Commercial Vehicles –
Driving the Future
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Commercial Vehicles – Driving the Future

Commercial vehicles drive the future for all of us – day after day: As buses they bring our children safely to school. As ambulances and rescue vehicles they assist in giving the gift of life. As trucks they deliver raw material and semi-finished products to the industry, which converts them into the products for tomorrow. With a 70% share of freight haulage, it is the backbone of the transport industry. One part of the future that is worth striving for is clean and safe traffic. Already we have made great strides on this road. Thanks to increasingly improved safety systems, today’s trucks are just as safe as passenger cars when it comes to driving performance. Nevertheless we are on the brink of making another quantum leap in truck safety. Beginning November 1, 2014, all mid-weight and heavyweight commercial vehicles will be required by law to be equipped with an electronic stabilisation program (ESP) all across Europe. Beginning November 1, 2015, these vehicles also will be required to be equipped with an emergency braking assistant and a lane departure warning system so that today’s most commonly occurring truck accidents, namely rear-end collisions or the unintended departure from the travel lane, will become a thing of the past.

A new chapter is being written also when it comes to emissions. The task of reducing pollutants emitted by commercial vehicles down to almost zero is as good as achieved. Today all newly registered trucks fulfil the EURO Norm VI and emit only up to 3% of the pollutants that their predecessors did in the early 1990s. Now commercial vehicle manufacturers are focused on reducing fuel consumption and CO2 emissions even more. Here the hybrid and pure electric drives are ideally suited for vehicles that see a large share of stop-and-go traffic and city driving, e.g. the light-duty freight vehicles (transporters), middle-duty trucks and public transportation buses. In Germany alone today there are already thousands of transporters and public buses on the road that use electric drives. For heavy trucks used for long-haul transport, the diesel internal combustion engine remains the backbone of truck drive-systems for the time being. However there are numerous possibilities to reduce CO2 emissions even more. Among these are the dual-fuel technologies where the diesel fuel is supplemented by compressed natural gas (CNG) or liquefied natural gas (LNG) stored in separate tanks. Also adjoining components and the drive-train can be further optimised. Furthermore savings can be achieved through lightweight vehicle and trailer constructions and the installation of low rolling-resistance tyres. Another big boost in reducing CO2 can be achieved through more development in vehicle and trailer aerodynamics. The long-term aim is to power long-haul freight transport purely with electric energy. Reducing CO2, however, is not the sole responsibility of the commercial vehicle manufacturers. It is a duty that has to be done in a mutual cooperation: the fuel manufacturers have to provide a widespread supply infrastructure for CNG and LNG. Transport companies and their drivers – also for their own interest – bear the responsibility for intelligent, travel-saving fleet management systems and energy-saving driving habits. Here the commercial vehicle manufacturers can provide support with telematics solutions. Last, but not least, policymakers also have to make their contribution – by creating a road infrastructure that is close to being free of traffic jams and by approving the registration of innovative, CO2-saving vehicle concepts, for example the long-truck whose CO2-saving comes at no cost to policymakers and could be implemented rapidly.

This shows that not only the vehicle manufacturers are in a position to drive the future with their research, innovation, and ideas. Everyone has to step up together and take the responsibility.

Matthias Wissmann, President, German Association of the Automotive Industry

Dr. Kay Lindemann, Managing Director, German Association of the Automotive Industry
Commercial vehicles keep our economy moving

We all would be very much poorer without freight haulage. It is the prerequisite that allows us to benefit from the spatial division of labour, which is crucial in enabling larger economies of scale and creating the advantages of specialisation from which we all benefit as consumers. Economies of scale become effective as soon as they begin to pay off with respect to market sales volumes, large machinery use, large-scale plants, and standardised and automated production processes that make production processes worthwhile and production far less costly. The benefits of specialisation result from the idea that not everyone has to produce everything. Instead manufacturers specialise in producing their own products for which they are best suited based on resource availability and the production expertise acquired over the years. These gains in productivity lead to higher standards of living and to a variety of domestic and exotic goods, which we all very much appreciate.
Freight haulage is also done via inland waterway and rail. The core and backbone of freight haulage is, however, the commercial vehicle. It handles over 70% of the freight haulage in Germany – a figure that is similar to the rest of Europe. And according to transportation forecasts, this will remain so in the future. The latest prognoses for the German Ministry of Transport – which forecast up to the year 2030 – project road freight haulage to grow at an annual rate of 1.8% and will maintain its market share.

The commercial vehicle ensures prosperity not only through its function as a booster of efficiency for the economy as a whole, but it also secures our prosperity and employment. Approximately 190,000 people work in the production of commercial vehicles. That represents about one quarter of all employees in Germany’s automobile industry. Moreover there are also the people whose jobs directly depend on the operation, maintenance and use of the commercial vehicle.
The commercial vehicle – the all-rounder

The classic commercial vehicle in fact does not really exist. Rather it appears in numerous variants performing countless duties within our economy. It is often customised for each specific purpose.

As a means of transport for goods it is a key component of our economic and raw material cycle. The commercial vehicle delivers raw materials to industrial plants, and from there it delivers finished goods to people – either directly to the doorstep via retail trade, or as a feeder for rail and sea freight in combined transport. On average it transports over 114 kg per person daily.

In passenger transport the commercial vehicle brings us to our destinations – to our holiday location, to school, or to the workplace. It is also a rescuer in emergencies – an ambulance or a fire truck. It is a very useful helper in our daily lives, for example when moving to a new home, or for sweeping streets.

Did you know in Germany?

- Every year the commercial vehicle performs over 11.7 million rescue and ambulance calls annually.
- Every year fire trucks extinguish over 200,000 fires and respond over 560,000 times for technical purposes ranging from rescue in car accidents to pumping out flooded basements.
- Over 2 million times each year commercial vehicles assist people in moving to a new home.
- Each day commercial vehicles deliver over 70 million letters.
- Each year commercial vehicles perform approximately 2.7 billion courier, express and package deliveries.
- Each year commercial vehicles haul away 44.1 million tonnes of household refuse.
- Each year commercial vehicles deliver 99 litres of beer per capita to store shelves.
- Each year and per capita commercial vehicles deliver over 65.7 kilograms of potatoes to markets.
- Each year and per capita commercial vehicles transport 95.4 kilograms of vegetables to retail shops.
- Each year and per capita commercial vehicles deliver 90 kilograms of meat to the consumers.
- Each year and per capita commercial vehicles deliver 36.7 kilograms of citrus fruit to the super markets.
- Each year and per capita commercial vehicles bring 12.7 kilograms of ready-made meals to the frozen food sections.
Road and rail go hand in hand

Its unmatched flexibility is the primary reason the commercial vehicle plays a major role within our freight transport system. It can drive right up to the loading dock, to every house doorstep, and to every construction site. Transport by rail and inland waterway, on the other hand, can only be used when the freight's departure and arrival points are already a part of the rail or inland waterway network. Otherwise the freight must rely on the services of the commercial vehicle for its first or last miles of haulage.

Transport by rail can make sense especially for long trips. Road transport as a rule is more economical and environmentally friendly for short distances because the combined road-rail transport requires more energy for freight reloading and for detours from the direct road connections. As a result, a role for rail freight does not get considered for the 78% of road freight transport done annually on stretches under 150 kilometres.

Moreover the commercial vehicle is the most suitable means for small volume transport. For example the economic threshold for rail freight transport is calculated to be well over 300 tonnes of payload.

Political efforts aimed at shifting as much as possible freight haulage over to inland waterways or to rail fail to adequately take the logistical needs of our economy into account. In addition, the efforts are part of an outdated transport policy which views the different modes of transport as opponents and attempts to pit one against the other.

However it is a fact that the various modes of transport have their own strengths and weaknesses, which predestine them to perform different transportation duties. Thus in the transportation market all the players have long been focused on cooperation rather than rivalry.

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Economy of commercial vehicles, rail, and water vessels

- Economy for small and short transport
- Reachability

+ Mass performance capability

Source: VDA
A new era in truck safety begins

When it comes to accident frequency, already today there is no difference when compared to the private automobile sector. Continuously improving safety technology has resulted in the number of accidents involving bodily injury, and which involve the truck, having dropped by 80% to 0.39 per 1 million kilometres driven since 1970. This corresponds exactly to the figure for passenger cars.

Accidents with injuries to persons
per 1 million veh. kilometers

Source: Federal Statistics Office
However this does not mean the possibilities for greater safety have been exhausted. To the contrary we are in the midst of making a quantum leap in truck safety. Effective November 1, 2014, all newly registered middle and heavy duty commercial vehicles will be legally required to have an electronic stability control (ESC). Here the targeted braking of individual wheels assists to keep the vehicle from skidding out of control. In addition, beginning November 1, 2015, trucks will have to be successively outfitted with emergency brake assistant and lane departure warning systems. In the event of a threatening collision with a traveling object, the emergency brake assistant executes braking should the driver fail to heed acoustic or optical warnings quickly enough. If the distance to the edge of the lane becomes too small, the lane departure warning system acoustically warns the driver. These innovations serve to prevent the most common accidents involving heavy duty commercial vehicles, namely rear-end collision accidents (33%), lane or drifting-off-the-lane accidents (39%). Commercial vehicle manufacturers have long been offering these innovations. Legal requirements now assure that these innovations will be put to widespread use.

Consequently experts project the number of road accidents happening outside of the city limits to fall 50% and resulting damage to drop 90%.

Anders Nielsen, Spokesman of the Board of MAN Truck & Bus AG: “We owe it to the innovations of commercial vehicle manufacturers that trucks have become safer and more efficient year after year. However the work for the most efficient and safe transport solutions involves much more – it is a joint task that must include contributions from manufacturers, policymaking, and drivers.”
A NEW ERA IN TRUCK SAFETY BEGINS

Beyond these innovations commercial vehicle manufacturers have other systems available in their product ranges:

- Adaptive cruise control (ACC), which detects slower moving vehicles up ahead and automatically and cautiously slows the vehicle until it reaches the pre-selected distance. This also functions in stop-and-go traffic. It not only improves safety but also driver comfort.

- Roll stabilisers, which calculate the necessary shock absorber force and matches it to the loading on the vehicle (braking, accelerating, curve and hill travel) and to the road surface characteristics. They especially improve driving safety in vehicles with high centres of gravity, e.g. trucks with swap bodies.

- Alertness assistant, which, using various indicators like the steering behaviour, detects growing driver fatigue and warns him optically and/or acoustically.

- Brake assistant, which detects an emergency braking and assists in maximising the braking power in a fraction of a second.

- New mirror systems to reduce blind spots to a minimum and thus prevent accidents when turning or changing lanes. For example side view mirrors can be extended outwards in order to improve visibility of the space behind the vehicle.

- For transporters so-called lateral wind and lane change assistants are already available. Wind gusts lead to the vehicle taking appropriate braking action on the individual wheels to prevent the vehicle from being pushed off lane. Lane change assistants provide an acoustic warning of cars inside the blind spot in the event of an intended lane change.

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**Selected types of accidents involving heavy duty trucks whereby passengers in cars were either killed or seriously injured**

<table>
<thead>
<tr>
<th>Type of accident</th>
<th>Adressed system</th>
<th>Share in accidents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unintended lane departure into oncoming traffic lane</td>
<td>Lane departure warning system</td>
<td>10 %</td>
</tr>
<tr>
<td>Head-on collision against a passenger vehicle</td>
<td>Emergency braking assistant</td>
<td>35 %</td>
</tr>
<tr>
<td>Side collision to a perpendicular-positioned crashed car</td>
<td>Emergency braking assistant</td>
<td>5 %</td>
</tr>
<tr>
<td>Collision at the end of a traffic jam</td>
<td>Emergency braking assistant</td>
<td>10 %</td>
</tr>
</tbody>
</table>

Source: VDA
Other applications will become available over the mid-term. Examples:

- Curve warning assistants, which work using the navigation system to analyse the radius of the next curve ahead of time and warn of an overly high curve-entry speed.
- Night viewing systems, which will profoundly improve visibility in darkness, e.g. infrared.
- Active lane tracking systems that not only warn, but also gently correct steering when the travel lane is unintendedly departed.
- Parking and manoeuvring systems, which can provide distances to obstacles within centimetre accuracy, using for example ultrasonic sensors placed at the vehicle front and back ends.

If an accident occurs despite all the precautions, passive safety systems assure that the consequences are as light as possible. To accomplish this, commercial vehicle manufacturers have optimised the driver cabins with special protection against roll-overs, frontal collisions, and collisions from a load sliding forward. Also protection of the partner is a top priority at the manufacturers – e.g. front under-ride protection which prevents a car from going underneath the heavy vehicle in a head-on collision.

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**Fatalities in accidents involving trucks**

**Seriousy injured persons in accidents involving trucks**

![Graphs showing trends in fatalities and seriously injured persons in accidents involving trucks](source: Federal Statistics Office)
The state and drivers also bear responsibility

The duty of the state is to assure that streets and roads remain in a safe condition. This includes, for example, the timely modernisation of street surfaces within the scope of maintenance management because uneven road surfaces reduce contact between the tyres and the road surface, which in turn can contribute to a loss of vehicle control. This is especially true for long haulage trucks which are travelling with trailers. With the respect to the aforementioned, the lack of investment in highways is critical. It is the reason that almost 20% of the street surfaces on our autobahns are rated as “poor” to “very poor”.

The driver is also responsible for the safety of the commercial vehicle. His responsibility begins already with correctly distributing and securing the cargo on his vehicle before starting the transport. During the transport it is of course helpful that the safety systems handle critical travel situations in an emergency. The best way to avoid accidents is to not allow oneself to enter into a critical situation to begin with. A requirement for this is calm, attentive and careful driving – and the appreciation of the special circumstances that the physical movement of a 40 ton-vehicle involves, including the dangerous centrifugal forces and forward momentum a payload can develop when braking or traveling over a curve. Here intensive driver instructions are necessary. But also here companies of the commercial vehicle industry are active and today belong to the largest training facilities of this type.
Focus on driver comfort

The most important capital in road freight haulage is the vehicle driver who has to spend a major part of his or her annual time inside the driver cabin – for both working and living. Therefore it needs to be designed to be as comfortable as possible.

Occupational psychologists have long known that the spatial layout of the workplace plays a decisive role in employee satisfaction and health. This is especially true for long-haul truck drivers who spend most of their time inside the driver cabin each year. For long-haul drivers the cabin is not only a cockpit and office for conducting transportation tasks, it also serves as the living space over a large part of the year.

Commercial vehicle manufacturers are also aware of their responsibility for driver health and thus have continuously optimised driver cabins. These have become in a sense mobile apartments which are no longer comparable to the cramp, purely functional driver cabins of the past. Through countless variants, today’s driver cabins can be adapted to suit individual wishes. They have level floors with carpeting, large volumes of space and enough interior height to allow drivers to stand upright. Also offered are relaxation zones on the passenger side, which allow drivers to completely stretch out their legs and enjoy their meals on a foldable table during the longer breaks. When desired driver seats may also be outfitted with a massage function for greater relaxation.

Haulage companies today are placing greater value on the comfort systems offered by the industry. This is gaining importance especially with respect to the shortage of drivers and the increasing competition between the freight transport companies in attracting long haul drivers.

Pierre Lahutte, Global Brand President Iveco: “Commercial vehicle manufacturers take their responsibility for the driver very seriously and view it as their duty to create a driver cabin that has an atmosphere of comfort. Nowadays driver cabins also include fixed climate control systems and refrigerators. This as whole not only contributes to relaxation for the driver, but to road safety as well.”
High performance, yet still ecological? Naturally!

No other mode of transport has developed as much as the commercial vehicle over the last decades. Modern engines today put out more than 700 horsepower for special applications on the roads yet emit just a fraction of the pollutants of what their predecessors did in the 1990s. By comparison the EURO-VI motors, which have been legally mandated since December 31, 2013, emit up to 97% less pollutant.

Ulrich Schöpker, Member of the Board of Schmitz Cargobull AG: “The trailer manufacturers have succeeded in reducing the weight of their trailers by over 30% – to below 6 tonnes since the 1970s. As a result they have made a contribution to the overall CO2 reductions achieved up to now.”

Exhaust emissions reduction of heavy trucks

Source: VDA
The historical challenge of decreasing pollutants down to almost zero has indeed been met by the commercial vehicle manufacturers. Now the focus has shifted to further reducing fuel consumption and CO2 emissions - though great progress has already been achieved here. A 40-tonne truck trailer today consumes about 60 percent less fuel per tonne-kilometre than a comparable one did in the mid-1960s.

Commercial vehicles – more climate-friendly than Rail?

Modern commercial vehicles, however, are not only much more environmentally friendly than their predecessors. In competition they also need not shy away from other modes of transport. Apart from blanket judgments, there is no “most environmentally friendly mode of transport”. A mode of transport’s climate impact depends greatly on the specific traffic conditions one finds from place to place. Studies conducted by environmental experts show that rail may offer climate advantages when, for example, hauling heavy, bulk materials or containers - provided the train length is sufficiently long, the share of empty runs is minimal and the before and after transport distance is short enough. But as soon as just one of these factors fails to be optimal, the commercial vehicle can become the better alternative. For example the transport of gear parts from Stuttgart to Rastatt is more climate-friendly by commercial vehicle, despite extremely short pre-transport travel, when the train consists of only 6 wagons due to logistical reasons. (see concrete data on the transport case in the annex)
What will power our movement tomorrow?

To achieve further CO2 savings, light and middle-duty commercial vehicles (usually used in local distribution with minimal daily mileage) and public transport buses are prime candidates for the application of hybrid and electric drives. Firstly, due to an adequate supply of charging stations (e.g. at the bus depot) there are no supply bottlenecks. Secondly, frequent braking and associated recuperation of brake energy help to recharge the batteries. Already today the necessary technology to do this is available. In Germany transporters and buses with electric drives are already in use. Fleet trials with electric transporters have shown fuel costs reductions of two thirds when compared to fleets driven by conventional drive systems. Also hybrid trucks with an allowable total load of up to 12 tonnes are already available from manufacturers.

For long-haul, heavy-duty vehicles, purely electric drives, e.g. the application of fuel cell technology, will become realistic later in the future. However the evolution of the commercial vehicle is already moving through various stages on the path to continuous CO2 emission reduction.

In addition to the optimisation potential of the diesel engine, opportunities for auxiliary units and drive train have not yet been exhausted. Here alone it is estimated that another 6% fuel savings is achievable through, among other techniques, automatically optimised transmissions, reducing engine friction through low friction surfaces, higher injection pressures and the recuperation of braking energy.

Martin Lundstedt, President of the Board of Scania AB: "In addition to diesel-based internal combustion motors as the ‘backbone’ of truck drive systems, a variety of alternative drives will increasingly come into use. Here the commercial vehicle manufacturers are already working on numerous innovations to further boost efficiency and CO2 reduction.”
Over the mid to long-term the use of compressed natural gas (CNG) and liquefied natural gas (LNG) will increasingly take on a role in long-haul trucks as an alternative fuel. This will yield less CO2 emission than the burning of diesel fuel. While the existing petrol stations and gas supply network can be used for the transport, storage and distribution of CNG, such an infrastructure has yet to be built for LNG. This is why it still remains only a mid-term possibility. The advantage offered by this fuel,
however, is that its high energy density allows a greater vehicle range than what is possible from CNG. With heavy duty trucks another possibility is to substitute only a part of their diesel fuel with natural gas in a separate tank (dual fuel). There is also the option of increasing the admixture ratio of climate-neutral bio-fuels of second and third generation to diesel fuel while taking changes in agricultural land-use and the associated ecological impacts into account.

Additional potential CO2 savings can be achieved through further aerodynamic optimisation of truck cabs and trailers. Here fuel consumption can be reduced by up to another 15 per cent. For example four per cent alone can be saved simply by adding "boat tails" to the back of trailers. These drag-reducing panels are approximately 40 cm long and are mounted at the rear edges of the trailer. Lawmakers must take steps to change the legal requirements to allow the corresponding longer lengths when registering vehicles.

Additional CO2 savings (2% - 5%) can be reached using special low rolling resistance tyres and lightweight materials for the tractor unit and trailer, such as aluminium and composites.

Transport companies and policymakers must also contribute

The commercial vehicle industry, however, is not alone responsible for reducing CO2. Also the transport companies can reduce CO2 emissions by utilising intelligent transport and route planning (e.g. minimising the total travel distances in transport and distribution, spontaneous acceptance of convenient transport orders during the
trip) and driver-training on fuel-saving driving habits and methods. Just through driver training, fuel savings of up to 10% can be achieved. The companies of the commercial vehicle industry provide assistance here with their offers for telematic services.

- Appropriate applications optimise the tours by company fleets and transmit incoming transport orders immediately into the navigation systems of the nearest vehicle.
- Driving records make the fuel consumption of drivers transparent.
- Using a 3D navigation map, GPS supported topography assistants analyse uphill and downhill grades of the route ahead and translate these into the transmission system so that the vehicle is always in the most energy efficient gear.

The state also has to do its homework. Among its duties are making sure that there is sufficient infrastructure capacity and reducing traffic jams as much as possible so that vehicles can travel constantly at a fuel-saving speed. Moreover it is necessary to use the ecological quantum leaps that results from permitting long trucks.

**Quiet on the road**

Our commercial vehicles are not only becoming safer, cleaner and more fuel efficient – they are also constantly becoming quieter. A noise level reduction of 8 dB (A) for a vehicle passing close by has been achieved compared to 1980. This translates to a total noise reduction of approximately 90%, which means today 13 modern trucks together reach the noise level of one truck from 1980. This has been accomplished by using low-vibration designs, optimum engine insulation, and a drive cabin that offers less contact surface against headwinds. Moreover commercial vehicle manufacturers are working closely with tyre and vehicle body producers. The noise reduction potential that can be influenced by the vehicle itself, however, can be reduced further only with great expense.

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**Jürgen Spier, Managing Director of Spier GmbH & Co. Fahrzeugwerk KG:** “The trailer is much more than a passive transport space. It is an active component of an integrated complete solution for reducing the CO2 emissions by heavy-duty commercial vehicles. Up to a 5% fuel reduction can be achieved alone through the aerodynamic optimisation of the semitrailer.”

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**Loud is out!**

Pass-by noise level [dB(A)]

Source: Continental AG
What policymakers can do

Beginning July, 2016, the new EU limits for noise emissions by vehicles will legally go into effect step-by-step. According to the new requirement, buses and delivery vehicles will have to be 4 dB (A) quieter, trucks by 3 dB (A). The noise burden a person subjectively perceives when standing next to a passing vehicle thus will drop an additional 25%. However in everyday conditions the noise burdens created by traffic are influenced by factors that go beyond the vehicle, e.g. the traffic density, the buildings in the immediate vicinity of the streets, the driving behaviour and the street surface conditions. Purely vehicle technical measures therefore will have limited impact. More rapid and far more effective would be changes in the street surface conditions, such as the application of low-noise surface layers.
Downward trend in emissions

Fears that growing traffic could also lead to growing ecological burdens are unfounded. Already in the past it has been shown that commercial vehicle manufacturers have been faster implementing their ideas to reduce emissions than traffic itself has grown. So despite growing traffic volume, emissions from commercial vehicles have absolutely decreased in almost every category in Germany. Based on the executed traffic performance, this means that emissions have fallen between 30 – 80%. Environmental experts anticipate this trend will continue over the long term.
Infrastructure – move into the future instead of administrating deficiencies!

For years investments have been greatly lagging behind demand. The German Ministry of Transport estimates the annual need for investment in the federal highway system at approximately € 8 billion. Other traffic experts even estimate € 8.6 billion. In reality investments have averaged only € 5.3 billion over the last 10 years.

Clearly expansion has been far below the traffic growth. As a result there are traffic jams on Germany’s autobahns whose number alone in 2013 reached 415,000, with a total length of 830,000 kilometres. The resulting loss in time places a massive burden on the transportation economy. In a survey 64% of the companies stated that their business was adversely impacted by the lack of road infrastructure. Also the climate gets damaged. Ultimately the current fuel consumption of a 40-tonne truck can triple when it has to brake twice over one kilometre instead of rolling through at a constant speed of 50 km per hour. Just how high the economic and ecological damage can be in a single case when maintenance on an especially important traffic connection is neglected over a stretch of just a few hundred meters was illustrated in 2013 when the Rheinbrücke (Rhine Bridge) in Leverkusen was closed for safety reasons to trucks weighing over 3.5 tonnes for 92 days. Over this time period just the economic and ecological damage resulting from the detour amounted to an estimated € 60 – 80 million. A timely maintenance measure here would have cost only a fraction of that amount.

Dr. Leif Östling, Member of the Board, Volkswagen AG, Business Unit 'Commercial Vehicles': “More efficient resource planning in logistics and higher safety are not only the tasks of the commercial vehicle manufacturers. Their innovation efforts must be accompanied by well-developed logistics concepts with business partners and complimented by an infrastructure policy that meets the needs.”

Breakdown of the German federal investment in highways as to budgetary funds and toll revenue

in billion €

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<th>Year</th>
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<th>Budgetary funds</th>
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</thead>
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<td>3,000</td>
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</tr>
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<td>2004</td>
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</tr>
<tr>
<td>2014</td>
<td>3,000</td>
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</tr>
</tbody>
</table>

Source: BMVI, Pro Mobilität
Truck toll - without boosting investment

The fact that investment has seriously lagged demand is truly incomprehensible in light of the fact the truck toll has created a new source of revenue for the state. Although the toll rates will fall as a consequence of a new expert report on road cost, policymakers wish to compensate for the loss of revenue by expanding the toll for trucks.

The truck toll today applies only to the federal autobahns and to 1000 km of four-lane federal highways. But beginning July 1st 2015, it will apply to another 1000 km. Over the mid-term it will be expanded to include all national highways.

Beginning October 1, 2015, the toll will not only apply to trucks weighing 12 tonnes allowable total weight and more, but also to trucks weighing 7.5 tonnes allowable total weight and more.

Moreover surcharges will be levied on the tolls because of air pollution and noise costs.

However there are strong objections against these measures.

In contrast to the federal autobahns (which also take on the cross-border and transit freight transport), the vehicles used on federal highways, especially those under 12 tonnes allowable total weight, are mostly on the road in regional commercial traffic. As a result especially the German transport industry and the infrastructure-weak regions with no autobahns are impacted by the toll.

Determining and quantifying the environmental costs is highly controversial when it comes to methodology. Various studies yield very different cost levels. In addition with the emissions-differentiated toll, there already exists a highly effective instrument for reducing emissions. Adding the environmental costs “on top of” the toll distorts the sense of the toll, which originally was intended as an instrument purely for financing road costs.
The long-truck – environmentally friendly, economical and safe

The global trend in the transport of goods is moving toward larger units – in ocean freight containers, in air freight, and also rail transport here in Germany. Recently German Rail was allowed to exceed the maximum allowable total length of 750 meters for a freight train at certain stretches and is now making efforts over the long-term for train lengths of up to 1500 meters on certain corridors. This development follows the logic that the required energy for transport increases more slowly than the growth in size of the transport means.

With trucks, extending the allowable total length from today's 18.75 meters to 25.25 meters would lower fuel consumption per kilometre-tonne by 20%. Moreover the equipment is already available for use today. It just has been combined in a different way: The usual truck trailer can be hitched to today's semis, or today's semi-trailer can be combined with a truck so that the combined traffic can be used with today's docking technology and rail car without limitation whenever needed.

Using the long-truck, the same freight volume that requires three commercial vehicles instead could be done with two. Here not only would fuel consumption fall, but so would damage to streets because the same total allowable weight of 40 tonnes would be spread over more axles.

Moreover, due to the elimination of the required space between the trucks, a combination of two long-truck vehicles requires less space on the road. Three conventional commercial vehicles need more space. Thanks to highly versatile axles that are used for the connection between both units of a long-truck, it is just as manoeuvrable as today's truck trailer and semi, and is also able to negotiate roundabouts just as well.

Foreign countries have long recognised the advantages of long-trucks. In the Netherlands, for example, they already have been in service for road transport for years, for the most part unnoticed by the public. In Germany policymakers had resisted to explore such concepts for years. But this has changed since the German government decided on January 1, 2012 to start a field trial with long-trucks in everyday traffic. One requirement was meeting strict standards with respect to driver qualification, vehicle safety features and the allowable street network. For the most part currently it is limited to the German autobahn network within the participating German states and the necessary street stretches that assure access to and from the autobahn for the participating companies.
Field trials yield top grades for safety and environment

Since the trial started 40 companies with 80 long-trucks have been on the road on a regular basis. They are transporting various components for different sectors – starting with food manufacturers and extending to include the automobile, paper, wind turbine, and insulation industries. The experiences made by the transport companies are very positive and have completely confirmed the expectations for environmental compatibility and economic efficiency. The savings in kilometres driven compared to the previous and transports by conventional trucks were approximately 30%. Fuel consumption and CO2 emissions also dropped considerably: between 20% and 30%. Also no complaints could be made with respect to safety. Over two and half years of field trials there has not been a single accident where a person has been injured or killed.

The field trial will continue until the end of 2016. However it is already clear that long-trucks represent a quantum leap with regards to environmental friendliness and economy – reason enough to soon discuss the question under which boundary conditions the application of long-trucks is possible when the field trial ends.

Comments by the participants of the long-truck field trial:

Wolfgang Thoma, Managing Director of forwarder Ansorge GmbH Co. KG: "The other traffic participants often did not even notice us. Only when some looked at the sign on the back of the truck did they realise it was a long-truck."


Rüdiger Elflein, Managing Director of Elflein Spedition Transport GmbH: "We only got positive reactions from both our business partners and from the public."

Thomas Schwarz, Managing Director of forwarder Schwarz GmbH: "In every respect our expectations were exceeded. Concerning driving dynamics, manoeuvrability and safety, the vehicles are completely problem-free to handle."

Source: VDA

Making two from three – resource savings thanks to long-trucks

Source: Der Feldversuch Lang-Lkw – eine Zwischenbilanz (Initiative für innovative Nutzfahrzeuge (Hrsg.))
Not only the engines and the safety equipment of our commercial vehicles are becoming more intelligent, but also their "brain". Telematics collect and process all important information and provide recommendations for taking steps - this saves costs and protects the environment.

More so than with a passenger car, the owner of a commercial vehicle focusses on making sure it is as economical as possible. One of the biggest assistants here is the commercial vehicle telematics. Already today there are numerous applications available on the market to support vehicle maintenance, optimise tour planning in order to navigate around traffic jams and much more.

Such applications can save the vehicle owner up to € 5000 per year and vehicle in fuel, repairs, maintenance, and personnel costs. The environment benefits accordingly from the savings in emissions. These could be as high as 10% per stretch.

Not least, commercial vehicles will also become a part of a comprehensive vehicle-vehicle and vehicle-infrastructure communication. For example it will be able to automatically and quickly send the information that a vehicle has stalled and is blocking a street to all vehicles in the area. At the same time an alternative route for drivers can be computed or the local traffic management centre will be able to temporarily adjust the traffic lights in the area to suit the situation.

Application of telematics for commercial vehicles

- Vehicle maintenance (just-in-time maintenance, vehicle status reporting, maintenance planning)
- Early automatic "registration" of vehicle docking at the loading ramp to reduce preparation for loading and unloading
- Automatic communication of transport orders to the navigation system
- Dynamic navigation (traffic jam avoidance) taking into account the vehicle’s mass and dimensions
- Automatic route planning as to on-hand orders and geographical positions of the commercial vehicles
- Vehicle reports (consumption, braking and driving conduct, etc.)
- Delivery tracking (for customers)
- Vehicle alarm in case of theft or dangerous situations or departure from a defined area
- Repair and maintenance costs
- Personnel costs
- Fuel costs
- Emissions savings
- Service
On the path to self-driving trucks

The vehicle’s communication with its surroundings will make it possible for trucks on the autobahn to drive completely by themselves and without accidents whenever the “human driver” switches to autopilot. This is already expected for the middle of the next decade. First practical trials have already successfully taken place.

Dr. Wolfgang Bernhard, Board Member of Daimler AG, Daimler Trucks and Buses: “Numerous drive and safety technologies enter the market first for commercial vehicles. We are pursuing this commitment to leadership in innovation at Daimler Trucks. Best example: With the self-driving ‘Future Truck 2025’ we are now heralding a new era in truck transport. It stands for an even more sustainable transport from which the economy, society, and consumers will benefit. Moreover we are taking a big step closer to the vision of accident-free driving.”
The Transporter delivers

Dr. Eckhard Scholz, Chairman of the Board of the Volkswagen Nutzfahrzeuge brand: “Especially in the sector of urban logistics we see great potential for light commercial vehicles with natural gas or different variants of electric drives for improving the impacts of delivery traffic within a sensitive environment.”

Commercial traffic in cities relies on small and versatile utility vehicles that can be driven to the most remote corners of the finely laid out street network. This task is performed by the transporter. But because of its close proximity to people, it has to fulfil the highest ecological standards.

Even more crucial in the future

Only one vehicle is able to assure supply direct to the doorstep – the transporter. It delivers letters, parcels, acts as an ambulance, a delivery vehicle for light materials, or as tool storage or a mobile command centre for tradesmen. It is the ultimate service provider. It is little wonder that two of every three commercial vehicles in Germany is a transporter. The large-scale societal trends indicate that its importance for our economy and freight business will continue to grow – driven by re-urbanisation, growing online commerce, and the ageing of society which makes the home supply of senior citizens with food, deliveries, care services, and medicine necessary.

Bernhard Schmitz, Director of Commercial Vehicles at Ford-Werke GmbH: “The transporter is the natural partner for an increasingly urban society – and foremost in developing countries whose growing cities would not be able to survive without the transporter.”
The large demand for environmental friendliness, which is brought on by the closeness to people, is met by the transporter today. Modern EURO-6 class engines emit only 2-3% of the pollutants measured in the early 1990s. Therefore today’s transporters are practically pollution free and engineers are now free to focus on further reducing CO2-emissions.

Predestined for alternative drive systems

As is the case with heavy duty commercial vehicles, the potential for savings is being increased step by step by optimising the internal combustion process, automating and optimising transmissions, reducing engine friction, and by using light-weight constructions. Another further large potential for reducing CO2 emissions lies in the use of natural gas and electric drives. Precisely transporters are predestined for this because they are predominantly in use in urban areas, where an adequate fuelling and charging infrastructure is at hand. Moreover frequent braking in city traffic in addition allows the recuperation of brake energy for the electric motors. Already today on German roads more than 26,000 transporters with gas drives are in service and over 2100 with electric drives.

As environmentally friendly as transporters are, they are just as safe. Accident statistics show that they are as safe as passenger cars. A study conducted by the German BAST, DEKRA, UDV and the VDA shows that accident involvement per 1000 transporters has fallen considerably since 2001 and is now at a similar level as the accident statistics from passenger cars.

Nevertheless, manufacturers are focused on making transporters even safer. For example if brake assistance systems were standard equipment in transporters, 43% of front end collisions involving small transporters could be prevented. Equipping the vehicles with ESC and lane departure warning systems would reduce the number of accidents caused by swerving and unintended lane departures 88%.

Steffen Raschig, Director of Commercial Vehicles of Adam Opel AG: “For transporter-customers, the total-cost-of-ownership is crucial. Here manufacturers are constantly working to keep these as low as possible. This can be achieved by extending the periods between maintenance, using commonly available and thus less costly tyre dimensions and, for example, by reducing fuel consumption in real operation. The nice thing about it: Not only the customer benefits, but so does the environment.”

Volker Mornhinweg, Head of Mercedes-Benz Vans: „The internet changes dramatically consumer behaviour and the corresponding transport solutions – and will continue to do so. Therefore, transporters must meet both the familiar as well as all upcoming new requirements. I think, that a manufacturer which deals not only with efficiency, safety and assistance systems but also with connectivity as a technology for the future is on the right track.”
The bus – lots of environmental protection for little money

Hartmut Schick, Head of Daimler Buses: “The bus is an absolute popular form of transport because it is clean, economical, and safe, and is thus considerate when it comes to the needs of the environment and people.”

The bus has democratised long-distance transport

Since opening on January 1, 2013, the market for long-distance bus lines has developed very dynamically. Established companies have expanded their route network and numerous providers have entered the market. Already one year after market opening, over 5000 weekly connections were offered. In the meantime all bigger cities and numerous smaller cities in Germany are connected to the long-distance bus network. The long-distance bus is popular to such an extent that the forecast for the German Ministry of Transport foresees traffic performance to increase sevenfold for the period of 2010 to 2030.

The first experiences have also confirmed the expectations that the bus – thanks to its high capacity utilisation – is able to clearly undercut the prices of rail transport. Per person and per kilometre the bus costs on average 5.7 cents; rail costs 14.4 cents. However the bus is somewhat slower than the train on the same stretch. Bus and rail thus really do not compete against each other in long distance transport; rather they serve two different market segments. The bus is for people who have a little more time, and a little less money. Today these people can enjoy greater mobility.
The coach – the choice for friends of nature and the environmentally conscious

Annually alone in Germany the coach is used by well over 100 million travellers – for holidays, day trips, excursions, or tours. It plays an important role in the growing market of “cultural tourism”. Also friends of nature and the environment appreciate the coach. For 58% of those travelling by coach, the natural environment is especially important. This share is considerably higher than those who travel by other means of transport. Thus for more than 20 per cent the natural environment is the reason for their trip.

More importantly is that the coach emits only 32 g of CO2 per passenger-kilometre - thanks to its close to 100% capacity utilisation - and it ranks number one ahead of rail when it comes to environmental impact.

Rudolf Kuchta, MAN Truck & Bus AG, Munich: “With the bus, the first vehicle to need only 1-litre per 100 km is already reality today. It is the unmatched CO2 and price champion in public transport.”
Main means of public transportation

Convenient door-to-door travel without any major detours – only the commercial vehicle can offer this. In freight haulage it is the truck and the transporter; but in public transportation it is the bus. Its flexibility allows it to travel to every corner of the finely laid out city network and to offer mobility for people who live far out in the countryside where rail is uneconomical. This is not only important for older citizens, who do not own a car, but also for school children.

The supply density with bus traffic therefore cannot be beaten. Across Germany over 11,000 bus lines provide a convenient supply of mobility. This figure does not even include the pure school bus. By comparison there are only 431 tram lines and close to 5000 lines for regional railways. Correspondingly one never needs to walk on average more than 6 minutes to the next bus stop, however, it takes already an average of 27 minutes to the next railway station.

These advantages make the bus the most used means of public transportation. It is used for 43% of the trips made. Tram and railway traffic share the remaining 57%.

The bus is not only flexible. It is foremost economical and environmentally friendly. Even though it transports more people than tram or train, it requires about one tenth of the tax funds used to finance the operating costs of public transport.

Also at average capacity utilisation it emits per passenger-kilometre only 75 g CO2 and thus as little as rail, for example. Additional CO2 improvements with the bus are also anticipated. This will be accomplished by using natural gas and hybrid drive systems on buses. Also fuel-cell buses are operated in Germany.

Thomas Hartmann, Managing Director of Volvo Buses Deutschland GmbH: “The intense popularity the long-distance bus has experienced since the market opening at the start of 2013 is the best proof that this type of transport mode is well liked.”
The bus is the backbone of public transportation
Share of public transportation in Germany in per cent

- Bus: 43%
- Trams / underground: 30%
- Commuter/regional rail: 21%

Source: VDV
Comparison of the greenhouse gas emissions in the transportation of heavy goods in factory traffic from Stuttgart to Bremen.
Transport case 1: transport of engines and gear parts from Stuttgart to Bremen. The following assumptions were made for the calculation:
- General assumption:
  - no consideration of empty trips
- Transport-mode-specific assumptions:
  - Truck: 30 l/100 km (in the case of full load, average value for this study)
  - Distance 633 km; load capacity utilisation: 84% with respect to the maximum effective freight load (semi-trailer)
  - Rail: entire train (20 carriages); distance 628 km; swap trailers which are each filled with approximately 10.5 t load (92% with respect to the maximum effective freight load).

Comparison of the greenhouse gas emissions in the transportation of heavy goods in factory traffic from Stuttgart to Rastatt. For the train the main run is shown in blue and the prerun in yellow.
Transport case 2: transport of engines and gear parts from Stuttgart to Rastatt. The following assumptions were made for the calculation:
- General assumptions:
  - 220 t, just-in-sequence delivery (twice per working day)
  - no consideration of empty trips
- Transport-mode-specific assumptions:
  - Truck: fuel consumption: 2 cases:
    a) 30 l/100 km (in the case of full load, average value for this study)
    b) 36 l/100 km (real consumption for the route travelled and actual load, demanding route profile)
  - Rail: distance 115 km; load capacity utilisation: 79% (semi-trailer)
  - Rail: distance 108 km; load capacity utilisation 73% (40 ft containers); 6 carriages; prerun to rail transport: 2 km truck

Source: PE International