

DEVELOPMENT OF A MICROWAVE-ASSISTED PARTICULATE FILTER REGENERATION SYSTEM

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A microwave-enhanced regeneration system for diesel particulate filters is being developed for future generation light-duty diesel applications including PNGV-type applications. A particulate filter with superior thermal and mechanical strengths, high filtration efficiency, and high filtration capacity was used in the current study. A 2.0 kW microwave system with specific capabilities, such as variable power output, reflected power measurement, and a tuned waveguide to minimize the reflected power was employed in the system. With the aid of computational modeling, a fine-tuned cavity was developed for the filter housing.

A Cummins 5.9-liter diesel engine with split exhaust flow and by-pass flow capabilities was used for the development study. The ability to regenerate filters effectively with minimal fuel penalty was demonstrated using engine exhaust as the oxygen source. Soot loadings up to 6 g/liter were used. Oxidant flow rates up to engine idling flow rates were used during regeneration. Various benefits/issues using supplementary air source vs. engine exhaust as oxidant supply are discussed. An optimal combination of soot loading and the oxidant quantity was determined through a parametric study for the system under consideration.