Dynamics of Porous Cylinders

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Synopsis

Steady flow through and around porous cylinders was modeled in OpenFOAM and studied numerically. Porosity was modeled using the Darcy-Forchheimer equation and implemented in Open-FOAM with the pisoFoam solver. The drag coefficient, wake geometry, velocity and pressure gradients were studied and verified with previously published literature on porous cylinders. Compared to solid cylinders, it was observed that porous cylinders have a lower drag coefficient, longer wake and unlike solid cylinders, the wake penetrates into the cylinder region. Additionally, a solid cylinder with a porous coating was modeled and the results were compared with those of solid and fully porous cylinders.