

Simulation of dust loading of pleated air filters

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ABSTRACT

The optimal pleat geometry for minimal initial pressure drop of a pleated air filter can be predicted by simulating the air flow through a model pleat. However, this geometry isn't necessarily optimal in regard to the dust capacity of the filter. The particles deposited in the pleat form a dust cake, which poses a resistance to the air flow. The deposition location of the dust depends on the air volume flow distribution in the pleat and the density and size of the particles. This leads to a variation of the dust cake growth rate with position along the pleat.

The dust deposition in a model pleat was simulated for a monodisperse dust, using the discrete phase model of FLUENT. Assuming homogeneous dust cake porosity and permeability, the air flow was recalculated after each iterative step of dust loading.

In this paper, simulated dust-loading characteristics of different pleat shapes will be presented.

BIOGRAPHY, SHORT SKETCH

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Bio

Philipp Hettkamp holds a MSc in physics (University of Bonn, Germany) and is currently working towards a PhD in the gas-particle-systems group at the Karlsruhe Institute of Technology. His research interests lie in dust loading kinetics of air filters. Before this he worked in the field of air cleaning / electrostatic precipitation at KMA Filter in Königswinter, Germany.