

VOLKSWAGEN TRUCK & BUS

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Volkswagen Truck & Bus – making logistics ready for the future

- **Brands present pioneering technology that will shape the future of transportation at the Innovation Day**
- **Leading the way for autonomous transportation: First autonomous truck is handed over to its owner. MAN and Scania working on cross-brand platooning**
- **Connectivity and digitization changing the world of transportation:**
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- **World premiere in Hamburg: e-Delivery, an electric distribution truck**
- **Andreas Renschler: “We chose exactly the right time to bundle our expertise and pool our resources. Today, we are one of the leading companies when it comes to developing technology and products for the future of transportation.”**

Braunschweig, October 11, 2017

Volkswagen Truck & Bus presented pioneering technology and products that will transform the entire logistics chain in a sustainable way during the Innovation Day in Hamburg. The Group, which includes brands such as MAN, Scania, Volkswagen Caminhões e Ônibus, and RIO, has set itself the goal of increasing efficiency and improving environmental performance in the world of transportation, as well as of making it safer. In order to achieve this, Volkswagen Truck & Bus is focusing on three trend-setting fields, namely automated driving, connectivity, and alternative drive systems that are friendly to the environment. Faced with enormous growth in transport volumes around the world and emission regulations that are becoming more and more stringent, customers are increasingly looking for such solutions. More efficient and cleaner transportation not only reduces the impact on the environment, it also makes logistics companies more profitable.

On the development side, Volkswagen Truck & Bus is pooling its brands' resources with the aim of leveraging synergies and incorporating the strengths of the individual brands in an optimum way. The concept of lead engineering plays a key role in this process. As part of lead engineering, responsibility for a joint development project is assigned to one brand. The Research and Development central function is responsible for coordinating the development activities performed by the brands. This enables the Group to execute various major projects at the same time and with the same level of focus, while swiftly pressing ahead with a broad range of issues. Anders Nielsen, CTO at Volkswagen Truck & Bus: “We are organizing collaboration and by doing so apply lead engineering which delegates responsibility for common development projects to one brand. This is to avoid duplication and leverage

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synergies by re-using technologies across the brands. This will allow us to free up research and development resources to focus on new technologies as well as to be faster to market in a cost-efficient way.”

The development activities are coordinated and performed together on the basis of combined roadmaps that show the long-term way towards the future of clean and sustainable transportation. Together with its brands, Volkswagen Truck & Bus is developing technologies and products that are in demand and that help customers to also run their business successfully in the future. As part of this process, an increasingly vital role is played by factors like efficiency, zero emissions and sustainability. Andreas Renschler, CEO of Volkswagen Truck & Bus and Volkswagen AG Board Member responsible for commercial vehicles, said: “We chose exactly the right time to bundle our expertise and pool our resources. Today, we are one of the leading companies when it comes to developing technology and products for the future of transportation. We have the potential to advance transportation to the next level of development.”

Automated driving: greater safety and fewer emissions

Automated driving offers tremendous potential for making the transportation of goods by road more sustainable. A large number of stages have to be reached before trucks that navigate congested urban areas autonomously can become reality: from automated protection vehicles in highway road maintenance and autonomous dump trucks in mines, all the way to driverless tractors in port terminals and platoons for long-haul transportation on the highways. Together with its brands, Volkswagen Truck & Bus is working hard on all these applications. Meanwhile, MAN and Scania platoons are being tested across the whole of Europe. In this respect, the concept of platooning describes a convoy of connected trucks that partly run autonomously, with the driver of the lead vehicle determining the route and the speed. Fuel consumption on the highways is significantly reduced thanks to slipstream driving. There is a lower risk of accidents and drivers of the vehicles behind the lead truck have time to perform other activities, while still being able to take control of their own vehicle at any time. Working in cooperation with DB Schenker, MAN will start testing the first platoons on the digital test track on the A9 highway between Munich and Nuremberg in spring 2018. Scania is involved in a platooning project in Singapore, where the plan is to have platoons run on public roads between two port terminals. “Platooning is the first step towards automated driving on public roads,” Andreas Renschler explained. “The next step will involve enabling truck convoys comprising different brands to operate in platoon formation. As part of this process, Scania and MAN will join forces under the Volkswagen Truck & Bus umbrella to pioneer technology and develop standards that will shape the future of the entire industry.”

Volkswagen Truck & Bus is working closely together with Volkswagen Group Research to make automated driving a viable option on public roads, all the way up to autonomous driving at level five. The “Fellow Truck” project, for instance, gradually integrates artificial intelligence modules into the vehicles. The aim is for Volkswagen to be in a position to offer specific products that enable the fully autonomous transportation of goods and people on public roads in a few years’ time. By achieving this aim, Volkswagen Truck & Bus will be making a sustainable contribution to improving the flow of traffic and road safety. However, for autonomous driving to become reality on public roads, changes need to be made to the

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legal framework and the requisite infrastructure needs to be built. Volkswagen Truck & Bus is counting on the support of policymakers in this respect. This is already possible in specially delineated areas:

Fully autonomous Scania vehicles are ready to be used in mines, while the first commercial vehicle will be shipped to its owner within the next few weeks. Henrik Henriksson, CEO of Scania: "We always aim to offer customers the best possible solution for their specific transportation needs and to make them more profitable. Using new technology makes it possible to come up with even better solutions. Autonomous trucks are the perfect solution for segregated areas, since they offer extra safety and efficiency."

In cooperation with seven partners from industry, research, and administration, MAN, too, has demonstrated how far the technology of automated driving has evolved with the impressive BMWI-subsidized research project "aFAS". The latter involves a driverless MAN truck driving autonomously as a safety vehicle for mobile road maintenance works for the first time in German history.

Digitization paves the way

Continuing digitization is set to radically change the world of logistics. Volkswagen Truck & Bus is actively advancing connected driving in transportation along the entire value creation chain and across all modes of transport. Its mission is to connect the entire supply chain, so that the greatest possible efficiency can be achieved. "Our customers, and with them the entire transportation industry, and, last but not least, the environment, will reap the benefits of connected digital transportation," Markus Lipinsky, CEO of RIO, emphasized.

RIO, the open cloud-based platform of the Volkswagen Truck & Bus Group, connects all players across the value creation chain. Algorithms will process the data that has emerged as a result of countless process steps in real time, serving as the basis for making better decisions. The RIO platform and digital RIO services will be available before the end of this year. Tests are currently being carried out with 20 MAN customers with mixed fleets, including Volkswagen's Group Logistics service providers. A total of more than 100 vehicles from Germany, France, Denmark, the UK, and Poland are involved in the testing. The platform serves as the foundation of the services offered by the brands, the partners from the logistics ecosystem, and the RIO digital brand. It connects services like vehicle tracking, driver communication, driving and efficiency analyses, digital maintenance management and tachograph data, as well as other advanced logistics services, making these available on the online RIO marketplace. MAN is the first OEM partner to equip its EURO VI vehicles ex works with RIO connectivity, which it has been doing since August.

Scania has always played a leading role in fleet connectivity. Together with MAN and Scania, Volkswagen Truck & Bus is currently in a position to build on over 300,000 connected trucks. By working together with U.S. partner Navistar, the company will use this as the basis on which to develop a total of 650,000 connected vehicles worldwide in the future. The vehicles will also be able to use the RIO platform to call upon the in-house OEM services of their respective brand, as well as services offered by third-party providers. Use of the platform will be particularly suitable for the ever-growing number of innovative start-ups, for example Loadfox, a freight exchange platform with algorithms that optimize truck capacity. This, in

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turn, will ensure fewer empty runs and higher margins for customers, while lowering the consumption of resources. sennder is another startup which specializes in same-day parcel delivery. What is so special about sennder is the fact that it manages to get by without the traditional hubs that still tend to form the backbone of classic modern-day logistics. A key aspect from a social perspective is that transporting goods more efficiently will help improve the flow of traffic and lower emissions. This is the only way that cities will be able to manage transport volumes that continue to grow rapidly.

Alternative drive systems for every situation

In light of the increasing exchange of goods, expanding cities and booming online sales, alternative drive systems that help to improve the quality of air in metropolitan areas are acquiring more and more importance. Significant progress is currently being made in the area of alternative drive systems. Last mile transportation services, i.e., the delivery of parcels to end customers, are becoming electric. Dr. Eckhard Scholz, CEO of Volkswagen Commercial Vehicles, explained: "The eCrafter is a high-performing van with a range of up to about 200 km. The vehicle will be shipped to selected customers by the end of 2017. The VW I.D. Buzz Cargo, a compact van that runs on electricity, is also being developed, its design and suitability for day-to-day life reminiscent of those of the classic VW Bulli." The model is set to be launched in 2022.

Volkswagen Truck & Bus is also working on electric solutions for use in both medium- and heavy-duty distribution transport and city buses. It will soon have a complete range of electric vehicles for the European market. The jointly developed e-drivetrain will form the basis of any electric architecture in the future. This electric powertrain is designed in a way that means that it can be used to drive future distribution trucks and city buses manufactured by the Volkswagen Truck & Bus brands as a universal modular element. Navistar, Volkswagen's strategic partner in the U.S., will also use the platform to be able to offer electric distribution trucks from 2019 onwards. MAN is already well on its way to developing an electric distribution truck. "We plan to deliver the first nine fully electric trucks to our customers in Austria by the end of 2017 – including large supermarket chains, breweries and haulers. Electric drives and distribution are a match made in heaven: The drives are quiet, do not produce any emissions locally, and are a perfect fit for customers' requirements. Equally, demand for these types of vehicles has been on the rise. We will be launching the first small set of vehicles on the market at the end of 2018," Joachim Drees, CEO of MAN Truck & Bus, explained.

World premiere in Hamburg for the electric distribution truck, the e-Delivery

With the fast-growing emerging economies in mind, another electrically powered distribution truck has been developed, which had its world premiere under the model designation Volkswagen e-Delivery at the Innovation Day. The e-Delivery is a modern truck for urban logistics designed to improve sustainability in the delivery of goods. It will be built at Volkswagen Caminhões e Ônibus in Brazil in 2020. Roberto Cortes, CEO of MAN Latin America: "The e-Delivery marks a milestone in the history of Volkswagen Caminhões e Ônibus. This is a brand-new platform that was developed in Brazil with the aim of offering new mobility alternatives to large cities."

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Both MAN and Scania will be testing the module on pre-series production versions of a city bus that runs on electric batteries (BEV) under everyday conditions in several European cities. Series production of these electric buses is due to start before 2020. Both brands can already offer comprehensive advice on introducing electric mobility solutions, along with the necessary charging requirements for electric buses, to bus operators and communities. As part of this endeavor, the focus is on being able to offer a variety of options, such as charging the buses overnight in depots or charging mid-route at bus stops.

As far as heavy-duty trucks are concerned and when it comes to long-haul transportation, modern-day battery technology still has a serious hurdle to overcome: Meeting the necessary energy requirements would disproportionately reduce load capacity. However, alternatives do exist. These include combustion engines powered by gas or biodiesel. Running engines on Liquefied Natural Gas (LNG) is a solution that holds great future potential for long-haul transportation. The future is looking rosy for this technology in long-haul transportation thanks to LNG's high energy density and the resulting considerable range of 1,000 km. Scania presented the first LNG truck in EURO VI back in 2014. An LNG campaign was launched in September 2017 in cooperation with Volkswagen's Group Logistics.

Initiatives are also under way to find a different way to electrify heavy-duty trucks to make sure that their range and load capacity can become suitable for long-haul traffic. The buzzword for this area of development is "e-road", which focuses on the use of overhead power lines, as in the rail sector. Trucks powered by overhead lines can run with zero emissions, and any batteries can be charged depending exactly on how many emission-free kilometers still lie ahead. A test route for electric Scania trucks already exists in Sweden. Test routes have also been announced in Germany.

Drive systems of the future will not be uniform, since their aim is to achieve an intelligent transition from diesel engines to alternative drive systems and fuels. "Volkswagen Truck & Bus has announced its aim of becoming number one in the field of alternative drive systems," Andreas Renschler explained. "The company already has a broadly diversified portfolio, which offers the best possible foundation for this endeavor."

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Transparent structures, clearly defined goals and a wealth of both tried and tested expertise and pioneering technology: Volkswagen Truck & Bus is rapidly becoming a Global Champion. This three-pronged approach, which combines automated transportation, digital services, and environmentally-friendly alternative drive systems, will reduce costs, make rising transport volumes manageable and protect the environment. In implementing the approach, the Group and its brands will set new benchmarks and be able to offer the right solution for every customer.

Die Volkswagen Truck & Bus GmbH ist eine 100%ige Tochtergesellschaft der Volkswagen AG und gehört mit ihren Marken MAN, Scania und Volkswagen Caminhões e Ônibus zu den weltweit führenden Nutzfahrzeugherstellern. Im Jahr 2016 setzten die Marken der Volkswagen Truck & Bus GmbH insgesamt rund 184.000 Fahrzeuge ab. Das Angebot umfasst leichte, mittelschwere und schwere Lkw sowie Busse, die an 25 Standorten in 17 Ländern produziert werden. Zum 31. Dezember 2016 beschäftigte das Unternehmen in seinen Nutzfahrzeugmarken weltweit rund 77.000 Mitarbeiter. Die Gruppe hat den Anspruch, das System Transport neu auszurichten – mit ihren Produkten, ihren Dienstleistungen und als Partner ihrer Kunden.