Study of Coanda effect for different fluids

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ABSTRACT

The objective of the present project is to study Coanda effect for different viscous fluids in open source CFD package OpenFOAM. Coanda effect for H_2O , D_2O, Cooking oil, Motor oil and high viscous fluid (oil use by train locomotive yards) is studied in gravity driven flow with flowrate inlet boundary condition. This project also explains setting up OpenFOAM case from existing tutorials available in the OpenFOAM repository along with meshing and post-processing methodologies. Geometry and mesh has been generated by using 'blockMesh' and 'snappyHexMesh' utility. Two phase, turbulent flow has been solved by using 'interFoam' solver and k-ω SST turbulent model since, it is predicted to be more accurate by [1]. Addition of friction to the wall of cylinder will be added using nutkRoughWallFunction condition which is a rough wall. Angle of adhesion, angle of deflection in the curved surface of cylinder for different viscous fluids are evaluated and the effect of viscosity on Coanda effect is studied. Obtained results are validated with the analytical results available in the literature. Details regarding geometry and flow has been listed in Table-1.

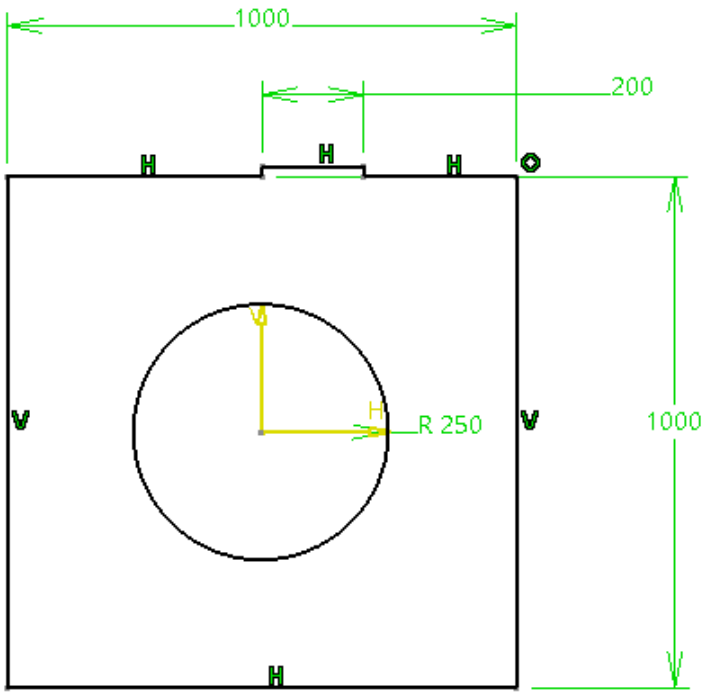

Figure1: Geometry of setup (Dimensions in mm)

Table-1:- Details of geometry and flow conditions

Geometry details	Length of the geometry (L) = 1m
	Height of the geometry (H) = 1m
	Cylinder radius (R) = 0.25m
Fluid Property	Kinematic viscosity of H_2O = 1e-06 m^2/s Kinematic viscosity of D_2O = 1.2e-06 Kinematic viscosity of Cooking Oil = 4.32e-05 Kinematic viscosity of Motor Oil (SAE 30 oil) =4.4e-04 Kinematic viscosity of High viscous fluid (SAE 50 oil) =1.735e-03 Kinematic viscosity of Air = 1.48e-05

Reference:

1. Mathematical Modelling and Numerical Investigations on the Coanda Effect by A.Dumitrache, F. Frunzulica and T.C. Ionescu (http://dx.doi.org/10.5772/50403)