EURO 5 Emission Limits for Passenger Cars and Light Duty Vehicles

Position Paper – September 2005

Submission to the public consultation of the European Commission on EURO 5 emission limits for passenger cars and light duty vehicles

Submitted by:

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Also on behalf of:

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Summary

The draft proposals for 'Euro 5' emission standards for cars and vans as released by the European Commission in July 2005 are in many respects disappointingly weak. A significant tightening of the standards is technically, economically and politically feasible and is necessary to:

- Protect human health and the environment;
- Provide Member States with a badly needed tool to comply with EU air quality regulations.
- Overcome the trade-off with between NO_X and CO_2 emissions, e.g. by application of Selective Catalytic Reduction. This would bring the long-standing 120 g/km CO_2 emissions target for passenger cars a step closer, provide consumers with diesel cars that burn less fuel and reduce the EU's oil import burden;
- Create a home market for 'clean' diesel cars, which would make it much easier to export European diesel technology to foreign markets, most notably the US;
- Anticipate the fact that Council and Parliament in the past usually tightened vehicle emission proposals from the European Commission, and that this draft proposal, if unchanged, is highly likely to suffer the same fate.

More specifically, the NGOs demand:

- A 90 rather than 80 per cent reduction of particle emissions from diesel cars - to 2 instead of 5 mg/km. Even a reduction to 1 mg/km is feasible, and measurable with the new protocol from the Particle Measurement Programme
- A 70 rather than 20 per cent reduction of NO_X emissions from diesel cars - to 75 instead of 200 mg/km. Such a standard would make it possible to sell European diesel technology in the US and be a step towards global harmonisation of standards. In addition, it would most probably lead to application of Selective Catalytic Reduction (SCR), which would end current cycle-beating practices and offer great benefits in terms of fuel consumption and CO_2 emissions.
- A 75 rather than 25 per cent reduction of NO_X and HC emissions from petrol cars. Same reason: such a reduction is much better in line with US and Californian standards and is technically feasible;
- An increase of the 'durability' AND the 'use compliance' ages to 200,000 rather than the current 100,000 km, as these mileages much better represent the lifetime of today's cars;
- A particle number standard not to be decided upon in comitology, but by Council and Parliament.
- 2008 as introduction year rather than a relative date after publication of the law, as this offers more certainty and an incentive to decide quickly;
- to learn from the past, namely the fact that industry cost figures in the past have consistently been drastically over-estimated;
- An announcement for a thorough overhaul of the regulatory strategy for emissions control, in particular in use compliance monitoring, now reports of chip-tuning and other cycle-beating practices are becoming ever more frequent.

NGOs welcome:

- The move to close the SUV 'loophole';
- The move to increase the durability requirements, although it does not go far enough and also the in-use compliance age should be increased;
- The intended introduction of a particle standard for direct injection petrol engines, although we believe that the standard could be tightened, in line with diesel.

Chapter 1: Introduction

Emissions from cars and vans are regulated by Directive 70/220/EEC and its amendments. These standards prescribe the maximum emission levels in tailpipe exhaust gases for all new vehicles sold in the European Union. New EURO standards are amendments to the Directive. Directive 98/70, for example, introduced the 'Euro 3' and 'Euro 4' standards for cars and vans (the so-called *light duty vehicles*). The current proposal for 'Euro 5' constitutes the next step.

Confusingly, the standard currently in force for heavy duty vehicles is also called Euro 5. A 'Euro 6' proposal is expected next year.

A good overview of EU emission standards for cars and vans can be found on http://www.dieselnet.com/standards/eu/ld.html

The discussion on a new 'Euro 5' standard began in 2003. The latest move is a draft Commission proposal issued in July 2005. The standards might enter into force in 2008 or 2009. The draft proposal can be found on http://europa.eu.int/comm/enterprise/automotive/pagesbackground/pollutant_emission/stakeholder_consultation/euro_5_draft_reg.pdf.

This document is written as a response to that draft proposal.

Chapter 2: The case for more stringent standards than the Commission's proposal

The health and environment case for cleaning up cars

Road transport is the biggest contributor to NO_X emissions and the second biggest to PM_{10} emissions. Currently, air pollution leads to about 370 000 premature deaths per year in Europe. Other problems include premature mortality, aggravation of respiratory and cardiovascular disease, aggravation of existing asthma, acute respiratory symptoms, chronic bronchitis, and decreased lung function. Numerous studies also link exhaust gases to increased incidence of lung cancer.
Furthermore biodiversity is threatened in more than 60% of European ecosystems because of nitrogen deposition above the critical loads. [5]. although environmental standards have been tightened, this 'does not appear to have a significant influence on the air quality' (EEA 2003). No clear improving trend is (yet?) visible in measurements. Also the ozone problem has remained as bad as it was.
If no additional measures are taken, in the year 2020 air pollution levels will still lead to 292,750 premature deaths and about 88,500 cases of serious hospital admissions for cardiac and respiratory problems. Eutrophication critical loads are exceeded on more than 650,000 km2 in 2020 [CAFÉ CBA], an area almost twice the size of Germany.

In particular diesel-fuelled vehicles are responsible for emissions of NO_X and PM_{10}. It has also become clear that traffic-related particles are amongst the most hazardous ones because of their size (generally under 1 micron) and because of their chemical composition.

The recent shift towards diesel passenger cars in most EU member-states makes the case for cleaning up this emission source even more urgent. Europe is approaching the 50 per cent diesel share in new car sales. Knowing that diesels have a much higher annual mileage than passenger cars, by 2020 some two thirds of car kilometres might be diesel-fuelled.

The air quality case

While EURO standards regulate pollutant emissions from the exhaust gases of new motor vehicles, the European air quality legislation focuses on the concentration of air pollutant's in the ambient air, with the aim to protect the environment and human health.
The Air Quality Framework Directive (1996/62/EC) establishes the basic principles for the set of European air quality legislation, setting objectives for ambient air quality in order to avoid, prevent or reduce harmful effects for human health and the environment. It requires that, if limit values are exceeded, Member States devise abatement plans and programmes. The First Daughter Directive (1999/30/EC) on SO2, NO2, PM_{10} and lead is most important in this context. Its limit values for small particulates (PM_{10}) have entered into force in 2005 and its limit values for NO2 will become binding in 2010. Diesel cars are important contributors to ambient air concentrations of both particulates and NO2.

The coming-into-force of the PM_{10} air quality standard in 2005 has already led to abundant problems in numerous Member States. The legislation sets levels of PM_{10} which can only be exceeded on 35 days in a year.
The directives lead primarily to problems in densely populated areas and around motorways, where traffic is by far the most dominant source of emissions. In February 2005 a number of Italian cities saw car bans on certain Sundays as cities hit their

35th day of excessive levels within 60 days of 2005. Other cities, for example in Germany, are not far behind and similar measures are discussed. In the Netherlands a string of building projects has been stopped.
Similar problems will occur in 2010, when new limit values on NO2 will become legally binding.

In response the (the threat of) legal challenges, local authorities are scratching their heads about the content of the action plans they should draw up. A number of countries already have introduced measures, such as the 80 km/h zones in the Netherlands, or the low emission zones in Sweden.

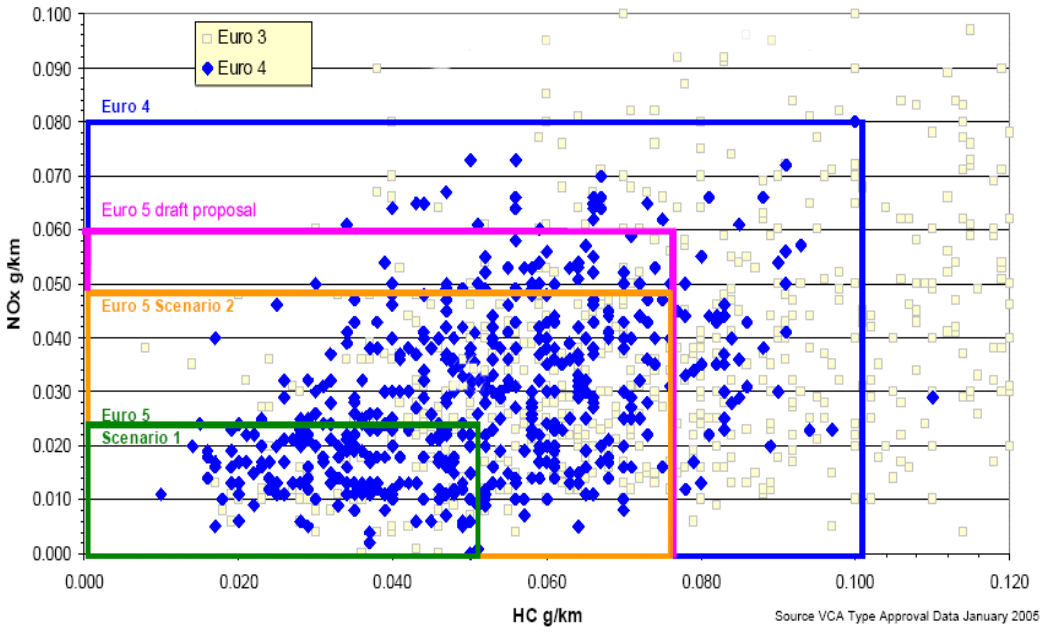
The freedom of manoeuvre for national, regional and local authorities is determined to a large degree by Brussels. For example, they may only privilege vehicles on the basis of EU-wide standards, and they may not reject dirty vehicles on roads that belong to the Trans-European Network. To them, every day earlier the 'Euro 5' standards enters into force, and every milligram it is stricter, really counts. Cleaning up the cars, a measure that can only be taken at EU level, would give these member states perspective of meeting the air quality limits.

The technological case: the Commission proposal falls far short of what is possible today and weaker than any of the scenarios taken into consideration

The draft Commission proposal falls far short of what is technically possible today, let alone what will be technically possible by 2008 or 2008 when the new standard will enter into force. The Commission itself is proving this point because the standards proposed (200 mg NO_X for diesel, 60 mg HC for petrol) are more lenient than any of the scenarios studied by the Commission, none of which appeared to be unfeasible.

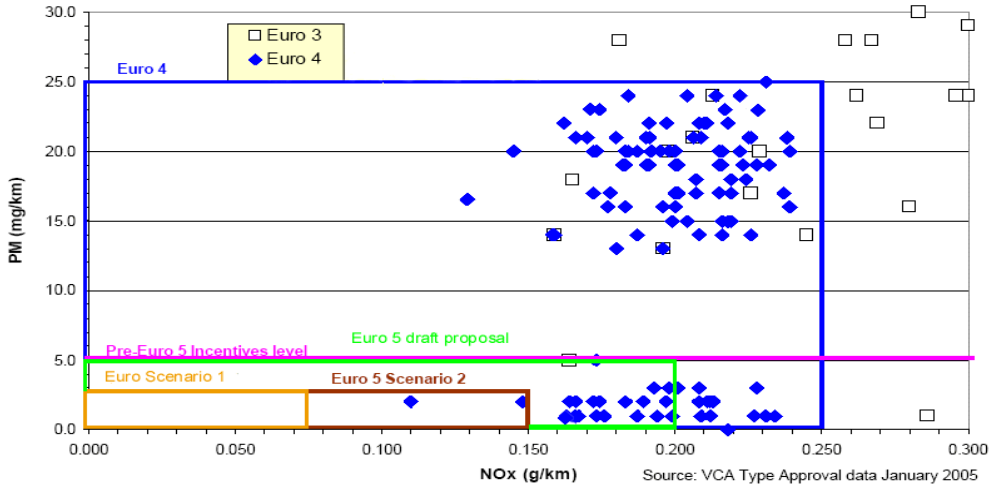
In historic contrast, the Euro 4 standards when set in 1998 were considered a serious challenge and were even claimed impossible to reach by the industry. The car industry even refused to deliver cost figures for Euro 4 diesel standards because it said that they were 'impossible to reach'.

Graph 1: Overview of petrol car certification data, the Euro 4 standards, different 'Euro 5' scenarios and the draft 'Euro 5' proposals



This graph clearly shows that the proposed 25% tightening of NO_X and HC standards relative to 'Euro 4' is very weak. Even 'Scenario 1', a 50% tightening for NO_X and a 70% tightening for HC, appears to be easily feasible with early 2005 technology.

Graph 2: Overview of diesel car certification data, the Euro 4 standards, different 'Euro 5' scenarios and the draft 'Euro 5' proposal



This graph clearly shows that the 200 mg/km NO_X standard is weak -weaker than the original scenarios considered by the Commission. Approximately half of the vehicles with early 2005 technology already met the NO_X standard. It also shows that diesel cars equipped with particle filters easily meet the 5 mg/km standards and generally meet 1 or 2 mg/km.

The economic case: 'ex ante' industry cost figures have lost any credibility

First of all, it is for stakeholders difficult so make useful remarks about the economic case, as the figures submitted by the industry and compiled by the 'validation panel' have not yet seen the light of day.

We would, however, like to stress that the cost figures as supplied by the automotive industry before the introduction of new regulation ('ex ante') are barely credible any more. The over-estimation of the costs of previous Euro standard class has taken on grotesque proportions. An extensive review by AEA Technology 'An evaluation of the air quality strategy' (December 2004) concludes that

'If the ex ante estimates for all four Euro standards are combined, this would lead to an increase in the unit costs per vehicle of €1,585 to €2,565 (petrol cars) and €1,840 to €2,945 (diesel cars).'[1]
http://www.defra.gov.uk/environment/airquality/strategy/evaluation/pdf/chapter2.pdf

The absurdity of these cost estimates can be illustrated by the fact that Renault manages to sell its Euro4-compliant Logans at a consumer price of € 5,000. Were

[1] Figures in £ converted to € with exchange rate 1,4829 (Sept 2005)

the industry cost estimates true, then a third to half of the price of the car would com from its anti-pollution equipment….

Therefore it is very urgent that the Commission considers in its impact assessment of the imminent definitive 'Euro 5' proposal the experiences gained in the past with 'ex ante' industry cost estimates, and corrects the costs with the experiences gained.

The global strategic case: the US and Asia

There has been much talk in the last years about the need to harmonise global emission standards. In particular industry has always been very keen on this topic. Therefore we treat this issue a little more in depth.

US: A missed opportunity to make EU diesel technology an export product

It is odd to see that the first time the 'global harmonisation' paradigm is put to a concrete test, short term opportunistic (cost) considerations prevail so clearly over the medium term strategic issues, in particular in relation to what is happening in the US. US air pollution standards for cars have historically been stricter than in Europe.

In particular, the diesel car has always been too 'dirty' to classify for export to the US. The time has come for diesel technology to finally become clean and become a product that is not just good enough for Europe but also for the rest of the world. In the next chapter we will take this issue further.

Asia: Europe might be forced to follow rather than to lead

Asia is a different situation. At this moment, the European car industry enjoys a comfortable situation in the emerging economies in Asia. All but two Asian countries (which are South Korea and Taiwan) follow the EU standards. The delay in implementation of EU standards follow is decreasing: their backlash used to be 6 to 8 years, but now they generally lag only 3 or 4 years behind.

This is a tremendous advantage for the European industry: the new standards are set in the home (EU) market, and when the technologies have matured and costs have come down enormously, a perfect export product is there.

If Europe halts the pace of improvement and becomes a laggard rather than a forerunner – as arguably is the case with the Euro 5 standards – it is quite possible that the Asian tigers adopt other standards, like the US ones or even own ones, for their home market. It is telling that China adopted the Euro 3 standards for petrol but already chose to adopt the Euro 4 standards for diesel cars. This is not so surprising given the fact that China hosts 16 of the 20 cities in the world with the worst air quality. If the EU does not deliver, ambitious countries like China might choose their own path (as they did on case of fuel economy standards). This could make it more difficult for European companies to compete, and certainly lead to a less predictable and secure situation. It is thus essential to stay ahead in Europe.

The political case: the Commission should have learned that it should propose more ambitious standards

The job of the European Commission as initiators of legislation can be considered a success when its proposals are adopted by Council and Parliament without major modifications.

History clearly shows that in the field of emission standards, the Council and the Parliament have found it necessary to tighten the standards. For example, the Commission in the past proposed binding 'Euro 3' standards and indicative 'Euro 4' standards, a process that ended up with both Euro 3 and 4 being binding and some values tightened (98/70./EEC). The Commission had not even been able to make a

cost assessment of ‘Euro 4’ standards for diesel cars, as the industry claimed that these standards would not be technically feasible.
Even much more drastic tightening by Council and Parliament has taken place in case of fuel standards (98/69/EEC). The standards currently in place were even regarded as technically unfeasible and certainly economically disastrous.

Chapter 3: the case for a 70% tightening of the NO_X standard of diesel cars

One of the most disappointing features of the Commission's proposal is the only 20 per cent reduction of NO_X emissions from diesel cars, in order to avoid the necessity of exhaust after treatment technology. In this section we will argue why this value is a bad choice and why a 70 per cent reduction of NO_X emissions is technically feasible and economically and environmentally very desirable.

Current EGR based technologies appears to lead to cycle beating

Exhaust Gas Recirculation (EGR) is currently the generally used technology to lower NO_X emissions from diesel cars. Research into heavy duty engines with the ARTEMIS driving cycle has already shown that this technology has lead to extensive cycle beating practices

In light duty evidence is emerging too, using the same ARTEMIS cycle. The situation seems to be particularly bad for urban NO_X emissions, which rise to values around 1 gram per km, exceeding the standard by a factor 4. It is exactly the urban emissions that lead to the greatest problems. This could be one of the factors that explain why urban air quality has not noticeably improved.

After treatment would reduce the need for EGR-based solutions and thereby also reduce the amount of cycle beating.

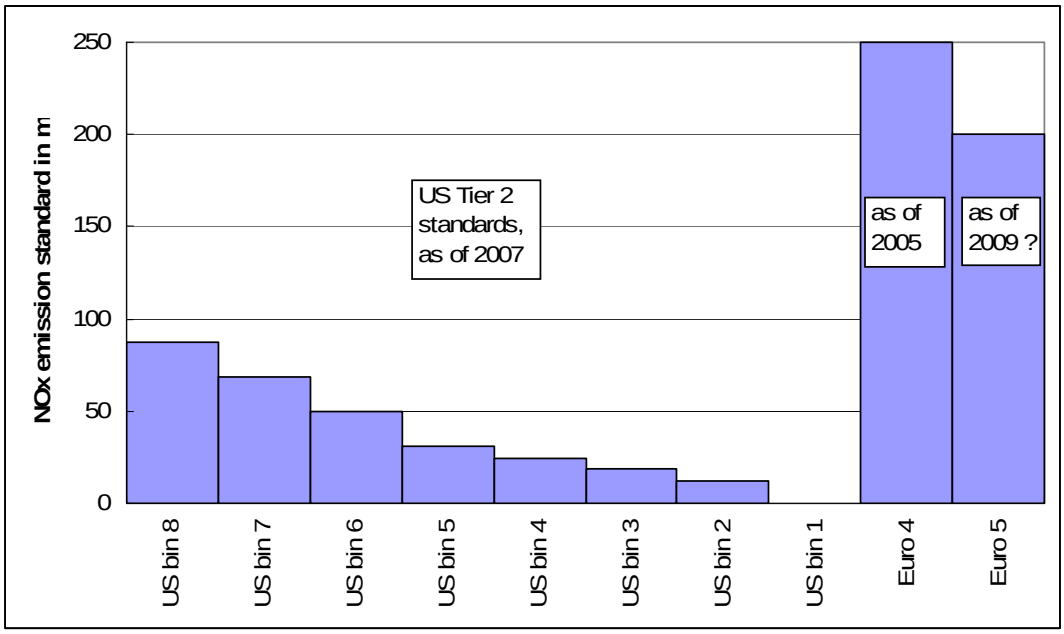
It is needed to harmonise world standards and to open the US market for European diesel technology

Over the last years there has been much talk over global harmonisation of emission standards for vehicles. This is particularly important in the case of diesel cars, given the fact that Europe lags much behind the US' standards for diesel cars.

In the US, as of 2007 the complete set of 'Tier 2' emission standards for passenger will have entered into force. The standards apply to cars, SUVs and light duty trucks, up to a weight of over 4 tonnes, so even the largest vehicles for passenger transport will have to comply with the rules. *Every vehicle* sold will have to meet a NO_X standard of 87 mg/km and the *average* NO_X standard that has to be met by the vehicles sold is 31 mg/km (both values converted from the grams/mile standards on the FTP75 cycle).

This is in stark contrast with the current Euro 4 standard of 250 mg/km and the proposed 'Euro 5' standard of 200 mg/km. See the following graph.

Graph 3: US and EU NO_X emission standards for diesel cars. Note that US standards are fuel neutral and hence also apply to petrol cars.



Explanation of the US 'bins': Manufacturers can choose in which bin they want to certify their cars, as long as on average they comply with Bin 5. Bin 1-4 apply to 193,000 km, bin 5-8 apply to 80,000 km.

It is clear that the current draft Commission 'Euro 5' proposal for NO_X emissions from diesel cars, 200 mg/km, is still much more lenient than the US standard.

This implies that if European manufacturers want so sell their diesel car models on the US market, they will have to develop much more advanced technologies than they will have to do for the home market. As the diesel market in the US is still small (only 43,000 light duty vehicles in 2004, compared with close to 10m diesel cars and vans in the EU25), they will have to spread these extra costs over a relatively small number of vehicles sold. Thus, European diesel technology will stay relatively uncompetitive in the US in the absence of a supporting home market.
If European regulators, however, decide to introduce NO_X limits that are close to the US standards, European manufacturers could develop one diesel technology for both markets. Development costs could be spread over many millions of vehicles, which would enable them to make a competitive diesel product for the US market. A -70% of 75 mg/km NO_X standard would help tremendously to pave the way for European diesel technology. Such vehicles could comply with the upper bins (7 or 8) in the US legislation, which would be sufficient to pass, provided the manufacturer compensates the still relatively high emissions with clean petrol vehicles in Bin 1 to 4.

It will lead to better outcomes in terms of NO_X, but also on CO_2 and costs

A string of European manufacturers are exploring ways to compete with diesel technology on the US market, and two important ones, Daimler Chrysler and Ford, have expressed their preference for an SCR-based solution.
They argue that over the last years it has become clear that lean NO_X traps (LNT) face problems in reducing NO_X by deep percentages, and will probably keep facing durability difficulties and fuel economy / CO_2 penalties. In contrast, Selective Cata-

lytic Reduction (SCR) technology has greatly developed, originally just for heavy duty engines.

Daimler Chrysler

The plans recently unveiled by Mercedes are noteworthy. Mercedes plans to meet the new US emissions standards with SCR technology and is currently in discussion with US regulators about how to do this, in particular about how to ensure that drivers have permanent access to urea so that NO_X emissions do not rise when the urea tank runs empty.

A paper by the company (DC 2005) concludes:

- 'The system that best meets the requirements is the SCR urea after treatment system' …
- … 'Due to its high efficiency, engine out NO_X emissions can remain relatively high, which limits the impact on fuel consumption.'

Ford Motor Company

In addition, Ford Motor Company last year presented a paper at the Diesel Engine Emission Reduction conference in the US: http://www.eere.energy.gov/vehiclesandfuels/pdfs/deer_2004/session11/2004_deer_hoard.pdf).

After an extensive lifecycle cost benefit analysis this paper concluded: 'Urea SCR systems are expected to be significantly lower cost than LNT (Lean NO_X Trap) systems'.

The main reason for this is that an SCR system, although substantial upfront investments in urea infrastructure are needed, pays itself back quickly because of savings on fuel consumption. Ford estimated a 5 per cent reduction of fuel consumption compared with alternative abatement scenarios.

Aaqius & Aaqius

The same conference also saw a paper by Aaqius & Aaqius: http://www.eere.energy.gov/vehiclesandfuels/pdfs/deer_2004/session11/2004_deer_joubert2.pdf

It concluded:

- 'For future emissions regulations in EU & US, SCR in combination with DPF offers a unique and global solution for the most severe regulations
- CO_2 emission will be an issue for the next decade: With SCR fuel consumption are lowest.
- For future emissions regulations in 2010 - 2012, EU & US could use the same technology to comply emissions regulations.
- EU & US have to work closely in order to define standard for SCR. '

CAR research

Finally, the SCR technology was the technology deemed most likely to be available for NO_X reduction from light duty diesel engines in an expert survey undertaken by the Centre for Automotive Research (CAR)[2].

Summary of likely impacts of a -70% standard for NO_X emissions from diesel cars

First, it is crystal clear that there is widespread belief in the US that advanced after treatment systems will be available and needed in order to comply with the federal

[2] Center for Automotive Research, Advanced Power Technology Alliance - Advanced Internal Combustion Engine Survey (Light Duty Vehicle Technology), Ann Arbor, April 2004

'Tier 2' standards. Some manufacturers even believe that 'Bin 5' standards (31 mg/km) on NO_X are feasible with diesel SUVs.
The key advantage of a -70% 'Euro 5' NO_X standard (i.e. 75 mg/km) for diesel cars is that it will most probably incentivise the industry towards EU-wide application of the after treatment technology that is the best from a lifecycle perspective, namely Selective Catalytic Reduction.
SCR offers – in combination with and oxidation catalyst and a particle filter - the possibility to optimise the engine for fuel consumption, and so to avoid important compromises on CO_2 emissions. If we go along with the industry estimate of some 5 per cent savings on fuel, this translates into:

- Some 8 grammes of CO_2 per vehicle kilometre, a major step towards achieving the 120 g/km target of the Community that should be achieved by 2010;
- Some 3 litres of fuel savings per 1,000 km driven, or some 750 litres of fuel over the entire lifetime of the vehicle. Assuming in total 40 million 'Euro 5' vehicles will be sold in the EU25 (8 million per year over 5 years) this would save 30 billion litres of diesel fuel, or some EUR 15 billions on oil imports;
- This equates to some EUR 700 cost savings to consumers over the lifetime of the vehicle
- According to Ford research, these benefits outweigh the cost of SCR technology.

Chapter 4: Other specific issues

Both durability and in use compliance to 200,000 km

We welcome the proposal by the Commission to increase the durability requirements to 160,000 km. However, we are disappointed that the proposal does not make any reference to the, probably even more important, 'in use compliance' period which is still at the obsolete of 5 years or 100,000 km. We would prefer both to be set at 200,000 km, being much better in line with the real "life expectancy" of a car and better in line with US standards (120,000 miles = 193,000 km).

Petrol car standards

We regret the lenient standards for petrol vehicles, particularly the fact that the Commission has backtracked from 37.5% reduction (proposal in the CARS21 group) to only 25% reduction, which is more lenient than any of the variants studied. Apart from the fact that we foresee for this reason problems in preparing an impact assessment (no cost figures available !) the graph in Section 2 clearly shows that much stricter limits are easily feasible.

In addition, again the issue of global harmonisation comes up. If we are serious about this, we fail to understand why the Commission proposes standards that are obviously weaker than the US federal standard, let alone the Californian ones. It would be a real waste if manufacturers chose to equip their EU models with different (i.e. worse) catalysts than their US and Californian ones. As 75% reduction would come much closer to the US and Californian standards and is perfectly feasible as the graph shows.

Particle mass standard 2 instead of 5 mg

The particle test values (see graph in Chapter 2) clearly indicate that the majority of diesel particle filters is able to achieve values as low as 1 or 2 mg/km, and we see no reason to keep the standard at 5 mg/km, certainly not now the PMP protocol has shown to be able to measure particulate mass very accurately and repeatably.

The same applies to the intended standard for petrol cars. This standard could also be tightened to 2 mg/km.

Adjustment of mass figure after adoption of PMP protocol

Without prejudice to the previous paragraph of the particle mass limit, we agree that a proper adjustment of limit values is needed when the test method changes.

Particle number standard and comitology

We welcome the fact that the Commission announces a particle standard to be set, but regret the proposal to do this in comitology. As the Commission itself acknowledges, the particle standard is crucial to ensure real impact in human health. We can imagine it would be burdensome to have a full-fledges legislative procedure for particle numbers as a mere amendment to 'Euro 5', but we are disappointed that the Commission does not even announce a 'Euro 6' standard that offers the prospect for a definitive solution for air pollution from cars. The issue is far too important to leave to comitology alone – there should be at least a prospect for a political process.

Closing the 'SUV loophole'

We welcome the intention of the Commission to correct this obsolete loophole.

Medium term: a thorough overhaul needed

For the medium term, the complete strategy for controlling vehicle emissions needs to be thoroughly re-assessed, now tales of cycle-beating and chiptuning are becom-

ing ever more common. This is clearly the issue for the future. The least the EU could do is to move to 'not to exceed' values like the US. But a complete rethink would even be better, including measures to drastically increase the on-road checks and improve the roadworthiness test and standards.

References

- CAFE CBA Baseline report, http://www.cafe-cba.org

- DC 2005, Selective Catalytic Reduction mit Harnstoff – der effektive Weg zum Stockoxidminderung am Pkw-Dieselmotor, Daimler Chrysler, Stuttgart, March 2005

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