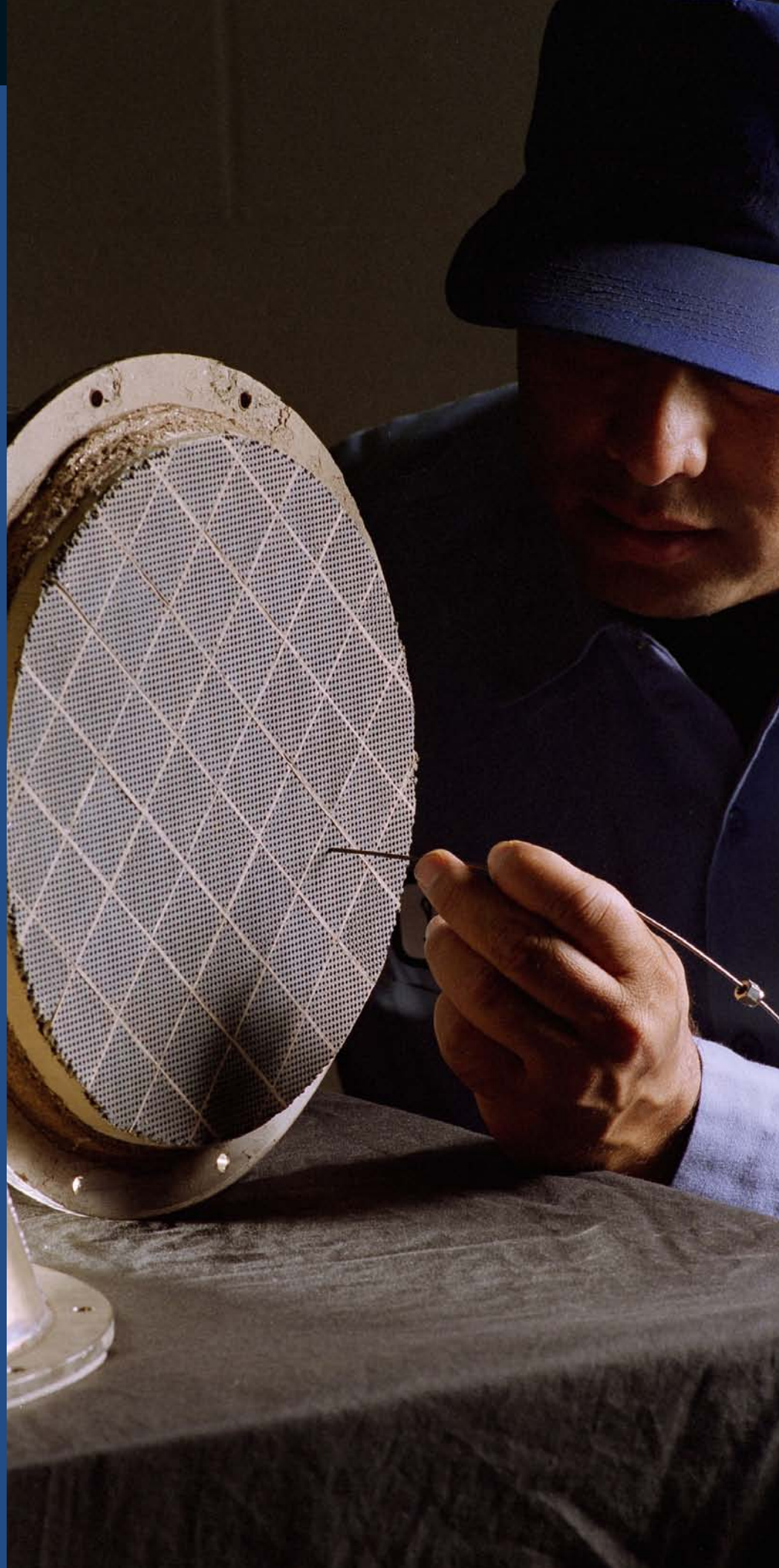


**DIESEL  
PARTICULATE  
FILTER (DPF)  
TESTING**



Increasingly stringent environmental regulations for diesel engine emissions are driving efforts to develop concepts for reducing emission levels, predominantly for particulate matter (PM). The US federal limit for PM emissions from heavy-duty diesel engines has decreased from 0.1 g/hp-hr to 0.01 g/hp-hr for 2007. The use of diesel particulate filters (DPFs) is considered to be the only feasible diesel aftertreatment technology for achieving the US 2007/2010 and Euro V particulate limits.

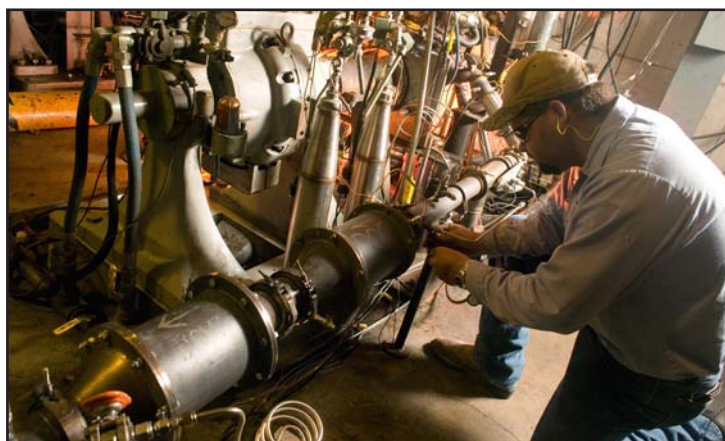
Southwest Research Institute® (SwRI®), with more than 50 years of experience in engine, fuel and vehicle research, offers complete facilities for testing diesel engines and their aftertreatment systems.

## CAPABILITIES

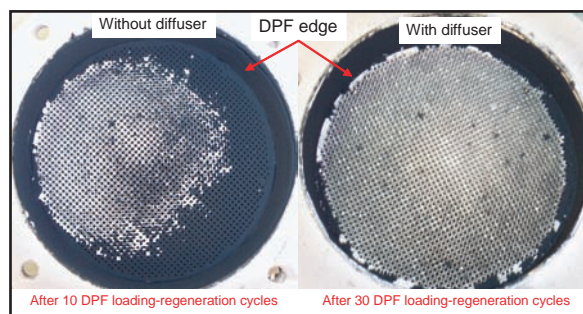
Institute engineers combine state-of-the-art equipment with extensive DPF experience to provide engine manufacturers and component suppliers with comprehensive services, including:

- ❑ DPF filtration efficiency measurement
- ❑ Catalyst formulation evaluation
- ❑ Balance point tests (for catalyzed DPFs)
- ❑ Precise on-engine DPF PM loading techniques
- ❑ Automated DPF regeneration using supplemental fuel injection (SFI) or in-cylinder post-injection
- ❑ Regeneration survivability tests
- ❑ Long-term ash accumulation
- ❑ DPF hot vibration testing
- ❑ On-vehicle DPF durability testing
- ❑ Off-engine DPF cleaning techniques
- ❑ Application-specific troubleshooting (e.g., solutions for DPF plugging)

*Diesel particulate filter (DPF) testing on a light-duty engine*



D015382\_7215



*Comparison of DPF inlets with and without a flow diffuser following multiple loading and regeneration cycles*

*Thermocouple installation on a diesel particulate filter for performance evaluation*

## Instrumentation

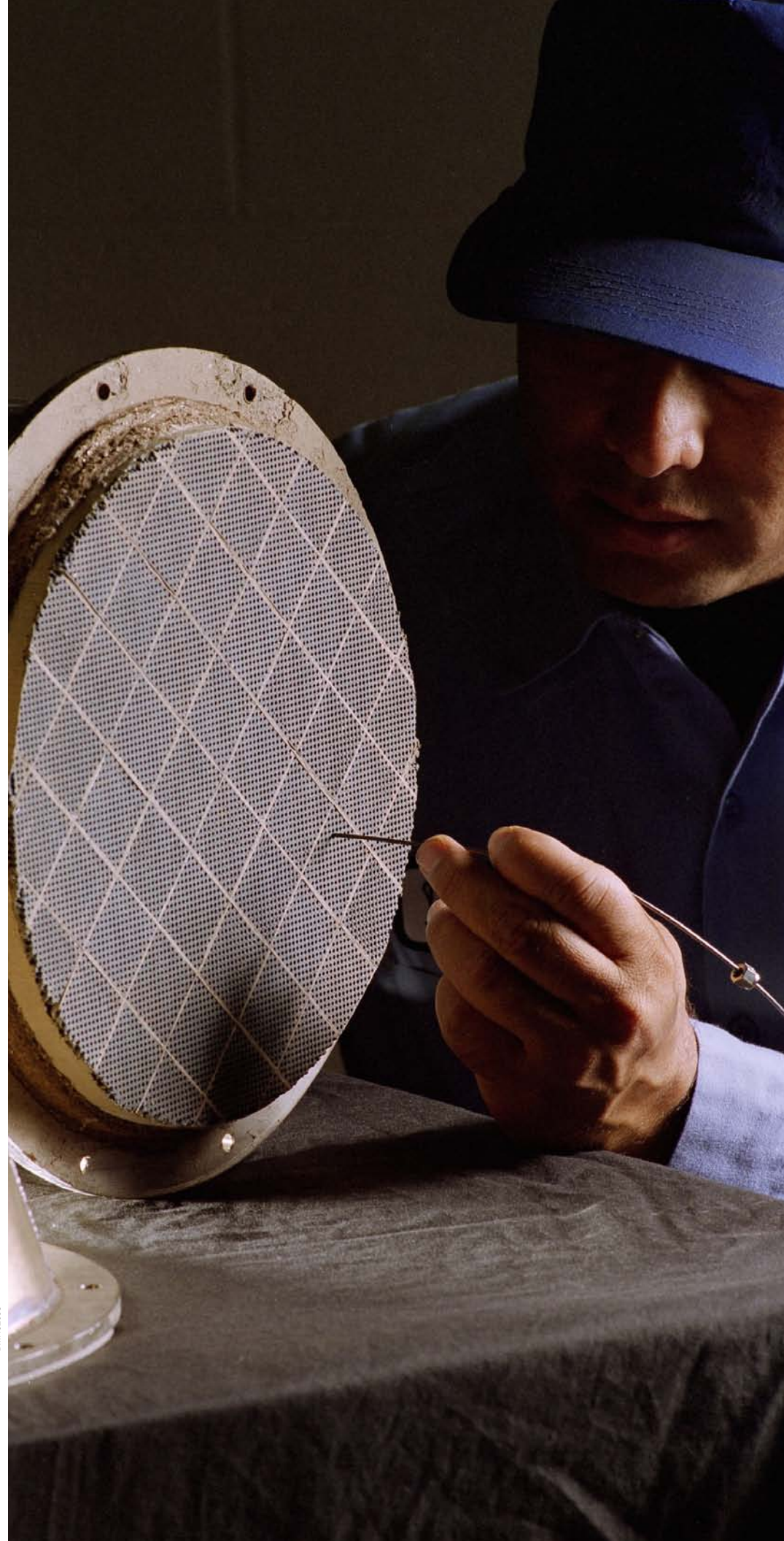
Engine test benches can include numerous instruments to aid in determining the performance characteristics of DPFs:

- ❑ Gaseous emissions analyzers for HC, CO, CO<sub>2</sub>, NO<sub>x</sub>, and O<sub>2</sub>
- ❑ PM size and number distributions for accurate filtration efficiency measurements
- ❑ PM-soluble organic fraction (SOF) content analysis
- ❑ SwRI methodology for measuring real-time temperature distributions in DPFs
- ❑ DPF pressure-drop characteristics
- ❑ ECU mapping for DPF loading / regeneration performance

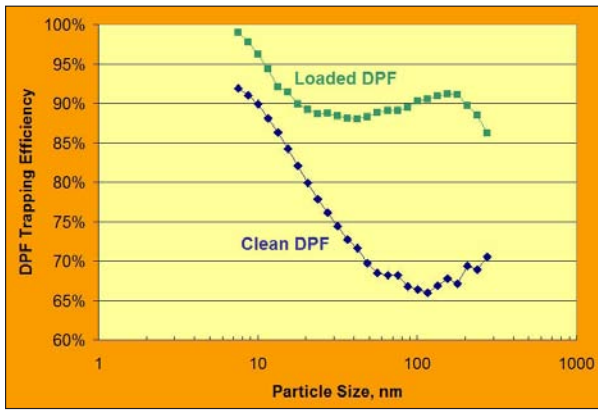
## Survivability Tests

Successful regeneration of the DPF under any given engine operating condition has been identified by industry as a major challenge. SwRI can perform DPF survivability evaluations based on three regeneration failure types:

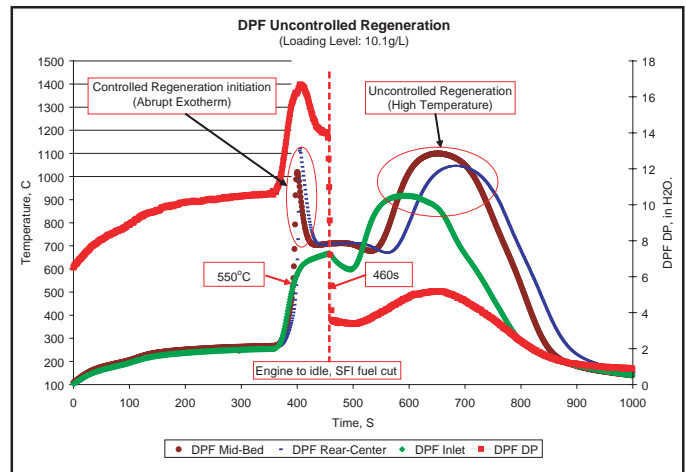
- ❑ Type A – Excess exotherm at the start of regeneration due to rapid temperature ramping rate
- ❑ Type B – Combination of excessive PM loading, high O<sub>2</sub> concentration, and low exhaust flow rate (“classic runaway regeneration”)
- ❑ Type C – Uneven temperature distribution during regeneration causing incomplete regeneration



DIM132908



Measurement of real-time DPF trapping efficiency as a function of particle size, showing distinction in trapping efficiency between clean and loaded DPFs



Two thermal-related risks during DPF regeneration



Southwest Research Institute is an independent, nonprofit, applied engineering and physical sciences research and development organization using multidisciplinary approaches to problem solving. The Institute occupies more than 1,200 acres in San Antonio, Texas, and provides nearly two million square feet of laboratories, test facilities, workshops, and offices for more than 3,000 employees who perform contract work for industry and government clients.

**We welcome your inquiries.  
For additional information, please contact:**



Phillip Weber  
 Manager, Aftertreatment R&D  
 (210) 522-5872 • Fax (210) 522-3950  
 phillip.weber@swri.org

Department of Engine and Emissions Research  
 Engine, Emissions and Vehicle Research Division  
 Southwest Research Institute  
 6220 Culebra Road • P.O. Drawer 28510  
 San Antonio, Texas 78228-0510

[www.swri.org](http://www.swri.org)

An Equal Opportunity Employer M/F/D/V  
 Committed to Diversity in the Workplace