



MDEC 2001 - Toronto

Selection of Diesel Particulate Filter (DPF) Regenerating Additives for New Diesel Engines

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DPF Regeneration



- All DPF technology requires a strategy for cleaning out the trapped soot, otherwise the units will fail due excessive back pressure build up.

- These strategies can be :
 - continuous techniques like the Johnson Matthey - CRT™
 - periodic regeneration events like external heating
 - Combinations of the above like metal based catalyst fuel additive assisted regeneration

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Comparison of Regenerating Strategies

Japan JCAP program - PEC evaluation of Filters

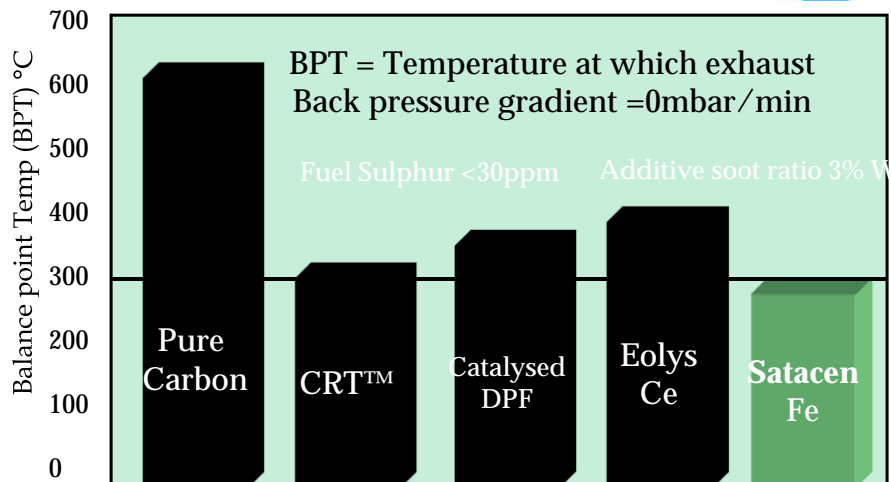


	Engine	CRT™	CSF
Regeneration observed	Year 1989 reg. engine	-Regeneration observed in some mid-to-high speed RPM ranges	-Regeneration observed in all ranges at exhaust temperature of 400°C or higher
	Short-term reg. engine	-Excessive NO2 emission	-Regeneration zone in high RPM expanded on engines complying with 1989 reg. or above.
	Long-term reg. engine	-Regeneration zone wider than 1989 reg. and short-term reg.	-Regeneration zone expanded further than short-term reg. engine
Urban drive mode	Short-term reg. engine	-No regeneration observed in repeated JARI engine test cycles - Excessive NO2 emission	

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Comparison of Regenerating Strategies

ATA Vol 53 11/12 Nov/Dec 2000 - Peter Herzog



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Up-take of DPF Technology in Europe



- Passenger car manufacturers are already supplying or are about to supply DPF equipped diesel passenger cars
 - Metal based Regeneration additives are already being extensively used to as the chosen regeneration strategy to burn off the entrapped soot within these DPFs
- More smaller, high volume cars are introduced with DPFs to meeting the forthcoming Euro IV legislation on PM emissions
- Newer regeneration additives will be required to meet the performance profiles of these new diesel passenger cars and heavy duty applications

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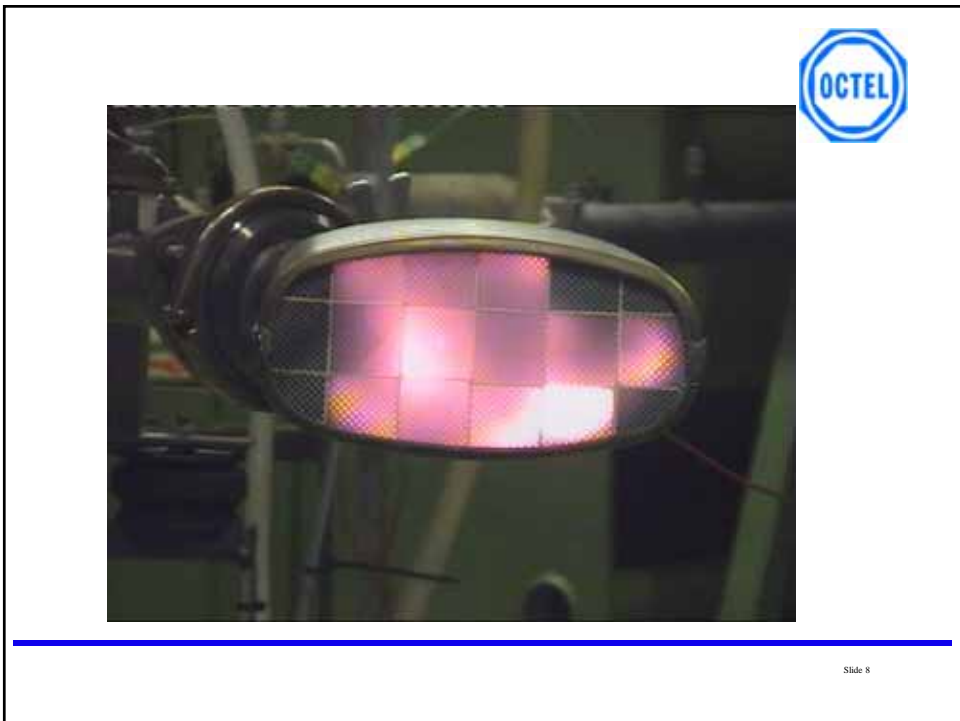
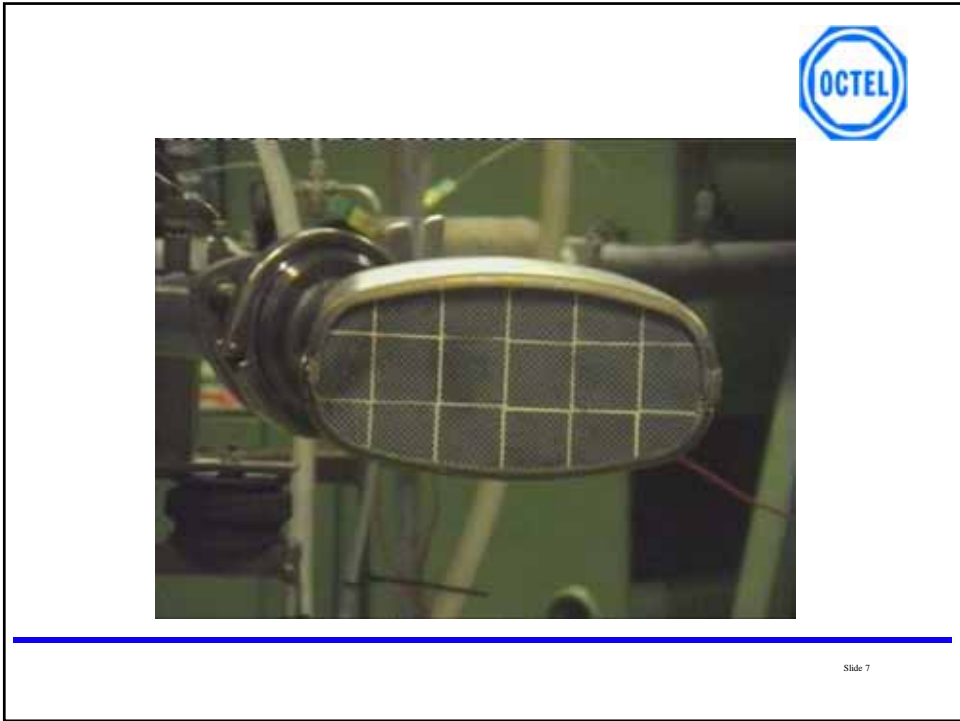
What is an Effective DPF regeneration?

Effective DPF Regeneration is a Combination of:



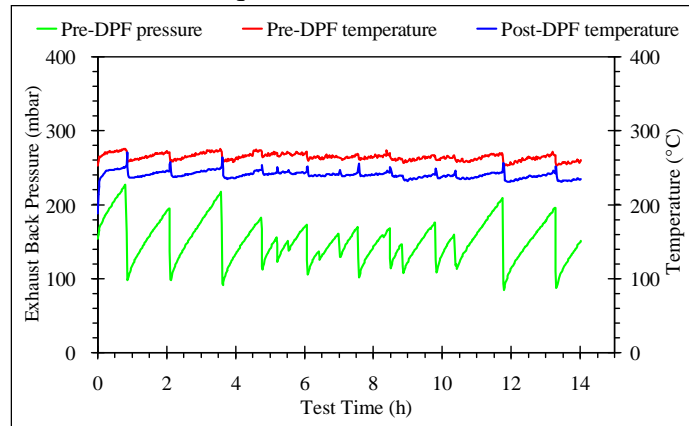
- Regeneration temperature
 - Lowest possible - to cover as many modes of operation as possible
 - More frequent regenerations = lower average back pressure
- Time taken to regenerate the DPF
 - Shorter the better - Engine management can return to normal mode
- Control of the exotherm
 - Avoid substrate damage
- Completeness of the soot burn
 - Lower residual DPF back pressure = Better economy

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The Best Case Regenerating the DPF - Bench Engine

3000 rev/min: 30 Nm torque



Regeneration log

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DPF Additive Checklist 1



- ❑ Compact Package - For on-board dosing (approx. 3 - 4 litres for 110,000 km of operation. Assuming 9 l/100 km fuel consumption)
- ❑ Be pumpable at temperatures between -40°C and +90°C
- ❑ Long term package stability. Remain as an active homogeneous solution for 5 years. Maximum vehicle service.
- ❑ Provide the lowest regeneration temperature possible
- ❑ Be present in a form that minimises exhaust back pressure increase from long term ash build up in the DPF

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DPF Additive Checklist 2



- ❑ Have no effect on fuel properties
 - ❑ Cetane number, lubricity, thermal stability, cleanliness and water separation
- ❑ Manufacturing additives that are both re-active and fuel compatibility, requires unique chemical engineering
- ❑ The metallic form / composition is very influential on the overall product performance as a DPF regenerating additive.
- ❑ No impact on other emissions - ie. NO_x and NO_2
- ❑ Passed epidemiological review. UBA, VERT and SwEPA

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Regenerating the DPF Light Duty

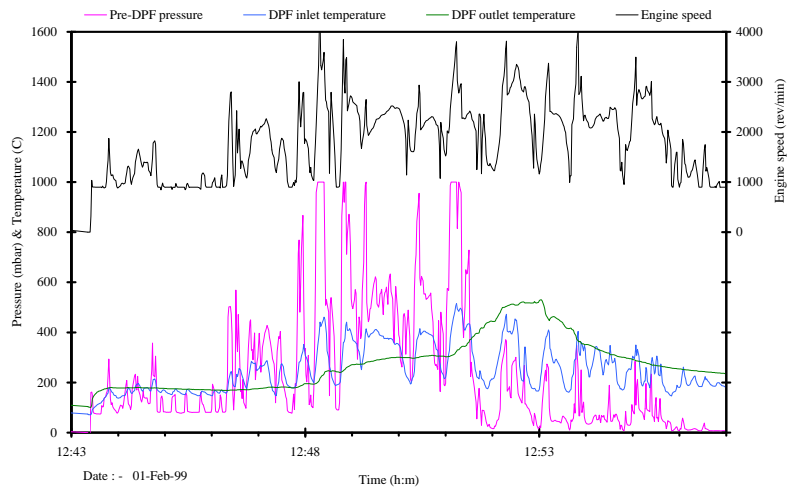
VW 1.9 TDI SiC DPF and Fe based additive



- ❑ Views of DPF installation, instrumentation

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Regenerating the DPF Light Duty VW 1.9 TDI SiC DPF and Fe based additive



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Regenerating the DPF - Heavy Duty 10 litre EGR Turbo Cummins Truck



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Regenerating the DPF - Heavy Duty 10 litre EGR Turbo Cummins Truck



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Regenerating the DPF - Heavy Duty 10 litre EGR Turbo Cummins Truck



DPF

- ❑ Cummins L10 engine
- ❑ Test truck for alternative DPF types
- ❑ Fuel treated with Octel Octimax™

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Regenerating the DPF - Heavy Duty 10 litre EGR Turbo Cummins Truck Heavy Duty Tractor Unit - Emissions Test Filter Papers

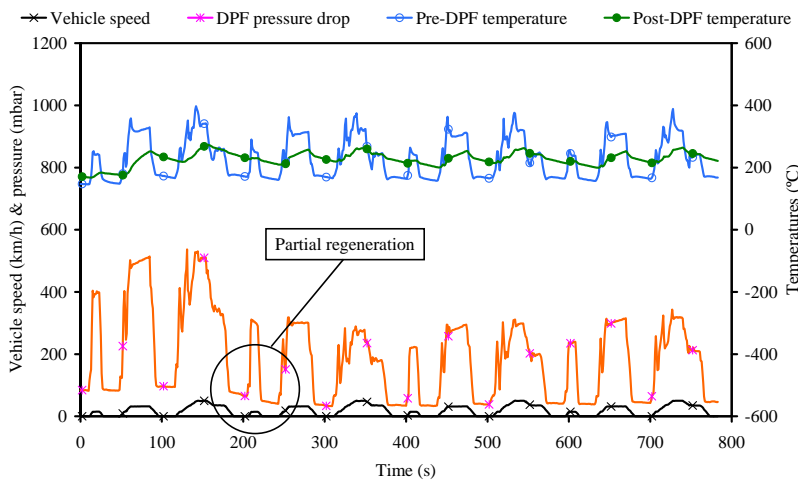


Without DPF

With DPF

Side 17

Regenerating the DPF - Heavy Duty



Side 18

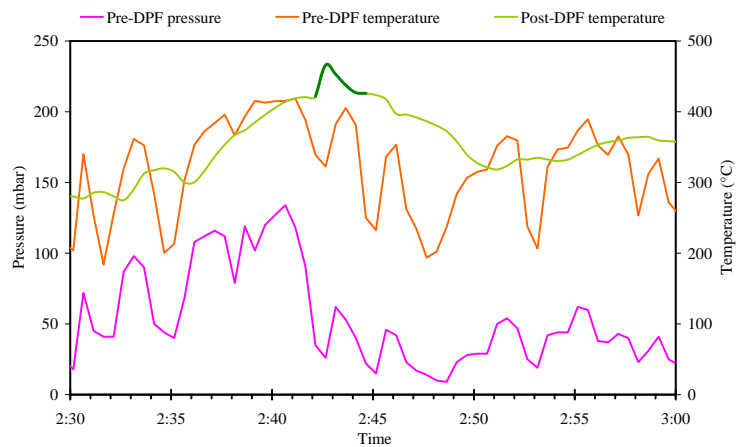
Regenerating the DPF - Heavy Duty 6 Vehicle HD Trial - MB Actros 1835



- 3 filter materials
- 350 + K KM
- 3 years
- Durability
- Performance
- Control
- Emissions

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Regenerating the DPF - Heavy Duty 6 Vehicle HD Trial - MB Actros 1835 Regeneration Event



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