Investigation of the Impact of Diesel Exhaust and Particulate Composition on the Regeneration Process of Catalyzed DPF

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Impact of Burner on Particle Size Distribution of Exhaust at Upstream DPF

Results

Impact of Burner on Particle Size Distribution of Exhaust at Upstream DPF

• No effect on ultrafine particles
• Significant increase in nano particles
• Similar trend on size distribution at different temperature

Conclusions and Future Analysis

• The effect of active regeneration on exhaust had been studied.
• Different types of soot from different engine conditions yield different characteristics in regeneration process.
• More investigations will be carried on in order to gain more understandings on the pressure drop profile during regeneration.
• Understandings on nano-particles history during regeneration process are needed to verify.

Experimental Setup

• Burner is Oxy-Acetylene torch
• Regeneration is performed at low load condition (mode 4)
• Control regeneration temperature by adjusting the fuel and O₂ flow rate
• Burner is operated near the neutral flame condition for complete combustion
• With the current size of torch and nozzle tip, temperature can be yielded at up to 700°C

Pressure Drop, Temperature, and Particle Size History during Regeneration Period

• Pressure drop increases and after reaches maximum value, decreases toward the end of regeneration process.
• This increase cannot be totally accounted for by the increase in temperature (Darcy’s pressure drop equation).

Temperature Distribution within DPF during Regeneration

• Inlet temperature are not uniform
• Heat loss is apparent near the canister wall
• Different types of soot have different temperature profiles within DPF

Objectives

• In-situ regeneration process is one of the most important activities in diesel particulate filter (DPF) system. More fundamental understandings therefore are needed to explore.
• Study the impact of active regeneration (using burner) on engine exhaust.
• Understand emission characteristics during regeneration period.
• Different types of soot from different engine conditions (mode 5—higher EC and mode 3—higher OC are introduced in this study) may effect regeneration performance.