ENVIRONMENT MANAGEMENT – THE WAY TO INNOVATION, TECHNICAL PROGRESS AND ECONOMIC BENNEFITS

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In ultimele două decade,standardele UniuniiEuropene au crescut în mod constant cerinţele pentru emisii cât mai nedaunatoare mediului înconjurator provenite din transportul commercial. La începutul anilor 1990, Uniunea Europeană a specificat pentru prima data limite privind emisile motoarelor diesel de pe vehiculele comerciale iar după aceasta a hotărât în mod treptat să facă aceste limite mai stringente pe parcursul a cinci faze, aşa numitele Euro 1, Euro 2, Euro3, Euro 4 şi Euro5. Având în vedere faptul ca standardul Euro 4 a intrat în vigoare din Octombrie 2006 iar Euro 5 va intra în vigoare la sfârşitul lui 2009, obiectivele pentru fiecare companie producatoare de automobile sunt realizarea de produse de înaltă calitate şi obţinerea profitabilităţii utilizând noi tehnologii care fac vehiculele mai "curate" şi mai eficiente la consumul de carburant.

By the last two decades, the European Union standards have constantly increased the demanding for harmful emissions in commercial transport. At the beginning of the 1990s, the European Union for the first time specified emission limits for diesel engines in commercial vehicles and after that decided to incrementally make this limits more stringent in five phases, so-called Euro 1, Euro 2, Euro3, Euro 4 and Euro5 standards. Knowing that the Euro 4 standard came into effect in October 2006 and the Euro 5 will go into effect at the end of 2009, the goals for each car manufacturing company are to produce high-quality products and the achievements of the profitability using new technologies that makes vehicles cleaner and more efficient in fuel consummation.

Key words: management, standards, innovation, technology, environment

1. Introduction

The European Parliament and European Council in spring 2005 reaffirmed the European Union objective that global surface temperatures should not rise by more than $2^{o}C$ compared with pre-industrial levels in order to prevent dangerous and irreversible anthropogenic climate change. The European Council also

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underlined that to foster energy security of supply and a sustainable use of energy there was a need to enhance demand - side management and improve energy efficiency, in particular in the transport sector.
Now the European Union is at the forefront of international efforts to combat these climate changes and must deliver the reductions in greenhouse gas emissions to which it has committed under the Kyoto Protocol.

Thus, in January 2007 the commission proposed that the European Union pursues in the context of international negotiations the objective of a 30% reduction in greenhouse gas emissions by developed countries by 2020 (compared to 1990 levels) and that the EU should already now take on a firm independent commitment to achieve at least 20% reduction of greenhouse gas emissions by 2020. To avoid distortions and for the sake of economic and social fairness, all sectors must contribute to the reduction efforts.

2. The transport sector and its problems

The mobility provided by vehicles has become a prerequisite for the functioning of European society and economy. Vehicles underpin our lifestyle by facilitating social interaction and the reliable distribution of goods across the continent. Thus, in 2005 the road transport sector accounted for ca. 86% of passenger transport activity and ca. 70% of freight transport activity in Europe. The role of the road transport in European passenger and goods transport is continuously increasing but in the same time the gas emissions from the vehicles also are increasing.

So, while the European Union as a whole has reduced emissions of greenhouse gases by just under 5% over the 1990-2004 period, the gas emissions from road transport have increased by 26%. Road transport is the biggest transport emission source with approximately 1/3 from freight and 2/3 from passengers and also the second largest greenhouse gas emitting sector in the UE. It remains one of the few sectors whose emissions keep rising, thereby jeopardizing the progress made by other sectors.
Furthermore, road transport relies quasi exclusively on fossil fuels, consuming 60 % of all the oil consumed in the EU.

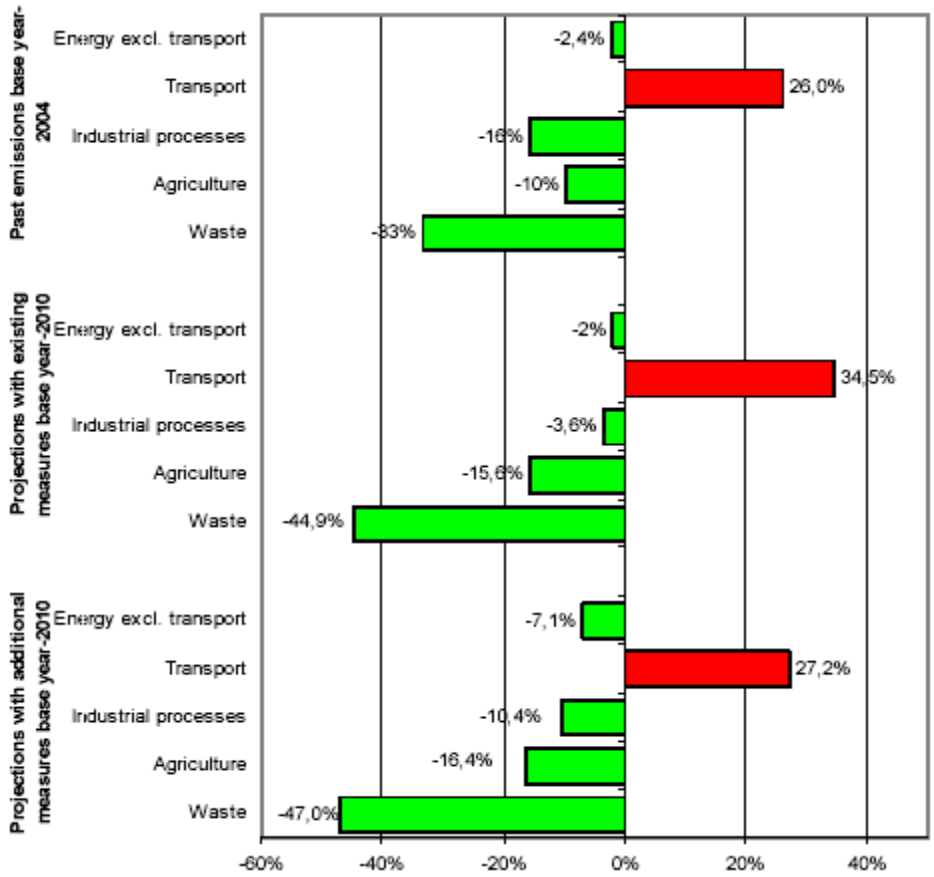

Fig.1 Change in European Union greenhouse gas emissions by sector, base year to 2004, sector projection "with existing" and "with additional measures", base year to 2010 (source EEA)

Looking only at the absolute emissions in the different sectors is not enough. The need for a rebalancing of the efforts taken up by the different sectors and their ability to reduce greenhouse gas emissions must also be assessed. While at first glance action in the road transport sector can appear more expensive than in other sectors, several studies conclude that efficiency measures in the transport sector can be more cost effective than some measures in other sectors, if are used new technologies that generate less pollution and are much efficient from the point of view of the costs and fuel consumption.

3. The European Union goals and strategies

To be able to solve the problems from the transport sector and to meet its Kyoto Protocol commitments, the European Union had to come with some firmly goals that also must be in concordance with the Lisbon strategy in which the main objectives are: making Europe a more attractive place to invest and work, knowledge and information for growth and creating more and better jobs.

The automotive industry plays a substantial role in the European economy and currently faces considerable changes in its operating environment but is also a major contributor to the Community Growth and Jobs of the European Union Lisbon strategy.

The automotive sector's underlying role within the European economic structure also means that it has considerable interaction with other special areas of the European society such as environment, energy, transport and is expected to contribute to the achievement of these special society goals that the European Union established:

- ✓ Providing for a higher level of environmental protection in the European Union;
- ✓ Improving the European Union energy security of supply;
- ✓ Mobility/traffic and infrastructure better management;
- ✓ Improving the road safety.

For the accomplishment of these goals some very good strategies were needed. So, for a higher level of environmental protection tighter requirements on gas emissions from the transport sector are necessary. Consequently, after the first specified emission limits for diesel engines at the beginning of the 1990s, the European Union decided to incrementally make these limits more stringent in five phases culminating in the fall of 2009. Compared to the first European Union limits, the reduction of pollutants by 2009 will mean 86 percent less nitrogen oxide emissions and a 98-percent reduction in particulates. The fourth of the five phases, the Euro 4 standard, came into effect in October last year. Also must be mentioned the fact that the automotive industry has signed a voluntary agreement with the European Commission to reduce new car CO_2 emissions to 140 grams per kilometer in 2008 and to 120 grams per kilometer until 2012.

For the improvement of the European Union energy security of supply, is necessary a better fuel efficiency for all the types of vehicles. The road transport sector uses mainly petrol and diesel fuel to power vehicles and is 98% dependent on products derived from oil which is largely imported. Reducing energy consumption in road transport through improved energy efficiency, diversifying the types of energy used and reducing dependence on imported fossil fuels are all important priorities for the European Union and the automotive industry clearly has a role to play in facilitating the achievement of this society goal.

Thus, tighter requirements on gas emissions and fuel efficiency for all kind of vehicles will encourage the development and application of new environmental technologies. The society goals promote innovation and technological development, enabling the European Union car industry to achieve the global leading in the field of clean technologies. Europe already has world leading diesel engine technology, and will be able to further develop this technology while making advances in petrol technology fuel efficiency and hybrid power trains.

The leading in fuel efficiency should in the short term pave the way to exports of technologies and vehicles to emerging markets where oil is scarce and that have set ambitious fuel efficiency targets. In the longer term, it is expected to provide a longstanding competitive edge and the advanced technologies required to move towards a truly low-carbon road transport system. Also, by promoting further advances in technologies, the strategy will promote highly qualified jobs in Europe.

The management of mobility/traffic and infrastructure present an interesting potential for gas emissions reduction, with measures such as synchronization of traffic lights, enforcement of speed limits and measures to curb congestion by means of traffic flow management.

Whether it be long distance haulage or short radius distribution, the amount of fuel consumed by engines of identical out put may very by up to 50 percent, for example due to different route profile or road conditions. Even vehicles used in the same field of application can post fuel consumption figures that differ by up to 30 percent because of different average road speed and volumes of traffic.

For example, if a truck is mostly driven on fairly flat motorways, it will almost certainly consume less fuel than an identical vehicle with the same load that has to cover the same distance on more hilly terrain, taking country roads and passing through villages. Generally speaking, fuel consumption comparisons should only be made on the same route with an identical volume of traffic and under identical weather conditions. Although navigation systems can help the driver to select the ideal route, it is simply not possible to avoid ever obstacle. Step climbs, traffic tailbacks and traffic lights are not only tine consuming and annoying hindrances, they are also one of the chief enemies of low fuel consumption. That’s because topography and traffic volume, frequent load alterations can seriously harm fuel economy. For instance, stopping just once at traffic lights on a country road can increase the fuel consumption by more than half a liter. A fact that makes it clear why taking shortcuts through towns generally has no benefit in terms of fuel economy. Even the shortest route is not always the best when it comes to save fuel.

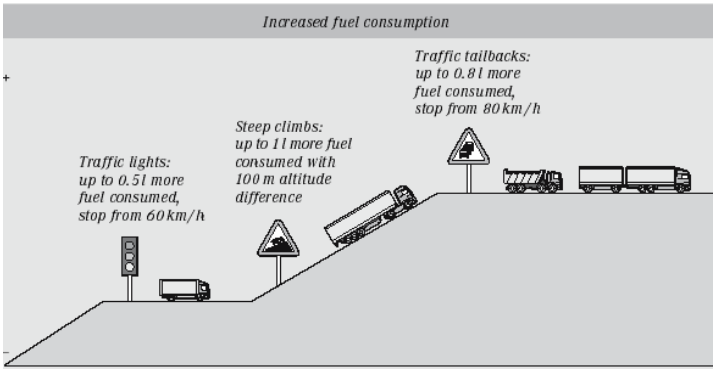

Fig.2 Influencing factors of fuel consumption

So definitely a better management of the traffic flow and infrastructure is an important solution when it comes to save fuel and reduce the gas emissions.

Regarding the road safety is noteworthy the progress that has been made in improving the safety on European roads. During the last 30 years traffic on European roads has tripled while the number of casualties has halved during the same period. This has largely been as a result of improved occupant protection in vehicles.

4. The Euro standard for diesel engines

The European Union standard represents sets of requirements defining the acceptable limits for exhaust emissions for new vehicles sold in the EU member states. Currently, emissions of NO_x , HC, carbon monoxide (CO) and particulate matter are regulated for most vehicle types. In the figure bellow are presented the emission limits for diesel engines.

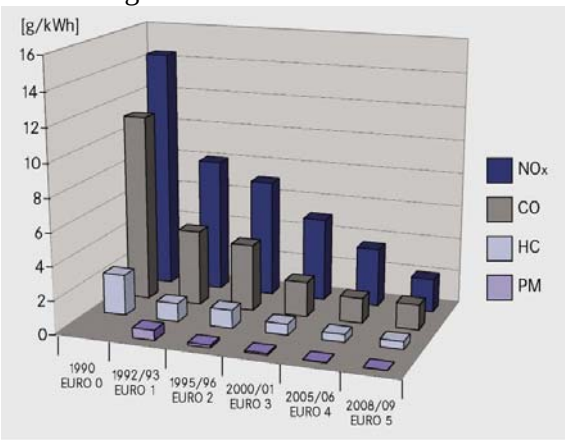

Fig.3 Development of the Euro standard from 1990 to 2009

The values (g/kWh) for each type of emissions are also presented in the next table

Type of emission	Euro 1	Euro 2	Euro 3	Euro 4	Euro 5
Nitrogen oxides	9,80	6,80	5,00	3,50	2,00
Carbon monoxides	3,20	2,80	2,10	1,50	1,50
Hydrocarbons	1,30	1,30	0,66	0,46	0,46
Particulate matter	0,70	0,20	0,10	0,02	0,02

So far, it has been possible to meet the emissions standards Euro 1, Euro 2 and Euro 3 by means of improved engine technology but this will no longer be the case in the future. Full compliance with the Euro 4 and Euro 5 limits will only be possible with effective exhaust treatment methods.

The car manufacturers are also interested in developing new exhaust treatment methods for diesel engines because using diesel engines instead of gasoline engines is more fuel efficiency. For example, a study realized in 2004 by the US Environmental Protection Agency (EPA) shows that if the USA would have one third diesels from the light duty vehicle population, that could save up to 1.4 million barrels of oil per day, which is exactly the amount of oil that the US currently imports from Saudi Arabia. Among all the benefits from the new technologies (less pollution, fuel efficiency, lower costs, etc), it worth to mention that the engines having BlueTec technology can burn diesel that doesn't match the quality of the fuel commonly used in central Europe, a particularly important consideration for long-haul transport to regions where low-sulfur diesel fuel isn't available. Thus the BlueTec technology developed and implemented by DaimlerChrysler is becoming a truly success.

5. BlueTec technology

As we said before, full compliance with the Euro 4 and Euro 5 limits will only be possible with effective exhaust treatment methods. This is why DaimlerChrysler decided back in 2002 to promote the development of diesel technology based on the SCR (selective catalytic reduction) process. From the combination of improved engines and SCR technology, the engineers at the Commercial Vehicles division created the new diesel technology BlueTec. Applying Bluetec technology essentially means designing engines for optimum combustion, which results in reduced particulate emissions and improved fuel economy.

However, these two benefits come at the price of higher levels of nitrogen oxide emissions (NO_X), which must then be treated in the exhaust line. This is done by adding the aqueous reduction solution AdBlue, which is converted into ammonia (NH_3) in the hot exhaust line. In the SCR catalytic converter, the ammonia then

reduces the nitrogen oxides to harmless nitrogen (N_2) and water vapor (H_2O) in chemical reactions.

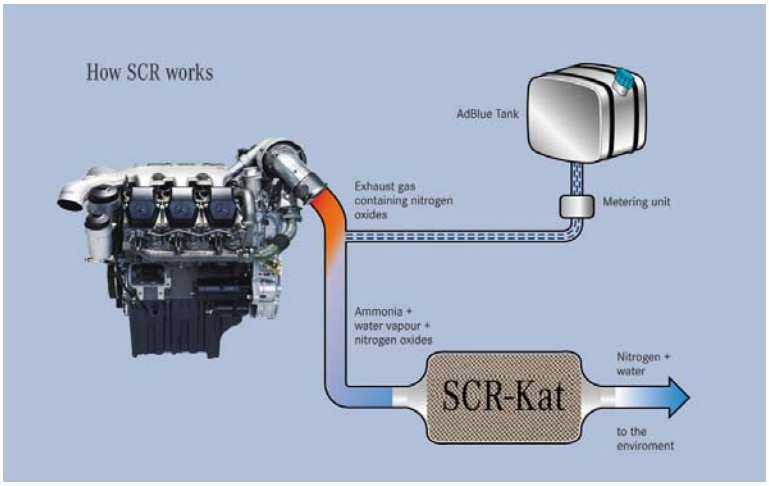

Fig.4 The SCR process

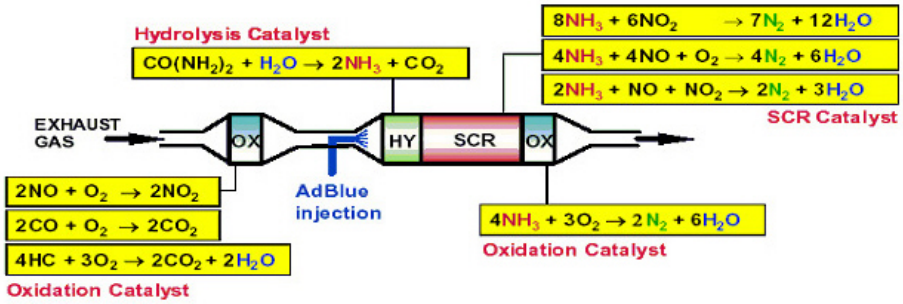

Fig.5 Chemical reactions in a SCR system

BlueTec, the new SCR diesel technology includes three key components: an advanced diesel engine, a catalytic converter and an AdBlue tank. More efficient, more powerful and cleaner diesel engines promise additional fuel saving and form the basis for BlueTec technology. Until now, SCR catalytic converters have been used to eliminate NO_x emissions from power stations. In Mercedes-Benz vehicles, the converter consists of a high strength ceramic base with an extremely large surface area that promotes an efficient catalytic reaction. A reducing agent converts the harmful nitrogen oxides into the harmless substances nitrogen and water. So, BlueTec requires AdBlue, an additive that is stored in a separate tank. AdBlue can be topped up at the pumps just like diesel.

6. AdBlue Aditive

AdBlue is a special additive which plays a central role in this new system**.** AdBlue is an odourless, nontoxic high purity 32,5 % strength urea solution which is transported in a separate onboard tank. AdBlue is not a fuel additive and it

never comes into contact with the fuel line. From it's tank, it passes along with the exhaust gases, into the catalytic converter, where it converts nitrogen oxides into harmless nitrogen and water, significantly reducing emissions. AdBlue has a tremendous range: around one liter of AdBlue is consumed per 25 liters of diesel and this means that a truck equipped with a standard 90 liter AdBlue tank, can cover about 6500 km which is easily enough to drive from Hamburg to Athens and back or Stockholm to Madrid and back.

Additionally must be mentioned that as the diesel tank has a larger diameter than the pipe for refilling the AdBlue tank, it is impossible to put diesel into the AdBlue tank. Also a magnet in the AdBlue tank is required to open the valve in the AdBlue nozzle. As there is no magnet present in the diesel tank, the valve in the AdBlue nozzle cannot open and AdBlue cannot filled into the diesel tank.

7. BlueTech benefits

The Euro 4 compared with the Euro 3 standard means a reduction of nitrogen oxides by 30 % and a reduction of particulates by 80 % but the only difference between Euro 4 and Euro 5 standard is the limit value for NO_x emission that will be lowered by 40 % compared to Euro 4 and in this case to accomplish those limits, BlueTec is the perfect solution.

The benefits of BlueTech:

- No other Euro 4/5 technology currently available reduces particulates and gaseous pollutants in exhaust gases as effectively as BlueTec and has enough potential to be in accordance with future euro standards;
- Thanks to the highly effective combustion assured by the enhanced engines, there are up to 90% fewer particulate and soot emissions than in the case of Euro 3 vehicles;
- Up to 70% of nitrogen oxides (NOX) are eliminated;
- The amount of nitrogen dioxide – a critical factor – emitted by BlueTec 4/5 vehicles is extremely low;
- Improved economy: up to 6% reduction in fuel consumption (depending on engine variant), lower road tolls for low-emission vehicles, further government incentives and, in addition, higher residual values when reselling thanks to advanced technology.

8. Conclusions

Fresh technical developments and innovations mean that there is always something new to learn. The technology at the heart of today's sophisticated vehicles has developed at an astounding rate. But we must not forget that these developments have a strong basis. The Europe automotive industry plays a

substantial role in the European life and economy and also acts as a major system integrator and consequently generates significant economic and innovation activity in a large number of other important industries, both in the manufacturing sectors (steel, chemical, electronic, metals, information and telecommunication systems) and the service sector (sales, maintenance, insurance, finance, logistics). Annually, the European automotive industry invests over € 20 billion in Research and Development, making it the large private R&D investor in Europe and most of the car manufacturers opted to use the SCR technology.

Mercedes-Benz, Volvo Trucks, Daf, Iveco and Renault put the basis of an alliance with the objective to contribute to a cleaner future in the road transport sector. Together, these companies represent almost 80% from European truck market.

The Euro 5 emission standard will increase the price of passenger cars with diesel engine in average with 337 euro but, the most important fact is that Euro 5 will improve a lot the environment and the people health. The experts say that many people will be saved from cancer or premature death. Euro 5 means that in 2020, over 25.000 years of lives will be saved. This means that annually 2300 people will not die any more.

Regarding the human resource, vehicle and equipment manufacturers provide employment for over 2,2 million Europeans and support an additional 10 million indirect jobs in both large companies and SMEs. To be able to create and develop new technologies, the companies need skilled workforce so, they are also providing new training systems and contribute to the modern education of the Europeans.

The achievement of the profitability is obtained by using new innovations and technologies that are more and more harmless to the environment and makes vehicles more reliable, fuel efficient and cleaner. Tighter emissions standards have not only the role to protect the environment and assure the achievement of the society goals and commitments regarding the environmental protection but also have the role to stimulate the creation and the development of the new technologies that represent the future, the safety and the welfare of our world.

B I B L I O G R A P H Y

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