

Appendix A. Supplementary material

Table S1. Properties of studied diesel (EN590) and HVO (NEXBTL) fuels from fuel analysis.

		EN590	NEXBTL
Density	kg/m ³	821.5	778.6
Viscosity at 40 °C	mm ² /s		2.831
Cetane number		53	77
Net heat of combustion	MJ/kg	43.206	43.956
Sulphur content	mg/kg	5.8	<1
Water coloumetric	mg/kg	23	17
Carbon	wt-%	85.2	84.5
Hydrogen	wt-%	13.7	15.1
Ash, 775 °C	wt-%	<0.001	<0.001
Monoaromatics	wt-%	17.8	0.2
Diaromatics	wt-%	1.6	<0.1
Tri+-aromatics	wt-%	1.7	<0.1
n-paraffins, C10-C20	wt-%		5.91
n-paraffins, C6-C36	wt-%		6.4
Distillation 5 vol-%	°C	186.9	237.8
Distillation 50 vol-%	°C	235.4	277.4
Distillation 90 vol-%	°C	299.1	289.7
Distillation 95 vol-%	°C	316.1	293.9

Table S2. Analyzers for raw exhaust measurements.

Substance	Manufacturer	Model	Measurement principle
O ₂	Servomex	Xentra 4900	Paramagnetic cell
CO	Servomex	Xentra 4900	NDIR
CO ₂	Servomex	Xentra 4900	NDIR
HC	CAI	300-HFID	FID
NO, NO _x	Eco Physics	CLD 700 EL ht	Chemiluminescence
NO _x sensor	Continental	UNINO _x 6614J	Decomposition of NO _x in high temperature to O ₂ which is measured
Smoke	AVL	415 S	Filter paper method
PM	Pegasor	M-sensor	Particle are charged and electrically detected

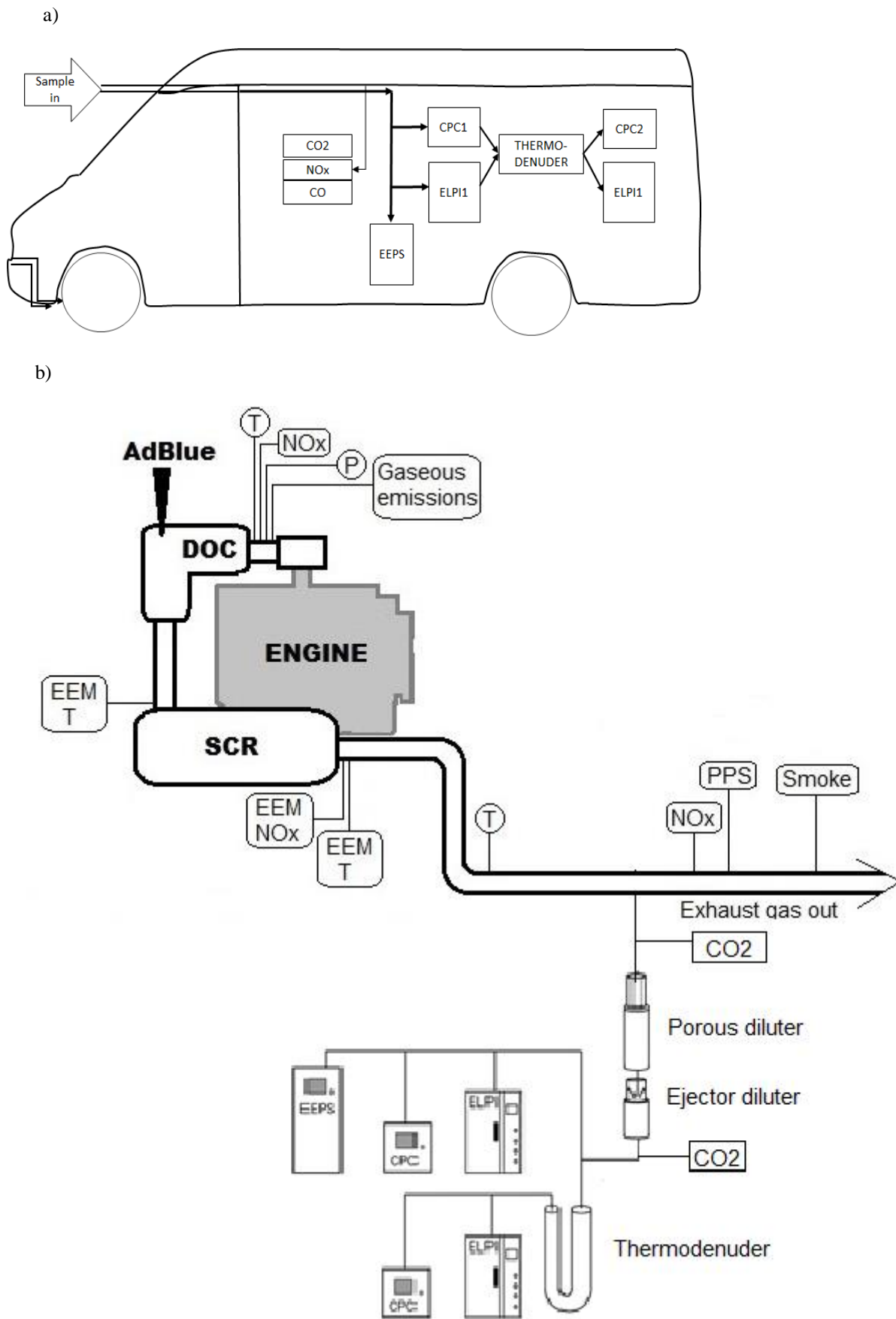


Figure S1. Measurement set up for chasing (a) and for the dynamometer (b).

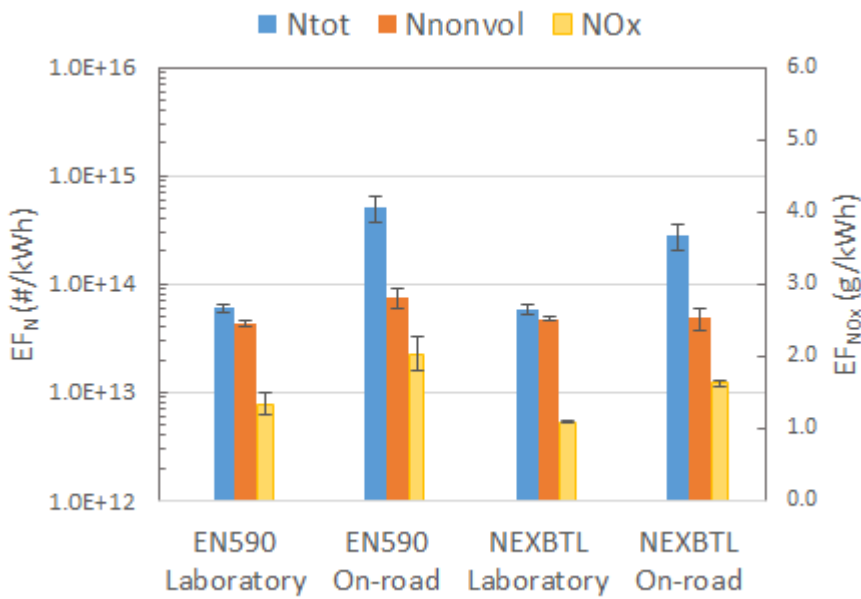


Figure S2. Emissions factors for total particle number, nonvolatile particle number and NOx over the transient cycle under real-world and laboratory conditions excluding turnaround. The engine was fuelled with standard diesel and with NEXBTL hydrotreated vegetable oil.

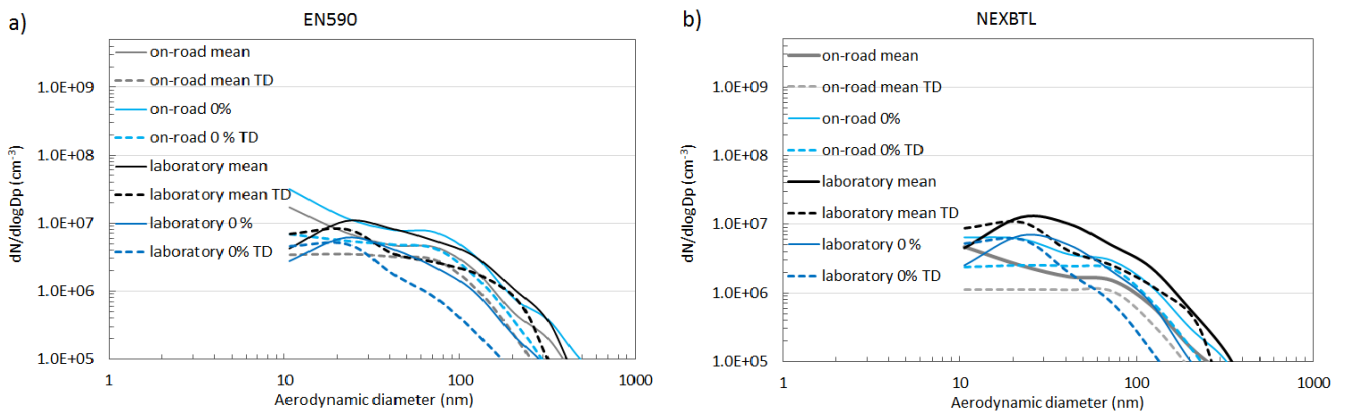


Figure S3. Mean particle number size distributions during transient tests measured with the ELPIs, with and without the thermodenuder (TD). Measurements were made both in real-world and in laboratory conditions.

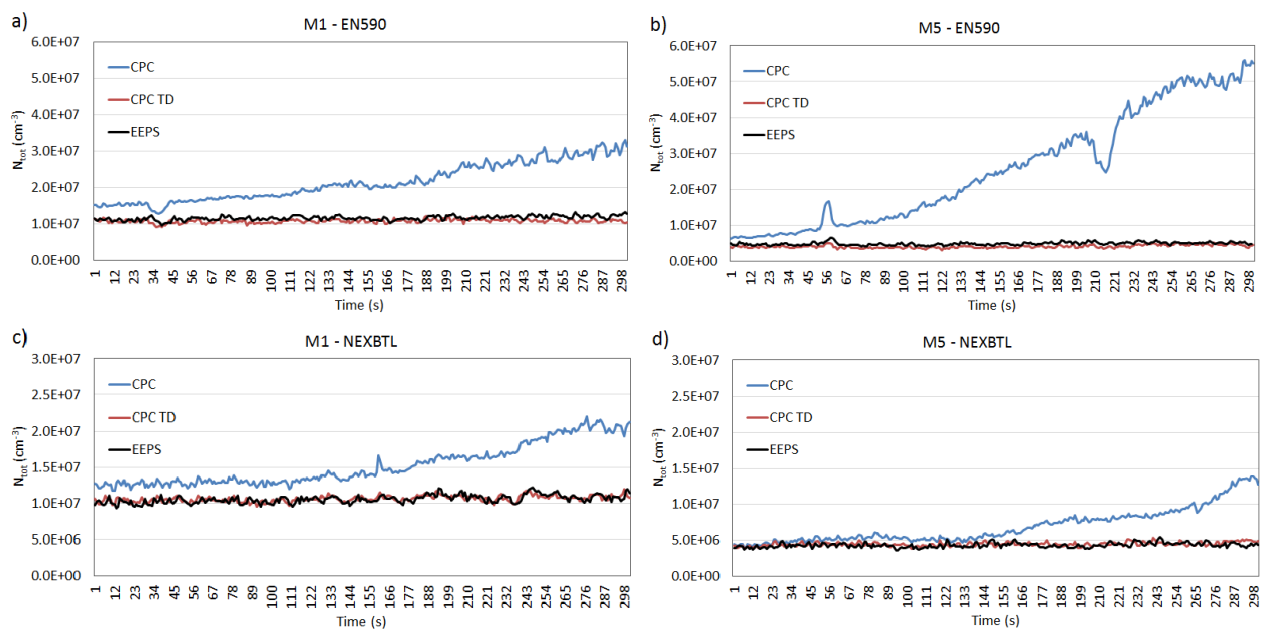


Figure S4. Time series of particle number concentrations at steady modes M1 (2200 rpm, 100% engine load) and M5 (1500 rpm, 100% engine load) for both fuels. Measurements were carried out with the CPC and EEPS before the thermodenuder (TD) and with the other CPC after the TD. Concentrations were calculated to raw exhaust.