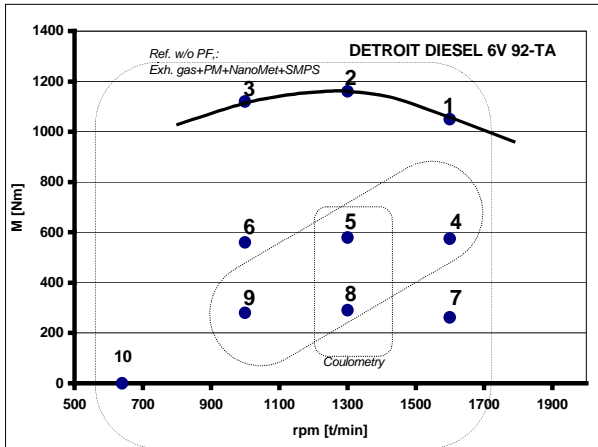
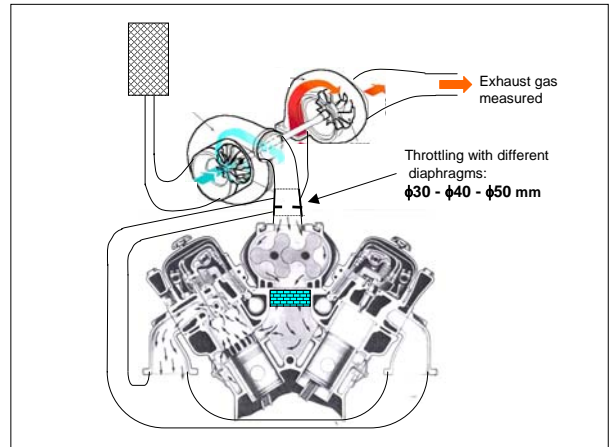


Engine Intake Throttling for Active Regeneration of Diesel Particle Filters / 2 Stroke-Application (2)

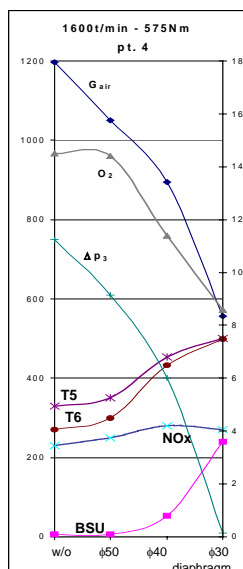
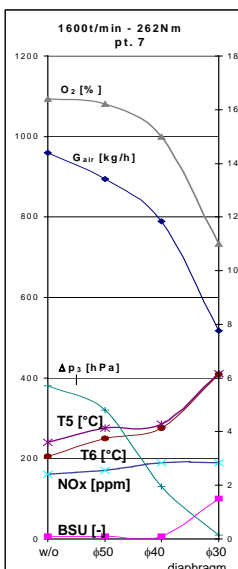
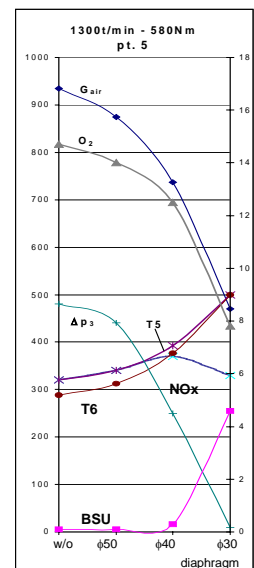
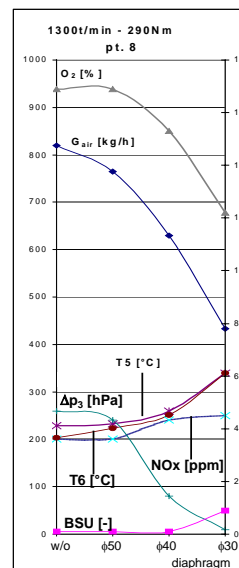
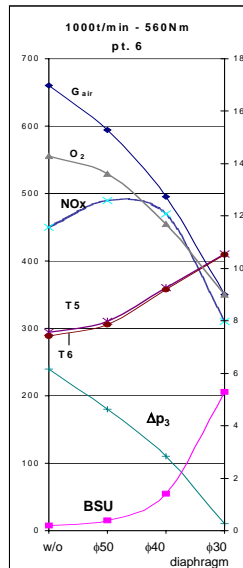
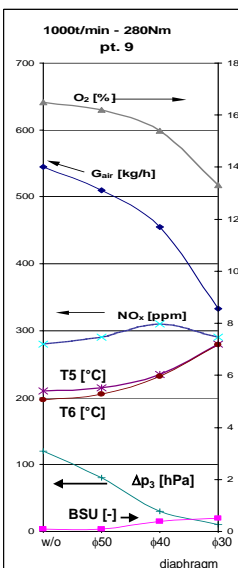
A. Mayer, J. Czerwinski, J.-L. Pétermann, Th. Lutz, Chr. Lämmle, M. Wyser, F. Legerer
 TTM AFHB AFHB ETHZ EMPA BUWAL AKPF



Engine operating points in the measuring program



Detroit Diesel 6V 92 TA – engine with throttling



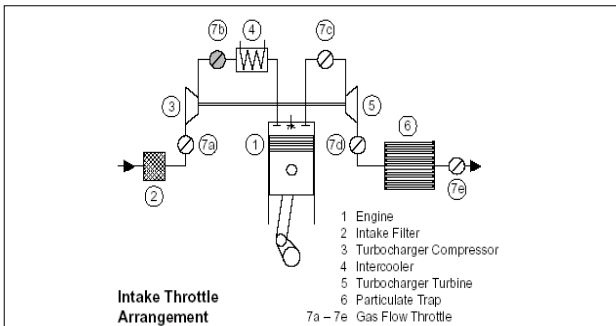
- 2-stroke engines are difficult candidates for trap retrofitting
- 2-stroke engines are more sensitive to back pressure increase
- smoke emission increases when scavenging is reduced
- temperature increase by throttling is therefore limited to 100 - 150 °C
- this temperature increase however will be sufficient in most cases to support active control of additive (FBC-) regeneration or proper functioning of catalytic coatings like CRT and CSF

Throttling with a diaphragm after TC compressor
 DETROIT DIESEL 6V 92-TA

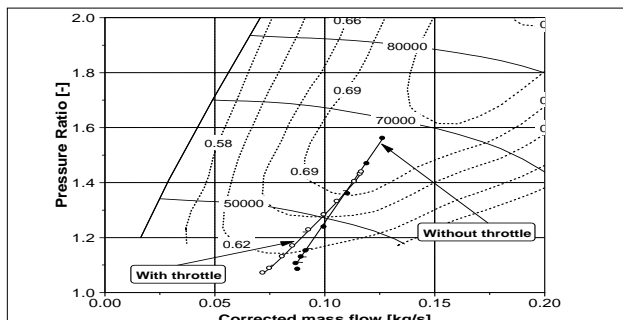
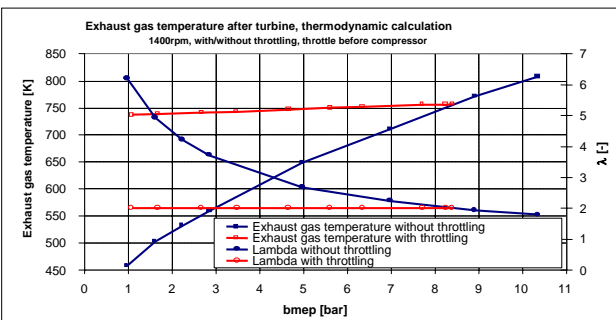
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Engine Intake Throttling for Active Regeneration of Diesel Particle Filters / 4 Stroke-Application (1)

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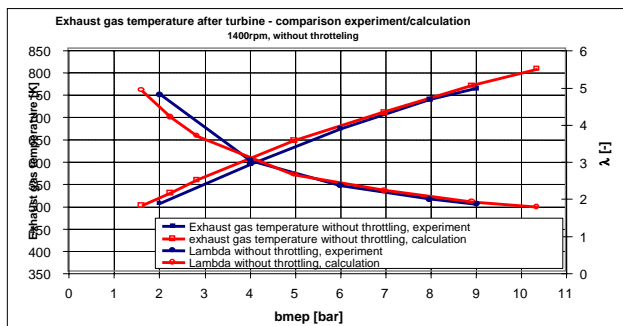
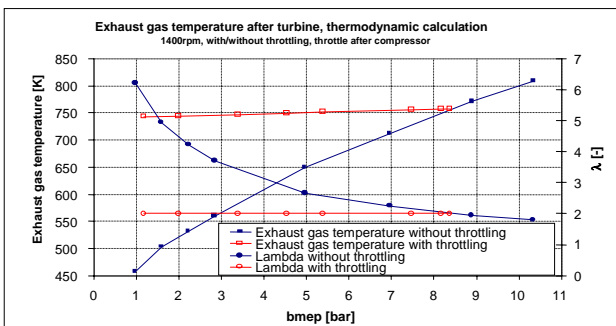


- Reducing Air Flow to minimum Lambda is the easiest way to increase exhaust temperature at part load conditions
- Throttling can be used at any point of the system but throttling downstream of TC-compressor is recommended
- Application is possible for any Diesel technology
 - original equipment as well as retrofits
- Active regeneration of particle trap systems can be realized with little additional effort
- Closed loop regulation of throttle in function of Lambda realizes the dream of a fully automatic retrofit system



Temperatures of exhaust gas with and without throttling for constant air excess before compressor at 1400 rpm (computational model)

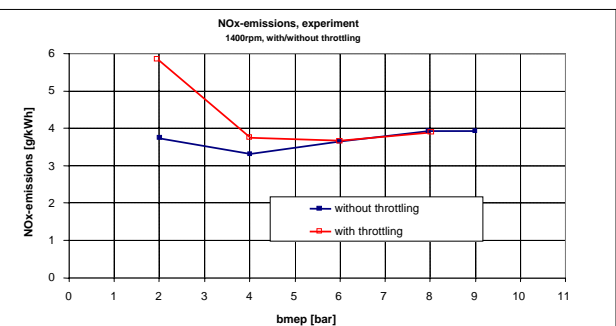
Characteristics of the compressor of the turbocharger with both operating lines, with and without throttling. Turbo RPM (solid line) and compression efficiency (dotted line) are plotted parameters



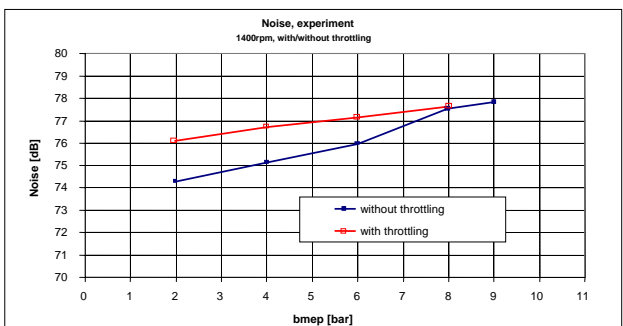
Exhaust gas temperature after turbine of turbocharger, if throttled after compressor (computational model)

Exhaust gas temperature after turbine without throttling; comparison of experiment and computational simulation

- effects of throttling at different positions of the system are comparable
- exhaust gas temperature can be increased by 300 °C (at zero load)
- impact on turbocharger characteristics is negligible
- impact on fuel consumption is high but can be neglected since throttling time is very short (10 minutes per working day)
- impact on emissions like NOx and noise is as predicted
- computer simulations and test data are in perfect agreement



NOx emissions with and without throttling



Noise of combustion with and without throttling

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