Considerations of Periodical Technical Inspection of Vehicles with deNO\textsubscript{x} Systems

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Abstract

An independent periodical technical inspection (PTI)\textsuperscript{1} of vehicles is proposed in the last time as a better prevention against increased emissions of the fleet.

Several projects focused on the Diesel vehicles (HD & LD) and on the functionality of the exhaust aftertreatment systems as a key element for lowering emissions of a vehicle or machine.

The present paper summarizes the results obtained on 3 modern passenger cars Euro 6b (with EGR, DOC, DPF & SCR) during load jumps, representing the heat-up or cool-down behavior of the exhaust system.

The Portable devices for PTI were tested together with the stationary jumps, representing the heat-up or cool-down behavior of the exhaust system.

The present knowledge and proposals of supplementary test procedures (like IUC or PTI) were shortly described.

It can be stated that the efficiency of the SCR-systems in a short PTI test is visible, and it is possible to quantify it in the positive or negative load jump if a longer driving period at the constant OP (10 to 15 minutes) is realized in order to attain the stabilization of the system. For that a chassis dynamometer is recommended. A simple “5 minutes” test of the functionality of a deNO\textsubscript{x} system is not possible. On the contrary, the testing of DPF quality can be easily and quickly performed by means of a PN-measurement at vehicle standstill and it became already a legal reality in some countries.

Possible procedure/conclusions

The experiences gained from the observations of emissions behavior during load jumps on the investigated cars can be summarized as follows:

• the efficiency of the SCR-systems is visible, and it is possible to quantify it in the positive or negative load jump if a longer driving period at the constant OP (10 to 15 minutes) is driven,

• some vehicles (V1 and V2) perform the RAI stop at wheel-stop,

• by means of \textit{\textbf{N}}\textsubscript{\textit{H}}\textsubscript{\textit{2}}\textit{O}-measurement it is possible to visualize some draw-backs of urea mixture preparation.

After the tests of different aftertreatment devices by means of positive and negative engine load jumps, it can be stated:

• as a method to obtain a heat-up and light-off of the exhaust system the authors recommend the use of a simple, only-braking roller dynamometer, which enables a continuous NO\textsubscript{x} measurement.

• the determination of the filtration efficiency of the DPF can be easily remarked by means of the PM-measuring instruments; this can be done also at idling.

• the low-cost analyzers, which were used for CO, NO/NO\textsubscript{x}, \textit{\textbf{NH}}\textsubscript{3} and PN were confirmed as useful for the simple (field) tests.

The procedures, which are proposed up to date, can be summarized as follows:

• DPF: PN-measurement at one OP, standstill of vehicle, total time of testing including preparations, visual control, conditioning and measurements, circa 10 minutes;

• SCR: warm-up or cool-down the vehicle on a chassis dynamometer with continuous NO\textsubscript{x}-measurement, total test duration at control station approximately 1.5 hours (including assembling and disassembling of the vehicle on chassis dyno).

Open questions

• Tuning of the minimum limit value of NO\textsubscript{x}, reduction rate (RR)

• Solution of the question “wheel-stop → RAI-stop”

• Tuning of the time to drive after load jump for LD and for HD

• More testing for statistical robustness

• Testing of UAT

• Testing with failures

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