Reduction of CO$_2$ emission and implication of costs *****

Summary: Climate change and energy security concerns are in our view the primary drivers in the current discussions on CO$_2$ reduction in the automotive industry. Even though it has not been finally proven by scientists, it is widely assumed that global warming is caused by anthropogenic greenhouse gases (GHGs), with CO$_2$ playing the most prominent role.

Recent studies concluded that the economic impact of climate change in Germany would amount to costs in the region of 800 billion euros by 2050. The need for a global response seems to be the order of the day for both politicians and regulators, thus putting further pressure on the industry. With particular reference to the automotive industry, two major challenges arise: fuel saving and emission reduction. Two different problems, leading to the same challenge, how to make vehicles more efficient, while keeping additional costs at an acceptable level so as to make "green" vehicles attractive to consumers.

Keywords: cost, emissions, automotive industry, solutions


Ključne reči: cene, emisija gasova, industrija vozila

* Article received October 13, 2009, accepted December 22, 2009.
** Academy of Economic Studies Bucharest, Faculty of Accounting and Management Information Systems, gostănîlă@gmail.com
*** University of Pitești, Faculty of Economic Science
**** Economics Institute, Belgrade
***** This paper forms part of the results of research on project 149011 – “Determining the Dimensions of the Organizational Structure for the Purpose of Quantifying the Influence of the Most Important Contingent Factors of an Enterprise” financed by the Ministry of science and technological development, Republic of Serbia.
1. INRODUCTION

The various technological options to contribute to CO$_2$ emission reduction can be categorized into three main areas: engine concepts, alternative fuels and beyond engine technology.

Most of the experts we interviewed agree with our assessment that traditional gasoline and diesel engines will continue to dominate over the next decades. Improvements through downsizing, charging and direct injection provide an adequate pathway and potential for future emission reduction. Diesels, similar to gasoline, will continue to play their successful and dominant role, although regulatory requirements in terms of other exhaust emissions are putting an extra burden on diesel development and its costs. The convergence of diesel and gasoline engines is also a viable option, as it combines the advantages of both technologies.

The efficiency of internal combustion engines will further be improved by moves towards electrification and hybridisation. Small electric engines will be used for start-stop systems, regenerative braking and engine assistance. Further levels of hybridisation to follow will depend on the CO$_2$ footprint of each individual automaker and their own requirements to meet their particular CO$_2$ target. The fuel cell is already an important field to explore, and is something which no manufacturers can afford to disregard.

The consequence of all this is that the internal combustion engine will remain an important part of road transport over the next decades. Even though this seems a disenchanted prospect, pushing the dream of a zero emission form of transport further away, it does still demonstrate that improvements of current engines are crucial for the environment and are not just short-term solutions. The same is true for hybrids, which many of the experts we interviewed saw as the bridging technology that will become outdated as soon as the fuel cell is available.

The following table provides an assessment on the general reduction options of different engine and fuel technologies.

Besides the area of engine technology and alternative fuel, automakers face additional CO$_2$ reduction potential in the periphery or construction of the vehicle, such as:

- Transmissions
- Driver assistance systems
- New construction techniques and alternative materials
- New tyre technology and design
- Vehicle design affecting aerodynamic drag,
- Energy management within the vehicle
Table 1.: Overall assessment of emission reduction technologies as of today (Source: The automotive industry and climate change Framework and dynamics of the CO₂ (re)volution PwC)

<table>
<thead>
<tr>
<th></th>
<th>Reduction of green house gas emission</th>
<th>Mature technology</th>
<th>Infrastructure availability</th>
<th>Fuel availability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gasoline</td>
<td>0</td>
<td>+++/+</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td>Diesel</td>
<td>0</td>
<td>++</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td>Biofuels</td>
<td>+</td>
<td>+++/+</td>
<td>+</td>
<td>0/-</td>
</tr>
<tr>
<td>CNG/LPG</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Hydrogen (fuel cell)</td>
<td>++</td>
<td>--</td>
<td>--</td>
<td>-</td>
</tr>
<tr>
<td>Hybrid</td>
<td>+</td>
<td>0</td>
<td>++</td>
<td>+</td>
</tr>
</tbody>
</table>

The key in achieving cost effective, short-term CO₂ emission limits will require automakers as well as governments to broaden their outlook. A holistic approach to the problem will become essential, reaching beyond the passing of rules and regulations and the redesign of present engine technology. At the same time, the change in the demand patterns will be key to the impact of any approach available today. Given current consumer preferences, the automotive industry will need to influence the market and actively entice consumers and not simply supply it with vehicles that people don’t want to buy. However, in order to achieve such a difficult goal without putting the competitiveness of the industry at risk, policy makers and regulators will need to find balanced and effective incentives, such as those through taxation, to support such a process.

Figure 1.: Price, competitive and environmental pressures (Source: PwC Automotive Institute)

The automotive industry is in a constant state of flux social, economical and ecological changes lead to continuous new challenges for the industry. In Europe alone, automotive manufacturers are faced with a stagnating demand for new vehicles, coupled at the same time with an increased demand for greater numbers of variants and body styles, rising input prices (raw material costs), excess capacity and fierce competition, which again all serve to limit their pricing
power in the market and their ability to overcome cost challenges. In this intensely competitive environment, increasing ecological pressures are only adding to the demand for automotive manufacturers to come up with even more innovations just to remain competitive, but at the same time, at a cost that seemingly cannot be recouped.

2. COST ARE AUTOMAKERS OVERSTATING THE NEGATIVE IMPACT OF THE CO₂ MEASURES?

Market perception and emotional aspects are not the only change elements to be considered when analysing the potential for demand shifts. Price is another key factor which strongly influences the demand, especially in price-sensitive saturated markets, and automakers have voiced their concerns that the cost of implementing the CO₂ technology could have a severe negative impact on the European market. The EU-15 market is essentially a stagnant market. Since peaking in 1999 at 15.1 million units, the market has fluctuated between 14.2 million units and 14.8 million units, even though prices for new vehicles decreased. In this environment, Renault’s VP Patrick Pelata stated that his company estimates that a 10% increase in prices will result in 15.20% fall in sales. Assuming that the related costs are transferred to the customers one to one and taking an average transaction price of 20,000 euros per vehicle in the EU, the cost of the CO₂ mandate could mean a sales loss of between 4.1 and 5.5 million units, given that ACEA estimates that the 130 g/km CO₂ limit for 2012 will cost on average 3,650 euros per car.

This illustration provides only a rough estimate, as demand in the EU market is much more complicated. Not all vehicles have the same Price Elasticity of Demand (PED), so that an extra 3,650 euros per vehicle has less impact where
demand is more inelastic, as in the case of luxury or sports vehicles. Pelata.s statement seems to focus on B and C segment vehicles, where Renault.s competitive efforts are focussed.

Another issue is that the additional costs to implement the new limits, currently estimated at 3,650 euros per vehicle by ACEA, are likely to be lower by 2012 as further potential for efficiency gains will be tapped and scale economies will have a bearing. This factor has been observed in the past for technologies such as catalytic converters and Antilock Braking System (ABS) brakes. Finally, the implementation costs will greatly depend on the vehicle, so that not all vehicles or manufacturers will incur the same costs. In addition, it is likely that some automakers will look to absorb the extra costs in order to protect sales rather than pass the whole cost through to the customers.

The average customer only pays a price premium if he gets a tangible and direct value in return.. Dr. Thomas Schlick, VDA . Verband der Automobilindustrie. Additionally, increasing running costs brought by high fuel prices are focussing consumer minds on fuel efficiency. A break-even for more expensive technologies offering lower fuel consumption/CO$_2$ emissions will be reached earlier in an era of high fuel prices.

3. EMISSIONS AND HIGH COSTS

Auto makers believe that a lack of a robust impact assessment has led to a significant under-estimation in the costs of meeting the Euro 6 targets. Diesel car prices, for example, are forecast to rise.

![Figure 3: Evolution of emission standards (Source: ACEA – European Automobile Industry Report)](image-url)
In 2005, the Commission’s Clean Air for Europe (CAFE) Programme suggested a €202 increase. However, an independent panel, set up by the Commission, later forecast that the cost could be more than four times higher at €900. The Commission’s figure was also based on the assumption of a fall in precious metal prices, which has already been seen to be incorrect. The effect of a significant price increase could damage the market for fuel efficient diesel cars and vans, particularly during the economic downturn. This could have the perverse effect of an increase in CO₂ emissions from cars and hurt the competitiveness of European manufacturers, who are technology leaders when it comes to diesel engines. Issues like market distortion and the counter effect on European CO₂ emission targets demonstrate why a thorough and transparent impact assessment, based on realistic cost assumptions, must form the basis for any technology-led targets for vehicle manufacturers.

Encourage fleet renewal Significant improvements in air quality will occur thanks to fleet renewal. As older cars and trucks are replaced by newer models, emissions from road transport will come down, even in the absence of the latest emission limits.

The conclusion that can be drawn is that a rapid replacement of older vehicles with newer models would contribute more to reducing emission levels than any further tightening limits. This is especially true for gasoline cars and is supported by the findings of the CAFE Programme which foresees a reduction in NOx and VOC emissions from gasoline vehicles of more than 90% by 2020, even without Euro 5. Some governments have considered imposing sales taxes for new cars. This is not the right approach. The industry believes all member states should be encouraged to take steps to accelerate fleet renewal.

BIBLIOGRAPHY

1. European Automobile Industry Report European Automobile manufacturers association Carlos Ghosn, Ivan Hodac;
2. The automotive industry and climate change Framework and dynamics of the CO₂ (r)evolution pwc
3. POSSIBLE REGULATORY APPROACHES TO REDUCING CO₂ EMISSIONS FROM CARS Final Report Malcolm F., Richard S., Gerben P., Patrick B., Emma W., Carolina V., Amber H.
4. www.euractiv.com
5. www.hybridsynergydrive.com
6. www.autofacts.com
7. www.pwc.de/de/automotive
8. www.acea.be