

Study of Multi-Form Single Chamber Oscillating Water Column in OpenFOAM

Bindusara Reddy
 Bachelor of Technology
 Department of Ocean Engineering
 Indian Institute of Technology, Madras - Chennai, Tamil Nadu , India.

ABSTRACT:

The Case Study presents the implementation of simulation of three different chamber geometries in an Oscillating Water Column using the CFD package OpenFOAM. Oscillating Water Columns are Wave Energy Extractors which utilize the oscillations of the free surface to generate a pressure response in the air trapped between the interface and the chamber. The air is allowed to drive a turbine generator to produce electricity. A single chamber OWC is considered in this present study and the response for four different waves have been evaluated on three different geometries of the chamber for two different width top slot openings. The chamber geometry was defined and the concluding results for the rectangular chamber have been validated with experimental results from an Ocean Engineering journal paper. The geometry and mesh were created in Salome using the corresponding geometry and mesh module. The mesh was constructed using 3d Extrusion algorithm and imported to OpenFOAM using the 'ideasUnvToFoam' utility. Multiphase, Incompressible, laminar wave generation and interaction was solved using the 'interFoam' solver. The results were analyzed in paraview and compared with experimental literature.

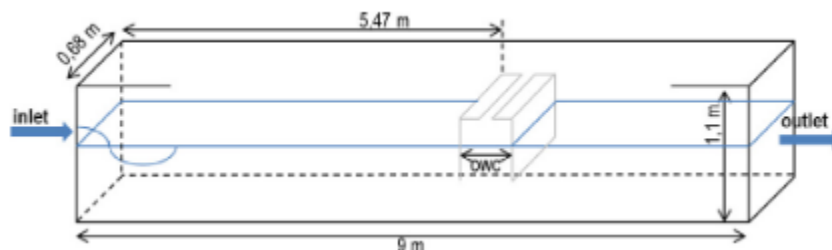


Fig 1. Numerical Setup

Geometry	H (m)	T (s)	Slot 1 (mm)	Slot 2 (mm)
Rectangular	0.08	1.3	50	9
Rectangular	0.08	1.7	50	9
Rectangular	0.08	2.2	50	9
Rectangular	0.08	3.2	50	9
Trapezoid	0.08	1.3	50	9
Inverted Trapezoid	0.08	1.3	50	9