Experimental Study of Regeneration in Diesel Particulate Filters Used with a Light-Duty Engine
Manuel A. Gonzalez D., Roger Krieger, David E. Foster
Sponsor: General Motors

Background & Project Goals
To obtain detailed experimental data for calibrating, validating, and improving computational models of loading and regeneration of diesel particulate filters (DPF’s).
The work will consist of loading a DPF with soot from the light-duty engine and then regenerating the filter using synthetic exhaust in an off-engine regeneration system and also in a second phase, with the DPF both loaded and regenerated on the engine.
The temperatures and exhaust gas compositions for DPF loading will be representative of the European Urban Driving Cycle with engine load up to 2500 rpm @ 8 bar BMEP using a GM 1.9L CIDI engine.

Project Plan
- Design and construct a new synthetic-exhaust gas generation system to allow variations in species concentration, temperature, and flow rate of the synthetic exhaust.
- Utilize controlled multi-cylinder engine operation to load soot onto an instrumented DPF
- Install loaded DPF into synthetic-gas laboratory and regenerate while monitoring inlet and outlet gas composition as well as instrumented DPF behavior
- Perform on-engine regenerations using active and passive regeneration strategies

Synthetic Gas Laboratory Capabilities
- Synthetic gas species: CO₂, NO₂, NO, Water, O₂, N₂
- Mass flow control for individual species: within +/- 1.5%
- DPF inlet temperatures: 400 – 650 °C
- Instrumented DPF core temperature measurements at five different planes along the DPF axis
- Initial condition and transient performance measurements for flow, temperatures and pressures
- Energy balance calculations based on inflow/outflow and measured heat transfer

Multi-cylinder engine for DPF soot loading and regeneration strategies
Synthetic Gas System
DPF exploded view and schematics for core T/Cs