EXPERIMENTS AND ANALYSIS OF DPF LOADING AND REGENERATION

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Understanding particulate filter regeneration is important for the design and operation of a diesel exhaust aftertreatment system. The experimental data includes soot loading and unloading (filter regeneration) curves from tests conducted on an engine dynamometer and filter regeneration data from a laboratory flow reactor. A comparison is made between the performance of uncatalyzed diesel particulate filters (DPFs) and catalyzed DPFs based on the rate of soot burnoff. Filter regenerations have been carried out both by burnoff at high load conditions and by fuel- assisted burnoff via the injection of fuel up-stream of the filter.

Experimental results indicate that the catalyzed DPFs regenerate at a much faster rate than the uncatalyzed DPFs at the same engine exhaust conditions. DPF regeneration was demonstrated by generating an exotherm via the oxidation of supplementary hydrocarbons. Flow reactor studies showed that the catalytic coating led to significantly higher soot oxidation rates than that of the uncoated DPF. Analysis showed the activation energy of the catalyzed DPF to be 38 kJ/mol and the uncatalyzed DPF to be 85 kJ/mol.