EVOLUTIONARY VS. REVOLUTIONARY TRENDS IN THE COMMERCIAL VEHICLE INDUSTRY – IS THE CO_2 DISCUSSION LEADING TO STRUCTURAL CHANGE?

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Abstract

Controlling CO_2 emissions and a shift in market priorities will pose major challenges for the commercial vehicle industry. Of particular significance is the growing volume of commercial vehicles in the BRIC markets, particularly in China and India where technologically sophisticated commercial vehicle products from Western truck manufacturers meet “price-optimized” low-cost markets. Solutions must be found for this supposed conflict.

The study is based on interviews with representatives and decision-makers from well-known European commercial vehicle manufacturers and selected companies in the supplier industry. Proceeding from market analyses and assessing the options available, the study reveals potential scenarios for resolving the following three questions:

- Which technological developments are necessary and promise success?
- What can successful commercial vehicle options look like in future?
- Which cooperation potentials exist for truck OEMs and trailer manufacturers?

Keywords: CO_2 Regulation, Commercial Vehicles, Product Technology Strategy, BRIC

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1. Background of the study

Based on a strategy analysis, a study conducted by Consulting4Drive GmbH and Forschungsgesellschaft Kraftfahrwesen mbH Aachen (fka) examines the opportunities and risks of CO_2 legislation expected for the heavy commercial vehicle segment. As part of this study, leading commercial vehicle manufacturers were asked to say how they are positioned against the backdrop of the new general framework in relation to the three chief drivers: markets, fields of application and technology strategies.

Against the backdrop of rising worldwide demand for energy, haulage capacities and ever-scarcer crude-oil reserves as well as the global increase in CO_2 emissions, the industrialized nations are called upon to reduce the CO_2 they produce, particularly in the transport sector. Over recent years, the European Union (EU) has introduced statutory regulations to reduce the fleet consumption of passenger cars and N1 light commercial vehicles (up to 3.5 t) which are now to be extended to include N3 heavy commercial vehicles (over 12 t). Doing so, the EU is following the endeavors on the part of Japan and the USA where limit values have already been discussed or defined for maximum consumption per km or haul capacity per km. The limit values will be introduced in these countries between 2014 and 2017 (Figure 1).

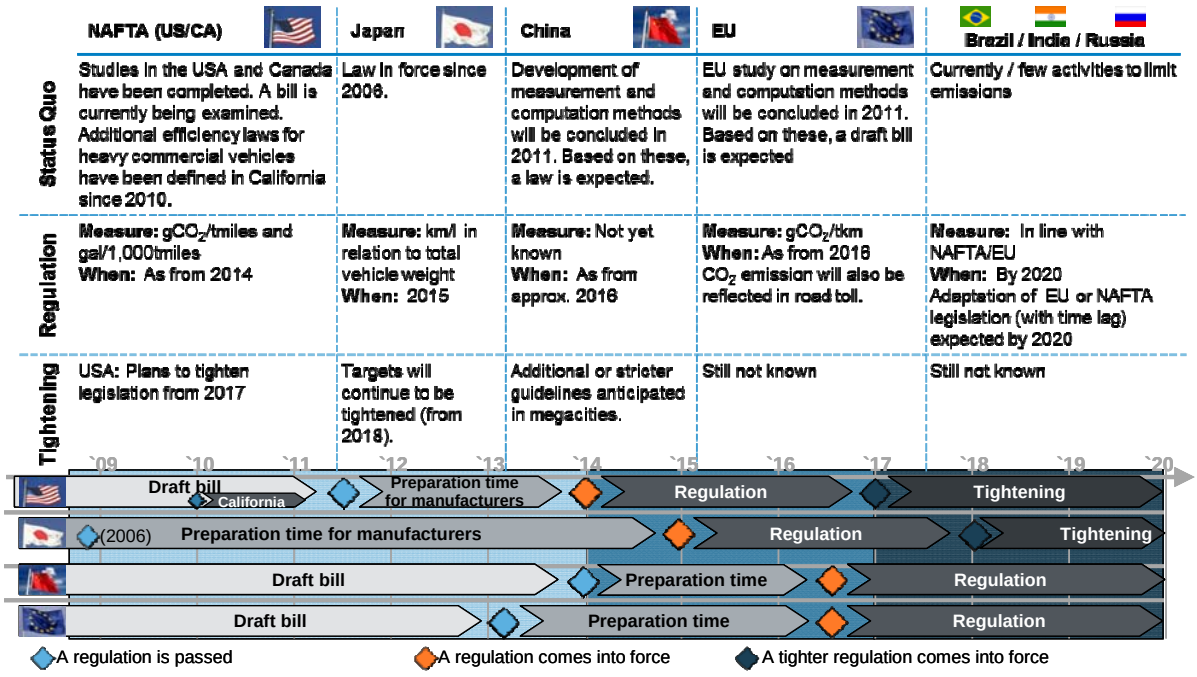

Figure 1: CO_2 legislation roadmap – CO_2 emissions are likely to be regulated for commercial vehicles in all key markets by 2020

For Europe alone, several working groups in the European Automobile Manufacturers' Association (ACEA) are currently in the process of analyzing the commercial vehicle market in Europe as well as its effect on CO_2 emissions, and are defining fleet values for manufacturers.

On the basis of this general framework and in consideration of the complexity of the commercial vehicle segment, the legislative trends in the triad markets of Europe, USA and Japan as well as in the BRIC markets were discussed with the interviewees participating.

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After analyzing the technological potential and associated additional costs, opportunities and risks were evaluated for future overall vehicle concepts in relation to heavy commercial vehicles (Figure 2).

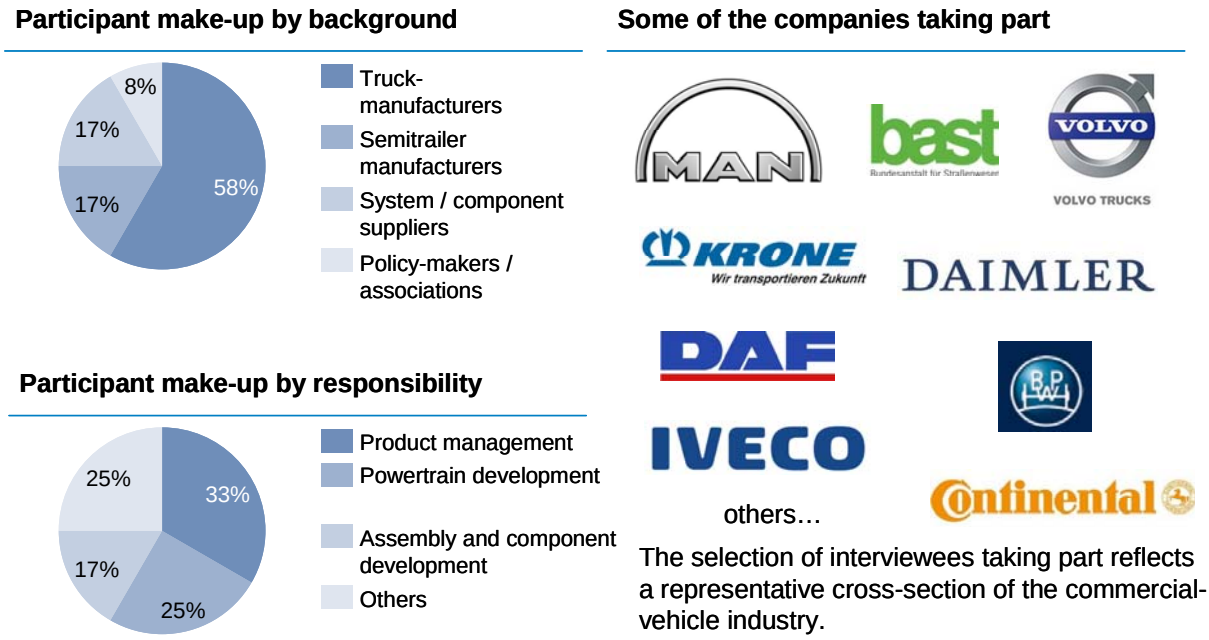

Figure 2: The results were obtained from in-depth expert interviews with top decision-makers representative of the entire commercial vehicle industry

As part of the certification process in the commercial vehicle segment, the engines have so far merely been tested on test benches with a focus on exhaust emissions (standards EU1-EU6). With CO_2 emission being included in emission legislation, this process will change, moving the focus onto the overall vehicle, including its specific vehicle body.

2. The right technology strategy decides the future of the company's success

Consequently, the market and technology study looks at both the tractor and the vehicle body or trailer. The initial focus is on optimizing evolutionary technology, such as lightweight concepts, aerodynamic spoilers or adapted trailer designs to reduce running resistances and hence fuel consumption. Using the example of a long-distance vehicle, individual technological measures were defined with the experts interviewed before comparing and incorporating them in a strategic technology roadmap. Produced in this way, the technology roadmap shows that by consolidating the technologies already developed today but not yet established on the market, it is possible in an initial technology package to reduce fuel consumption by approx. 6% over a base vehicle, leading to reasonable additional costs of approx. € 1,000 - € 1,500. Depending on annual mileage and the price of fuel, the user will be able to refinance these additional costs within an interval of just 4-11 months. In a modular succession of technology packages, the roadmap formulates a maximum potential CO_2 saving of up to approx. 25 % that can be achieved with improved evolutionary technologies (Figure 3).

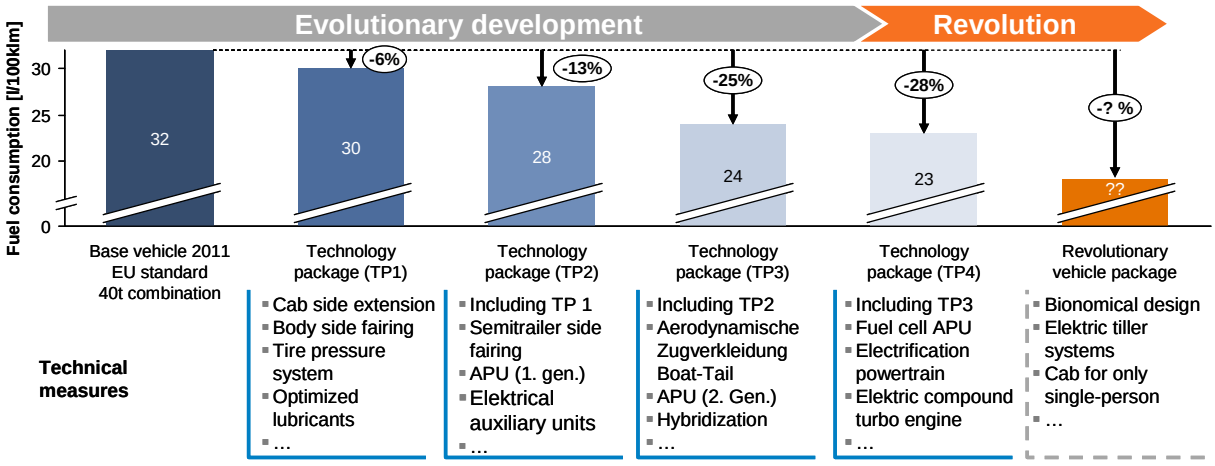

Figure 3: CO_2 technology roadmap – conventional technologies still provide a high potential for CO_2 reduction, but technologies beyond these are necessary for meeting the expected EU regulation targets

However, some of these technologies are difficult to realize on account of the existing legislative framework, making intensive dialog necessary between policy-makers, industry and science. As a result, progressive overall vehicle concepts, e.g. the teardrop trailer, could take to the road in future. The dominant measures to reduce fuel consumption are seen for all respondents in the reduction of the driving resistance, especially in aerodynamics (Figure 4 and 5).

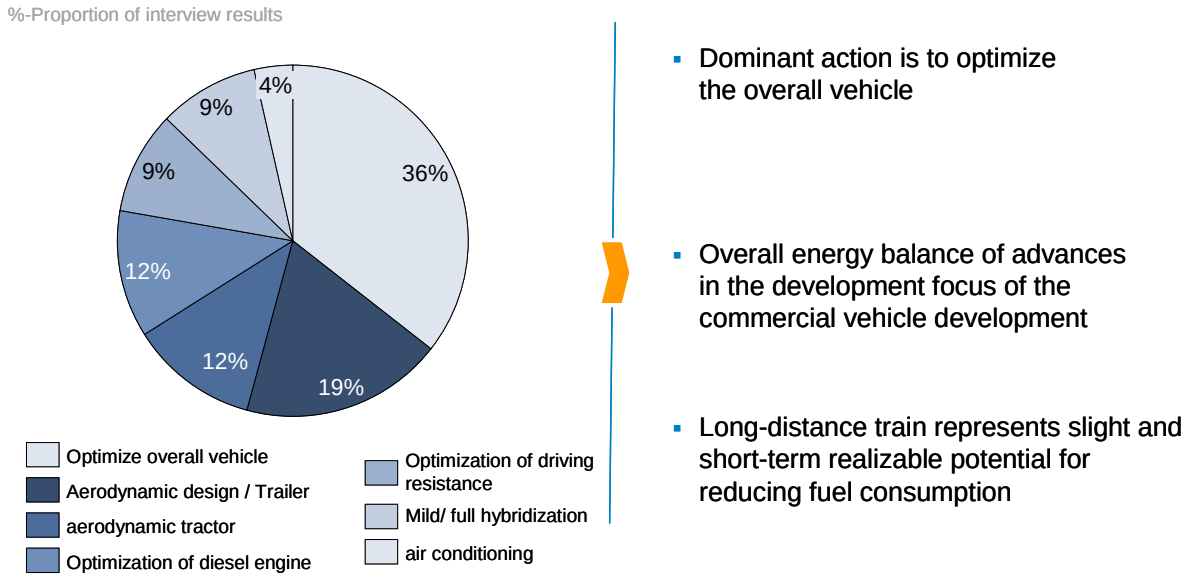

Figure 4: Fields of technology to reduce CO_2 emission – the aerodynamic measures are considered to be the most important lever

Daimler AG (Example New Actros)

- Create an aerodynamically optimized Stream Space Cab
- Actively controlled radiator shutter
- Aerodynamic underbody cover for mainline applications
- Increasing share of total vehicles in wind tunnel tests

Source: Daimler AG

MAN (Example Concept S)

- All-new aerodynamically shaped utility vehicle concept
- Break back pressure on the front faces
- Large radii in the transition to the side surfaces
- Rear entry and reduction of the rear vortex intensity

Source: MAN Truck & Bus AG

Quelle: C4D-Marktstudie/ Recherche

Figure 5: Aerodynamic simulations include increasing overall vehicle concepts

3. Commercial vehicle manufacturer to system supplier

A long-term and sustainable reduction in CO_2 emissions, though, demands revolutionary overall vehicle concepts. Concept studies for use in long-distance haulage, such as the “MAN Concept S”, point the revolutionary way toward achieving fuel savings of over 30% (Figure 3).

In the future, successful companies will be the provider of a general product system for a vehicle consisting of tractor and semi-trailers. In contrast to today's commercial vehicle business, the commercial vehicle development is extended to the total combination. In addition, important for the commercial vehicle manufacturer services that go far beyond its current business model, for example, in the after sales and financial services. Concepts of this type have to date focused on long-distance applications which is shown to be the segment with the highest volume for all of the OEMs interviewed. This comes with advantages from the aspect of developing and implementing what, in part, are extremely cost-intensive innovations.

4. Development and production cycles in the commercial vehicle industry

Summarizing, it can be stated that, in terms of introducing CO_2-cutting measures, the need to act in the commercial vehicle industry is higher than ever. The challenge for the development of commercial vehicles is the decision for the future technology path (Figure 6). Today's evolutionary technology will conquer in the years to move towards the truck. The final turn to revolutionary development decisions can only be initiated by optimization or adjustment of legal regulations. Customers and manufacturers must be supported by political decisions on their common path and motivation programs especially for the clients should be intensified.

To assess the feasibility and the market penetration of technical innovations, especially for the revolutionary development steps, it is essential to consider and to analyze the development and product life cycles in the commercial vehicle industry. The existing development processes in the commercial vehicle industry include 3 phases: research, advanced development, and series production development. During the research phase the aim is to develop innovative technologies with a market relevance of 10-15 years. The advanced development phase drives the development of components and systems for the next generation product range, which reaches maturity in 5-8 years. The series development phase is the one with the most concrete relation to the final product, switching the focus from strategic technology and market view to the operational implementation of the ideas and solutions generated over the past years and covers the last 3-4 years till the final truck on the road.

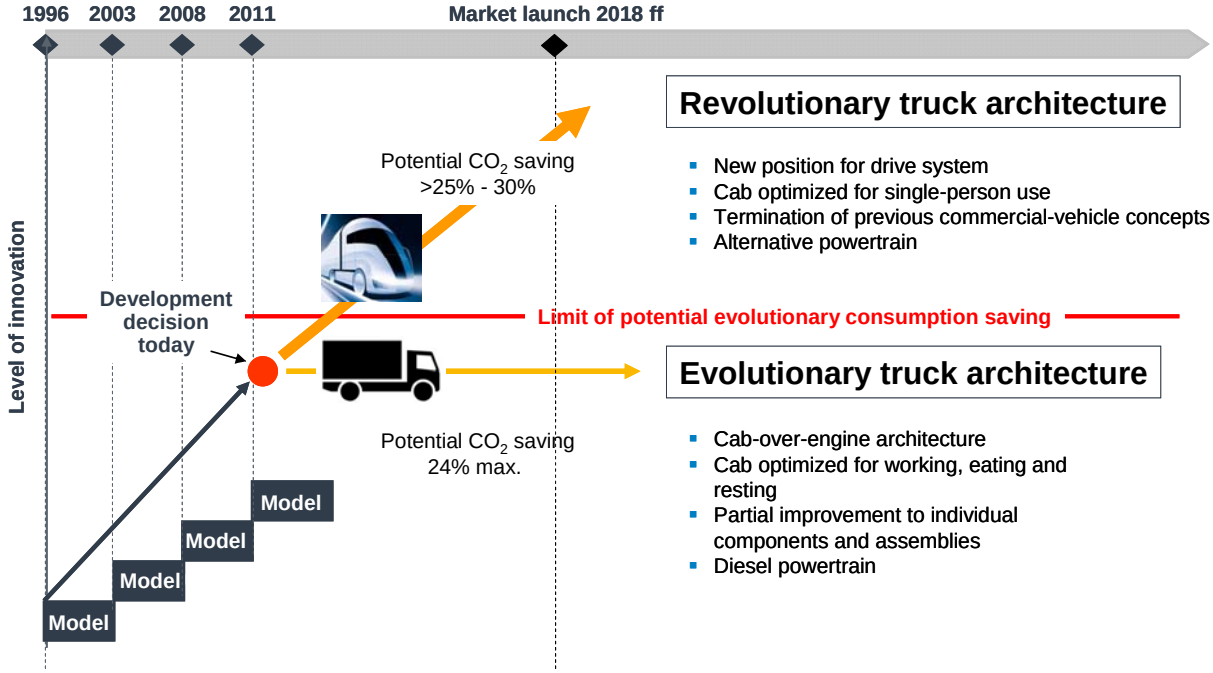

Figure 6: The different technologies enable different levels of CO_2 reduction – for the biggest challenge for all OEMs, is to decide on which future technology path to take

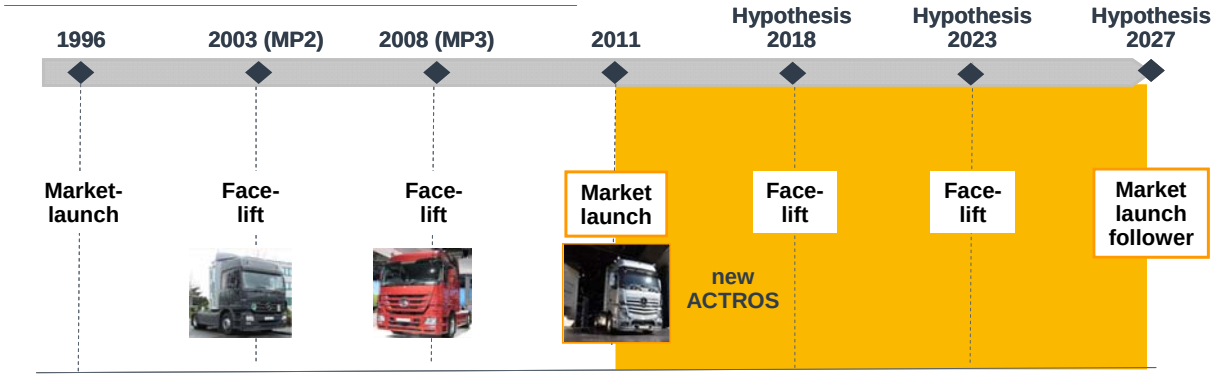

Figure 7: Product lifecycle of a Mercedes-Benz Actros

Thus, having met the strategic product decision based on the results of the research phase means approx. 70-80 months of development work prior to the launch after which the product will stay on the market for the next 20 years due to the usual product life cycle. This is why it is crucial for the success of tomorrow to talk about the technologies and product characteristics today (Figure 7).

5. The commercial vehicles strategic portfolio cube

However, the commercial vehicle market is not only characterized by its large number of chassis designs with different cabs and axle combinations but also by the numerous body versions and tractor vehicle combinations. In terms of vehicle configuration, the balance between vehicle structure, powertrain and accessory loads must be re-considered for each individual vehicle application. It is therefore necessary to cover the entire product range of a manufacturer's commercial vehicles, classify it into market-specific CO_2 targets and meet the resultant demands with appropriate technological measures. The possible targets – set in Europe by ACEA and the European Commission – give a clear direction in this context and follow a global trend.

The answers to this brief must be sought against the backdrop of the global work of European OEMs by analyzing the strategy cube (Technology-Market-Application Segments) in detail (Figure 8).

Only this way is it possible to ensure any selective development of cost-effective future technologies as the main criterion for a company's future success.

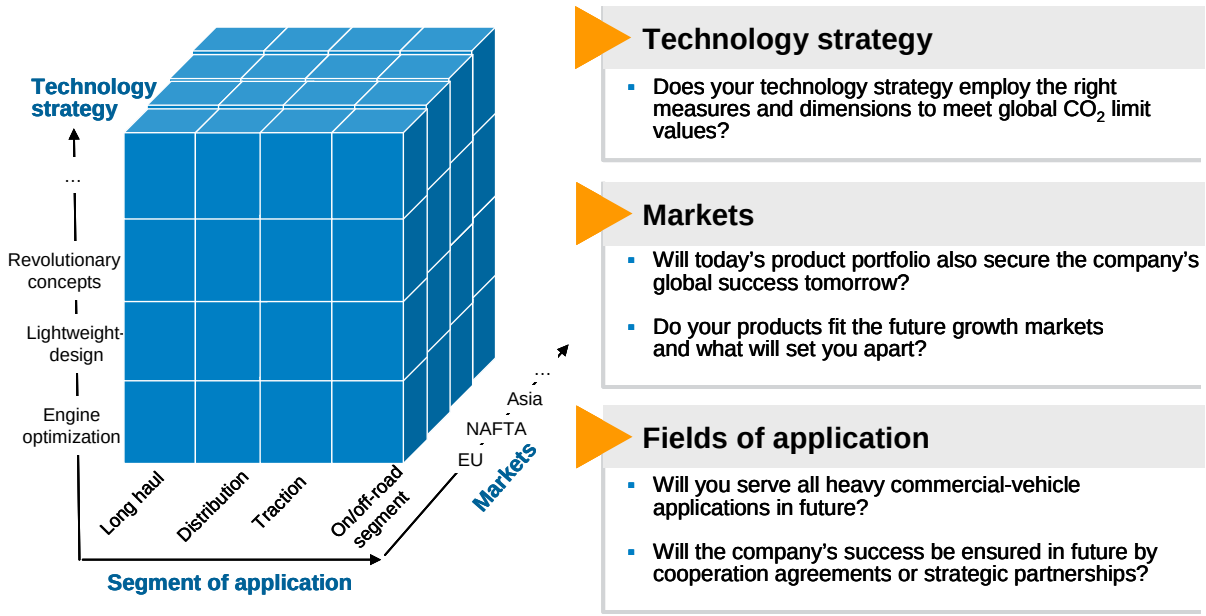

Figure 8: Strategic implications - the following questions must be answered for the global success of a commercial vehicle manufacturer

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