

Strategies for the commercial vehicle markets in America, Asia and Europe

- **Attractive products, more efficient operational procedures and the development of growth potential are the cornerstones of corporate success**
- **Emission control technology and vehicle safety are becoming crucial factors in the competitive environment**
- **DaimlerChrysler uses synergy through a process of intelligent networking within a global group of companies**
- **Presentation by Dr Eckhard Cordes, Member of the Board of Management of DaimlerChrysler AG responsible for the Commercial Vehicle Division, at the VDA International Commercial Vehicle Press Workshop in Frankfurt on July 8/9, 2004**

The commercial vehicle business is known for its highly heterogeneous nature – a fact clearly underlined by the multitude and variety of product concepts on offer for trucks, vans and buses. In developed markets such as NAFTA, Europe and Japan, the general conditions for commercial vehicles differ widely, especially when it comes to the legal framework and customer requirements. To cite a familiar example, the maximum permitted truck length in Europe refers to the length of the entire vehicle, whilst in the USA only the actual load length is limited. Conventional trucks with immense scope for a large cab and sleeping/living quarters are therefore still common in the USA. In Europe, meanwhile, engineers face the challenge of reaching an effective compromise between an attractive workplace and living area for the driver on the one hand and an optimal load length on the other. In Japan, as in Europe, the maximum permitted

truck length refers to the entire vehicle. For the global manufacturer with a presence in all of the core regions, the economic fulfilment of customer requirements and legal requirements that differ from region to region represents a major challenge. The situation is made all the more difficult by the considerable difference between commercial vehicle prices in developed and growing markets.

Basic strategies for global commercial vehicle markets

Today corporate success is essentially governed by the implementation of three basic strategies: product, cost and growth. To be successful, a global manufacturer must offer an attractive, high-quality and economical product portfolio in all regions, implement efficient cost structures and develop growth potential in both its own and other regions.

Attractive product range – encouraging customer response

The best sales argument of all is a good product, as has been proven once again by the market success of the heavy-duty Mercedes-Benz Actros truck unveiled at the last International Commercial Vehicle Show.

DaimlerChrysler has refused to compromise when it comes to product development, despite the difficult market conditions of recent years. By taking on board customer feedback, focussing on quality and further increasing economic efficiency, the company has made the Actros one of the most successful trucks on the market – a vehicle which has achieved an extraordinarily positive response and attracted a high number of orders in just a short space of time.

Economic benefit achieved through efficient operational procedures

Economic efficiency is crucial in the commercial vehicle industry. Each investment decision made by our customers is based on how much a vehicle costs. In order to remain competitive, some customers calculate to the nearest fraction of a cent per kilometre. Economy is also a priority for manufacturers, since their aim is to ensure maximum customer benefit in the most efficient manner possible. Faced with a difficult market environment, in recent years especially so, commercial vehicle manufacturers started to focus on optimising cost structures and on improving the efficiency of their operational procedures. DaimlerChrysler began to introduce restructuring and efficiency programmes for all its business units at an early stage, i.e. at the start of the current economic downturn in the year 2001. These programmes have proved to be a great success. In order to remain competitive, DaimlerChrysler will continue to strive to make its operational procedures even more efficient and even more effective.

Newly industrialising economies – major growth opportunities

The development of growth potential is a further cornerstone of corporate success, although this is only possible to a minor extent in developed markets. Any company with serious ambitions of achieving significant growth simply has to move into the newly industrialising markets, especially those in Asia. Manufacturers whose products are expensive and are geared towards developed markets are mostly restricted to serving mere niche segments and can only share in market growth to a limited extent. Saleable and, above all, low-cost vehicles must be offered in developing regions. From a DaimlerChrysler standpoint, this is best achieved through co-operation with local manufacturers. In China, DaimlerChrysler is

working intensively to set up a joint venture for the production of Mercedes-Benz Sprinter and Viano/Vito vans. A further joint venture – for the production of medium and heavy-duty commercial vehicles, engines and other components – is also planned for the Chinese market.

Globalisation extends the profile of requirements

The increasing globalisation of the commercial vehicle industry is throwing up new challenges. It will no longer be enough to occupy a position of strength in the individual regions alone. Customer requirements and vehicle concepts are becoming more varied, whilst processes and technologies are becoming more complex and investment is rising. Strategy elements that have proven successful in the past will no longer be sufficient. A global manufacturer has to ensure closer co-operation and ties between the individual regions in order to meet these new challenges. Based on a central idea – 'as much standardisation as possible, as much regional differentiation as necessary' – the aim must be to combine technologies, processes and products efficiently without neglecting specific market requirements. In addition commercial vehicle manufacturers are obliged to follow directives that are being changed increasingly frequently. Furthermore they have to take into account new requirements, especially statutory regulations, when designing and developing their product solutions. The acquisition of extensive environmental and emission- technology know-how and the ability to play a pioneering role in the field of safety engineering are fast becoming factors that can give a manufacturer the all-important competitive edge. Synergies and economies of scale are the new prerequisites for companies that want to remain economically efficient as global sellers within the context of this business environment.

Significant economies of scale through the sharing of components

By translating high volumes into economies of scale, commercial vehicle manufacturers can continue to optimise costs with an eye towards the future. DaimlerChrysler calls this initiative 'Turning Scale into Profit'. By intelligently linking standardised and regional components, it will be possible to take into account specific market requirements so that the truck can retain its familiar regional appearance. Future truck generations are set to use common units and components, regardless of brand or region. The major components account for over 50 percent of the material costs and thus offer the biggest potential for savings. Consequently, DaimlerChrysler gives engines, transmissions and axles top priority when it comes to implementing the 'Turning Scale into Profit' strategy.

One of the key projects is the joint development of a new engine family for all DaimlerChrysler heavy-duty commercial vehicles, which is set to replace the four different engine series currently used: two at Mercedes-Benz and one each at Mitsubishi Fuso and DDC. The new power plants will be the most produced heavy-duty truck engines in the world, offer the widest output range and feature state-of-the-art emission control technology. Production launch is scheduled for the year 2007.

Overall responsibility for product creation is assigned to the Truck Product Creation unit. This new unit – created as a result of the organisational restructuring measures that were implemented on January 1, 2004 – closely networks all the major functions at the start of the product creation process (product planning, product development, production strategy and planning, purchasing) on a global basis. By working together in this way, it is possible to develop the best solutions for each specific brand and continent whilst fully exploiting the available synergy potential. The 'Lead

Engineering' concept introduced as part of the organisational restructuring measures for DaimlerChrysler truck business fulfils the requirements on a process and organisational level so that the aforementioned synergies and, therefore, cost savings can be identified and achieved. Each part in the vehicle is assigned to a Lead Engineering Team whose task it is to modify and implement the module for all regions, the aim being system commonality. Finally the Lead Engineering strategy provides for regionally-specific adaptation and integration of the module in question. This concept not only cuts costs, it also ensures high-quality, technologically advanced solutions for customers.

In addition, development costs can be reduced thanks to high volumes and high demand within DaimlerChrysler, which gives the company the edge in terms of both technology and costs.

Know-how in all environmental technologies

All commercial vehicle manufacturers are currently working intensively to develop leading-edge emission-control concepts, since lower emissions can give a vehicle the all-important competitive edge. This is precisely the reason why manufacturers pursue a range of strategies to comply with emission standards. Major advances in engine technology have been achieved by improving the injection system, optimising the combustion chamber and adding superchargers and intercoolers, for example. However, emission laws are becoming stricter, with new limits being introduced at increasingly short intervals. New technologies are therefore required to ensure compliance with the latest standards. Specific concepts are needed for each region, since there is unlikely to be any world-wide harmonisation of emission standards in the short or medium term and different standards,

limits and measuring techniques will continue to apply in Europe, the USA and Japan.

There are generally three ways of reducing emissions. Firstly by means of in-engine measures such as exhaust gas recirculation (EGR). Secondly through exhaust gas aftertreatment systems such as SCR (Selective Catalytic Reduction), NSC (NO_x Storage Catalyst) or a diesel particulate filter (DPF). The third approach involves a combination of in-engine measures and exhaust gas aftertreatment systems.

EGR is an in-engine technology that reduces NO_x emissions by recirculating and cooling the combustion gases. The effect is essentially based on the reduction of the peak temperatures during the combustion process. The fact that the exhaust gas is recirculated means there is less oxygen in the diesel/air mixture. This results in a lower power output and an increase in the emission of soot particles.

EGR is a tried-and-trusted technology that is easy to control. Its disadvantages are higher fuel consumption, lower engine output, increased particulate emissions and the high demands placed on the cooling system.

SCR technology relies on the use of ammonia to reduce the nitrogen oxides in the exhaust gas as well as higher combustion temperatures to reduce soot emissions. Having been successfully used to control emissions in power stations for several decades, SCR technology has recently been modified specifically for use in conjunction with diesel engines. The principle is based on the addition of ammonia or urea as a reducing agent in order to convert the harmful nitrogen oxides in the exhaust gas into harmless nitrogen and water vapour in a catalytic converter. In this process, a fluid called "AdBlue" is sprayed into the flow of exhaust gas downstream of the

engine. AdBlue is a non-toxic, colourless, odourless substance that is converted into ammonia by the heat of the exhaust gases.

In-engine reduction of nitrogen oxides is always at the expense of fuel consumption and soot particle emissions. SCR is a future-compatible emission-control concept that sets new standards in terms of its combination of economy, power output and environmental compatibility.

One major advantage of SCR technology is that it ensures lower fuel consumption than certain other technologies. In addition, SCR technology is not sensitive to sulphur, which is especially important because low-sulphur fuel is not always available. The only disadvantage is that a special additive which requires its own infrastructure is needed. This infrastructure is currently being set up.

The NSC technology, which is in the research phase, enables the nitrogen oxides to be reduced after leaving the engine by chemically converting them into nitrates and storing them in an accumulator. If the accumulator were allowed to fill up, all the nitrogen oxides would escape into the atmosphere through the exhaust. A further chemical reaction is therefore needed to empty the accumulator at regular intervals. Unburned fuel converts the nitrates into water, nitrogen and CO₂ which are then emitted with the exhaust gas. The advantage of NSC technology is that no additives such as AdBlue are required. Its disadvantages are high fuel consumption and poor resistance to aging. In addition, NSC is highly sensitive to sulphur, so low-sulphur fuel must always be available.

Different requirements in the triad markets

Compliance with the new Euro 4 standard due to come into force in Europe in October 2006 cannot be assured by using in-engine systems alone. To counter high fuel costs in Europe, DaimlerChrysler has opted for SCR technology which reduces fuel consumption in the face of the high cost of fuel and ensures compliance with the Euro 4 and Euro 5 emission standard. Based on SCR technology, the new diesel-engine system DaimlerChrysler has developed for Mercedes-Benz heavy-duty commercial vehicles is being launched under the name "BlueTec". SCR technology will also be used in the Japanese market.

In the USA the economic advantages of the SCR system are less pronounced due to the lower fuel prices. In addition, EPA 07 specifies a much lower particulate limit than Euro 4, thus making a particulate filter compulsory. EGR technology with an additional particulate filter has therefore become the preferred choice for model year 2007 in the USA. With much stricter nitrogen emission limits due to become US law in 2010, DaimlerChrysler believes SCR technology will be as indispensable in the USA as it is in Europe and Japan. The definitive limits for the emission standards after Euro 5 (from the year 2012) and EPA 10 (from the year 2010) have not yet been defined in the triad markets.

In the future, a single technology will no longer be sufficient for ensuring compliance with emission standards. On the technological side, a package solution that can be adapted to suit all regions world-wide will be required. In-engine emission-control concepts and exhaust gas aftertreatment methods will need to be combined in order to ensure compliance with the specified limits. This is why DaimlerChrysler is further developing systems

in all areas of emission control, so that it can acquire and develop know-how and thus react flexibly to different requirements.

Drivers also have a part to play, since fuel consumption and emissions can be reduced by up to five percent simply by improving their driving style. DaimlerChrysler is also heavily involved in this area and can offer suitable training.

Alongside optimising the conventional engine/exhaust system, DaimlerChrysler is working on further solutions to reduce emissions. No globally active commercial vehicle manufacturer's portfolio would be complete without alternative fuels and drive systems such as the hybrid engine and fuel-cell drive. DaimlerChrysler has been carrying out intensive tests with hybrid drive systems over the last ten years. To test the fuel-cell drive system in practice, DaimlerChrysler has a fleet of 30 fuel-cell buses operating daily on regular-service routes in ten European cities. In addition to this, the delivery of three fuel cell buses to Beijing has been agreed.

Pioneering role in vehicle safety

The social importance of road safety is increasing in almost every country in the world. In the commercial vehicle segment especially, aspects such as safety and crash avoidance are becoming increasingly crucial, especially since the volume of goods transport vehicles on the road is set to rise further still. According to the latest studies, the eastwards expansion of the EU will result in a 50 to 60-percent increase in the volume of traffic in Europe over the next ten years, not to mention a 100-percent increase in the amount of east-west traffic. Road users therefore face increased stress levels as well as a higher risk of fatigue and lapses in concentration.

Active safety before passive safety

As a true innovator in the field of safety engineering, DaimlerChrysler supports international co-operation by performing global accident research, modifying existing safety systems and developing new safety systems. Unveiled four years ago, the 'vision of accident-free driving' has given rise to a whole host of innovative technologies and new products. Their use can drastically reduce the number of road accidents. DaimlerChrysler believes that 90 percent of all accidents can be avoided, provided that the new technologies are introduced universally.

DaimlerChrysler invests more in safety technology for its commercial vehicles than any other manufacturer in the world. The research and development engineers are able to draw on the company's many years of experience in the field of safety engineering for passenger cars. Passive safety systems that lessen the impact of accidents are important but their success is limited when they are installed in heavy-duty commercial vehicles. For this reason, DaimlerChrysler's foremost aim is not to lessen the impact of accidents but to prevent accidents altogether. This means that active safety systems take first priority in the commercial vehicle sector, irrespective of market or region. However, the use of safety and assistance systems does not relieve drivers of their usual responsibilities in any way, shape or form. The safety systems are designed to intervene when the driver makes errors due to fatigue or inattentiveness. These systems therefore protect the driver and passengers on board as well as all other road users.

First-generation active safety systems – such as the Electronic Stability Program (ESP) or the electronic brake system with Brake Assist – are fitted in Mercedes-Benz trucks, buses and vans. And with great success, as figures released by the German Federal Statistical Office reveal: trucks

made by Mercedes-Benz, a DaimlerChrysler brand, are involved in fewer accidents than other brands. Regular modifications ensure that the systems remain state-of-the-art.

Second-generation active safety systems – driver assistance systems – are designed to come into play when technology proves quicker than humans at assessing traffic situations and reacting accordingly. In the case of trucks, such products include the Lane Assistant and Telligent proximity control systems. Demand for these systems, which were introduced two years ago, more than doubled in 2003 compared to the previous year.

Thinking ahead to intelligent transport

In order to bring the 'vision of accident-free driving' a step closer to reality, the newly developed assistant systems will be able to recognise and "understand" situations on the road. One of the next steps is the introduction of the Telligent emergency braking system – a modified version of Telligent proximity control – scheduled for production launch in spring 2006. This emergency braking system can initiate an emergency stop of its own accord. Radar sensors measure the distance between the vehicle and a moving or stationary obstacle. Based on the distance to the vehicle in front and the current vehicle speed or the difference in speed between the two vehicles, the system determines whether the traffic situation is critical. The driver first receives an audible warning. If the driver then fails to react, the system initiates an emergency stop of its own accord.

A further milestone is the ability of sensors to detect road conditions. Existing assistant systems can become even more effective if they learn how to detect road conditions. For instance, whether there is ice or snow on the road, or whether the road is wet or dry. Depending on the road's friction coefficient, the braking distance may be shortened or lengthened; this

information is vital when it comes to maintaining the correct safety distance behind the vehicle in front. The DaimlerChrysler engineers are working intensively to bring the friction coefficient recognition system up to production standard.

One project still in the research phase is the "Active Lane Assistant" system based on the existing Lane Assistant. In this case, "active" means that the system automatically controls the steering rather than just sounding a warning when there is a danger of the vehicle departing from its lane. One of the prerequisites for such a system is an electronic interface to the steering.

DaimlerChrysler is also carrying out vital research and development work in the field of "sensor fusion". Sensor fusion means the ability to process information from video and radar sensors simultaneously so that the prevailing conditions in and around the vehicle can be assessed more effectively and the systems that control the vehicle can react even more precisely.

Incentives for improving safety and environmental acceptance

Haulage companies have to be encouraged to invest in safety systems or lower-emission engine systems which go beyond legislative requirements – a task which proves extremely difficult as emission laws are becoming stricter, with new limits being introduced at increasingly short intervals. Amortisation times are therefore becoming shorter. In this case it is not just the vehicle manufacturers who should be offering suitable incentives. Politicians and insurance companies are also called upon to encourage and reward hauliers who invest in additional accident-avoidance and environmental-protection systems. There is much scope for doing this, two examples being reduced road tolls and lower insurance premiums for

compliant vehicles. What is really needed is an international scheme along the lines of the European Commission's road safety campaign, for example.

Road toll charges in Switzerland are likely to be dependent on vehicle emission categories in the future. If implemented, such a scheme would benefit Euro 4 and Euro 5 trucks to the tune of around eight cents per kilometre. And the scheme would apply to all roads in Switzerland. Road toll charges dependent on truck emission categories are also being debated in Austria. If the truck is in a lower emission category, local restrictions can be lifted, for example the ban on night-time driving on the Inntal motorway in Austria or the ban on trucks entering various towns and cities in Scandinavia.

Scandinavia, the UK, the Netherlands and Spain already have schemes in place for providing hauliers with tax benefits or direct aid. Depending on the tax liability of the haulage company, concrete and calculable economic advantages can be achieved.

Intelligent networking within a global company

DaimlerChrysler is a global manufacturer with a strong and varied portfolio of brands and products – from Mercedes-Benz, Freightliner and Fuso to Setra. By standardising the numerous regional technologies, processes and cultures, DaimlerChrysler is able to exploit the synergy potential in what is a global group of companies.

The differences between the regions involved in global networking also opens up opportunities. One way of making the most of such opportunities is to use existing products to penetrate new markets or to actively pursue strategic partnerships, the goal being to offer a full product range.

DaimlerChrysler can launch products developed by one region in new

markets, for example the robust Mitsubishi Canter light truck in Europe and the NAFTA countries or the heavy-duty Mercedes-Benz Actros truck in Korea. The replacement of the Brazilian product range with the European product range is an example of how new markets can be opened up using existing products.

A further approach is to transfer successful vehicle and technology concepts and expertise to other products or markets. The experience of Mitsubishi Fuso in the field of hybrid engines will be of benefit to other markets, for example, with Fuso set to play the leading role in development.

The creation of regional centres of excellence as part of the Lead Engineering concept means that the location with the best expertise can be used to centrally develop components and vehicles. The solutions devised are then adopted and adapted in the individual regions.

A co-ordinated global development network with regional centres of excellence is not just a good idea from a cost-cutting standpoint, it also makes sense in terms of innovation quality and the speed with which innovations are brought to market. Customer-oriented innovations are of strategic importance, especially for the Commercial Vehicle Division. They are major factors that distinguish DaimlerChrysler products from competitor offerings and, as such, are indispensable for safeguarding the future of the company. This is why DaimlerChrysler invests more than € 1 billion per year in commercial vehicle research and development.

Outlook

DaimlerChrysler was quick to recognise and take up the challenge of implementing new strategies. The Lane Assistant and proximity control system for buses and coaches are two of the safety-related products being

unveiled at the International Commercial Vehicle Show in 2004. In the van sector, the highlight will be a "safety Sprinter" which is fitted with standard Sprinter safety systems such as ABS, ASR, BAS and ESP as well as a variable steering ratio and an Active Roll Stability system.

In addition DaimlerChrysler will be unveiling a complete family of long-distance haulage trucks featuring the new BlueTec diesel technology. These trucks comply with the Euro 4 standard, due to come into force in October 2006, and the Euro 5 standard effective as of October 2009. The new emission-control concept is based on SCR technology. With up to 80 percent less pollutants in the exhaust gas compared to the currently applicable Euro 3 standard, not to mention tangibly lower fuel consumption, the new Mercedes-Benz trucks featuring BlueTec are ecologically and economically unique transport solutions for the future of long-distance goods transport on the road.

Website

Further information and news about DaimlerChrysler can be found on our website: **www.media.daimlerchrysler.com**