CHALLENGING THE MACROSCOPIC POROUS MEDIA BOUNDARY CONDITION OF ANSYS CFD BY DETAILED SIMULATIONS ON FIBROUS STRUCTURES

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Flow simulation of filter elements is becoming an indispensible tool in product development. Current workstations offer the possibility to handle huge mesh sizes, making it possible to model even more details of a design study. Thus, a filter element no longer needs to be modeled just as a single porous block. The geometry of the pleated porous filter medium can be resolved. One interesting topic is how the shape of a pleated filter medium affects filtration performance.

Prior to evaluating various kinds of pleat shape, we did a mesh study for CFD simulation of a single pleat. The Software ANSYS FLUENT13 was applied. It turned out that the transition from the channel flow to the flow inside the porous medium is crucial for the results. Therefore, we did additional simulation on a micron scale of a flow in a channel formed by 3D fibrous structures.

In our presentation we will briefly summarize the mesh study for a single pleat and present results of the micron scale simulations. We will demonstrate and discuss that mesh size of the porous medium plays a very important role for simulation of filter elements.