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Kolloquium für Mechanik

Referees:	**Prof. Dr.-Ing. Jennifer Niessner** Faculty of Technical Processes, Heilbronn University of Applied Sciences
Date:	Thursday, November 28, 2019
Time:	15:45 h
Location:	Building 10.81, Emil Mosonyi-Hörsaal (HS 62, R 153)
Title:	**Multi-scale modeling and simulation of liquid aerosol transport and two-phase flow in fibrous porous media**

Abstract

Liquid aerosols emerge in production processes where lubricants are used in machining processes. Furthermore, motor oil may droplets may enter the air braking system of trucks and busses which leads to safety issues. Like fine dust, liquid aerosols represent a health risk as small droplets may enter the pulmonary system and cause intoxication, allergies, or lung cancer.
We present a multi-scale approach for modeling, simulating, and finally optimizing filters for liquid aerosols with respect to pressure loss and fractional efficiency. From nano CT scans of current filter materials CAD geometries of the real fibrous media are generated by means of image processing. CFD simulations on the so-called micro-scale characterize both the fractional efficiency of the material and allow for a determination of parameters and constitutive relationships as well as an oil source term for use in the macro-scale simulations. As single droplets and single fibers are resolved on the micro-scale the simulation is restricted to small sections of the filter (cubes with edge lengths in the order of 1 mm). The micro-scale simulations are also used in order to generate the optimum filter material with respect to separation efficiency by means of stochastic generation of virtual fibrous media.
The macro-scale parameters and constitutive relationships enter the CFD simulations on the macro-scale where the whole filter is considered and no droplets and fibers are resolved any more. Instead, averaged parameters are used and the pressure loss across the filter can be determined. On the macro-scale the filter setup is to be optimized (several layers, alternating coarse, fine, oleophilic, and oleophobic layers) in order to reduce pressure loss and thus, energy needs.

Alle Interessenten sind herzlich eingeladen.
Prof. Dr.-Ing. Bettina Frohnapfel