

Evaluation of measuring methods for particle emissions from modern diesel vehicles in periodic emission control

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Motivation:

Since 1992 exhaust gas emission testing in regular periodic inspection checks in the EU [92/55/EEC]

- ensuring low level emissions over the useful life of the vehicle
- harmonizing the test procedures
- opacity of the diesel exhaust fumes as an adequate indicator (simpler, quicker and less expensive procedure)

"This Directive will be adapted from time to time to take into account developments in vehicle construction which facilitate in-service testing and in test methods which reflect more closely the actual conditions in which a vehicle is used".

Tightening of the PM emission standards down to the particle number limit, which became effective at a Euro 5b stage ((EC) No 692/2008) for passenger cars and at a Euro VI stage for Heavy Duty Engines.

Current opacimeters are not sensitive enough to quantify the emission performance of DPF-equipped diesels and there are concerns about whether they will be able to identify malfunctions (e.g. cracks) of the DPF.

In order to adapt the exhaust emission control to technical progress, the establishment of novel measuring instruments for periodic emission control will become necessary in the near future.



Objectives:

- Metrological background for the measurement of particle concentration in exhaust gases of diesel vehicles in periodic emission control
- Validation of novel instruments provides ideas for new developments of instruments
- Support for the adaption of the periodic exhaust emission control to technical progress
- Trusted periodic emission control

Research activities:

Evaluation of measurement devices and metrological procedures for the periodic emissions inspection of modern diesel vehicles.

The various candidate instruments operate on different physical principles, therefore, measure different aerosol properties. Hence, the candidate instrumentation will be assessed via comparative measurements of the particle number concentration (PN) and/or the aerosol opacity.

Your expertise in new devices measuring particle concentration in PTI

If you are developing or have already developed such instrumentation (even as a prototype) and you are interested in participating in the measurement campaign, please get in touch with us.

(Confidentiality of instrument details will be guaranteed and results of the research project will be published as an anonymous intercomparison)

Technical requirements in European regulation

Technical requirements from national regulatory authorities

Report:

Consistent requirements specified for novel measuring instruments (prototypes) and comparison with European legislative requirements

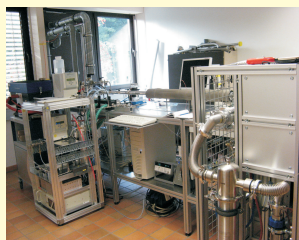
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Candidate Instrumentation

Requirements

Planned activities:

Laboratory tests at METAS, MIKES and PTB:



Performance characteristics:

- measurement accuracy
- sensitivity
- dynamic response
- sample pressure or temperature effects on the instrument response will be assessed for the complete system, including necessary sampling and conditioning devices.

Calibration aerosol:

- soot aerosol from CAST or other combustion sources
- number concentrations: 10^5 to 10^8 cm⁻³
- light extinction coefficients: 0.01 m⁻¹ to 3.0 m⁻¹
- polydisperse aerosols with geometric mean diameter of 50 to 100 nm and geometric standard deviation of 1.6 to 2.0



Applicability of novel measuring instruments in field tests:

- Suitable instruments identified in the laboratory have to be tested in field measurements at JRC/IE
- User handling experience with the novel instruments under service conditions at service organisations in cooperation with PTB

EMRP

European Metrology Research Programme

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Emerging requirements from measuring pollutants from automotive exhaust emissions

<http://www.ptb.de/emrp/partemission-home.html>

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