Experimental investigations of parameters influencing microparticles resuspension in ventilated duct - Application to Indoor Air Quality control

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In the context of Indoor Air Quality management, the Energy Systems and Environmental engineering Department of IMT Atlantique has scientific and technical skills about resuspension of microparticles in ventilated duct in relation with indoor air quality and professional exposure. Indeed, microparticles resuspension can contribute to indoor aerosol concentration (among which PM10) leading to potentialy harmfull long-term (residential, tertiary or public building) or short-term (specific professional) exposition.

Up to now, two PhD thesis have been conducted in the lab on this topic, and another one is under progress, which focus on resuspension induced by airflow accelerations mimicking situations of fan restart after a shutdown period. An experimental methodology, based on a time-resolved approach at local scale, has thus been developed to relate the intantaneous fraction of particles resuspended to the instantaneous properties of the airflow near the duct wall. A dedicated facility was built, mostly consisting in a straight channel, equiped with various measuring instruments to record simultaneously the number of resuspended particles and the airflow properties in the close duct vicinity.

These investigations have therefore provided solid knowledge on the phenomenon and led to international publications in scientific journals and international conferences. They also have made it possible to develop several collaborations with national and international academic partners, to reinforce the experimental aspects, or engage works on models development and validation, and in particular a stochastic Monte Carlo model. These researches also made it possible to raise new questions that could be addressed through the open post-doctorate position.

For example, new factors inducing the resuspension phenomenon could be tackled, such as vibrations, sudden pressure variations or pipe singularities. Moreover, as resuspension concerns a wide range of potential particulate pollutants, the methodology could be complemented by the preparation, generation and characterization of various complex microparticles (surrogate or real inert pollutant, bioaerosols …), and potential blends of microparticles. The influence of air temperature and relative humidity, as well as respective electrostatic charge and roughness of the duct wall surface and particles surface could also be investigated.

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