As a matter of course, the MAN Lion's Chassis RR8/9 and RC2/3 (with D15 and D08 engines in each case) for city and intercity bus applications will also be equipped with the new gearbox variant. The gearbox can be optimally adapted to the different engine variants on account of the gearbox control unit's ability to adapt selectively to variable idling speeds and engine maps. The MAN Lion's Coach, NEOPLAN Tourliner and NEOPLAN Cityliner coaches as well as the RR2/3/4/5 chassis (D26 engine) will follow suit in the near future in the form of the EcoLife 2 Coach variant with input torques of up to 2,500 Newton metres. Consequently, they will also benefit from these new developments.

Lighter, more robust, easier to service: the gearbox hardware

There is only one development trend when it comes to modern components of a highly efficient driveline: lighter, more robust and more intelligent. The engineers stuck to this approach when developing the new EcoLife 2 gearbox. Despite the installation dimensions and mounting brackets being largely identical, it was possible to make the unit eight kilograms lighter. For the most part, this was achieved by removing the separate retarder cooling system and integrating it into the overall cooling system. The clutch disc packs are now cooled as required, which makes the clutch much more robust. A friction-optimised sealing concept is also used.

The engineers paid particular attention to a component that is largely responsible for vibration control at low speeds and reduced noise: the torsion damper of the hydrodynamic torque converter. This consists of a spring set, which facilitates rotation between the crankshaft and gearbox input shaft due



to its coil springs positioned in windows, and a friction device. The twisting angle has been increased from 8.9 to 14.3 degrees and the pre-load torque has been eliminated. This, together with the inclusion of the forged cover design of the damper used in the highly stressed MAN EfficientHybrid versions, has made it possible to reduce stiffness and simultaneously increase robustness and, as a result, reliability. The converter itself has also been fitted with a new circuit cover, which ensures that all gearbox variants have stop/start capability. In terms of fuel consumption and noise emissions, significant gains can be made on account of the resulting downsizing and downspeeding of idling speeds in particular (up to 550 rpm).

Lower speeds, improved retarder output: the new control system

The centrepiece of the new gearbox, however, is the new gearshift logic, which stands out due to its intelligent features. Thanks to the modern software controller that is integrated into the gearbox, the gearbox control system is designed for a very long service life and boasts impressive power reserves for future applications. Generally speaking, the refined gearshift logic is based on a new gradation of the six gears. The overall transmission-ratio spread of the gears in the modified gear set has increased from 5,469 to 5,727. In particular, the two overdrive stages five and six are designed to be significantly longer than before, which, in conjunction with the two possible axle ratios of $i = 4.56$ and 5.67 , leads to a significant reduction in revolutions at high speeds (around 1,400 rpm at 100 km/h for the Lion's Intercity with D15 engine) and helps to prevent fluctuation between fourth and fifth gear at city driving speed. By reducing the gear ratio difference from first to second gear, the opposite effect is utilised. In this way, the gear change can be made earlier when setting off or later when slowing down – this protects the engine as it does not need to be brought up to speed to such a great extent. The intelligent, further refined TopoDyn Life control system also ensures that topography, vehicle weight and all other driving resistances are recorded intelligently in real time and factored into the complex gearshift strategy.

Another benefit is provided by the re-engineered retarder with its optimised deceleration performance. Instead of being deactivated in second gear as was previously the case, it is now deactivated in first gear just above the idling speed. Similarly, the converter lockup clutch, which is essential for this



type of gearbox, is not opened until that point. As such, the coasting phase with no fuel delivery, which ends at this point, can be maintained until shortly before standstill and is therefore extended by around two seconds. In municipal buses with MAN EfficientHybrid, the important recuperation phases that see valuable deceleration energy fed into the energy-storing Ultracaps, are also extended in the process – a clear efficiency advantage.

The EfficientRoll function, also known as the “rolling” or “gliding” function is another new feature of the EcoLife 2 coach variant. This function is used, for example, on intercity routes or on the motorway to make use of the existing momentum on a downhill gradient to cap the frictional connection between the engine and the gearbox, thus achieving the greatest possible fuel saving. To this end, the converter-clutch unit is opened automatically without any input from the driver. The converter keeps the engine slightly above idling speed, so the fuel supply is not cut off entirely. For some time now, a similar system has been provided by the automated 12-speed gearbox of the new generation MAN TipMatic Coach in conjunction with its EfficientCruise gearshift strategy.

Improved service ensures low total cost of ownership (TCO)

Service is an extremely important topic for customers – and not without reason. In the new EcoLife 2 gearbox, it is possible to reduce drag and churning losses by optimising the quantity of lubricating oil, not least by integrating the retarder into the primary cooling circuit. The dual cooling system provides reliable protection against overheating, making it possible for the first time ever to individually extend the oil-change intervals of 180,000 kilometres at the customer's request, subject to the deployment profile and use of the vehicle. For this purpose, the essential digital trend data of the gearbox is exported and analysed by MAN Service. EcoFluid Life oil, which is tailored to the specific requirements, is used. A new feature is the oil filler tube position, which is always in the same place and is easy to access, thus improving serviceability. All other installation and connection dimensions are unchanged, which, coupled with the new transport lugs on the housing, make the service technician's job nice and easy. All of the measures relating to increased serviceability contribute to keeping the TCO as low as possible. What's more, it has also been possible to improve the longevity of the



gearbox as well as its reliability over the entire service life by implementing all optimisation measures, such as using components with a greater level of robustness.

Customer benefits of EcoLife 2 at a glance:

- Lower **fuel consumption** compared to previous gearboxes due to reduced drag losses, modified gear set with greater transmission-ratio spread and longer final transmission ratios.
- Consistent **reduction of engine speeds** on account of new gear ratios, improved TopoDyn Life gearshift control and improved torsion damper with reduced noise levels.
- Optimised **retarder operation** by means of continuous actuation in coasting mode right through to standstill with no fuel delivery.
- Improved **gearshift quality** in all driving situations provides relief for the driver and increases both the driving comfort and the durability of the driveline.
- Greater reliability and **serviceability** as a result of improved component **robustness** with oil-change intervals that can be extended beyond the previously applicable 180,000 kilometres on a case-by-case basis.
- Optimisation of the **automatic stop/start system** for city buses with significant extension of the recuperation phases in MAN EfficientHybrid variants.