SET STUDY

Sustainable Emission Test

The largest emission project for in use vehicle in Europe

Recommendation for effective exhaust emissions control during PTI

November 2014

Background

After being treated, exhaust emissions from combustion engines contain less pollutants harmful to health and environment. Therefore, regular exhaust emission control for motor vehicles is necessary. Through periodical tests, the control aims to ensure adherence to limit values for pollutant emissions over the whole period of vehicle use. In order to improve air quality, it must be assured that the motor vehicles' emission after-treatment systems operate well during the whole period of use. This implies that failures and maloperations are identified and repaired consistently and without gaps. Despite numerous innovations and regulatory measures (e.g. new technology, particulate matter badge) the air especially in urban areas is still polluted (e.g. particulate matter, nitrogen oxide) and limit values are frequently exceeded. There is a reasonable suspicion, that the current periodic emission test is not able to detect deterioration.

The "conventional" emissions control is carried out as direct measuring at the tailpipe. Under specific conditions in some member states modern vehicles can also be tested by means of reading out the Data Trouble Codes (DTC's) of the on board diagnostic (OBD) system. However, since the introduction of EOBD systems, their quality and effectiveness have been subject to discussion. The specific aim of the SET study was to investigate the possibility of defining an improved test procedure for the measurement of particulate matter (PM), to be included in PTI tests for modern diesel cars with different types of exhaust after-treatment system. In addition, an improved test has been investigated to measure CO emissions from modern petrol cars.

Field trials were performed at 16 test stations located in various EU Member States: Belgium, France, Germany, The Netherlands, Spain and Sweden. A test procedure was developed for these field trials which included tailpipe measurements and also a check on the OBD system for both petrol and diesel vehicles (M1 and N1 category). 1654 diesel tests and 1374 petrol tests had been submitted for analyzes. The majority of vehicles were Euro 4 and 5 together with some Euro 3 vehicles and a few Euro 6 vehicles.

Aims of the Study

- Comparison of OBD read out (DTC's, Readiness Codes (RC) Status, Malfunction Indicator Lamp (MIL) status information) versus the tailpipe emission test (CO, k values for PM);
- Definition of suitable thresholds for PM-measurement devices (m^{-1}; mg/m3) for diesel vehicles, taking into account, accuracy of measurement devices as well as the level of gross pollutants to-day;
- Definition of new thresholds for CO measurement, taking into account, accuracy of measurement devices as well as level of gross pollutants today;
- Compiling a precise recommendation including a cost-benefit analysis for the European Commission to adjust the PTI directive.

Main Recommendations

- There is no clear correlation between an emission test and OBD check for either petrol or diesel vehicles. It is therefore recommended that for Euro 4 or later vehicles, both an emission test and an OBD check should be performed. An official exhaust emission inspection performed via the on-board diagnostics system is thus not equivalent to an inspection of the exhaust gases, although this equivalence is claimed in Directive 2014/45/EU Annex I, No. 8.2.1.2/No. 8.2.2.2.
- Petrol vehicles:
  - For Euro 4 or later vehicles, a revised limit of 0.1% CO should be used for the fast idle test.
- For diesel vehicles:
  - For Euro 4 vehicles, because some are fitted with DPF's whereas other are not, the limit should be the plate value, but maximum 1.0 m^{-1};
  - For Euro 5 or later vehicles, a general limit is practical to apply to all diesel vehicles. It is recommended that a limit of 0.2 m^{-1} is used in the future.

The benefit-cost ratio for the new testing procedure (combination of OBD-reading and tailpipe measurement including new thresholds) starts with approximately 8 and increases up to 13 in 2030.

CITA International Motor Vehicle Inspection Committee
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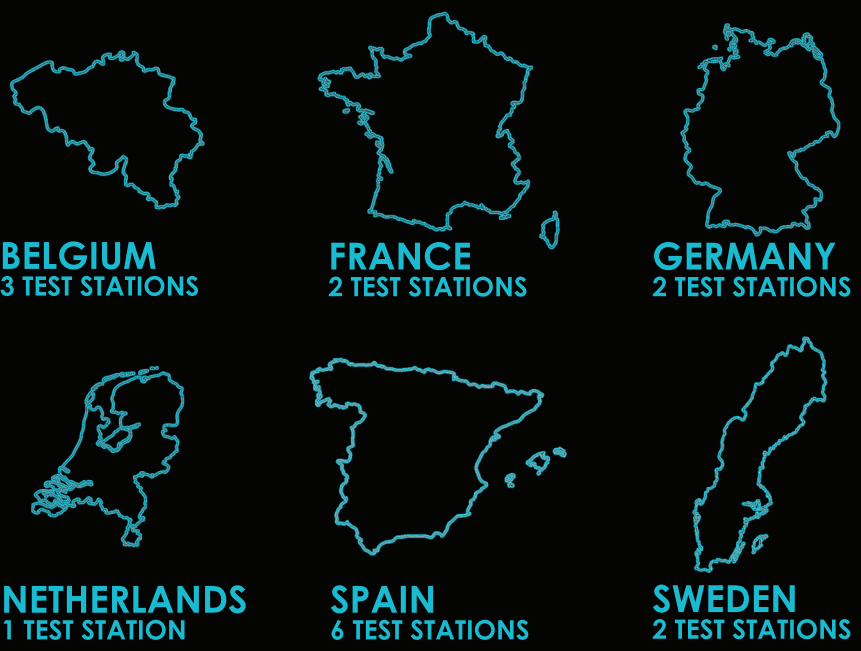
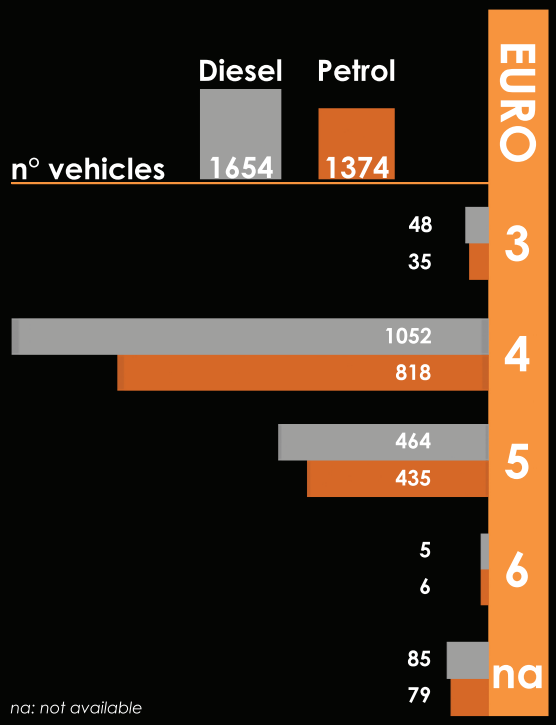
12 MONTHS / 6 COUNTRIES INVOLVED





AIMS

- Susteinable Thresholds for **PM** and **CO**;
- Comparison of **OBD** read out [DTC's, Readiness Codes (RC) Status, Malfunction Indicator Lamp (MIL) status information] versus the **tailpipe emission test** (CO, k values for PM);
- Recommendations for **EC** and **Cost-Benefit analysis**.

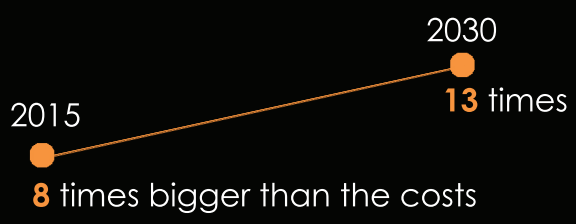
RECOMMENDATIONS

- Mandatory Combination of **OBD** and **Tailpipe test**;
- **New Thresholds**:
  - CO max 0.1% (EURO4);
  - Plate Value, max 1.0 m^{-1} (EURO4);
  - K-Value max 0.2 m^{-1} (EURO5).

NEXT STEPS

- Inexpensive test methods to measure **NO_x**;
- Applicable limit values for **NO_x**.

FAVORABLE COST-BENEFIT RATIO



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