

ON THE CHARACTERIZATION OF PARTICULATE MATTER EMISSIONS FROM SOLID BIOMASS COMBUSTION

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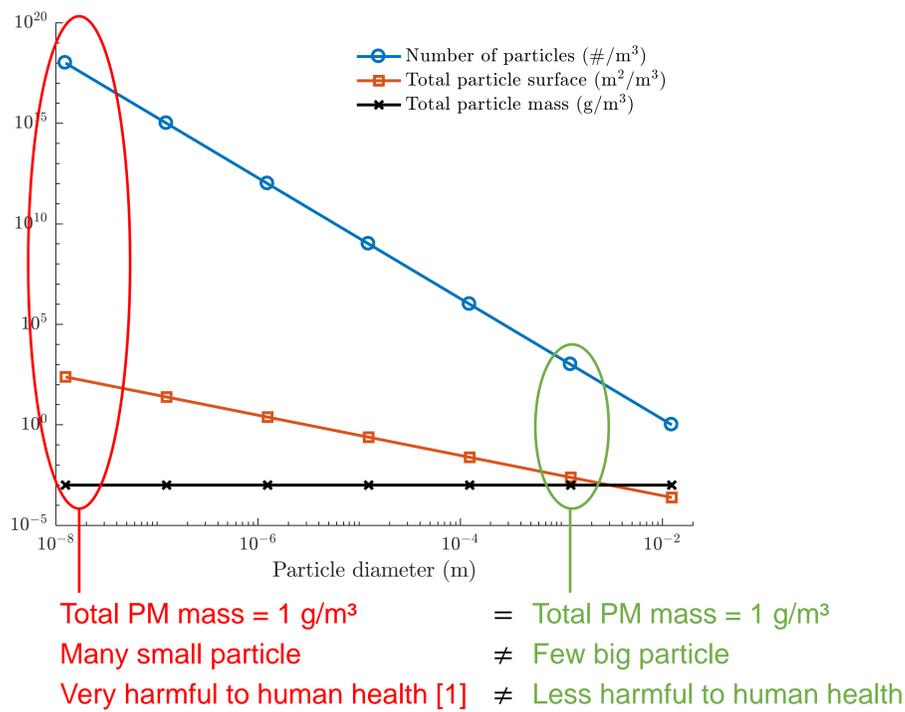
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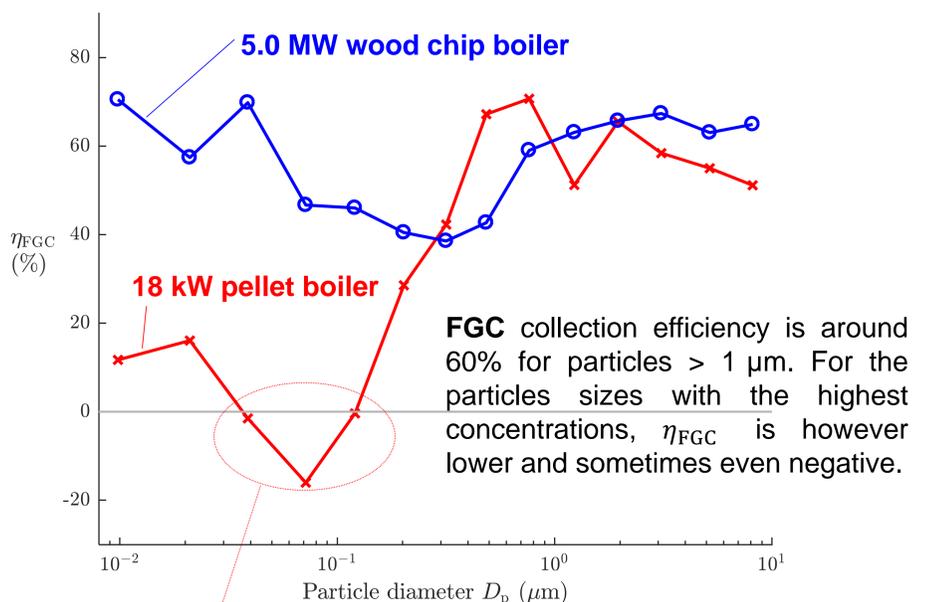
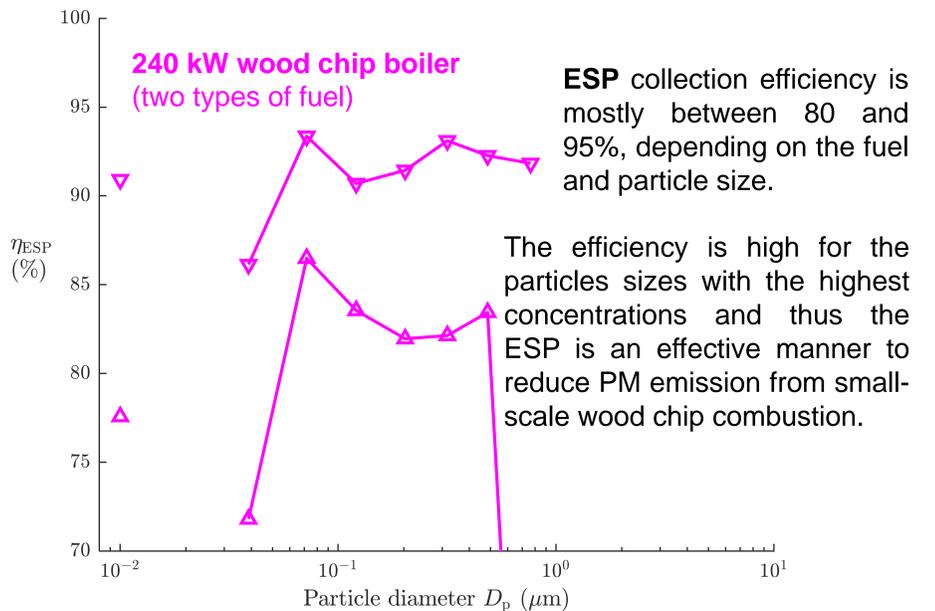
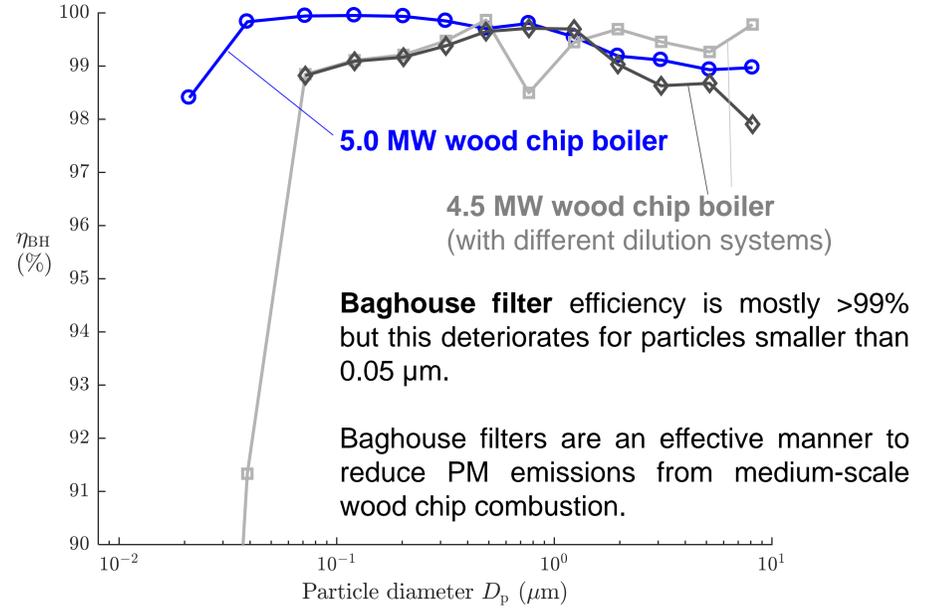
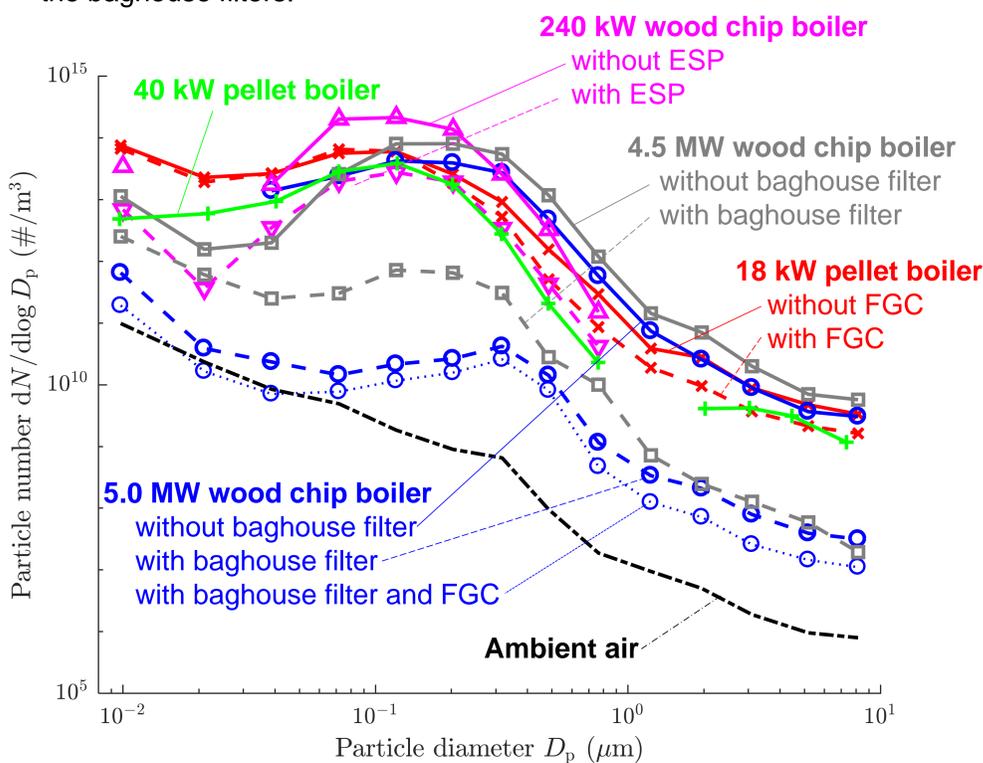
Biomass combustion plays an important role in the transition to a renewable energy landscape, especially for industrial and domestic heat generation. The Particulate Matter (PM) emissions from solid biomass combustion are a major drawback for the further development of this technology.

PM emissions are often expressed in mass per volume of flue gas (g/m^3). However, this gives no information about the size and the number of particles.



PM emissions should be characterized using the particle number and particle size (i.e. particle number size distribution). The particle number size distribution is measured with an Electrical Low Pressure Impactor (ELPI+, Dekati) with a two-stage dilution system. See reference [2] for our detailed description of the used measurement setup.

In the period from 2016 to 2020, we carried out several PM emissions measurements from different pellet and wood chip boilers, both in small- and medium-scale installations. Most boilers were equipped with flue gas cleaning technology, such as **baghouse filters**, **electrostatic precipitators (ESP)** or **flue gas condensers (FGC)**. When no flue gas cleaning is applied, the emission from wood chips are typically higher compared with wood pellets. With flue gas cleaning, PM emissions are considerably lower, especially with the medium-scale boilers due the high capture efficiency of the baghouse filters.



This negative η_{FGC} is due to particle growth mechanisms such as condensation growth and an increased agglomeration rate due to the liquid bridge formed between the particles [3]. This is the subject of our ongoing research. Regardless of the negative η_{FGC} , the overall PM reduction is positive. In addition, the additional thermal output of the condenser ensures even less PM per energy produced.

References

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- [2] Cornette *et al.* (2020) Aerosol and Air Quality Research, 20: 499-519. DOI: [10.4209/aaqr.2019.10.0487](https://doi.org/10.4209/aaqr.2019.10.0487)
- [3] Li *et al.* (2020) Journal of Cleaner Production, 261: 121270. DOI: [10.1016/j.jclepro.2020.121270](https://doi.org/10.1016/j.jclepro.2020.121270)