OSCILLATING WATER COLUMN WITH PROJECTING WALLS

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*Abstract*—Oscillating-water-column (OWC) devices, of fixed structure or floating, are an important class of wave energy devices. A large part of wave energy converter prototypes deployed so far into the sea is of OWC type. Among the numerous wave energy converters (WECs), the oscillating water column (OWC), which runs on the concept of capturing energy from the rise and fall of the water column in a closed chamber resulting from wave motion, has become quite popular. The compressed water column in the chamber advances an air stream that can drive a turbine coupled to electric generators. Many experimental and numerical investigations are performed on the OWC till date. The change in efficiency of OWC with respect to parameters like shape, size, damping etc. are studied. Also, the performance of OWC under different conditions, the concept of multi-resonant OWC and the recent development in OWC research, the concept of integration of OWC with projecting walls, its advantages and disadvantages, are also discussed. The present study aims to investigate the influence of the projecting sidewalls, or so-called harbour walls, of an OWC on its energy-efficiency characteristics. The design and optimization of the harbour wall’s projecting length and its inclination are as important as the hydrodynamics of waves inside the chamber, apart from the characteristics of the air vent and the turbine parameters, which play a critical part in the performance of these devices. Different numerical modelling and study are being carried out on the same. An open source hydrodynamics program REEF3D is used for the modelling of the oscillating water column with projecting walls numerically. The results are compared with published journal papers, designed to run on many processors. High-order spatial and temporal discretization schemes result in accurate and stable numerical behaviour. With a focus on coastal, marine and hydraulic engineering flows, REEF3D solves the governing equations at all relevant scales. Finding the percentage efficiency of such a system when installed in real sea conditions.

*Keywords— Wave energy, Oscillating water column, Projecting sidewalls, Harbour walls, Energy efficiency*