Measurement of particle emission from diesel exhaust using 2nd generation biofuel

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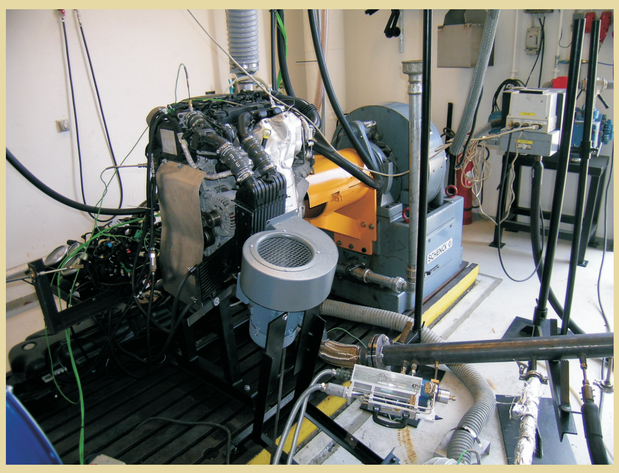
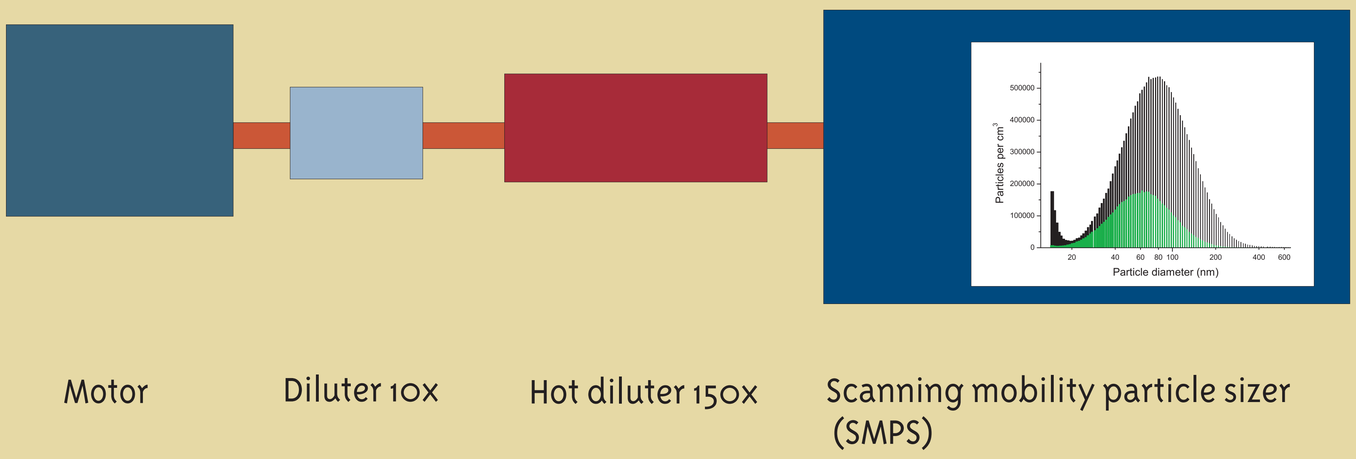
Introduction

Within the last two decades airborne nanoparticles have been subject to a large body of research, which has partly been motivated by the special health and safety issues related to airborne nanoparticles .A significant source of particle emission in urban areas originates from diesel driven vehicles. The impact of different types of fuels on particle emission is a subject of increasing importance ,due to the rising use of biofuels .Current regulation of particle emission from vehicles is based on mass measurements, but inclusion of particle number concentration is expected in European legislation within the near future .However not much data on particle emission from vehicles using 2nd generation biodiesel is current available and calls for further investigations.



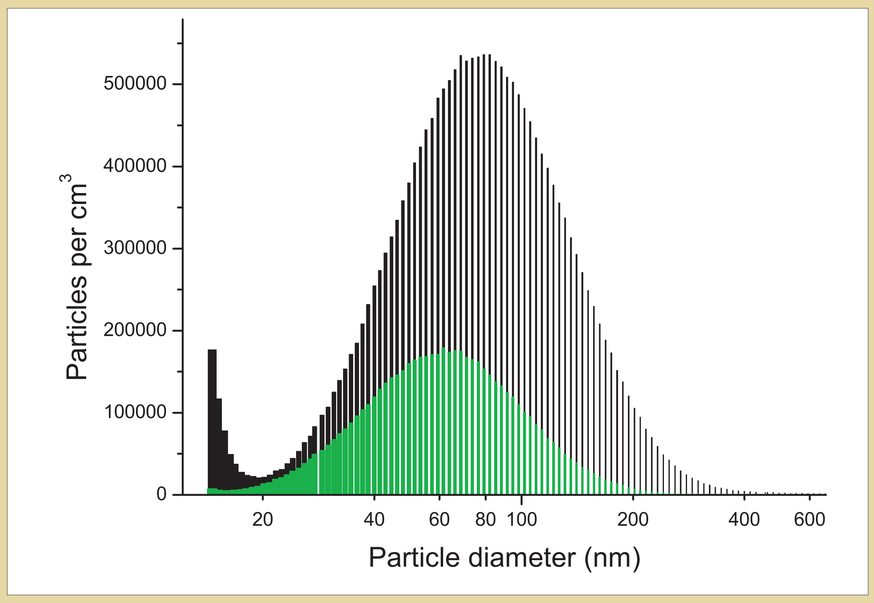
Engine setup for particle emission measurements



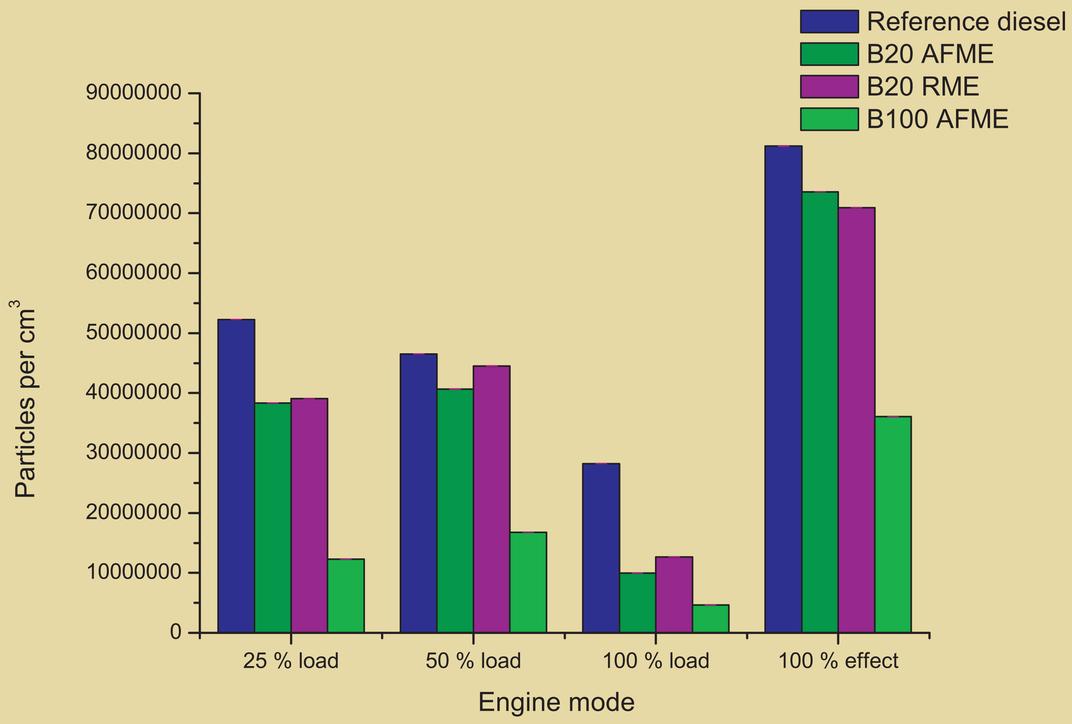
Experimental

This comparative study presents particle emission from a Euro 3 engine using standard petrochemical diesel ,B20 ,or B100 .The 2nd generation biodiesel (B100) used to produce the B20 mix was made from AFME (Animal Fat Methyl Ester), for comparison a B20 mix made form RME (rapeseed oil methyl ester) was included. The engine was operated in 4 different operating modes, which simulate driving conditions of various loads and effect. Specifically were 25 % ,50 % and 100 % loads of max torque and 100 % effect of the engine tested .These specific test conditions were chosen in order to provide a full image of particle emission under normal driving conditions.

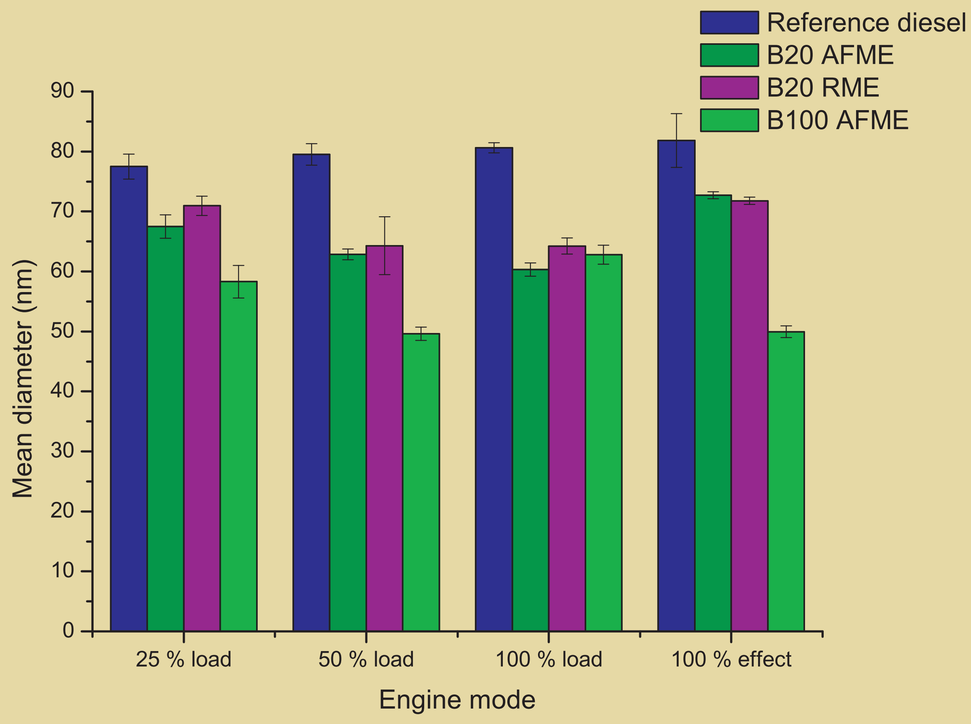
Both particle number concentration and particle size distribution was characterized using a hot dilution system and a scanning particle sizer (SMPS).



Particle concentration as a function of particle diameter. Reference diesel (black) and B100 AFME (green) at 50% load.



Emitted particle concentration for 4 driving modes and 4 types of fuel



Mean particle diameter for 4 driving modes and 4 types of fuel.

Conclusion

The concentration of particles with a diameter between 12-650 nm emitted form a Euro 3 diesel engine was lower using 2nd generation biodiesel made from animal feed stock. This result was found for all 4 driving modes.

Exhaust particles produced using 2nd generation biodiesel as fuel was found to have a lower diameter than particels produed using reference diesel.

Most particels were emitted under driving condition with 100 % effect on the engine, while driving condition of 100 % load emitted less particles than 25 % and 50 % load.

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