

The novel SCR and PNA exhaust gas after treatment systems for future diesel passenger cars

Nebojsa Milovanovic, Shant Hamalian and Charles Francois Tumelaire
MAHLE Powertrain Ltd., UK

Magnus Lewander and Kenneth Larsen
Haldor Topsoe, Denmark

ABSTRACT

The future emission legislations for diesel passenger cars are likely to include more dynamic test cycles than we have today, such as the WLTP and RDE cycles in the EU (from 2017) and very challenging SULEV legislations in the USA (from 2020).

The current Exhaust Gas AfterTreatment Systems (EGATS) in production to meet EU6 emissions mainly consist of DOC and DPF with an underfloor SCR (ufSCR). Alternatively, a DOC with a DPF filter and SCR on the same substrate-SCR on DPF (cc SCR) can be used. In both configurations, the SCR system provides sufficient NO_x reduction over the current NEDC test cycle to meet EU6c requirements. The ccSCR is more efficient than ufSCR and provides the potential for fuel consumption reduction at the same ammonia usage. However, for the WLTP or RDE the ccSCR may be unable to meet EU6c emissions due to lower volume compared to ufSCR. To mitigate this, additional SCR volume is needed.

For meeting the future USA legislations the combination of NO_x Adsorber Catalyst (NAC) and SCR is needed, which requires fuel to be used as a reductant to purge NAC, giving a CO₂ penalty. One way to avoid this is to use a Passive NO_x Adsorber (PNA) instead of NAC. The PNA has same functionality but additionally, the ability to self-purge at the SCR light-off temperature.

The experimental results from a D segment vehicle using different SCR configurations and PNA technology are presented and potentials and limitations of each of configuration are discussed.