Strategies for particle emission control from gas fuelled Heavy-Duty engines: potentiality of filter technology

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The increasingly urgent decarbonisation issue, hand in hand with the upcoming restrictive Euro VII regulations on particulate emission, have reinforced the interest in Natural Gas Heavy-Duty engines for the transport sector and, contemporary, the need of specific technologies for the abatement of such pollutant.

Different approaches have been followed by the authors during the recent years and the potentiality of the investigated technologies has been assessed. Acknowledging in lube oil consumption mechanisms the main cause of particles emissions from gas fuelled engines [1], the improvement of the engine ring-pack design and the optimization of the oil formulation revealed strong tools in such sense [2, 3].

An interesting solution to pursue the more and more challenging emissions targets is represented by the use of dedicated aftertreatment systems, composed by the standard Three-Way Catalyst, for the conversion of gas-phase criteria pollutants in conjunction with Particulate Filters for the abatement of exhaust particles [4, 5].

In the present study, the performance of a cordierite filter was explored through an extensive experimental campaign, running a Natural Gas Heavy Duty engine compliant with the last Euro VI regulation. The filtration efficiency was analysed in terms of particle number, mass and size distribution upstream and downstream the ATS, over the World Harmonized Transient Cycle (WHTCs).

The adopted particulate filter showed very high filtration efficiency (about 98%), evidencing interesting potentiality of such systems and giving the basis for further insights on different aspects highlighted during the experimental campaign. The exploited technology can represent a feasible way for the compliance of future Heavy-Duty engines powered with low or zero-carbon fuels, like biomethane or hydrogen, representing a mid-term solution for the sustainability of the transport sector.

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