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Optimizing Gasoline Particulate Filter technologies in order to improve filtration performance under current RDE conditions

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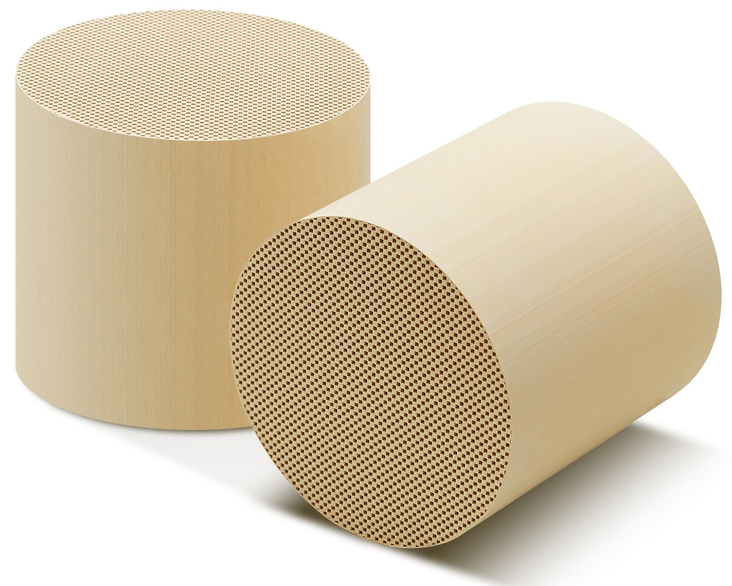
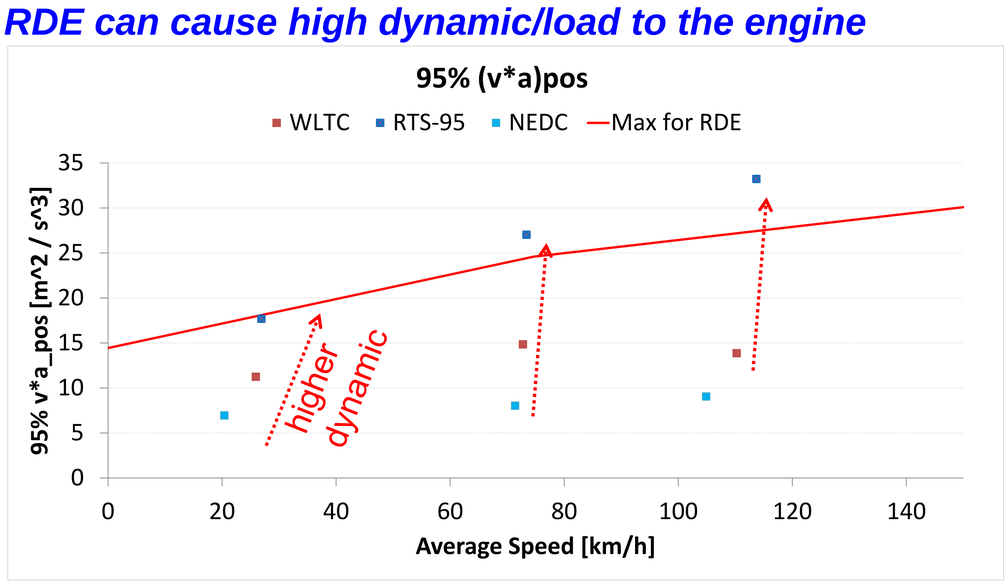
- Increasing tight Particulate Number (PN) emissions regulations affect Gasoline Direct Injection (GDI) engines. The Gasoline Particle Filter (GPF) is a technical solution to comply with the tight legislation requirement on PN. Tighter boundary conditions during Real Driving Emissions (RDE) testing like: sub 0°C engine cold start, high driving dynamics with high road load, in conjunction with a potential future sub 23nm PN measurement, will further challenge the exhaust after–treatment system

- This study focuses on high filtration efficiency GPF's layout and performance investigations

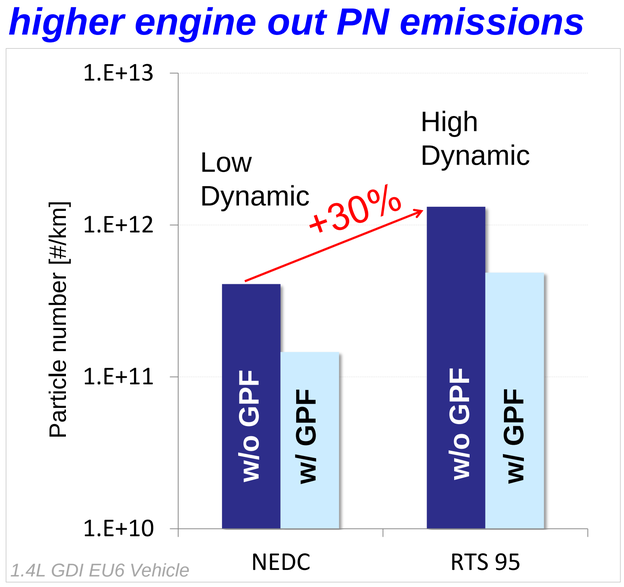


The Challenge

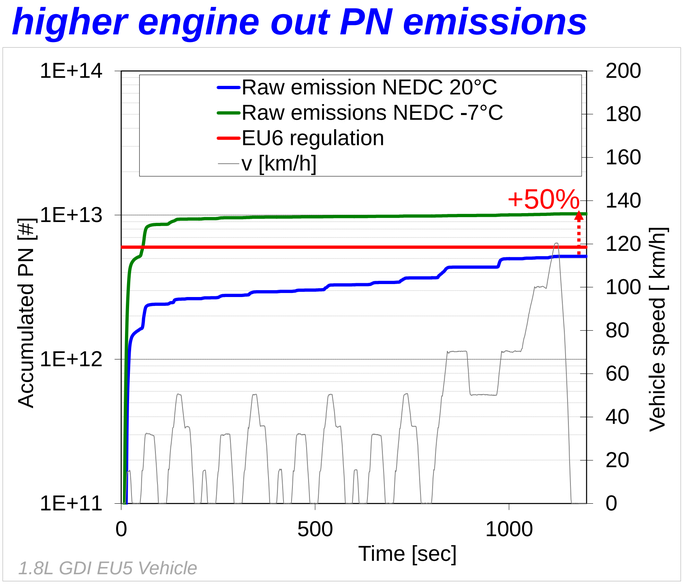
RDE can cause high dynamic/load to the engine



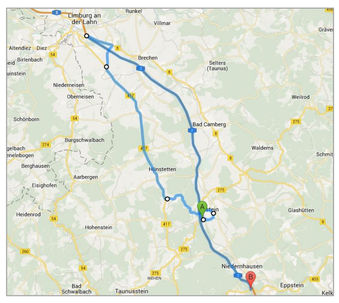
High engine load can cause higher engine out PN emissions

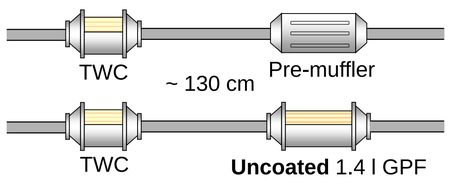


Lower ambient temperature causes higher engine out PN emissions



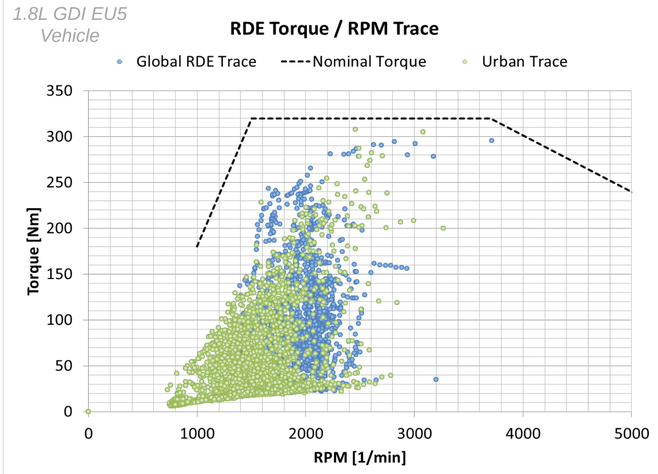
RDE route and system layout



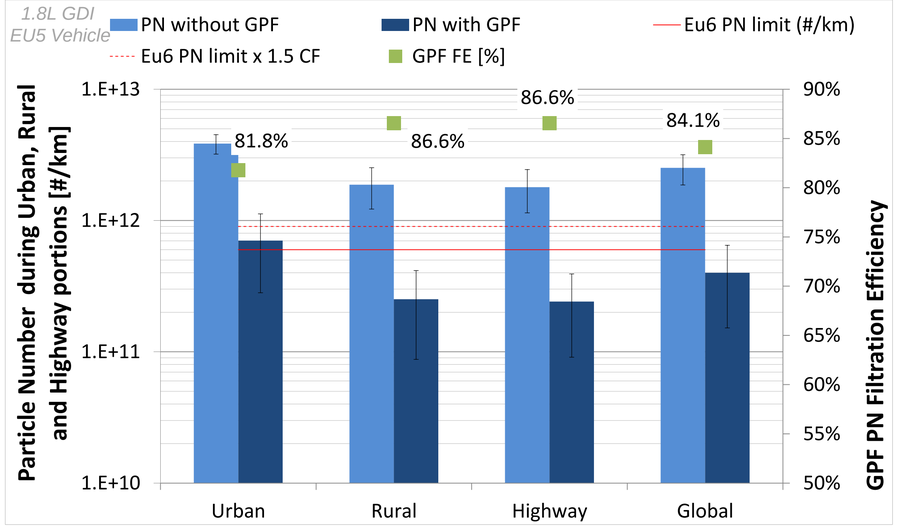


Engine	Euro 5, 1.8L TFSI
Fuel	E5 Gasoline 95 RON
Filter position	Underfloor (UF)
Transmission	Manual
PN PEMS Sensor	Pegasor

RDE engine load points

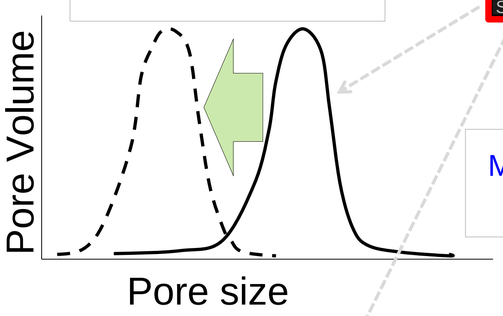


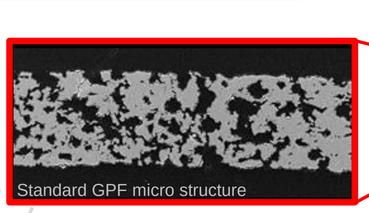
Medium load RDE test results w/o & w/ GPF

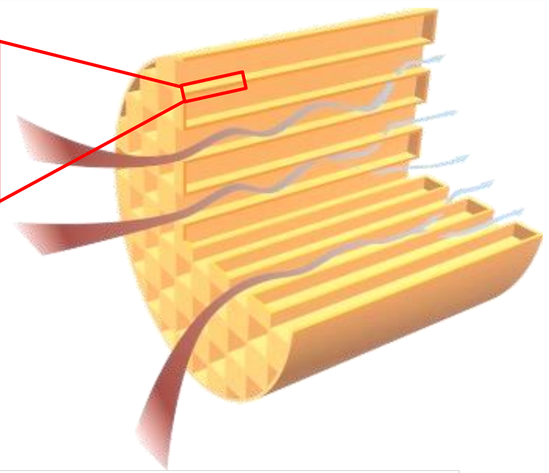


Next generation GPF

Reduce pore size to increase Filtration

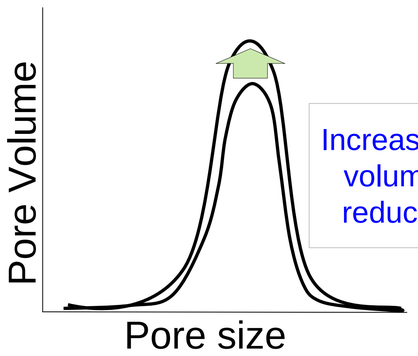




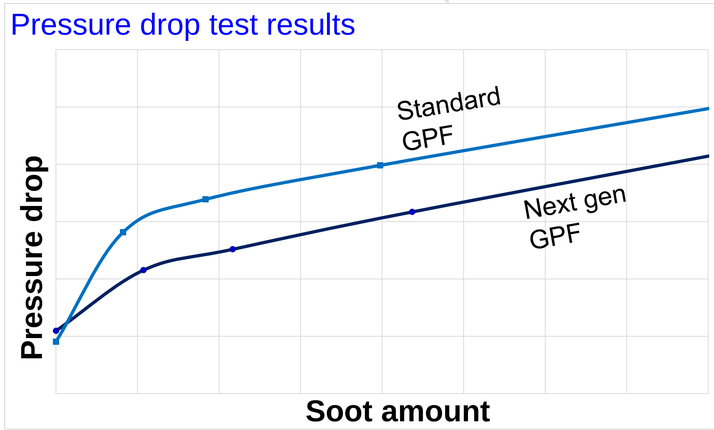


Micro structure Optimization

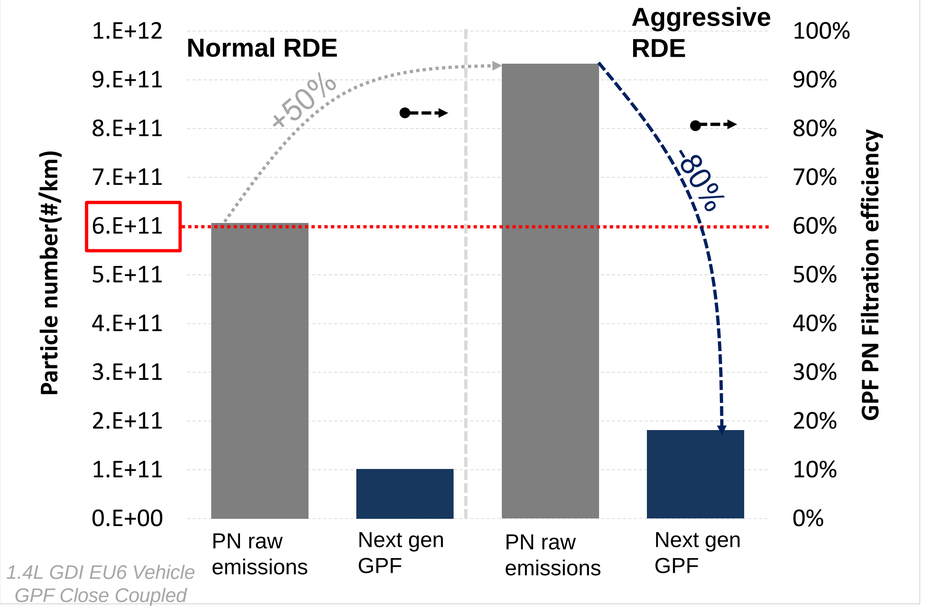
Increase pore volume to reduce dp



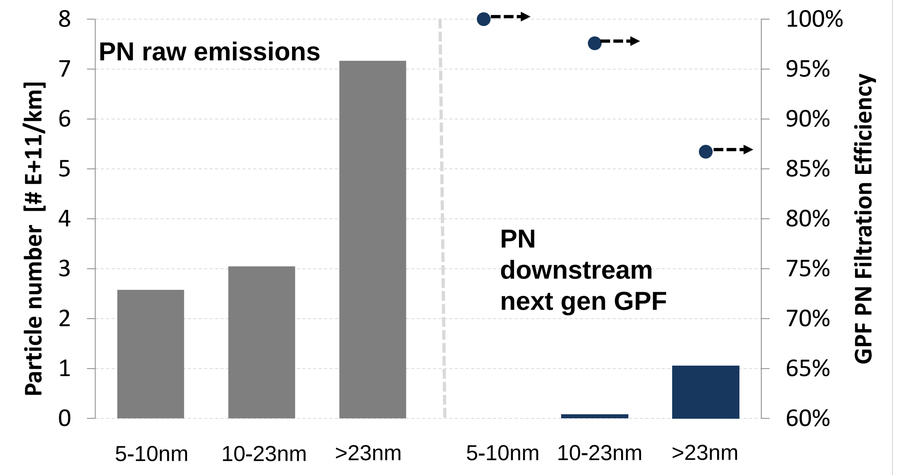
Pressure drop test results



RDE test results



WLTC sub 23nm PN measurements



Conclusions

- ❑ RDE is challenging for gasoline vehicles after-treatment system
- ❑ NGK next gen GPF has high Particle Number Filtration Efficiency even during severe RDE conditions.
- ❑ Sub 23nm Particles are efficiently removed by next gen GPF

GPF: Gasoline Particulate Filter

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