NO_x and CO_2 measurements of Euro 6 cars in real driving conditions with portable measuring devices

For many years now, the Environmental Action Germany (Deutsche Umwelthilfe, DUH) has been campaigning for clean air, something which is vital for our health and quality of life. Reducing air pollutants is also important for climate protection. Road traffic makes a significant contribution to air pollution. The emissions scandal that started with VW in September 2015 has made it clear that diesel cars made by practically all manufacturers meet the prescribed emission limits only in the laboratory and that the emission control is switched off illegally in real driving conditions. In reality, therefore, diesel cars discharge many times more toxic nitrogen oxides (NO_X) than allowed. Emissions of carbon dioxide (CO_2), which is so harmful to the climate, are, in reality, often significantly higher than the values specified by the manufacturers.

Legal framework

The legal basis for the emissions standards is European Regulation (EC) 715/2007 in conjunction with Commission Regulation (EC) 692/2008. According to these regulations, Euro 5 diesel passenger cars have a limit of 180 mg NO_x/km and Euro 6 cars a limit of 80mg NO_x/km. Regulation (EC) 715/2007 stipulates that the emission control system of the vehicle should work when in normal use and thus expressly also at low outdoor temperatures. Defeat devices that reduce the effectiveness of emission control systems are expressly prohibited (Article 5, paragraph 2). In neither of these regulations is there any mention of the admissibility of so-called 'thermal windows', a new concept of automobile companies to divert attention from their fraud with regard to exhaust gas purification. On the contrary, Regulation (EC) 692/2008 expressly demands the functioning of the emission control particularly at low temperatures.

The European Air Quality Directive sets binding limit values for ambient air. The annual average may thus not exceed the value of 40 µg/m³. Compliance with this value has been mandatory since 2010. It is, however, persistently exceeded at about 60 per cent of all measuring points close to traffic in Germany. The main cause of these high values are diesel vehicles. Particularly high loads have been occurring during the winter months for years.

Due to the continued violation of the European law on the one hand and the fact that, on the part of the federal government, no effective measures are being implemented to end the exceedance of the limit as soon as possible, the European Commission launched an infringement procedure against Germany on 18 June 2015. In the event of an anticipated conviction, large fines loom large.

The Emission Control Institute of the Environmental Action Germany (DUH)

In order to identify and provide reliable and transparent information on the actual pollutant emissions of diesel cars of the current Euro 6 standard, the DUH set up the 'Emission Control Institute' (Emissions-Kontroll-Institut, EKI) in March 2016 and is, to date, the first and only environmental organization to do so. The real NO_x and CO_2 emissions in normal use on the road were determined using PEMS instruments. Already since September 2015, the DUH has also had pollutant emissions of diesel cars investigated in partly elaborate laboratory tests, especially in the Swiss emissions testing agency in Bern/Biel. The aim of the EKI is to show the real emissions of on-the-road vehicles and with what techniques and at what temperatures the effectiveness of the exhaust gas treatment is reduced.

The DUH makes public all the measured results in press conferences, in press releases and on its website. The DUH forwards the measured values along with indications of the presence of defeat devices to the relevant institutions and authorities at national and international level.

By carrying out these measurements, the DUH wishes to draw attention to the fact that the authorities are responsible for the widespread fraud in the automotive industry on account of their refusal over many years to get to the bottom of the causes of the long-known exceedances of the limit values and to prevent this from happening. Many diesel cars satisfy the limit values only in the NEDC test cycle carried out in the laboratory at between 20 to 30 degrees Celsius; on the road, however, they exceed, on average, by a factor of 7.1 (source: International Council on Clean Transportation ICCT 2014*). As long as the authorities refuse to undertake transparent monitoring, the DUH will carry out measurements under real driving conditions. The measurements are intended to emphasise the urgent need for action in view of the nearly nationwide exceedance of the emission limits in the existing fleet of cars and to urge the relevant authorities to take action.

The measurements

The EKI performs measurements on cars in real driving conditions on the road using mobile testing units (Portable Emission Measurement System, or PEMS). Among other things, the amount of nitrogen oxide (NO_x) and carbon dioxide (CO_2) is determined. The aim of the measurements is to determine whether the vehicles comply with the exhaust gas regulations as required even under normal driving conditions (i.e. not just in the NEDC test cycle in the laboratory). The DUH uses the devices Semtech NOx and Semtech FEM as made by Sensor. Measurements are conducted under the supervision of Dr Axel Friedrich, the former Head of the Department of Transport and Noise of the Federal Environment Agency.

Diesel cars and vehicles with petrol, natural gas or hybrid drive are the subjects of the tests.

* [HYPERLINK "http://www.theicct.org/real-world-exhaust-emissions-modern-diesel-cars"]

The measurements are carried out in normal traffic on a specified test track of around 32 km in length in Berlin, with parts of the track consisting of urban traffic, country roads and motorways. The speed limit on the rural road is 80 km/h and 120 km/h on the motorway. The drivers follow the rules of the Highway Code and comply with the indications of the gearshift indicators present in the vehicles. As a rule, every vehicle undergoes ten tests.