Synopsis

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Numerical Simulations of Fluid Flow in Pipe Presenting Effect of Fluid Viscosity and Flow Coefficient (Cv) calculations

This research migration project aims to simulate the numerical simulations of the fluids flow through the pipe using OpenFOAM. The flow simulation uses the solver, `simpleFoam` to simulate a 2D and 3D pipe flow simulations for three different levels of fluid viscosities such as high viscous (fuel oil), medium viscous (water), and low viscous (alcohol) and compares the results of the simulation against the experimental data analysed in MATLAB and commercial CFD code Fluent from research paper. The project aims to migrate the study carried out by Baru et. al. Furthermore, this research migration project aims for introducing baffle plate with several holes inside same pipe to control flow and by using superheated steam as fluid. In the first part, this study includes steady state flow simulation using `rhoSimpleFoam` to calculate flow coefficient (Cv) and compares it with theoretical calculations for Cv. In the second part, transient analysis using rho`PimpleFoam` presents fluctuations in axial velocity due to flow restriction engendered by baffle plate inside pipe.

References

[1] Bejena, Baru & Prabhu S, Venkatesa & Gundaboina, Saikiran. (2021). Computational Fluid Dynamics Simulation and Analysis of Fluid Flow in Pipe: Effect of Fluid Viscosity. Journal of Computational and Theoretical Nanoscience. 18. 805–810. 10.1166/jctn.2021.9680. 1