

## AIR PARTICLE COUNTER FOR POWDER BED FUSION AND POWDER METALLURGY PROCESS

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This presentation shows an air quality sensor that can be used to measure air quality and amount of powder in the area neighbouring with machinery for additive manufacturing and powder metallurgy processes. Health and safety in additive manufacturing is becoming an increasingly important issue as the use of powder-based additive technologies increases. In order to monitor the concentration of metallic and polymer dusts and powder particles, the most commonly used in the Selective Laser Sintering / Melting (SLS/SLM) process, an optical sensor has been developed to measure the concentration of dust in the air.

Investigations of the powder fall rate allowed us to design a system that allows the powder to be drawn in at a speed greater than the fall rate of the expected particle size and to establish the boundary parameters for the CFD simulation knowing the shape of the channel and the fan performance. On the basis of specific material characteristics, parameters of the electronic system processing impulses from the optical barrier were determined. A formula has been worked out on the basis of which it is possible to determine the dust concentration in a given volume depending on the number of particles and the material used. Significant problems in the detector circuit were very large gain, and noise at very low signal levels. The formula used to determine dust concentration in an open area was adapted and implemented in python language, which allows to determine dust zones in a closed room using isolines. Achieved results were used to develop a commercial solution that can operate as a stand-alone device or as a slave device in a ModBus network.

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