Evaluation of exhaust emissions from three diesel-hybrid cars and simulation of after-treatment systems for ultralow real-world NOx emissions

Abstract:
Hybridisation offers great potential for decreasing pollutant and carbon dioxide emissions of diesel cars. However, an assessment of the real-world emissions performance of modern diesel hybrids is yet missing. Here, we test three diesel-hybrid cars on the road and benchmark our findings with two cars against tests on the chassis dynamometer and model simulations. The pollutant emissions of the two cars tested on the chassis dynamometer were in compliance with the relevant Euro standards over the NEDC and WLTP. On the road, all three diesel-hybrids exceeded the regulatory NOX limits (average exceedance for all trips: +150% for the Volvo, +510% for the Peugeot and +550% for the Mercedes-Benz;) and they also showed elevated on-road CO2 emissions (average exceedances of certification values: +178%, +77% and +52%, respectively). These findings point to a wide discrepancy between certified and on-road CO2 and suggest that hybridisation alone is insufficient to achieve low NOX emissions of diesel powertrains. Instead, our simulation suggests that properly calibrated selective catalytic reduction filter (SCRF) and lean-NOX trap (LNT) aftertreatment technologies can reduce the on-road NOX emissions to 0.023 g/km and 0.068 g/km on average, well below the Euro 6 limit (0.080 g/km).

URI:
http://pubs.acs.org/doi/abs/10.1021/acs.est.6b03585 [1]

Authors:
FRANCO Vicente
ZACHAROPOULOU Theodora
HAMMER Jan
SCHMIDT Helge
MOCK Peter
WEISS Martin
SAMARAS Zissis

Publication Year:
2016

Science Areas:
Energy and transport [2]