

Real Driving NO_x Emissions of European Trucks and Detection of Manipulated Emission Systems

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Nitrogen dioxide (NO₂) is the most problematic pollutant in Europe and many other countries. NO₂ has a negative impact for the health and the environment, and in most European cities the currently allowed mean annual limit of 40 µg/m³ is exceeded. Vehicles, especially Diesel, are the most relevant source. They emit NO_x (NO + NO₂), and NO can also be converted to NO₂ in the atmosphere. Thus vehicle NO_x emissions are regulated in the EU with the EURO Norm Standard (e.g. EURO 6 since 1.1.2013 for trucks with 400mg/kWh). Trucks achieve these low emissions with complex emission after treatment systems. All EURO 6 trucks and almost all EURO 5 trucks use the SCR system consuming AdBlue to reduce the NO_x emissions.

Since the diesel emission scandal for cars, it is well known that real driving emissions (RDE) can be several times higher than the EURO Norm Standard. The main problem is that RDE are only randomly investigated.

Here we present a study of NO_x RDE of more than 250 randomly chosen trucks on German highways. The measurements were performed with a newly developed mobile NO_x-ICAD + CO₂ -instrument applying the plume chasing measurement principle, where the pollutants are investigated in the emission plume and were converted to emission factors to be compared to the EURO standard. For most trucks the brand, the model name, the country of registration and its EURO class could be determined and used in a statistical analysis.

The observed NO_x emission data show that typical truck RDE are in the range of the expected EURO Norm or slightly higher. However, almost every fourth truck from Eastern Europe show emissions much higher than the EURO Norm. This was not observed for German trucks. As the emissions increase up to a factor of 5 to 10 these view trucks contribute significantly to the air pollution. These high emissions clearly indicate a defect emission treatment system. Most likely it indicates illegal manipulated emissions systems where the AdBlue injection is blocked (AdBlue emulator) to save money. This study shows that our measurement system can effectively investigate these manipulated vehicles.

Further results and consequences of NO_x RDE from trucks are presented.