



ZF Eliminates the Bottleneck: Intelligent Technology Makes Logistics at Depots More Efficient and Safer

- **With intelligent mechanical systems, sensor systems and control units, ZF enables commercial vehicles to see, think and act**
- **ZF Innovation Truck: A heavy truck autonomously and electrically maneuvers swap bodies at the depot**
- **The Terminal Yard Tractor independently maneuvers trailers**
- **ZF's tailor-made routing system connects and coordinates driverless vehicles on depots in real time**

Friedrichshafen. With two innovative solutions, ZF shows what direction logistics could take at depots, in forwarding companies, at sea and airports and other specified areas. In future, the vehicles could autonomously maneuver swap bodies or trailers to their respective destinations. This is based on the technology company's key principle "see. think. act". Building on this, they develop means for the logistics sector to increase efficiency, speed and environmental friendliness whilst reducing accidents and avoiding damage. Last but not least, driverless vehicles with the ability to maneuver help counter the ever growing shortage of skilled workers in the logistics industry.

The logistics industry is currently experiencing positive growth forecasts and increasing transport volumes. The flip side of this is an increase in flexibility requirements as well as time and cost pressure. Forwarding companies especially suffer from the shortage of skilled workers, which will drastically intensify among professional drivers. With the ZF Innovation Truck and the Terminal Yard Tractor, ZF offers future-oriented solutions to the central challenges faced by forwarding companies: "Autonomous vehicles that, thanks to our technologies, can see, think and act are turning the idea of consistent smart logistics into reality, at depots and other specified areas," says Fredrik Staedtler, head of ZF's Commercial Vehicle Technology Division. "These vehicles can



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prevent maneuvering damage and downtimes, which gives logistics companies a competitive advantage. The functions presented in our current innovation vehicles are therefore applications that are in high demand and pay off quickly."

New swap body technology to increase efficiency and safety

When maneuvering in the depot, challenging tasks such as lifting, shifting and stacking containers – meaning unloading freight from one truck and loading another – are the ones that tie up driver resources the most, cost time, and often lead to accidents and expensive damage. In contrast, the ZF Innovation Truck – a hybrid truck based on a heavy six-wheeler – carries out these tasks without a driver. As soon as the driver has entered the premises, he can get out, activate the autonomous driving mode and then take a break. The truck will find its way to the target position driving autonomously and electrically. Likewise of its own accord, the ZF Innovation Truck then loads a new container. Controlled by the central computer ZF proAI, the ZF Innovation Truck always manages this quickly, precisely, and with the maximum possible safety. In addition, neither stress, fatigue, distractions nor darkness or adverse weather conditions can influence the truck.

Whilst ZF proAI is the Innovation Truck's brain, other ZF technologies enable it to act: among others, the active electrohydraulic ReAX commercial vehicle steering system and the TraXon Hybrid automatic transmission system. The latter is characterized by a modular integrated electric motor that allows locally emission-free driving. To give the ZF Innovation Truck its orientation and vision, the technology company selected a cost-effective, camera-based and laser-supported sensor setup, completing it with a GPS system.

Autonomous loading

The extended sensor set additionally enables the Terminal Yard Tractor to keep an eye on its surroundings. Here, the central computer ZF proAI coordinates the functions of longitudinal and lateral guidance: This enables this shuttle vehicle to take the trailer from the truck and



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autonomously maneuver it to the ramp for loading and discharging. Once this has been completed, it takes the trailer back to the truck.

An on-site computer calculates the trajectory and transfers the data to the on-board unit of the ZF OPENMATICS telematics system by wireless signal. ZF proAI in the vehicle processes the information in real time and converts it into instructions for action for the engine, steering system and brakes.

Electronically routed commercial vehicles

An intelligent and dynamic routing system tells each innovation vehicle where to go, when to go, and what to do there. As soon as the autonomous driving mode is activated, the vehicles automatically log on using the depot's individual LTE/WLAN wireless signal as well as the OPENMATICS on-board unit. The routing constantly checks and considers, for example, the vehicle's current position and the routes of other vehicles on the premises and immediately adjusts the vehicle's own routing when necessary.

Minimum effort, maximum value

Thanks to a sensor set in the vehicle and a routing system on the work premises, drivers are shown on their tablets how to approach and pick up the respective swap bodies quickly and smoothly. With this, the technology company is pushing ahead with useful functions for truck fleets, keeping an eye to the future of both manual and autonomous driving as well as driverless logistics.

Captions:

- 1) For faster, safer and more efficient logistic processes: The unmanned ZF Innovation Truck maneuvers depots or similar areas and autonomously masters lifting, shifting and stacking. In addition, the TraXon Hybrid transmission system allows the truck to locally maneuver emission-free and quietly.
- 2) Truck tractors can wait: ZF's autonomous Terminal Yard Tractor maneuvers trailers in defined areas to the ramps and back



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- 3) The mobile super computer is one of the keys to smart logistics for forwarding companies: The ZF proAI central computer manages the autopilot functions both in the Innovation Truck and in the Terminal Yard Tractor, covering all longitudinal and lateral guiding.
- 4) Networking makes mechanics smarter: The ZF routing system transmits data to tell the autonomously maneuvering vehicles on the work premises where they need to be, when they need to be there and the best way to get there.
- 5) Intelligent logistics thanks to ZF systems: In the ZF Innovation Truck, the ZF proAI central computer acts as its brain, whilst other ZF products ensure it is capable of acting. Among these are the active electrohydraulic ReAX commercial vehicle steering system and the TraXon Hybrid automatic transmission system.
- 6) ZF's system competence for intelligent logistics: The expanded sensor kit allows the Terminal Yard Tractor to keep an eye on its surroundings, whilst the ZF proAI central computer coordinates all longitudinal and lateral guiding functions.

Images: ZF

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ZF Friedrichshafen AG

ZF is a global leader in driveline and chassis technology as well as active and passive safety technology. The company has a global workforce of 146,000 with approximately 230 locations in some 40 countries. In 2017, ZF achieved sales of €36.4 billion. ZF is one of the largest automotive suppliers worldwide.

ZF allows vehicles to see, think and act. The company invests more than six percent of its sales in research and development annually – in particular for the development of efficient and electric drivelines and also in striving for a world without accidents. With its broad portfolio, ZF is advancing mobility and services in the automobile, truck and industrial technology sectors.

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