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Comments to the Communication COM (2009)279/4 on a sustainable future for transport: towards an integrated, technology-led and user friendly system

The VERT Association, an international non-profit group of experts from research and industry has been formed recently with the purpose to introduce best available technology BAT for the complete detoxification of engine exhaust gases. The work of this group is based on an earlier working group AKPF, which was active and very successful in this field over > 10 years, setting standards, developing metrology, educating the industry and consulting governments. Two well known major achievements of this group are the introduction of the particle number count criterion, which is now the basis of the new European Directives Euro 5/6 and EuroVI and the VERT filter list, published by the Swiss government, which contains many filter systems with efficiencies > 99.9 % for alveoli-penetrating particles, now available on the market.

We would like to thank the European Commission for consulting stakeholders on the sustainable future for transport and we agree with the Commission proposal that the transport sector has enormous impacts in many areas of society and needs to undergo major changes; we would share with the Commission the following comments and suggestions.

The problem will be twofold:

- a) How to succeed soon?
- b) How to finance the necessary actions?

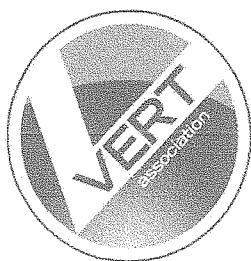
In particular we would like to shed light on some aspects which in our view are not sufficiently covered by this document:

Diesel - the working horse

We agree that four issues will dominate the future combustion engine industry: mobility, energy resources, climate change and health. No doubt, society will have to meet increasing needs for mobility; therefore, more vehicles will be required mainly in developing countries. Internal combustion engines will serve as prime movers for these vehicles for many more decades; diesel engines, being the most economic type of internal combustion engines, having a potential of improvement regarding fuel economy of 20 % will be indispensable. Since this need for improvement is immediate, we feel it would be misleading to speculate about future solutions like fuel cells or vehicle electrification which are right now neither mature, nor cost-effective and probably not even more sustainable; grey emissions ought to be taken into account. Please recall that the efficiency of a Diesel truck engine is at present in the range of 45 % with 50 % in reach, whereas the efficiency of a big steam turbine power plant (where the electricity should come from) is only 40-42 % and of a big gas turbine it is 35-38 %, combined processes reaching more, however restricted to large plants bringing about distribution costs.

Exhaust gas after treatment

Modern exhaust gas after treatment have introduced a completely new philosophy of engine engineering: whereas before trade-off was necessary, the engine had to be optimized for power, emissions and efficiency and none of them could reach its possible optimum values. This is now decoupled: Engines can



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be developed for performance and fuel economy and after treatment filtration and catalysis will take care of emissions – much more efficient than engine combustion tuning would be able. Reduction of particles can be in the range of 99.99%, reduction of CO and HC in the range of 99 % and reduction of NO and NO₂ in the range of 98 %. This technology is readily available for original equipment and for retrofit of in-use engines. For the short and medium term actions there is no urgent need to look for new technology – industry is able to supply highly efficient prime movers with existing Diesel technology and highly efficient after treatment (EPA 2010, EURO VI) at reasonable cost and will be able to supply those also into fast growing markets.

Retrofit of in-use engines

The document is concerned with improvement of new products only - mainly by standard setting – while it omits upgrading, i.e. retrofit of in use - engines. There is a very large fleet (>200 million diesels) of deployed prime movers all over the world. They pollute much more than their new counterparts. And they will live for 2-3 more decades or even longer due to the effects of the economic crisis. We have to clean these engines too, by improving their efficiency and by reducing their contribution to global warming. The good news is: yes, we can. Technology is available for filtration and catalysis as well as for fuel economy improvement at reasonable costs. Discussion is needed in order to come to a technical consensus while legislation is needed to implement these technologies.

Detoxification

Emissions from the vehicle sector are the major source of many health problems and this creates very high costs for society – unfortunately, not the polluter pays as it should be according to the Treaty principle, as the document says. Detoxification must have very high priority but the way it is handled now is not efficient and it is even not correct from a health point of view. Standards are in place for CO, HC, NO_x and PM - however, neither HC nor NO_x nor PM are chemical substances to be placed before any toxicologist to put a number on. The composition of HC, NO_x and PM is different with each engine. We must clearly name the toxic substances which might be PAH in the HC group, NO₂ in the NO_x group and BC or even metal oxides in the PM group. Only if there are clear definitions the right measures will be selected. Progress is achieved with PM which is now supplemented by PN, the number of ultrafine, insoluble particles – which is a tremendous progress. If metal-oxides of these insoluble particles however are a true toxic substances, than filters are also needed for SI-engines.

Benefit/Cost-ratio

All actions to improve sustainability of the transport sector require a clear monetary investigation taking into consideration all aspects from cradle to grave. Unfortunately, this fact is not covered sufficiently in the document apart of mentioning that little money will be available to subsidize those actions. There will be no money available and every measure must pay for itself! In case of particle filters this has been investigated by AKPF and others with the result that the health benefit by introducing particle filters is about 10 times higher than the actual cost. In other words society is making money and not spending money. When Switzerland introduced particle filter retrofit for construction in 2002 the federal government did it not only for health but expressis verbis “because it is evidently a national economic advantage”. And even higher ratio results if global warming effects are taken into account. This benefit/cost criterion must push priorities.

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BC-impact on global warming

The contribution of the transport sector to global warming by emitting ultrafine black carbon particles is not even mentioned in the document. The US-House of Representatives has concluded that BC is Nr 2 after CO₂ end of 2007! US-Senate requested US-EPA in spring 2009 to report. BC emitted by a truck Diesel engine contributes to forcing global warming at least as much as CO₂ – (many scientists like Mark Jacobson from Stanford University claim much higher values). CO₂ can be reduced only a little (20 %?); however, one should keep in mind: it is the natural product of combustion – is anybody willing to suggest elimination of combustion at all? It will cost a lot for a modest reduction of forcing global warming by reducing CO₂-emissions, including low carbon fuels development – while in contrast the contributor BC can be completely eliminated. So if global warming is an important issue than filtration of all engines emitting BC particles is a necessity and it provides a very high benefit/cost ratio. Even more important, it can be done immediately for new and in use engines.

Besides of road transport

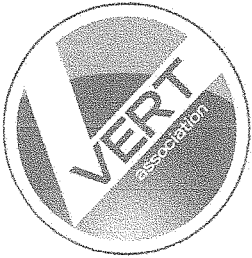
There are many diesel engines in other transport applications like locomotives and marine. The same principles can and should be applied. Besides transport, there is a fast increasing number of genset-Diesels particularly in developing countries; and with further industrialisation-development this number will further grow (10'000 large engines for peak energy generation in the city of Santiago de Chile!). We cannot exclude these and we must not exclude agriculture tractors and we should not exclude construction which happens to work right in the middle of our population; There should be a coordinated policy inside the European commission.

Cabine Air Filtration

The communication mentions concerns about health of professional drivers. But interestingly enough there are pollution limitations at the exhaust pipe and there are standards for indoor pollution. But there is nothing for the vehicle cabine air. It is widely known that the ultrafine particle concentration in a vehicle cabine is up to 15 times higher than outside of this same vehicle. And professional drivers spend 8 hours in this environment. Not surprising, cancer rate of excavator drivers, after 20 years of work is about 4 times above average. Are there no solutions? On the contrary: there are technical solutions which are low cost and so effective that the air inside a cabine is cleaned by a factor of 100. This constitutes another chance for regulation which does both, it improves the quality of life and moreover it reduces health costs significantly.

Solar based fuel synthesis

This is not within our expertise but we like to contribute to the discussion: there will be a shortage of fossil fuel sooner or later – using the vehicle increase scenario mentioned in the document it might be soon. Biofuels, Rudolf Diesel's big hope (1912), are very limited (and they compete with food as well); the same may likely hold for synthesis on bio-waste basis; however, there is one real chance: solar thermal energy (see Desertec) used for hydrogen production and as basis for design fuel synthesis – hopefully by using CO₂ from the atmosphere. After over 20 years of the Almeria 50 MW power plant, the demonstration of 4000 km high voltage DC transfer with 5 % loss only and after so many fuel synthesis proposals this is apparently no longer a dream and is worth a very big investment of the EC in African partner countries. It might not be too late. And by the way: Diesel engines will remain the same with highly efficient exhaust aftertreatment but there will be a closed CO₂ loop.



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Leadership: Today Europe has the leadership in many of the above mentioned technological areas and it might be able to remain ahead.

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