

Modeling of Flows in Porous Materials under Pressure Difference

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Abstract : This paper is concerned with the numerical study of the flow through porous media. The purpose of this project is to determine the permeability of a medium and its connection to porosity to be able to identify how the permeability of said medium can be altered without changing the porosity. The numerical simulations are performed in 2D flow configurations with the laminar solvers implemented in Workbench - ANSYS Fluent. The direction of flow of the working fluid (water) is axial, from left to right, and in steady-state conditions. The working fluid is water. The 2D geometry is a channel with 300 mm length and 30 mm width, with a different number of circles that are positioned differently, modelling a porous medium. The permeability of a porous medium can be altered without changing the porosity by positioning the circles differently (by missing the same number of circles) in the flow domain, which induces a change in the flow spectrum. The main goal of the paper is to investigate the flow pattern and permeability under controlled perturbations induced by the variation of velocity and porous medium. Numerical solutions provide insight into all flow magnitudes, one of the most important being the WSS distribution on the circles.

Keywords : CFD, porous media, permeability, flow spectrum

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