

## NUMERICAL SIMULATION OF LAMINAR AND TURBULENT FLOW THROUGH THE CIRCULAR PIPE

Monalisha

Final-Year B.E. Student

Department of Civil and Environment Engineering

Birla Institute of Technology, Mesra, Ranchi

Email: - [monathealchemist@gmail.com](mailto:monathealchemist@gmail.com)

Date :- 14/03/2020

### **ABSTRACT**

The current project is aimed to present the simulation of two-dimensional laminar flow and turbulent flow through the closed pipe using OpenFoam. The aim is to compare the results of different velocities of turbulent flow with each other and to study the dependence of turbulence factors on velocity profile. The aim is to obtain the fully developed flow in the pipe for both turbulent and laminar flow. I have used icoFoam solver for the laminar flow and pimpleFoam for the turbulent flow. I have used RAS (K-epsilon method) for the simulation of turbulence flow. OpenFoam (version: -07) and paraview have been used for the project.

Keywords: - Laminar, Turbulent, OpenFoam, Fully developed flow, icoFoam, pimpleFoam, entrance length, RAS, k-epsilon

**PROBLEM SETUP:-** The diameter of the pipe is 0.02m. The fluid is water. It is assumed to be incompressible, 2-Dimensional, steady (for laminar) and unsteady (for turbulent). The following 2 tables explain the simulation set up for the problem.

### **Laminar Flow: - Re =2100**

S.No.	Angle at the centre of the sector	Solver used
case 1	4 <sup>0</sup>	icoFoam

Table 01

### **Turbulent Flow: -**

S. No.	Angle at the centre of the sector	Velocity (m/s)	Solver and Turbulence Model
1.	5 <sup>0</sup>	4.01	pimpleFoam, RAS->K-epsilon model
2.	5 <sup>0</sup>	40	pimpleFoam, RAS -> k-epsilon model
3.	5 <sup>0</sup>	391	pimpleFoam, RAS->k-epsilon model

Table 02