

8th ETH Conference on Combustion Generated Nanoparticles

POSTERS (ABSTRACT)

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Influences of Oil, Fuel & Catalyst on particle emissions of a DI 2-Stroke scooter

The growing number of 2-wheelers became ever more urgent question in the last years. Particularly in several cities where the scooters and low-power motorcycles are used for individual transportation, the emissions components of this vehicle group have to be minimized.

Several research works and technical improvements have been performed (Small Engine Technology Conferences 1999-2001-2003) nevertheless further efforts are necessary.

The Laboratory for Exhaust Gas Control of the University of Applied Sciences, Biel-Bienne, CH was mandated by the Swiss EPA (BUWAL) to investigate several topics concerning the emissions of 2-wheelers.

During the last four years the particulate mass- and counts emissions of 2-stroke engines were investigated. These emissions reach the level of diesel engines and cannot be neglected in the context of the present discussions, while the diesel exhaust gases are cleaned by means of the particle filters.

Objective of the present work was to show what is the influence of lube oil, fuels and catalytic activity on the emissions, and especially on the (nano) particulates.

It is important to remark that the results from single vehicles and single measurements cannot be generalized and further research in this domain is necessary.

The investigated scooter was a Peugeot 2-stroke Looxor TSDI. It was measured on the chassis dynamometer with exhaust gas and PM-gravimetry from the CVS dilution-tunnel and with sampling at the tail-pipe for the nanoparticle analysis through the NanoMet minidiluter.

Increased lube oil dosing (injection in crankcase) causes a higher particle mass PM and higher particle counts (SMPS, CPC, DC). The Sulfur content (in ppm) is not the only parameter influencing the droplet formation and condensation processes; there are co-influences of the HC-composition and additive packages of the oil (further research).

Influences of Oil, Fuel & Catalyst on particle emissions of a DI 2-Stroke scooter

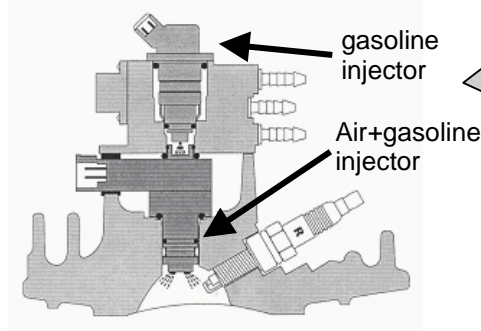
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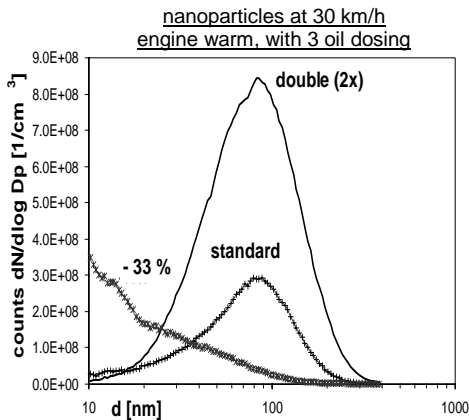
AFHB measurements:

The Scooter Looxor TSDI was measured on the chassis dynamometer with exhaust gas and PM-gravimetry from the CVS dilution-tunnel and with sampling at the tail-pipe for the nanoparticle analysis through the NanoMet minidiluter.

TSDI (Two Stroke Direct Injection)

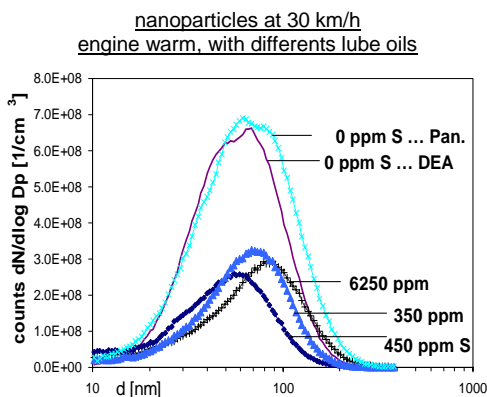
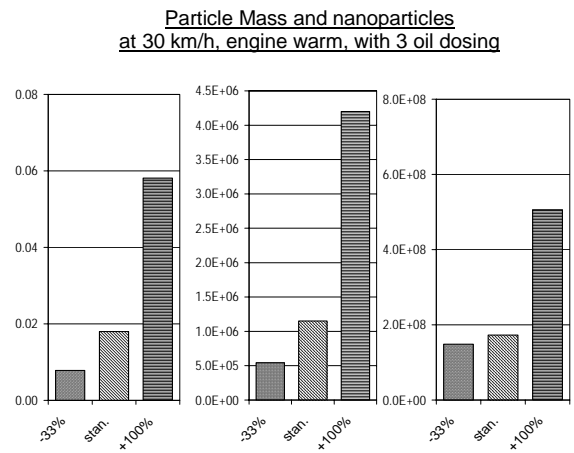


Property	Unit	the different lube oils					DEA
		Original Oil	Panolin TS	Panolin 2-Stroke Synth.	Nycolube	Panolin Synth. Aqua	
Viscosity kin 40°C	mm ² /s		90	103		95	95.6
Viscosity kin 100°C	mm ² /s		11.2	8.2	7.9	6.3	13.5
Density 15°C	kg/m ³		882	925		946	882
Pourpoint	°C		-27	-40		-28	-27
Flamepoint	°C		> 150	> 150		> 150	> 210
Total Base Number TBN	mg KOH/g		3	3		2.5	
Sulfur	ppm	2790	6250	450	350	0	0
Fe	ppm	0	0	5	1	2	0
Mo	ppm	0	1	0	0	0	0
Mg	ppm	26	2	3	2	1	1
Zn	ppm	20	105	18	0	0	0
Ca	ppm	287	617	458	322	11	0
P	ppm	30	90	36	6	16	0



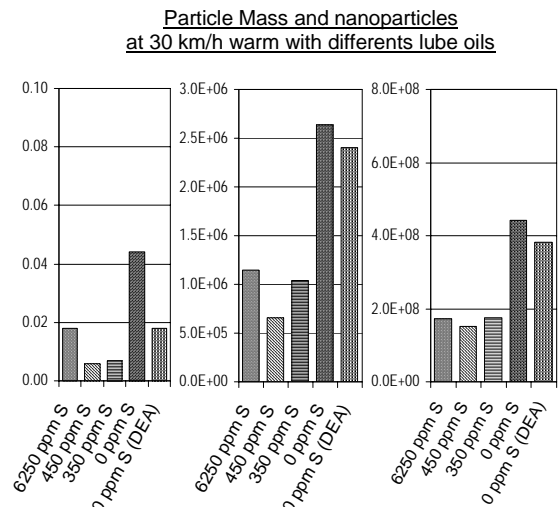
Oil dosing

Increased lube oil dosing (injection in crankcase) causes a **higher particle mass PM** and **higher particle counts (SMPS, CPC, DC)**.



Oil Quality

The Sulfur content (in ppm) is not the only parameter influencing the droplet formation and condensation processes; there are co-influences of the HC-composition and additive packages of the oil (further research).



Reduction of S-content in the lube oil (to approx. 400 ppm) reduces at first the particle emissions, but the further reduction (until S = 0 ppm) increases the particle emissions strongly.