

Study Of Flow Pattern and Vortices in a backward-stepped flow with two inlets

Abstract-The aim of this study is to examine the flow pattern and behaviour of vortices in a backward-stepped flow with two inlets in order to get a basic understanding about how mixing occurs within a micro scale combustor along with it the best suitable injection position for flame stability. For simplicity and only understanding the flow physics, single fluid is used. Open-source CFD package, **OpenFOAM@-v7** is used and *pimpleFoam* solver is used for the case study. Here for the case study, a channel type geometry(micro-scale combustor) is observed and the secondary inlet is added. The vortices generated are studied by changing the position of the secondary inlet, injection velocity. The second inlet may break the vortex near the step and increase the mixing.

Problem statement

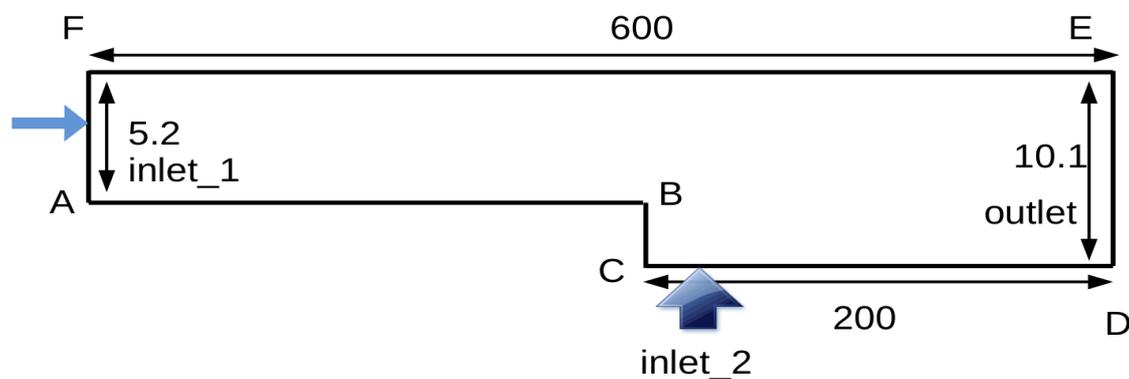


Fig: 1 2D view of backward facing step

This case considers the water flow between two parallel plates. The fluid enters through the inlet_1 with a velocity of 1m/s. In this case, flow through the parallel plates simulation approaches is considered for incompressible, isothermal, and transient flow. First fluid enters through the inlet_1 and an injection port is there at the lower plate. The same type of fluid is injected through the injection port (inlet_2). We want to see the effect of the vortex and the quality of mixing at the step by varying the injection port position and injection velocity.

Fluid property	Value
Kinetic viscosity, fluid(μ),Pa.s	$6.5e^{-6}$
Density of the fluid(ρ),kg/m ³	1000

Table 1: Details of fluids property

Reference :

1. https://www.researchgate.net/publication/232005183_Experimental_and_Theoretical_Investigati_on_of_Backward-Facing_Step_Flow