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Automotive Competence Center **SPECIAL**

01/2010

> **The commercial vehicle industry – Driving back on growth track**

THE COMMERCIAL VEHICLE INDUSTRY – DRIVING BACK ON GROWTH TRACK

Time to face upcoming challenges



EDITORIAL

Dear Reader,

The truck industry was hit even harder by the crisis in 2008/2009 than the car industry. And the crisis was made even worse by a cyclical downturn that led to sales losses of up to 60%. Handling this major challenge took up almost all management capacity. Now that the worst of the crisis is over, we should look ahead and prepare for the upswing in the major markets. To fully benefit from the recovery, truck companies should be ready to seize new market opportunities, embrace new technologies and fully tap their R&D efficiency potential.

In this issue, our experts share their knowledge from a leading-edge work in the global truck industry, and provide insights into the challenges of the future.

We hope you will enjoy reading about the topics that shape the truck industry.

Sincerely,

A handwritten signature in black ink, appearing to read 'R. Kalmbach'.

Ralf Kalmbach

TRUCK POWERTRAIN 2020

In search of the green truck

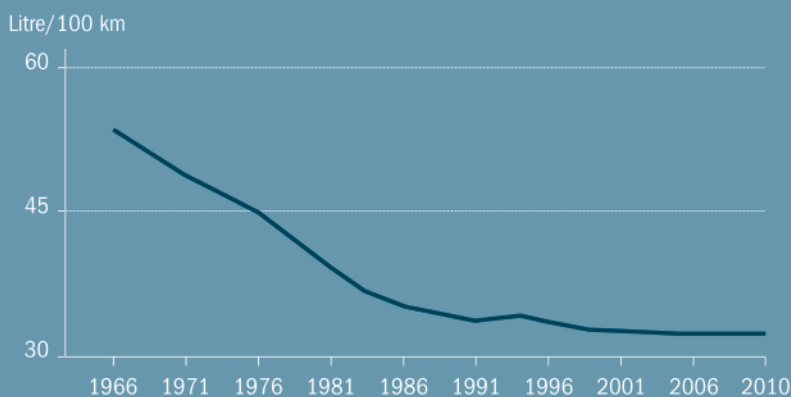
Carbon emissions have for some years now been the dominant theme shaping car makers' endeavors to innovate. Ultimately, this theme will lead to significant changes in the business models of manufacturers and suppliers alike. As Figure 1 shows, CO₂ emissions have long been the implicit focus of attention in the truck and bus industry too, where fuel consumption – and the associated need to optimize the total cost of ownership (TCO) – is at a premium.

As more and more attention turns to reducing global warming, however, commercial vehicles will soon find themselves confronted by targets that can no longer be met merely by optimizing the conventional powertrain. Japan has already set such goals for 2015, e.g. all trucks with a GVW of 16-20 ton have to consume less than 24 l/100 km what means a reduction of up to 20% depending on the engine considered with respect to today's values.

The EU and the US are poised to follow suit by 2016 at the latest. And for good reason: If the G8 countries are to meet their target of limiting global warming to two degrees Celsius through 2100, carbon emissions from medium-duty and heavy-duty commercial vehicles must be slashed dramatically. Our calculations show that current levels must be reduced by 25-30% by 2020 for new vehicles, depending on the development of the vehicle parc and the annual mileage.

Technology has advanced in leaps and bounds in recent decades. Now, however, it has reached the point where tweaking conventional powertrains can no longer materially improve fuel consumption in fleets deployed throughout the triad markets. Two things are needed to achieve the necessary reductions: radical changes in vehicle design; and the usage of alternative technologies such as hybrid/electric powertrains, fuel cells and alternative fuels.

Figure 1: Average fuel consumption for a 40-ton long-haul truck in Europe



Source: ACEA

TRUCK POWERTRAIN 2020

In search of the green truck

Radical changes in vehicle design will be most important in the long-haul segment, where an array of modifications such as superior aerodynamics can yield savings of 15% and more. Some regions – such as Europe – need to urgently adapt their legislation in order to enable these modifications. In other segments where vehicles usually drive at lower speeds (city traffic being one example), these changes will be of less importance.

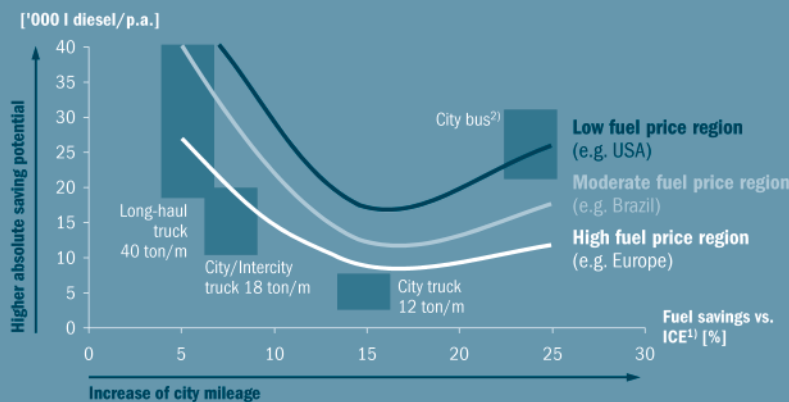
Hybrid systems on the contrary can reduce consumption by as much as 30% in city traffic, depending on daily route profile of the vehicle. The drawback is that, with the exception of a few special applications such as bucket trucks, this kind of system is today still quite simply non profitable.

Figure 2 shows the break-even curves for hybrid-electric vehicles (HEVs) as a function of urban (city) mileage and fuel prices. Assuming a 4% annual increase in the price

of diesel, and based on aggressive costing assumptions for the relevant components, HEV systems are expected to be economically viable (in light of TCO considerations) by 2015 only in selected vehicle applications and mainly in countries with a high taxation of diesel fuel. More segments will become interesting for HEVs until 2020 along with further system cost reductions being long-haul trucks one example. However HEVs seem not to be the final answer to achieve the green truck, so the main question is: are there alternatives to HEVs?

Pure-plug electric vehicles will become economically viable only if fuel prices rise much higher than they are expected to between now and 2020. And even then, the sums will only add up in applications for which a limited range is not a problem, e.g. in urban delivery traffic and for city buses.

Figure 2: Expected break even line for delta TCO HEV vs. ICE, 2015



Vehicle segments

1) ln l/100 km

2) Serial system with higher initial cost increase (higher break-even point) than parallel system assumed for all other segments

Source: Lastauto Omnibus; Dekra; Roland Berger

TRUCK POWERTRAIN 2020

In search of the green truck

Vehicles powered by fuel cells still have three mountains to climb. First, the current process for producing hydrogen is essentially based on the use of fossil fuels rather than renewable energy sources. Second, producing hydrogen is today too expensive. And third, the cost of the fuel-cell system is about ten times the price of the entire vehicle. It follows that fuel-cell vehicles will play no more than a small part in the commercial vehicle industry over the next decade.

Nor will second-generation biofuels solve the problem of reducing CO₂ emissions, as they are not yet available in sufficiently large quantities. Moreover, they will probably remain far too expensive compared to fossil fuels between now and 2020.

Hence OEMs have no alternative but to focus on hybrid vehicles (alongside efforts to optimize overall vehicle design specially in the long haul segment). Vehicle manufacturers and system suppliers thus find themselves faced with a tricky dilemma. On the one hand, they have no choice but to go hybrid. On the other hand, they must master the resultant technological complexity, they have to roll out sufficiently high volumes to reduce costs and moreover they have formulate clear strategies about how to survive in the face of future competition from heavily regulated and subsidized growth markets such as China.

For instance EATON has chosen an aggressive strategy to introduce its HEV system into the market. The company has already established strong relationships with traditionally OEM customers such as UPS and is successfully positioning itself as a direct supplier of hybrid vehicles to these final customers. Furthermore EATON will also provide the charging infrastructure for some of them interested in plug-in HEVs.

The solution to this dilemma is presented – along with further fascinating aspects of global carbon footprint strategies – in our study entitled "Truck Powertrain 2020: Mastering the CO₂ challenge", which is due to be published in time for the IAA.

Advance order can be placed now with
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BIOFUELS

What is their real potential?

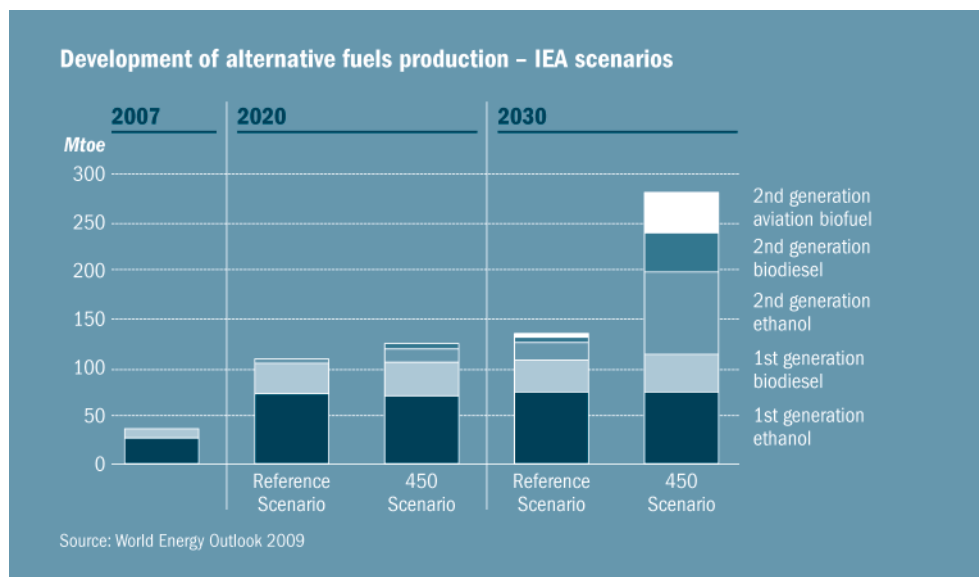
From 2000 through 2008, the biofuels market grew at a steady average of approximately 20% per year thanks to government-backed incentive programs (such as tax exemptions and subsidies) that introduced mandatory blending rates, mainly for biodiesel. The resultant heavy investments in the biofuels industry (mainly for first-generation transportation fuels derived from food crops) then led to substantial overcapacity, especially at European biodiesel production facilities, leading to severe situation for producers.

The market dipped in 2008 owing to falling oil prices, lower overall demand for fuel, high feedstock costs and financing costs. After several very difficult years for the biofuels industry, which also suffered from the wider financial crisis and saw many smaller producers slip into insolvency, the market is now expected to start growing again, albeit more slowly. The recovery is reflected in particular in heavy investment in Brazil, where key players such as Shell, Petrobras and BP are focusing on bioethanol derived from sugar cane.

Another growth region is Southeast Asia, where the potential for energy crops is huge and demand for energy is buoyant in fast-growing economies such as China, India, Malaysia and Indonesia.

The International Energy Agency (IEA) predicts that biofuel output overall will increase from 85 billion liters in 2008 to 125 billion liters in 2014. This would mean that bio-ethanol will corner ~5% of the global gasoline market and biodiesel ~1% of the global diesel market.

Looking further ahead, however, first-generation biofuels are expected to play only a minor role after 2020. The chances are that they will be largely replaced by alternative feedstocks and processing technologies, such as lignocellulosic biomass, the biomass-to-liquid (BTL) process, algae and so on. In other words, next-generation biofuels are poised to assume a dominant role. According to the IEA's "450 scenario", which targets vehicle CO₂ emissions of 450 ppm, demand for biofuels will be between 250 and 300 million tons per annum by 2030.



BIOFUELS

What is their real potential?

In this scenario, biofuels will account for about 9% of global transportation fuel by 2030, as its importance for trucks, ships and aircrafts increases after 2020.

Widespread confidence in this sector's ability to grow is based largely on the continuous support of governments, which have introduced policies to cut carbon emissions while stimulating domestic economies. In 2010 alone, new policies have already been adopted in 30 countries. Furthermore, the impact of incidents such as the Deep-water Horizon environmental disaster in the Gulf of Mexico is driving discussion of the need to further reduce dependency on fossil fuels by pushing more strongly for the introduction of biofuels in all areas of transportation, including road haulage, ships, trains and aircrafts.

Biofuels still face a number of major issues, however. Examples include:

- > The "food versus fuel" debate surrounding first-generation fuels based on food crops is still ongoing
- > Production technology issues
- > Economic challenges
- > Acceptance by car manufacturers and end customers

In response to the first two of these issues, an assortment of market players have engaged in intensive R&D activities and launched pilot-scale tests.

Two of the most promising production technologies are the production of cellulosic ethanol using advanced hydrolysis and fermentation techniques and the production of synthetic diesel through the gasification and synthesis of lignocellulosic material (based on the Fisher-Tropsch process). Both approaches are currently in the test plant stage. Second-generation biofuels are expected to solve many of the first generation's problems relating to food usage and greenhouse gas emission reduction targets. The problem is, however, that second-generation biofuels will be neither economically nor technically viable on a mass scale for another five to ten years – an outlook closely linked to crude oil price levels at a level of below 100 USD/bbl.

Second-generation biofuel targets have nevertheless already been set in the US, where 60 billion liters must be produced by 2022. Some European countries are expected to follow suit. If this sort of initiative gains momentum, funds – and attention – could well be diverted toward second-generation biofuels, thereby speeding up the overall advancement of relevant technologies. In the meantime, first-generation biofuels are being optimized to bridge the gap until their successors unfold their full effect. Biofuel companies are thus busily optimizing their logistics and product properties (hydro-treated biodiesel and bio-butanol), exploring alternative feedstock options that could still be used by existing technology (jatropha, used cooking oils, animal fats and new types of oils such as pine oils) and seeking to reuse supply materials (e.g. methanol and glycerin) to help address sustainability issues. At the same time, they are looking to improve the economic viability of the production process by using green by-products.

It is expected that an additional 5% to 10% of global gasoline and diesel demand could be substituted once second-generation biofuels reach their full potential, i.e. when 10% to 25% of the world's agricultural and forestry waste is used. Long-term potential also exists for what are called third-generation biofuels, most of which are algae-based. These alternatives could benefit from their significantly higher energy content per acre – as well as the fact that the land use debate can be avoided largely.

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LOW-COST TRUCK MARKET

India: an unusual case

The Indian truck industry is at a breaking point. In the past it was completely dominated by local players building low-cost trucks. Today, though, it is experiencing a huge shift toward higher-quality products. While Western OEMs enter this growing market, local players themselves are turning their gaze outward and preparing to establish a global footprint of their own.

China, Russia and India are typical low-cost markets that exhibit significant growth potential. At the same time, these markets harbor future potential for low-cost solutions (see Figure 1).

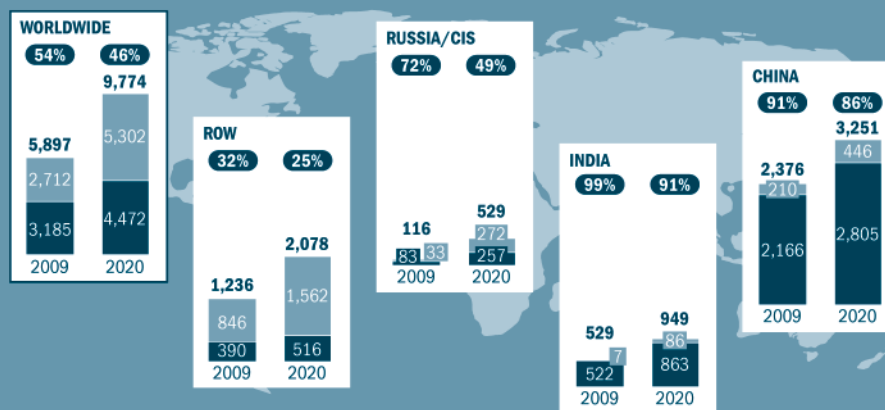
Failing to compete in this segment means not only ignoring half of the global commercial vehicle market, but also waiving the chance to partner customers in low-cost countries as they evolve from low-cost to value or even premium customers in the medium term.

Right now, most low-cost markets are dominated by local players. In the case of India, this is true in both the heavy-duty and medium-duty segments. Tata Motors commands a 73% and 67% share of these two market segments respectively. Other important players are Ashok Leyland and Eicher who, together with Tata Motors, control more than 90% of the market. Despite such a strong local presence, these companies are only just beginning to enter overseas markets, however. Tata, notably, has made an initial foray into Eastern Europe with its Telcoline model.

From the perspective of a triad OEM, market size and growth are not the only considerations. It is important also to understand product and customer requirements and vehicle pricing in the Indian market (see Figure 2). Robustness and a durable powertrain, for example, are essential in India as trucks are routinely overloaded.

Figure 1: The low-cost segment accounts for approx. 50% of the future world market

Low-cost volume potential ['000 vehicles]¹⁾

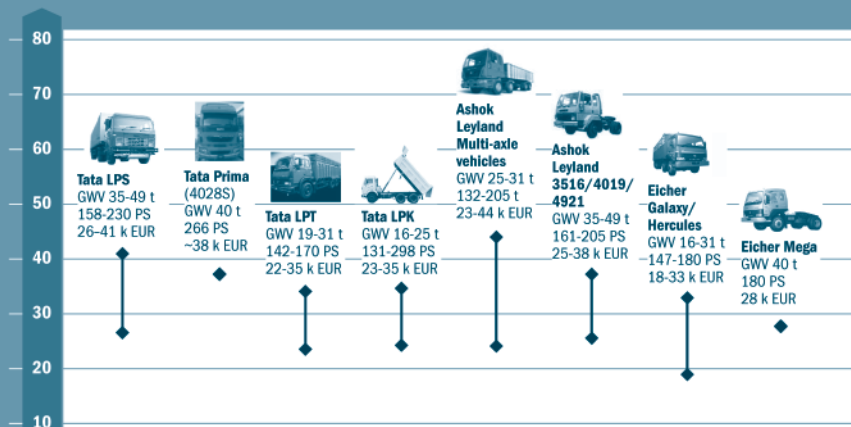


LOW-COST TRUCK MARKET

India: an unusual case

Figure 2: Low-cost heavy-duty trucks in India typically range from 18 to ~45 k EUR

Selected examples for low-cost heavy-duty trucks in India



The majority of the market currently plays out in a gross vehicle weight (GVW) range below 25 tons. Models above a GVW of 40 tons are rather rare. The Indian market for heavy-duty haulage is developing quickly, however. Completion of major road infrastructure projects such as the "Golden Quadrilateral" between four major cities and the introduction of a nationwide goods and services tax (GST) regime by 2011 are therefore likely to change this situation for ever.

Driven by the rapid growth in agricultural and industrial output that is anticipated over the next decade, freight traffic in India is expected to reach anywhere between 5,000 and 7,000 billion ton kilometers by 2020. Rail carrier Indian Railways has only limited capacity available (at least until its dedicated freight corridors become operational), so the share of freight forwarded by road may rise as high as 80% by the end of the decade, from today's figure of 65%. This development is slated to drive demand for heavy-duty vehicles for long-distance haulage applications.

Aware that the initial purchase price is a major buying criterion, domestic players have started to offer leasing arrangements, emphasize the superior durability of their products and support their offerings with robust service networks. Tata, for example, has built up a service network covering the entire Golden Quadrilateral, with service stations every 100 km, 80 mobile service vans and a standard two-year warranty that includes regular servicing.

Volvo and Daimler are examples of a number of Western OEMs that have entered the market in hopes of benefiting from future potential.

Volvo has managed a successful joint venture with local player Eicher, which now sees itself as a fifth brand in the Volvo Truck group. With some justification: Eicher has cornered 15% of the medium-duty market and 3% of the heavy-duty market, giving Volvo a firm foundation to build on. The joint venture is now aiming for a 15% market share in the growing heavy-duty segment.

LOW-COST TRUCK MARKET

India: an unusual case

To reach this goal, it has spent EUR 50 million to extend an engine plant in Pithampur and, hence, to increase engine production capacity from 40,000 to 125,000 units by 2013. The vehicles produced here will service demand worldwide, including that of the European market. Plans to launch a joint entry into new markets such as China are currently under discussion.

Daimler failed in its first attempt to enter the market through a joint venture with Hero, but recently decided to go ahead on its own. It now plans to launch new brands to compete in the lower-price segments, and also plans to develop a low-cost product specially for the Indian market. The same venture will also give Daimler a low-cost production base and R&D footprint with a view to future exports.




So what does it take for a Western OEM to succeed in a low-cost market? First, there must be a willingness and ability to adapt to local price levels.

From examples in the car industry (e.g. Peugeot's attempt to penetrate India with its 309 series in the 1990s), we have already learned that merely targeting a low-cost market with old Western products will not necessarily work.

Products must be tailored to local needs, which means that they cannot be developed far away at European or American headquarters. Local development capacity is cheaper and reduces overall costs in any case. Moreover, this constellation also ensures that local requirements are met without the danger of "overengineering".

In addition, a low-cost engineering base in, say, India can be used to build vehicle and engine platforms that are not only cheap to produce, but are also suitable for other low-cost markets. Upgrades can even make them acceptable by Western standards.

Figure 3: New platforms from Indian players: "Next-generation low-cost" platforms

 <p>"Engineering your tomorrow" Ashok Leyland U Truck platform</p>	<ul style="list-style-type: none">> Comprises a total of 25 models (16-49t) to be launched until 2012 to replace existing range> New cab planned> New Neptune engines (160-390 hp, alternatively Cummins/CAT) – All models EU 3/4-compliant and EU 5-ready> Broad range of components/modules developed and produced locally with international suppliers (e.g. in joint venture with Continental)
 <p>"OK is no longer OK" Mahindra Navistar "New Range"</p>	<ul style="list-style-type: none">> "Made for India, made in India"> Developed in close collaboration with Navistar> Strategic step in the direction of a "full-liner" portfolio (initially LCVs only)> Indian-made MaxxForce 7.2 engines (EU 3/4-compliant)> New factory near Pune> Plans to pursue an export strategy
 <p>"The way the world trucks" Tata Prima "World Truck"</p>	<ul style="list-style-type: none">> Developed in collaboration with Tata-Daewoo joint venture and global support (e.g. Italian cab design, US/European engine, Mexican chassis, US suspension)> Entire model range (10-49 t) to be launched until 2012> Compliance with global standards (e.g. EU 3/4, EU 5-ready)> Global launch planned in two phases (including Latin America, Eastern Europe and Russia)

Source: Press; company information

LOW-COST TRUCK MARKET

India: an unusual case

One perfect example is Tata's Prima range of "World Trucks". Developed by a global team in collaboration with the Tata-Daewoo joint venture, this series already complies with the Euro 4 norm and is prepared for Euro 5, too. All versions in the range from 10 to 49 tons will be introduced in the next two years. Global roll-out is planned in two phases. Ashok Leyland is developing its "U truck" along similar lines.

Clearly, Indian manufacturers are already targeting the world with their new products, and are upgrading existing portfolios with new models developed in collaboration with many global suppliers. (see Figure 3). The subcontinent has evidently discovered that it is indeed possible to develop a common platform to deliver a variety of trucking solutions at lower cost.

As low-cost countries such as India adopt stricter emissions standards, their domestic manufacturers are being forced to develop products that comply with global emissions standards. Aided by improving economic conditions and a better infrastructure, these low-cost markets are thus becoming more amenable to global trucking solutions.

Overall, rapid adaptation to Western conditions with only two major differences – a fast-growing market and the option of low-cost production – is opening up immense opportunities on the Indian subcontinent.

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TRIAD-BASED OEMS AFTER THE CRISIS

Accelerating on the winding road to recovery

Although the triad markets have yet to emerge from the prevailing uncertainty, all key players at least returned to profitability in the second quarter of 2010. Looking ahead to the challenges that now face triad-based OEMs, this significant improvement gives grounds for a measure of optimism.

Snapshot: July 2009: A little over a year ago, the situation in the truck industry was little short of disastrous. Vehicle sales in the triad markets were down as much as 60% compared to the preceding years. Capacities have been reduced significantly, in Germany mostly through short-time work with up to 50 days, in other countries layoffs were inevitable. All the major OEMs were struggling, reporting huge losses and seeing EBIT margins drop as low as minus 13%. Even Scania's consistently profitable truck division only just managed to break even. As the outlook grew bleaker across the industry, agendas – perhaps exaggeratedly so – focused on one thing and one thing alone: survival.

Today's situation: Is the crisis already over? Ask this question today and most industry pundits will respond with an emphatic "no". What, then, makes us so optimistic?

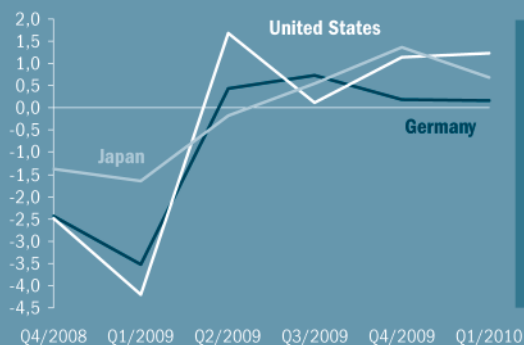
First, indicators suggest that the crisis has indeed bottomed out. GDP, a key indicator for the truck industry, is already rebounding in all triad markets.

Second, an examination of current volume development in the triad markets is likewise encouraging. Compared with early 2008, when the industry as a whole peaked, orders are still down by about 60%. Fair enough. Since the second quarter of 2010, though, a noticeable recovery has been apparent. Order intakes are surging, deliveries and new registrations are on the rise.

Third, the profit situation has improved significantly for all triad OEMs. Despite slow development in the first quarter of 2010, nearly all triad OEMs saw operating profits rebound in this period. Due to increased utilization and cost reductions paying off, second-quarter numbers are fairly positive. Scania reports an operating margin of ~17% for the second quarter, MAN's commercial vehicle division shows a positive development with return on sales of ~6%, Volvo's truck division reported a ~6% operating margin and Daimler as well showed a very positive development with EBIT margin of ~5% for trucks. Moreover the forecast given by key players are targeting even a further improvement through the reaming part of the year.

GDP – a key indicator for truck business – is already showing signs of recovery in most economies

Average sequential change in GDP¹⁾ [%]



NOTES

- > Incipient recovery perceivable as of Q2/2009
- > It will probably take until 2013 for real GDP in Germany to return to 2008 levels
- > Year-on-year growth of approx. 1.8% is forecast for industrialized countries in 2010

1) Real GDP

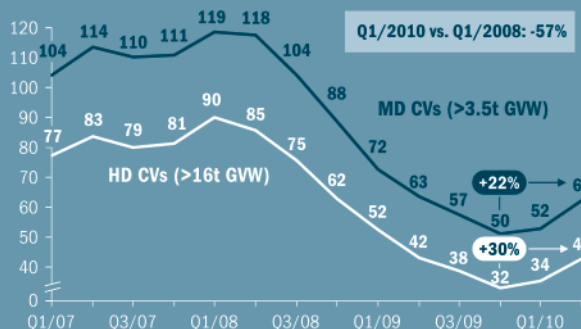
Source: EIU; National Statistical Bureau of China; Roland Berger

TRIAD-BASED OEMS AFTER THE CRISIS

Accelerating on the winding road to recovery

Recovery became visible as early as Q1 2010 – Q2 sales are up 30% and 22% respectively compared to all time low in Q4 2009

European¹⁾ truck sales, Q1/2007 through Q2/2010 [⁰⁰⁰ vehicles]



NOTES

- > First quarter of 2010 saw **growth** for the **first time in nearly two years**
- > **Market** volume is currently **about half** of its pre-crisis level
- > **Parallel sales trend** in evidence in heavy- and medium-duty segments
- > In Q2 **order** incomes reported by key OEMs show a **strong recovery** to be expected during the second half of 2010

1) EU 27, including EFTA, excluding Malta and Cyprus

Source: ACEA; Roland Berger

As a consequence, OEMs in the triad markets are once again ramping up the capacity they had earlier been forced to run down. Germany's MAN, for example, recently announced that short-time work would be reduced from around 50 days to less than 20 days. For its part, Daimler rehired 540 US employees in July to accommodate increased demand.

While it is thus fair to say that the crisis is not yet over, it is equally true that most truck OEMs have come through the storm in reasonably good shape. Clear signs of recovery are readily visible, although it will probably still take until 2012/2013 for the industry to return to pre-crisis volumes in triad markets.

Outlook for the triad markets

Now that triad OEMs have overcome the crisis, what does the future hold for them? A closer look at the current market situation reveals significant upside potential. Several reasons lead us to this conclusion.

The first is a straightforward comparison of figures. Taking quarterly sales in Europe as the point of reference, the medium- and heavy-duty segments are still about 60% off their 2008 peak.

Even compared with the more pedestrian year 2007, upside potential is still substantial at 40%.

Second, the long-term trend toward greater demand for transportation in the triad markets remains intact. Although demand crashed during the crisis, an unexpectedly rapid trade recovery is now taking place. Shipping volumes from China, for example – including a high percentage of consumer goods that are carried by road at least twice en route – have risen significantly. Indeed, trade volumes in Rotterdam and Los Angeles are already back to pre-crisis volumes. In Germany, which accounts for about 30% of the European transport market, shipping mileage recorded by the Toll Collect system rose by 6.6% in May – the fourth increase since February.

Third, bearing in mind existing fleet structures and their replacement needs, the fact that vehicle renewal was postponed during the crisis now creates considerable pent-up demand. The need to upgrade is particularly acute in Germany, where about 40% of the current road haulage fleet currently meets only the Euro III emissions standard. In light of current legislation and taxation trends, replacement will in future be driven by TCO considerations and is expected to further boost demand in the triad markets.

TRIAD-BASED OEMS AFTER THE CRISIS

Accelerating on the winding road to recovery

Fourth, demand from outside the triad markets too is picking up significantly. Most OEMs in the triad markets – especially those in Europe – have significant presence in those markets. Rising demand in emerging markets will therefore also encourage development in the triad markets.

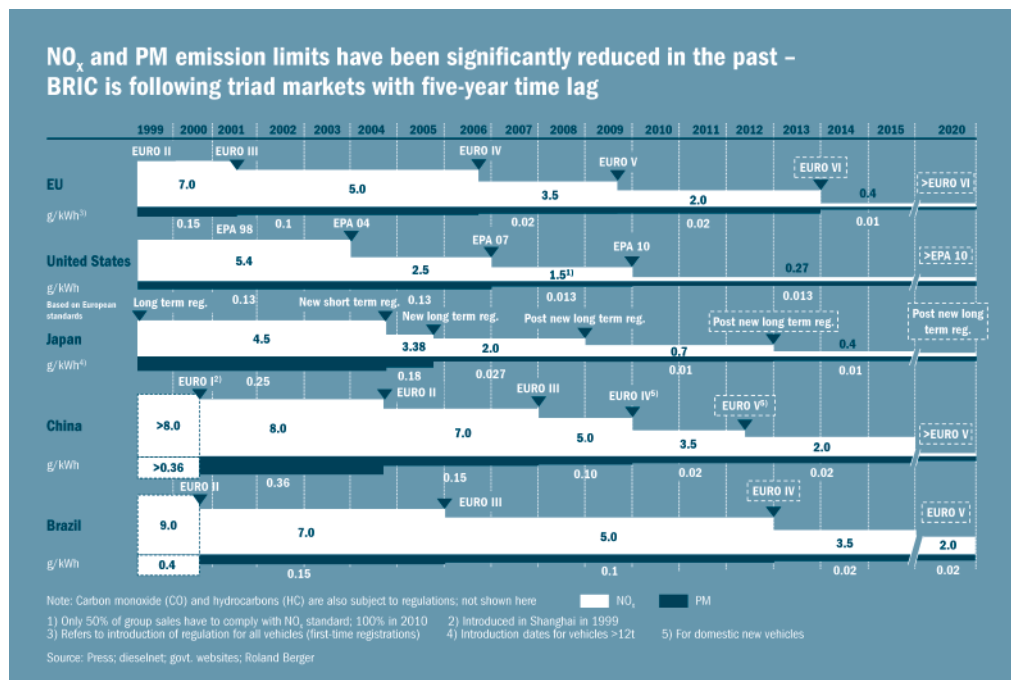
Upcoming challenges

So with the outlook brightening, profits healthy again and significant upside potential in reserve, does a golden age now await triad-based OEMs? By no means! Going forward, the challenges that lie ahead of triad OEMs are daunting, to say the least. Stricter emissions standards in particular go a long way toward offsetting the positive market outlook. Now that Euro 6 legislation has been finalized, huge investment in technologies to reduce emissions will be an unavoidable imperative in the future. Required investment per OEM is currently being estimated between EUR 0.5 and 1 bn, not considering expected upcoming regulations for CO₂ reduction. This – and the associated need for customers to accept higher prices – is definitely one of the biggest challenges that lies ahead.

On another level, customer preferences indicate a trend toward light-duty and heavy-duty vehicles, implying that the medium-duty segment will shrink. Since most triad-based OEMs focus so far on heavy- and medium-duty trucks only, this development could negatively affect their market position.

New players from emerging markets are shaping up to challenge triad OEMs on their own turf. Competition will intensify as a result, potentially placing heavy pressure on prices. Although OEMs from emerging markets are not expected to encroach on the core business of triad OEMs in the next few years, the markets of Eastern Europe and Latin America could be heavily affected by new offerings from companies such as Tata Trucks.

To summarize: 2010 is definitely not the time to sit back, relax and enjoy the improving conditions! It is rather the time for OEMs in the triad markets to find solutions to the upcoming challenges and make the right strategic decisions to step ahead and gain an edge on competition.



TRIAD-BASED OEMS AFTER THE CRISIS

Accelerating on the winding road to recovery

Top priorities for CEOs

In light of the situation today and the challenges that lie ahead, what key issues must top management address in the near future?

1. Clearly, one of the key topics is how to respond to more demanding requirements with regard to emissions in general and CO₂ reduction in particular. This issue is of relevance not only to the triad markets. It will also become increasingly important in fast-growing emerging markets. As R&D costs spiral in an attempt to master this challenge, the pivotal question will be how to leverage development costs across the largest possible number of trucks. Scale considerations are thus becoming more important than ever and will create potential for competitive advantages. Alongside the question of scale, though, advanced intelligent modularization strategies too will be required – in powertrain development, for instance. Daimler, for example, is pushing for a highly modularized engine strategy to leverage its development effort. Current diesel engine technology is expected to maintain its dominant position for the next 20 years. Even so, alternative powertrain concepts based on biofuels and hybrid solutions – especially for the inner-city segment – will gain a significant share in the powertrain mix of the future. Alongside powertrain strategies, lightweight construction concepts, the possibility of higher total truck weights and intelligent telematic solutions will also be necessary to master the challenge of placing demand for mobility on a more sustainable basis.
2. The crisis demonstrated that truck OEMs' business models are highly dependent on economic cycles, and are thus impacted immediately when a downturn sets in. Although the capital goods business has always been very cyclical, attempts to reduce heavy dependency on new truck sales could be promising for truck OEMs. One way might be to increase the share of service offerings such as telematics, rental, repair services and so on. In future, potential buyers will no longer be satisfied with the offer of a good truck solely. Instead, they will come to expect support in end-to-end mobility solutions that cover the entire spectrum of their needs.
3. Although prices remained remarkably stable during the crisis as key players cut capacity rather than lowering prices to shore up demand, the entry of new players from emerging markets is expected to put some pressure on prices in triad markets as well. Keeping a close eye on costs during the upswing will therefore be vital if triad OEMs are to stay competitive even on their home markets. Modularization in all key areas will be one main lever to reduce development expenditure, complexity and, ultimately, costs per truck.
4. By no means least, the center of gravity in the truck universe is going to shift over the next 20 years. From being dominated by the US, Japanese and European markets, significant changes in demand will cause the power base to shift increasingly toward the BRIC markets. Around 50% of all trucks are already sold in China; and this share will increase as China and India become the dominant markets. As this happens, it will be vital for triad-based OEMs to meet customers' expectations regarding prices and product characteristics in these markets. This implies that triad OEMs must establish a competitive footprint in these markets – in both production and R&D – as an essential prerequisite to be able to offer competitive products.

Looking at the recovery occurring in triad markets and the growth potential afforded by emerging markets, one has to say that triad OEMs are well positioned to master the upcoming challenges and emerge as winners. At the same time, they still have a number of tricky and far-reaching decisions to make. And those decisions have to be made soon.

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MATTHIAS WISSMANN – INTERVIEW

The commercial vehicle industry is entering a more positive phase



Matthias Wissmann
President of the VDA
(German Association of the
Automotive Industry)

Mr Wissmann, the commercial vehicle manufacturers appear to be recovering again. Is the crisis over?

Wissmann: It is true that after the financial and economic crisis started developing in autumn 2008, the commercial vehicle industry in particular had to cope with the largest slump in its sales figures ever seen in the history of the Federal Republic of Germany. Last year it was not uncommon for sales to be down by 30 or 40 per cent. Some companies in the trailer and body industry even saw their turnover collapse by 80 per cent. So the forward-looking manner in which this industry has weathered the storm is quite impressive. For example, employment has been maintained at a high level, and in this way the manufacturers have managed to keep the expertise on board. This is paying off now as the world's markets recover. Incoming orders for heavy commercial vehicles – an early indicator of economic performance – are now 80 per cent above the lowest point during the crisis. We have turned the corner, but we have not yet put the crisis behind us completely. The situation on the financial and raw materials markets still harbours some risks, especially for small and medium-sized suppliers. However, I am certain that the IAA Commercial Vehicles in Hannover in September will send out a clear signal that the industry is entering a new, more positive phase.

For quite a while now triad manufacturers have set their eyes on the quick growing BRIC markets. Could you tell us which you think are the most important strategic challenges on these countries?

Wissmann: Alongside China and India, we also expect Brazil to generate some considerable expansion this year,

both on the passenger car market and in the commercial vehicle business. All three of these countries are among the most dynamic growing car and commercial vehicle markets anywhere in the world, and the German OEMs have a strong presence on all three markets. In the first seven months of this year, the light vehicles market of Brazil was growing faster than its German equivalent for the very first time. In Russia, however, the situation is different. In 2009 the Russian market nearly collapsed. Now Russia has moved back into the growth zone – although starting from a low level. But this summer's heat wave and the interruptions to production in the automotive industry do indicate that exceptional factors could delay recovery in Russia somewhat.

Are European manufacturers equipped to conquer the BRIC markets?

Wissmann: From a German point of view, we are rather talking about growing market shares. And when I say this I mean our supply companies as well. For example, more than 70 German suppliers are now represented in India, almost a hundred in Brazil, and a whole 180 in China. Altogether, the presence of the German car and truck makers in the emerging markets is continually increasing.

Do you think it is realistic to expect manufacturers from the BRIC states to break onto European markets in the near future?

Wissmann: The fact that Indian companies are considering importing small cars to Europe, and that Volvo has been taken over by the Chinese firm Geely, shows that in the long run, in these countries ambitious plans are being pursued for gaining a foothold in Europe both in the light vehicle and in the commercial vehicle sector. Chinese companies in particular will want to push their way onto the European market as alternative powertrains become more widespread. However, they will only be able to do so if they meet European standards, especially those concerning safety.

MATTHIAS WISSMANN – INTERVIEW

The commercial vehicle industry is entering a more positive phase

The EU has already defined CO₂ emissions targets for passenger cars. Similar targets are expected for the commercial vehicle industry by 2016. How should the OEMs prepare to address this challenge?

Wissmann: The previous European Commission already overshot the target regarding the CO₂ limit values for passenger cars, and now the balance between ecology and economy is skewed. Fortunately, the European Council and the European Parliament have managed to make some necessary improvements. We expect a similar development in the current discussion surrounding light commercial vehicles. Tightening the exhaust standards to 135 grams of carbon dioxide per kilometre by 2020 would constitute high obstacles for the industry both on the ambitious deadline as well as on the extremely low limit of this value. Besides, the EU wants to set limit values without knowing their technological feasibility. A van is not a passenger car, and commercial vehicles have product cycles of ten years or more. The target already set of 175 grams by 2016 is a hugely ambitious one. It would simply not be serious to reduce this level above a reasonable degree. We are proving that we want and are able to implement environmental protection with engines that every year become more efficient and cleaner, and consume less. But we cannot fulfil these targets in just a few years, even if we invest billions – right after recovering from a severe crisis. Even Brussels must acknowledge that if at the end of the day, the load for a larger van will be divided up over several small vehicles in order to meet limit values, no one will benefit.

What do the OEMs expect from policy-makers in relation to reducing CO₂ emissions in the transport sector?

Wissmann: The German Government's coalition agreement demonstrates moderation, especially where light commercial vehicles are concerned. So it can help balance out the plans from Brussels to a more realistic extent. In my view the European Commission is being too populist. In key areas such as environmental policy the tone within the E.U. is being set by representatives from countries that as yet have little to do with the industry – to the possible detriment of the continent.

In politics it seems the prevailing opinion is that rail transport is more ecological than road transport. What is your opinion on this?

Wissmann: We – the railways and the automotive sector – left trench warfare behind us a long time ago. The rail sector recognises that railways are not inherently more environmentally friendly than trucks, and that for numerous types of transport and connections commercial vehicles clearly represent the more climate-friendly form of transport – while the railways can be a good choice especially for standard goods on long-haul routes. And the automotive OEMs are known to be some of rail's largest customers. Rail and roads are therefore not competing against each other, but are strong when they work together. I expect that this message will increasingly fall on fertile political soil – in both Berlin and Brussels. The fact that the action plan for freight transport to be passed by the German Cabinet in September sees roads and rail as transport partners with equal rights is, in my opinion, that right way to go. There is always going to be a bit of competition between road and rail about which mode of transport is better and more ecological under which conditions. This is a natural feature of an open, free society that attaches key importance to competition between ideas and creative competition on markets. Ultimately this makes us a strong industrial country and is also in the customers' interests.

ALTERNATIVES TO TRUCKS

Competition between modes of transport

In a globalized world built around labor specialization, freight transport is an essential element in every well-oiled economy. The volume of freight transport depends to a large extent on industry- and country-specific characteristics such as the degree of centralization, the sophistication of the transport infrastructure, the scope of raw material production and the degree of specialization. The principal modes of intracontinental transportation are road, rail, inland waterways and pipelines. For intercontinental transport, by contrast, the main modes are sea, air and pipelines. The choice of the mode of transport depends mostly on the freight volume and value, the cost of transportation, the distance involved and the availability of a suitable infrastructure. Much freight is forwarded by intermodal means (i.e. by more than one mode) and thus requires transshipment. One major advantage of road transport lies precisely in the existence of a dense infrastructure. In Germany, for instance, the road network (excluding urban roads) is six times as large as the rail network and more than 30 times larger than the network of inland waterways.

Decision factors affecting the mode of transport

Carriage by sea and via inland waterways is the cheapest mode of transport (on a cost per ton-kilometer basis). Often, however, this mode alone does not move goods to their final destination. For many routes, the key competitors are thus road and rail. Several factors influence the choice.

First, the topography of the country is important. In countries such as Australia, the US and Russia, where inland waterways are relatively sparse and distances are considerable, rail transport is much more attractive than in small countries such as France, Germany and Japan.

Second, the type and volume of goods is important too, as these factors have a significant influence on the cost of transport. For bulk cargo such as iron ore and coal, rail – and especially block (or whole) train forwarding – offers cost advantages. For unit loads and less-than-carload freight, road transport has the edge. The same is true for container transport on short and medium distances.

Third, reliability and flexibility (short lead times) are two further important decision criteria. The reliability side is usually in the hands of the operator and has less to do with the means of transport. Road transport tends to be more flexible, however.

A closer look at the comparative cost of road and intermodal/combined transport (e.g. transportation of standard containers or truck trailers by rail) serves as an example. Intermodal transport usually requires feeding and/or distribution by truck, including transshipment. Hence there is an associated "fixed cost" block, whereas variable costs per kilometer are usually lower for intermodal transport compared to road-only transport. Typically, the break-even distance, i.e. the distance where the cost of road and intermodal transport is identical, is usually around 500 to 600 km, though it can be considerably larger. The precise break-even point depends to a great extent on the specific circumstances of the transport case. For example:

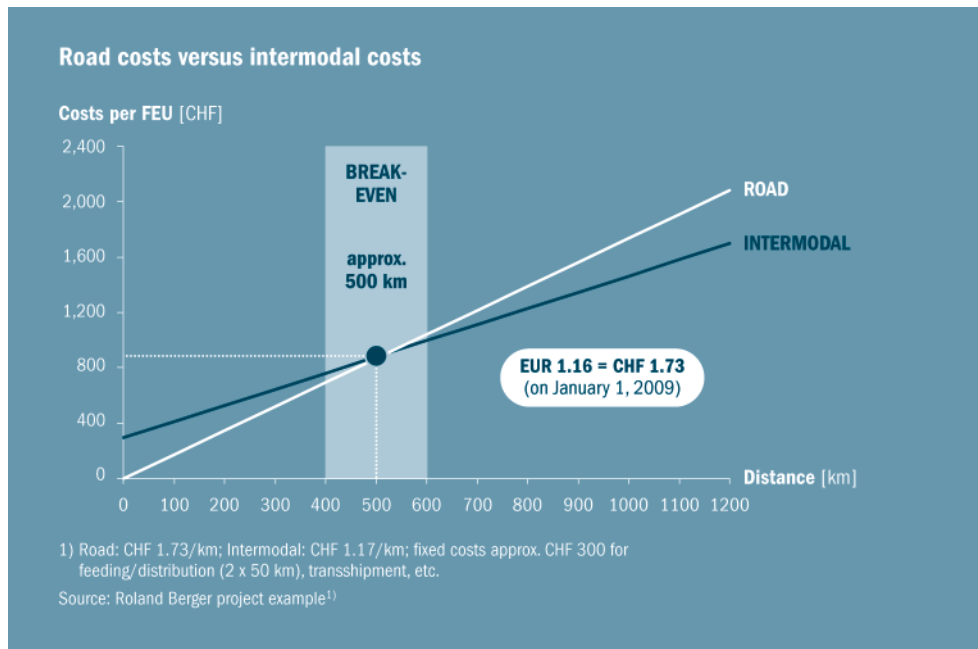
- > Intermodal transportation:
 - Feeding and distribution requirements, including potential detours
 - Additional transshipment costs

- > Intermodal and road transportation:
 - Costs per kilometer
 - Price of diesel
 - Road charges

Politics too exercises a powerful influence on the modal split. Governments can choose to extend the rail or road infrastructure, impose tolls on trucks, levy track access charges for rail freight and so on. All these are essentially ways to consciously influence the modal split. In several countries in Eastern Europe, rail has seen its market share decline partly because the road infrastructure has been upgraded faster than the rail network.

ALTERNATIVES TO TRUCKS

Competition between modes of transport



In Switzerland, a special toll for trucks, a ban on nighttime truck traffic and stagnation in road construction have given rail services a chunk of freight transport.

Ecological considerations and how these might impact the company image likewise affect the choice of mode. Swiss retail chain Migros, for example, actively promotes its use of Swiss Railways to transport goods, emphasizing the ecological benefit of doing so in its advertising.

Megatrucks with capacities of 60 tons would make road transport more efficient. Lower costs per ton-kilometer (tkm) and greater capacity would again increase the market share of road transport relative to rail.

However, the necessary infrastructure enhancements (e.g. parking areas on freeways and changes to traffic islands) will hinder the success of megatrucks – as will the concomitant political controversy.

The environmental perspective

It should be noted that all modes of transport have ecological pros and cons. The public discussion is often confined to CO₂ emissions of the transport modes. However, several additional factors have to be included in a more comprehensive and holistic comparison:

- > Other emissions like nitrogen oxide (NO_x), sulfur oxide (SO_x), particles; and noise emissions
- > Non-emission impacts like land usage
- > Influence of capacity utilization
- > Impact of feeder services (instead of simple comparisons by averages for transport modes; highly relevant for evaluation of potential substitution of transport mode)
- > Total life-cycle impact, incl. transport performance, transportation of fuel, manufacturing of transport vehicle, construction of infrastructure, corporate overhead etc.

ALTERNATIVES TO TRUCKS

Competition between modes of transport

Air transport generates far greater CO₂ emissions per tkm than any form of surface transport, for example. On the other hand, air transport uses comparatively little land. Rail and inland waterways usually have the lowest emissions when carrying high volumes of heavy goods. Where volumes are moderate and feeding distances by road are significant, however, road-only transportation can be more ecological. Truck producers and shipping companies have made good progress in this field in the past few years. Today, some truck fleets have average fuel consumption of around 30 l/100 km, for instance.

The question which mode of transport will benefit most from future traffic growth will depend in particular on developments in ecological performance. This is especially true as the political will to modernize and upgrade one infrastructure or the other, or to levy charges on one sector or the other, is decisive for the modal split. It therefore remains vitally important for truck manufacturers to further improve ecological performance and – perhaps even more importantly – to actively and forcefully advertise such advances.

Recent developments in freight transportation; outlook

The freight market was hit hard by the economic crisis. In the EU, transportation performance (measured in tkm) by road, rail and inland waterways decreased by 12% from 2008 to 2009. The road segment suffered least, though, with road transport performance down 10%, against a 17% slump in rail cargo volumes. Air freight was down 11% (in terms of tons loaded and unloaded). Here too, pre-crisis levels will not be achieved again until 2012.

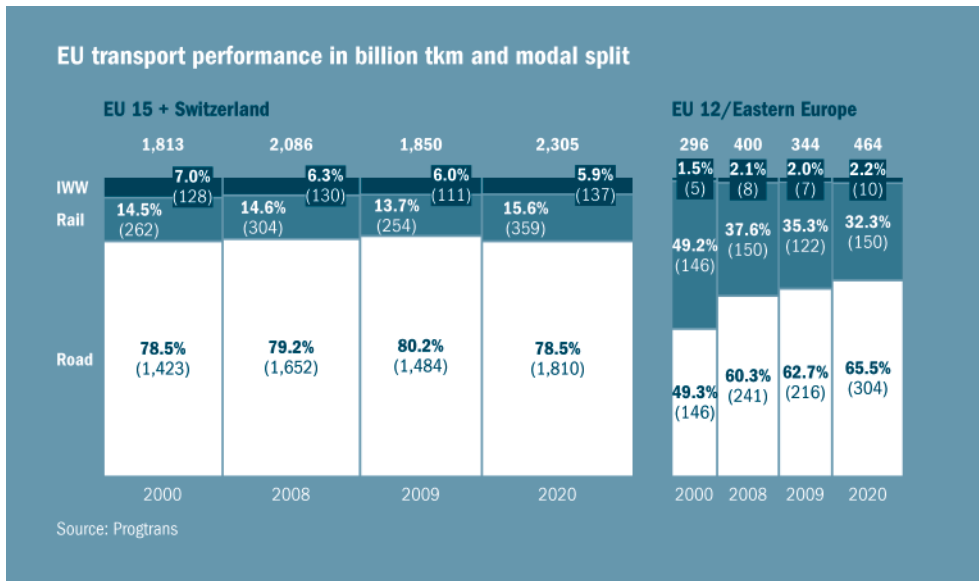
Throughout the EU, freight traffic will grow by around 2% p.a. through 2020. Total tkm growth between now and 2020 is thus expected to be equal to growth before the economic crisis. To put that another way: The volume lost to the economic crisis appears almost to have been lost for good. The most dynamic growth will take place in countries such as Austria and the Eastern European countries (e.g. Romania, Slovakia and Slovenia). Europe's largest markets, France and Germany, are also expected to experience above-average growth, whereas Italy and the Netherlands will be rather sluggish.

Compared with the BRIC area, scarcely any European country can be described as dynamic. BRIC countries handle almost five times as much freight as the EU, mostly due to extensive mining activity. Growth rates too are much higher: Transportation performance is expected to increase approximately by an annual 5% through 2020. Road transport will benefit from this development, rising to around 30% from its current low modal share.

The EU displays a varied picture. In the 15 countries that made up the EU until 2004, road transport, with a share of almost 80%, is easily the mode of choice (as opposed to railways and inland waterways). In these countries, road volumes are expected to decline by one or two percentage points over the next ten years. The increasing deregulation of cross-border rail traffic will be the main driver. For example, a new EU regulation that took effect in June 2010 forces member states to establish rail freight corridors that give freight trains a higher priority than passenger trains. Moves are also underway to harmonize different technologies, one prime example being the standardized rail control system ETCS.

ALTERNATIVES TO TRUCKS

Competition between modes of transport



By contrast, the road segment in the twelve "new" (mostly Eastern European) member states currently has a share of less than 63%, although this will rise above 65% by 2020 – at the expense of railways. These countries are investing heavily in their road infrastructure, whereas the status of rail networks remains somewhat problematic.

It goes without saying that every forecast is only as good as the assumptions on which it is based; and developments in the modal split will ultimately depend heavily on the political willingness to support one mode over the other. Lobbyists, meanwhile, are essential to point out advances in environmental friendliness.

And customers too will doubtless have their say in deciding how satisfied they are with different modes of transport. Aware of the importance of all these factors – not to mention the need for ongoing efficiency gains – the operators and suppliers of trucks and rolling stock have no choice but to activate all the levers at their disposal.

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LOW-EMISSION VEHICLES FOR THE CITY SEGMENT

An opportunity for hybrids?

Inner cities in the modern industrial world are already breathing easier. Partly at gunpoint, faced with emissions legislation and urban low-emission zones, all vehicle segments – from autos to transporters to buses – have sharply reduced their harmful emissions in recent years. Emissions of hydrocarbons, carbon dioxide and particulate matter have been slashed by as much as 98%; and when Euro 6 and EPA 10 are introduced, the nitrogen oxide given off by diesel-powered vehicles will likewise be curbed.

Legislation demands significant reduction in CO₂ emissions for Light duty vehicles

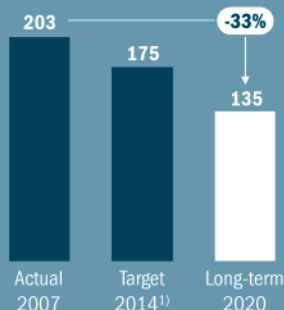
The law prescribes that light commercial vehicles (LCVs) must target 175 g/km as of 2014. Long-term limits of 135 g/km for LCVs are also in discussion. Yet these imperatives confront the industry with extraordinary technological challenges and huge cost increases for the customers. The targets can not be met solely with efficiency improvement levers at conventional combustion and diesel engines. New technological solutions have to be developed to an competitive price.

For the makers of light commercial vehicles, this means that lower CO₂ emissions – and hence an improvement of roughly 30% in fuel consumption – must be built into their fleets as of the very next vehicle generation if the 135 g/km will be confirmed for 2020. Developing a new commercial vehicle of this kind takes seven years on average, given a projected product lifecycle of ten years. Unlike in the automobile segment, LCVs face the additional obstacle that 95% of vehicles already run on diesel, leaving little room for gains simply by switching to this fuel type. Accordingly, the average transporter today already emits around a third less CO₂ than in 1980.

Draconian penalties of up to EUR 120/g CO₂ for exceeding the prescribed limits – not to mention the damage that would do to a manufacturer's image – provide motivation enough for companies to do everything technologically and economically feasible to systematically reduce their carbon footprint as ordered from above.

Current CO₂ emission targets in the EU for light commercial vehicles [g/km]

LIGHT COMMERCIAL VEHICLES²⁾



- > Objectives of proposed regulation for **light commercial vehicles** is step-by-step decrease between 2014 and 2016 to **175g CO₂/km**
- > **Long-term fleet emission target** of **135 g CO₂/km** by 2020 proposed
- > Regulation applies to vehicles used for the carriage of goods with a **reference mass not exceeding 2,610 kg**
- > **Targets will apply** to average specific emissions for new light commercial vehicles **for each manufacturer registered in EU**

1) For 65% of the fleet from 2012 on, gradually rising to 100% of the fleet by 2015

2) Current proposal for a regulation by the European Parliament and Council

Source: EU Commission; Parliament and Council; ICCT; Roland Berger

LOW-EMISSION VEHICLES FOR THE CITY SEGMENT

An opportunity for hybrids?

Urban low-emission zones demand emission-free vehicles

Many local authorities have so far failed to comply with the limits on particulate matter imposed by the EU. In response, low-emission zones are now springing up in urban areas across the continent. At present, these zones focus exclusively on reducing local emissions of particulate matter. However, as Europe tightens its thresholds for nitrogen oxide as well, it is fair to assume that this type of pollution too will soon be included in low-emission zones' considerations.

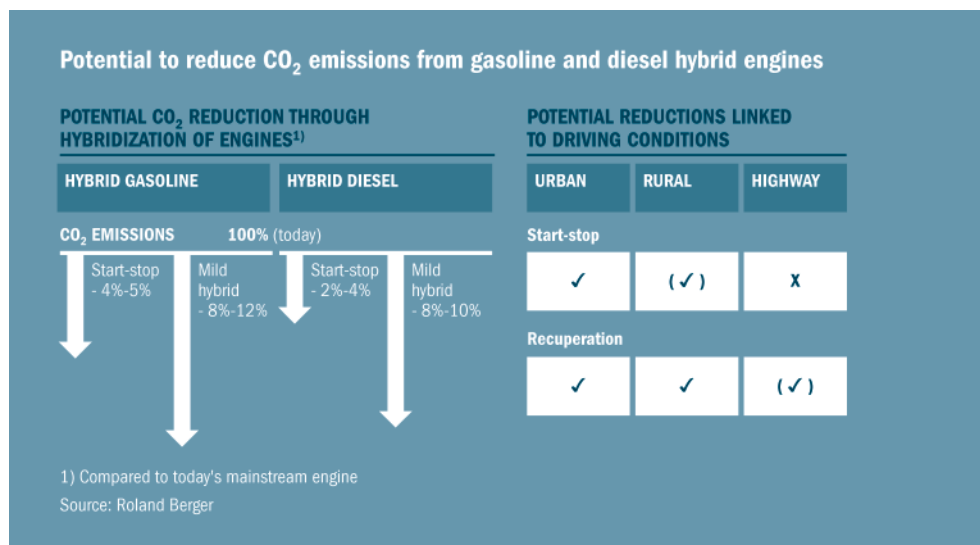
Pressure on urban delivery traffic – and hence on emission- and pollution-free transporters – is clearly set to increase in future. Three key motivating factors are behind this drive. One is a desire to ease the burden on the environment by reducing traffic volumes (and thereby reducing carbon dioxide emissions, soot particles and particulate matter). The second is the need to improve the quality of city life, again by curbing traffic volumes and also reducing noise pollution. The third important aspect is the need to manage the timing and spatial flow aspects of traffic demand (i.e. to ease traffic congestion).

Major cities such as London have already shown how introducing city center tolls and granting privileges to the drivers of low-emission vehicles (by providing special traffic lanes, lower toll fees and special parking spaces, for example) can step up the pressure to roll out emission-free vehicles.

Hybrid powertrains – The high road to an emission-free urban driving experience?

For delivery traffic in particular, CO₂ legislation and the spread of low-emission zones throughout Europe is making exceptionally clean vehicles an unavoidable imperative. At present, however, diesel engines more or less have a monopoly of the market. Yet merely raising injection pressures, downsizing, improving turbochargers, optimizing friction and tweaking at ancillary components is going to deliver a further 15% reduction in fuel consumption at best. These technical changes causes a price increase of about 1,000 Euro per vehicle.

Further potential to cut carbon emissions can, however, be realized only as powertrains increasingly go electric, from start-stop systems to mild and full hybrid vehicles.



LOW-EMISSION VEHICLES FOR THE CITY SEGMENT

An opportunity for hybrids?

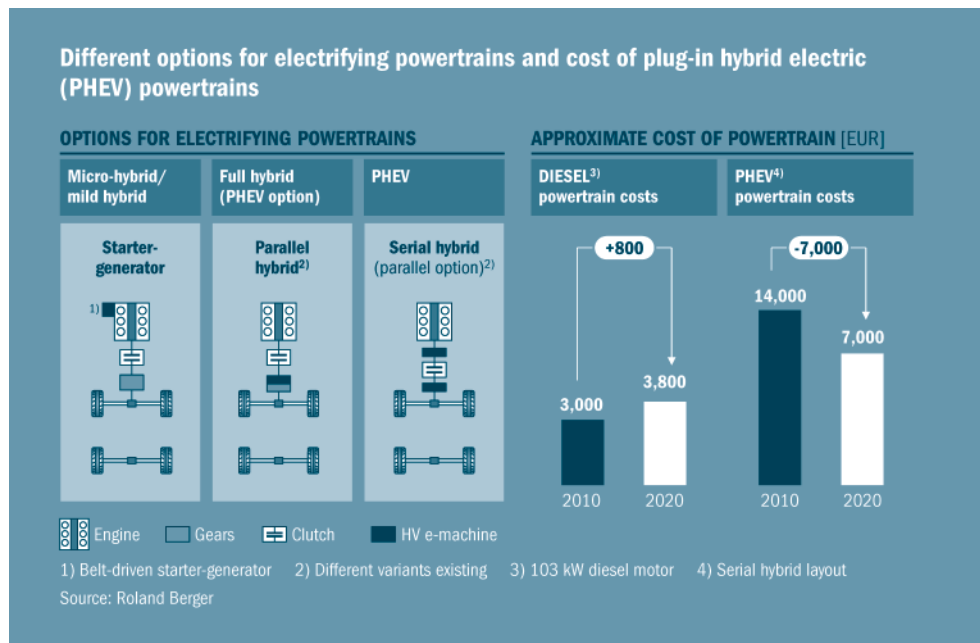
Hybridizing the powertrain alone can reduce diesel consumption by up to 10% (mild hybrid), for example; and hybrid systems can exploit their full strengths especially in inner-city traffic contexts. Constantly having to accelerate, brake and wait at traffic lights allows energy to be retrieved and stored in the battery (a process known as energy recuperation). A full hybrid powertrain can lower the fuel consumption up to 20%, but causes an additional price up to 7,000 Euro per vehicle. That will be a big burden for the light commercial vehicle segment and have to be taken in account by defining the long term targets for this segment.

The use of plug-in hybrids indeed paves the way to completely emission-free driving. Depending on the design, such vehicles can run solely on the electric engine and recharge the battery out of the wall, so to speak. In theory, this approach opens up ranges to compare with those of conventional drive systems.

Depending on the size and design of the electric motor, plug-in hybrids thus make completely emission-free driving a realistic possibility. Moreover, recharging batteries from a plug socket can generate even greater cost and environmental benefits if the electricity used in this mode is generated from renewable sources.

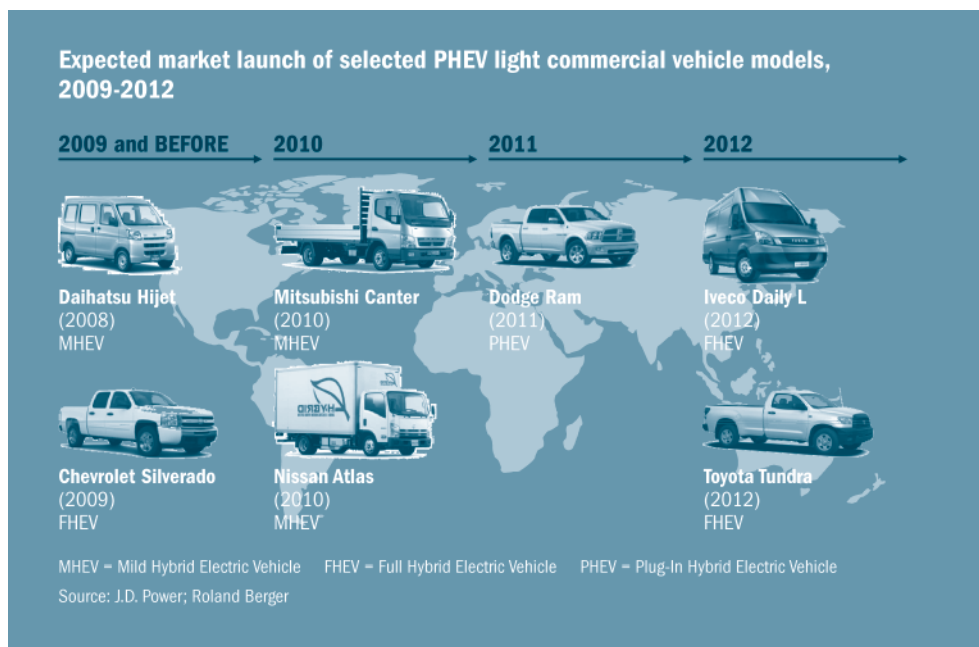
Ultimately, however, hybrid technology will not make the real breakthrough unless electric components are available at competitive prices. On this score, hybrid drive systems have to compete with very economical and cost-effective diesel engines.

In light of the potential savings hybrid drives will in future be deployed in urban traffic contexts – in delivery traffic, for example – where they can unfold their full benefit.



LOW-EMISSION VEHICLES FOR THE CITY SEGMENT

An opportunity for hybrids?



Potential of hydrogen

The vision of the emission-free vehicle can also be realized by using hydrogen as a fuel. To do so, the electric energy needed for the motor is generated by hydrogen in a fuel cell. The wave of interest that has focused the issue of electromobility on battery-storage solutions in recent years should not obscure the fact that key players in the automotive industry – above all Daimler, General Motors, Toyota, Hyundai and Honda – also remain committed to fuel cell and hydrogen technologies.

There are two reasons why most of these groups are pursuing this two-pronged strategy (with battery-driven electric vehicles on the one hand and the use of fuel cell technology on the other).

One relates to persistent concerns about the reliability of battery-driven vehicles. The other is that fuel cell technology is also suitable for vehicles that have to handle heavier loads (such as trucks and buses). A further reason why car makers are clinging to hydrogen technology is to shore up their value chains – and keep links in these chains from finding their way to the world's low-technology regions.

LOW-EMISSION VEHICLES FOR THE CITY SEGMENT

An opportunity for hybrids?

Summary

Stiff challenges still line the road to environmentally friendly and emission-free delivery traffic in our cities. However light commercial vehicles are the backbone of our economy in our cities. To comply with ever stricter laws on the reduction of carbon emissions for light commercial vehicles and to avoid falling foul of access restrictions, the transporter of tomorrow must give off substantially lower emissions than it does today.

Hybrid drive systems in various forms – mild, full and plug-in hybrids – will therefore become increasingly widespread in the delivery segment as soon as economies of scale make them genuinely and sustainably competitive but still by a higher price. For that reason there must be a impact assessment before defining the ultimate CO₂ long term targets for light commercial vehicles.

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