Comparison of power takeoff between Fixed OWC and Backward Bent Duct Buoy OWC

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ABSTRACT

The objective of the present project is to compare the power takeoff between a fixed oscillating water column (OWC) and a backward bent duct buoy (BBDB) OWC using the open-source CFD package OpenFOAM. Oscillating Water Columns are wave energy extractors that utilize the oscillations of the free surface to generate a pressure response in the air trapped between the interface and the chamber. This pressurized air drives a turbine generator to produce electricity. In the BBDB OWC, there is a floatable part called the buoy that floats on the ocean, while in the fixed OWC, there is no such part. For this study, a single-chamber OWC is considered for both fixed and BBDB types, and the response for cnoidal waves of different time periods has been evaluated for these two types of OWC. Both OWCs are considered to be fixed, but their geometries are different. Further studies can be conducted using this project for floating-type BBDB OWC. The geometry and mesh were created in Salome, and the volume of fluid method in the interFoam solver was employed to simulate the water and air interface. Wave generation was achieved using the waveModels module in OpenFOAM. The results were then analyzed in Paraview and compared with experimental literature.

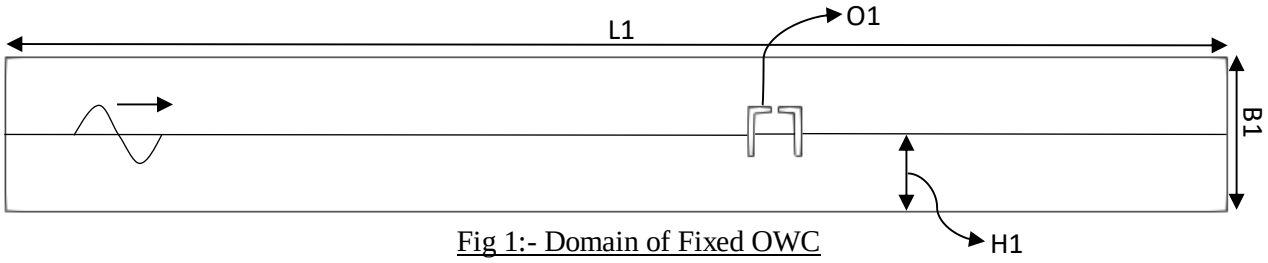

Fig 1:- Domain of Fixed OWC

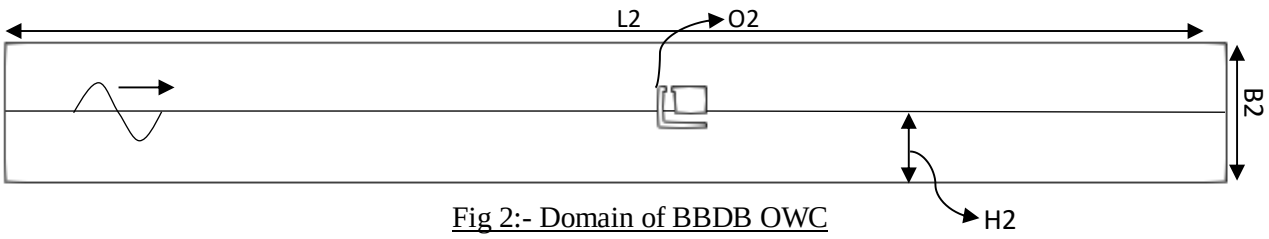

Fig 2:- Domain of BBDB OWC

Fixed OWC		Backward bent duct buoy OWC	
L1	9m	L2	10m
B1	1.1m	B2	1.1m
O1	0.050m, 0.009m	O2	30mm
H1	0.6m	H2	0.62m

Table 1:- Domain Specifications