

Real Driving Characterization of DPF Regeneration Events in Euro-5 Light Duty Diesel Vehicles in the Australian fleet

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Recently developed Diesel Particulate Filters (DPFs) are able to remove more than 90% of the solid particle numbers produced as the result of diesel combustion. The accumulated soot in the filters is usually removed from the filters during periodic regeneration events. Many studies have highlighted raised Particle Number (PN) emissions during regeneration events [1-3]. In this study, two recent model (year of manufacture ≥ 2015) diesel sports utility vehicles were tested with and without regeneration events over real driving routes using a portable emission measurement system (PEMS) in Sydney, Australia. Test vehicles were selected based on their sales performance in Australia, thereby being representative of the most popular diesel vehicles. The tests were performed to determine the extent to which DPF regeneration events adversely affect emissions performance. Results show a considerable rise in PN emissions during the tests that include a regeneration event up to 16.7 times more than that during normal operation without regeneration. According to the results, one of the test vehicles did not pass the Euro-5 PN standard during the regeneration test while neither of the vehicles passed the Euro-5 standard during the regeneration period.

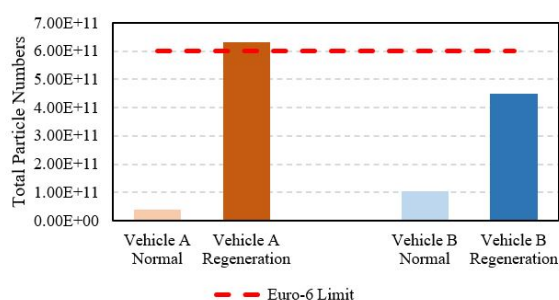


Figure 1-Total PN emissions for all tests in this study.

In addition to PN emissions, gaseous pollutant emissions were also elevated in regeneration tests compared to normal operation; for NO_x and THC by 14% and 99% on average, respectively. Compared to the Euro-5 limit values, both test vehicles fail to comply with NO_x and $\text{THC} + \text{NO}_x$ limits [4].

1. Yamada, H., *PN emissions from heavy-duty diesel engine with periodic regenerating DPF*. SAE International Journal of Engines, 2013. **6**(2): p. 1178-1189.
2. Smith, J.D., et al., *Real-time particulate emissions rates from active and passive heavy-duty diesel particulate filter regeneration*. Science of The Total Environment, 2019. **680**: p. 132-139.
3. Beatrice, C., et al., *How Much Regeneration Events Influence Particle Emissions of DPF-Equipped Vehicles?* 2017, SAE International.
4. Ko, J., C.-L. Myung, and S.J.A.E. Park, *Impacts of ambient temperature, DPF regeneration, and traffic congestion on NO_x emissions from a Euro 6-compliant diesel vehicle equipped with an LNT under real-world driving conditions*. 2019. **200**: p. 1-14.