

Numerical Investigation of Filter Cake Buildup with a 3D Model on microscopic Scales

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The primary goal of filter media simulation is to speed up development process and to reduce cost. Furthermore, simulation often provides a unique key for product optimization as it offers additional information that would be very tedious to extract from measurements. In the context of filtration simulations the multi-scale problem of filtration processes presents a major challenge. While the flow at inflow and outflow regions of the filter medium is influenced by the medium shape (pleat etc.) and the filter housing in size ranges of several centimeters, the flow inside the filter medium and filter cake is affected by fibrous and particulate structures in size ranges of a few microns.

Content of this work is the numerical investigation of particle structure buildup on microscopic scale with a 3D model. During the simulation the particle structure configuration is resolved in detail by the computational grid and thus the direct effects of the structure on the flow field and other particles are taken into account. The simulations were evaluated both in terms of the resulting pressure drop and porosity.