

Numerical simulations of water-jet in OpenFOAM

Dr. Raj Kumar Saini

Ph.D, Indian Institute of Technology, Bombay (IIT Bombay)

M.Tech, Indian Institute of Technology, Madras (IIT Madras)

Email : raj.km.saini@gmail.com

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Abstract

This case study demonstrates the simulation of the water-jet. The present case also describes the high impact of water-jet with high velocity on a solid inclined plate. Water-jet is used for many applications on metals, paper, cloth, leather, rubber, plastics, food, and ceramics. Water-jet is coming from a small pipe and hit the plate. The numerical simulations for tracking the free surface are carried out using a volume of fluid (VOF) method. Impacting of a Newtonian water-jet on a solid plate is investigated numerically with mesh refinement. The simulations are performed using OpenFOAM-v6. The simulation results are analyzed for the volume fraction of water, and velocity profiles which are obtained from the simulation.

Problem statement

Solving incompressible, transient flow in a 3D tank (water-jet) as shown in Figure 1. Water-jet hits a solid plate with velocity (v , m/s). Initially, it is full of air and then water is coming to hit the plate which is inclined 45° . The geometrical parameters are shown as: domain ($0.8 \text{ m} \times 0.8 \text{ m} \times 0.8 \text{ m}$); plate (radius= 0.15 m and thickness= 0.02 m). In this case, two phases flow simulation approaches are considered.

- Creating background a 3D mesh by using blockMesh utility;
- Creating a surface file (stl) using SALOME-9.3.0 (plate.stl, domain.stl);
- Mesh generating using snappyHexMesh in to OpenFOAM;
- Set boundary/initial conditions (BC/IC);
- Solver : **interFoam** .

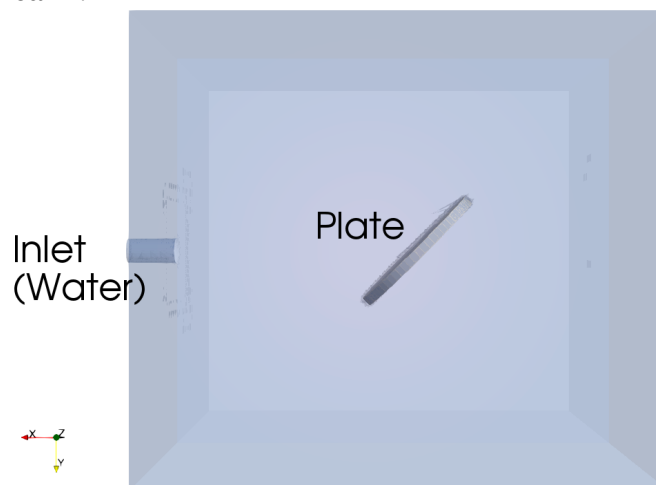


Figure 1: