Fluid jet impinged into another fluid matrix

Kriti Chaturvedi

Department of Chemical Engineering

Indian Institute of Technology, Bombay

Abstract

This case study demonstrates how a fluid (ink) jet acts when impinged into another fluid matrix. A 3D geometry is made in FreeCAD and meshed using the snappyHexMesh utility of OpenFoam. The flow is considered isothermal, laminar and in the absence of gravity, as a very thin stream is injected and surface tension effects would cancel out the gravity effects. A uniform velocity profile of the injected fluid is considered at the inlet. The study is carried out using OpenFoam (version – 07).

Problem Statement

The geometry consists of a cylindrical pipe (d=0.5m, h=50m) and a cubical tank (300m x 300m x 300m). Ink is injected from the inlet at the top of the cylindrical pipe. The flow is laminar and in the absence of gravity. The fluids are immiscible. The following table demonstrates the fluid properties of the two fluids used.

Solver: interFoam

Surface Tension (Ink/Fluid) – 0.03 N/m

Property	Ink	Fluid
Kinematic Viscosity (m^2/s)	10^{-6}	$4x10^{-6}$
Density (kg/m^3)	1000	1000

Table01

Fig1: Ink jet entering into fluid matrix