

## **Memo of the chair of the GRPE informal Group on REC**

### **Concerns: outstanding issue on NO<sub>2</sub> requirement for class 2 REC's**

Many contracting parties are facing difficulties meeting their ambient air quality standard for NO<sub>2</sub>. Exceedances of the ambient air quality requirement for NO<sub>2</sub> are mostly caused by a combination of high background levels of NO<sub>2</sub> caused by several sources, and elevated ground level emissions of NO and NO<sub>2</sub>, mainly by motor traffic.

5 to 15 % of the NO<sub>x</sub> emitted by diesel engines without aftertreatment consists of NO<sub>2</sub>. The remainder being mostly NO. After having been emitted into the ambient air this NO is gradually converted to NO<sub>2</sub>. For the background concentrations of NO<sub>2</sub> the ratio between NO<sub>2</sub> and NO<sub>x</sub> is therefore less important, albeit that NO consumes some of the ground level ozone for its conversion to NO<sub>2</sub>, thus reducing the ozone levels.

Due to the application of oxidation catalysts on diesel engine light duty road vehicles, the ratio between NO<sub>2</sub> and NO<sub>x</sub> has increased significantly. Sometimes to as high as 60%. This is a major reason for today's exceedance of the ambient air quality limit for NO<sub>2</sub>. Up till now heavy duty vehicles and machines were rarely equipped with oxidation catalysts. For vehicles and machines that are operated in areas non compliant for NO<sub>2</sub> a further increase of the NO<sub>2</sub> - NO<sub>x</sub> ratio is therefore to be avoided.

The draft ECE Regulation on the approval of Retrofit Emission Control systems aims at facilitating the improvement of the ambient air quality via reduction of the emissions of harmful substances by retrofitting the existing fleet of heavy duty vehicles and machines. Approval can be granted for systems that reduce the emissions of particulate matter, NO<sub>x</sub> or both particulate matter and NO<sub>x</sub>.

The draft Regulation addresses the concern for NO<sub>2</sub> by introducing 4 classes of systems: traps that do not increase the direct emissions of NO<sub>2</sub> (class 1), traps that allow for a restricted increase of the direct emissions of NO<sub>2</sub> (class 2), systems that reduce NO<sub>x</sub> (class 3) and systems that reduce particulates as well as NO<sub>x</sub> (class 4). The idea is that contracting parties will have the choice to incentivize the systems with no increase of NO<sub>2</sub> if they have problems with the ambient air quality requirement for NO<sub>2</sub>.

The challenge we face is to set a limit for the increase of direct NO<sub>2</sub> for class 2 systems.

Class 2 systems are designed to use NO<sub>2</sub> to facilitate the continuous regeneration of the captured soot during normal driving conditions. The required amount of NO<sub>2</sub> is generated by means of an oxidation catalyst upstream of the filter, or a catalytic coating integrated in the filter. Sufficient NO<sub>2</sub> typically lowers the oxidation temperature of soot from 550 – 600 to 250 – 300 degrees centigrade. Most of the filters installed today on diesel engine road vehicles are of this continuously regenerating type. In some of these retrofitted vehicles an incremental increase of direct NO<sub>2</sub> of 40 to 50 % has been demonstrated.

It has been suggested to set the limit value for incremental direct NO<sub>2</sub> at maximum 20% (e.g. from 10% to 30% NO<sub>2</sub> of total NO<sub>x</sub> emissions). The NO<sub>2</sub> emissions are derived from testing in the WHTC test cycle. Germany is the major spokesman of this view, supported by several other EU member states.

Particulate filter industry on the other hand claims they need a limit of at least 30% for the design of systems that will reliably function on most road vehicles and many machines. A 20 % limit would in their view exclude the use of close coupled DPF, needed for adequate regeneration on vehicles that are mainly operated in urban driving conditions. Such vehicles would then have to be equipped with

fuel additive (fuel born catalyst) type systems, or systems incorporating artificial heating of the exhaust gas by burners. These systems are more complex and expensive and lead to an increase of fuel consumption.

Contracting parties with NO<sub>2</sub> Ambient Air Quality problems could of course restrict their incentives for retrofitting to class 1 or class 3 or 4 systems. But they would not be able to restrict the use on their territory of foreign vehicles with class 2 systems, thus also having an interest in a strict limit for class 2 systems.

Setting a strict 20% cap on the increase of NO<sub>2</sub> of class 2 systems would however deny contracting parties without NO<sub>2</sub> air quality restraints access to (ECE approved) reliable, proven and cost effective technology to reduce particulate emissions.

Could an agreement be found in a mutual commitment by member states of the European Union to only incentivize class 1, 3, 4 systems, thus leaving the option to contracting parties outside the EU to use class 2 systems with a less strict limit on NO<sub>2</sub>? Transboundary traffic within the EU is probably mainly by vehicles registered in the EU.

In spite of lengthy discussions in the informal group it has up till now not been able to reach a compromise solution for this issue. It will therefore have to be addressed by GRPE in its June 2013 session.

Henk Baarbé, 24 May 2013