



City Buses Become More Efficient, Quieter, and Lighter Thanks to ZF: EcoLife Automatic Transmission with Start/Stop Function

- **ZF-EcoLife automatic transmission with start/stop function enables fuel savings of up to ten percent in conventional diesel city buses**
- **Realization of start/stop without additional electric motor in driveline possible**
- **Further development to improve performance of AVE 130 electrically driven low-floor axle**
- **Start of volume production of AV 133 including lightweight design version**
- **Innovative driveline consultancy offered by ZF optimizes the driveline of new buses with regard to fuel consumption for individual route profiles**

In October 2015, ZF Friedrichshafen AG is presenting its extensive product portfolio for midibuses, city buses, and coaches on the Busworld Kortrijk. The innovations include the reengineered ZF-EcoLife automatic transmission which now features the start/stop function. Fuel savings of up to ten percent can be achieved with this function alone in conventional diesel city buses. An additional electric motor in the driveline is not necessary and reduces thus costs and installation space. The further development of the AVE 130 electric portal axle is a suitable solution for electrically driven buses. With its product range, the technology company completely covers the demands of current and future bus applications. For ZF, automotive megatrends like efficiency, safety, and automated driving play an as important role as social and political long-term factors or the increase of comfort for drivers and passengers when developing new products.

The worldwide trend of urbanization, imminent gridlocks in global megacities, and international, enhanced environmental standards:



In the public transport sector in particular, the requirements for high-performant, noise- and emission-reduced mobility concepts are constantly increasing. "Efficient and economic system technologies relieving the public transport sector, the companies, and the cities alike and enabling safe and comfortable traveling for passengers are in high demand," explains Andreas Moser, Head of the Axle & Transmission Systems for Buses and Coaches business unit of ZF Friedrichshafen AG. "This is why we are constantly working on optimizing our products: functional innovations, lightweight design, or the electrification of the driveline play an important role."

ZF-EcoLife: one driveline system, two premieres

An excellent example for the continuous product improvement is the ZF-EcoLife 6-speed automatic transmission: At this year's Busworld Kortrijk, the technology company presents for the first time the innovative start/stop function for the already very fuel efficient and high-performant conventional bus transmission that decreases fuel consumption in urban applications by up to ten percent. In the transmission, the engineers strengthened the converter and the lock-up clutch of the series transmission. An electric motor is not necessary to realize this feature, costs and installation space can also be reduced. Another novelty is the EcoLife Coach transmission variant that now excels with an input torque of up to 2 300 Nm for intercity buses and coaches.

Tailored to the future: AVE 130 electric portal axle

2015 will also see the market launch of the next evolutionary stage of ZF's successful AVE 130 electric portal axle for city buses: Significantly increased performance and torque values of the two motors close to the wheel make the application of the highly efficient electrically driven low-floor axle even more attractive for public transport authorities. The maximum electric output of the two water-cooled, asynchronous motors integrated into the axle will increase from the existing 2 x 120 kW to 2 x 125 kW. At the same time, the effective nominal voltage of the electric motors will increase from 350 to 400 V, while the maximum torque climbs



from 2 x 465 Nm to 2 x 485 Nm. Furthermore, additional space for standing areas and seats is created with the new AVE 130 since the conventional drive shaft and propeller shaft in the rear are no longer needed. Not least, the AVE 130 yields significant weight advantages: Thanks to its two integrated electric motors, it weighs up to 500 kg less than all other solutions with electric central motor.

Intensified overall competence: axle systems for all bus classes

Another ZF product premiere at Busworld Kortrijk is the AV 133 low-floor axle for buses. The successor of the worldwide established AV 132 was from the ground up designed for modern BRT (Bus Rapid Transit) traffic concepts and new vehicle generations. The AV 133 version with aluminum spring carriers excels with a weight advantage of 45 kg. The new axle program of the A/AV 110 for midibuses rounds off the product portfolio in this segment.

ZF driveline consultancy: on the road with optimized fuel consumption

However, not only advanced technology plays an essential role for improving the public transport sector. In order to enable transmission and axle systems to achieve their full efficiency potential, they must be ideally adapted to one another. Thus, ZF offers an additional, modular service concept for public transport authorities. The route-related driveline consultancy for a detailed on-site analysis of route and vehicle-specific parameters is used by the ZF experts to calculate the ideal configuration parameters. The recommendations given as part of the consultancy have already decreased the fuel consumption of buses in operation by up to four percent.



Captions:

- 1.) Thanks to the start/stop function for the EcoLife transmission system, conventional diesel city buses consume up to ten percent less fuel.
- 2.) ZF's AVE 130 electric portal axle drives electric mobility in low-floor city buses – with more power and greater efficiency. Based on an electric single-wheel drive, it makes bus operation both extremely economical and environmentally friendly.
- 3.) The optional AV 133 version with lightweight spring carriers made of aluminum instead of steel reduces the axle weight by another 45 kg.
- 4.) Added value from system knowledge: With its route-related driveline consultancy, ZF offers a unique service for transport authorities that reduces fuel consumption of newly ordered buses by up to four percent.

Photos: ZF

Press contact:

Frank Discher, Technology and Product Communication,
Tel.: +49 7541 77-960770, e-mail: frank.discher@zf.com

Thomas Wenzel, Head of Technology and Product
Communication, Tel.: +49 7541 77-2543, e-mail:
thomas.wenzel@zf.com

ZF is a global leader in driveline and chassis technology as well as active and passive safety technology. The company, which acquired TRW Automotive on May 15, 2015, is now represented at about 230 locations in some 40 countries. The two companies, which were still independent in 2014, achieved a sales figure exceeding €30 billion with 134 000 employees. As in previous years, both companies have invested approximately 5 percent of their sales in Research and Development (recently €1.6 billion) in order to be successful with innovative products. ZF is one of the top three automotive suppliers worldwide.

In 2015, the company is celebrating its centennial. Originally named Zahnradfabrik GmbH, ZF was founded in Friedrichshafen in 1915 by



Luftschiffbau Zeppelin GmbH among others. In its early years, the company developed, tested, and manufactured aircraft transmissions. After 1919, the company focus shifted under Alfred Graf von Soden-Fraunhofen, the first Managing Director and later member of the Board of Management and CEO, to the automotive and commercial vehicle industry. In this sector, the company established itself once and for all as a major technology supplier, registering numerous patents for innovative transmission technology. The first location outside Europe was founded in Brazil in 1958, launching a globalization drive that still continues today. In addition, ZF constantly expanded its range of expertise – also through acquisitions. For instance, in 1984 ZF acquired the majority share in Lemförder Metallwaren & Co. KG, a move which expanded the product portfolio to include chassis technology. In 2001, ZF took over the former Mannesmann Sachs AG to strengthen its value added chain with driveline and chassis components. It adopted the current name of ZF Friedrichshafen AG in 1992. Today's product range includes driveline and chassis technology such as transmissions, driveline and chassis components, as well as complete axle systems and modules. ZF products are used in passenger cars, commercial vehicles, construction and agricultural machinery, rail vehicles, and marine applications. The company also focuses on the wind power and electronic components business. In addition, ZF Services represents the Group on the international aftermarket. In May 2015, ZF completed the acquisition of the U.S. automotive supplier TRW which had been previously announced in 2014. The shareholders of ZF Friedrichshafen AG are the Zeppelin Foundation, administered by the City of Friedrichshafen, holding a share of 93.8 percent, and the Dr. Jürgen and Irmgard Ulderup Foundation, Lemförde, with 6.2 percent. The "Motion and Mobility" slogan clearly states the company's core mission: Right from its foundation, ZF has developed and manufactured innovative products for all people around the globe who want to move things reliably, comfortably, and safely, and experience the ultimate in efficient mobility. Quality, technological leadership, and innovative power have always defined the Group's identity – today as much as ever.

For further press information and photo material please visit: www.zf.com