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Influence of sea bed slope on the performance of a shore-fixed oscillating water column wave energy converter¹ PIYUSH MOHAPATRA, TRILOCHAN SAHOO, ANIRBAN BHATTACHARYYA, Indian Institute of Technology Kharagpur — The oscillating water column (OWC) devices have been quite effective in harnessing energy from the ocean waves at prototype scales. A numerical study was carried out to analyze the influence of sea bed slope on the hydrodynamic efficiency of such a device. A computational fluid dynamics (CFD) based numerical wave tank (NWT) was developed using ANSYS-Fluent which uses a multiphase volume of fluid (VOF) method to simulate the ocean waves. The power take-off (PTO) unit of the device is modeled as a porous jump in the flow field to impose the pressure jump versus flow characteristics of the turbine. The sea bed beneath the OWC chamber is varied in accordance with slope height and slope length. The fluid flow parameters inside the chamber and the hydrodynamic efficiency of the chamber are calculated for various sloping bed conditions. The efficiency is plotted against the incident wave frequency and it was observed that the efficiency curve reaches a maximum for a certain incoming wave frequency. It was observed that depending on the sea bed slope not only the value of the peak efficiency varies but also there is a phase shift in the efficiency plot. It was verified that for a few of the slopes there is an improvement in hydrodynamic capture efficiency.

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