Transient Simulation of Accumulating Particle Deposition in Pipe Flow  
JAMES HEWETT, MATHIEU SELLIER, Department of Mechanical Engineering, University of Canterbury — Colloidal particles that deposit in pipe systems can lead to fouling which is an expensive problem in both the geothermal and oil & gas industries. We investigate the gradual accumulation of deposited colloids in pipe flow using numerical simulations. An Euler-Lagrangian approach is employed for modelling the fluid and particle phases. Particle transport to the pipe wall is modelled with Brownian motion and turbulent diffusion. A two-way coupling exists between the fouled material and the pipe flow; the local mass flux of depositing particles is affected by the surrounding fluid in the near-wall region. This coupling is modelled by changing the cells from fluid to solid as the deposited particles exceed each local cell volume. A similar method has been used to model fouling in engine exhaust systems (Paz et al., Heat Transfer Eng., 34(8-9):674-682, 2013). We compare our deposition velocities and deposition profiles with an experiment on silica scaling in turbulent pipe flow (Kokhanenko et al., 19th AFMC, 2014).

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