Vehicle Evaluation of
Downsized Dow ACM DPF

Fuhe Mao & Cheng G. Li

Dow Automotive

Present at
Diesel Engine-Efficiency and Emissions Research Conference
DEER 2006
Outline of Presentation

- Test Objective
- Test Procedure
- Driving Cycles
- Results
  - Dow ACM DPF
  - OEM DPF
Objectives

- Evaluation of Dow ACM DPF performance on a MY2005 LD vehicle on chassis dynamometer
- Comparison between OEM DPF and Dow DPF performance under modified city driving cycles
- Demonstration of Dow ACM DPF performance and downsizing potential
Vehicle Test Plan

- Development of driving cycles that is able to load ~8 g/l soot per regeneration without modification of OEM engine ECU
  
  - Baseline configuration: CC-DOC+DOC+OEM-DPF(4L)
  
  - Modified configuration: CC-DOC+DOC+Dow-DPF(3L)

- Evaluation of system performance for both configurations under developed driving cycles
Test Vehicle

- 1.9 L, turbocharged, Common rail, Diesel engine
- Automatic transmission
DPF System Configuration

- **OEM DPF (4L)** with upstream OEM DOC
  - Dow DPF (3L) with upstream OEM DOC
Vehicle Test Driving Cycle

Cycle was developed to load ~ 8g/l soot per regeneration
Soot loading rate on a 3L ACM DPF

DPF Weight Gain (g) vs. Accumulated Mileage

Approximately 9 g/L
Soot loaded (~9g/l) Dow DPF pressure drop

\[ \Delta P < 25 \text{ inH}_2\text{O} \text{ at 3500 RPM} \]
\( \Delta P \) comparison

Dow DPF: 3L, 7g/l soot; OEM DPF: 4L, 5g/l soot

![Graph showing exhaust flow rate vs. DPF pressure drop for OEM SiC DPF (4L), 5 g/l soot and DOW ACM DPF (3L), 7 g/l soot.](image)
ACM DPF temperature profiles during regeneration
ACM DPF temperature profiles during uncontrolled regeneration

Dow DPF
OEM DPF soot leakage

3 channel leakage observed
No soot leakage from Dow ACM DPF
(Smoke meter measurements verified)

~ 8 g/l soot loaded inlet
Soot loaded DPF outlet
Summary

- Dow ACM DPF and OEM DPF were tested on vehicle with accumulated 27,000 km and multiple regenerations.
- OEM DPF was found channel crack and soot leakage after 10,000 km vehicle test.
- Dow DPF was not found channel crack and soot leakage after 14,000 km vehicle test with uncontrolled regenerations.
- The size of Dow DPF was reduced by 25% than OEM DPF and kept the same back pressure at higher soot loading.