Title of Diploma Thesis

Array of Oblate Spheroidal Heaving Wave Energy Converters in front of a Wall

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Academic Year

2019-2020

ABSTRACT

In this diploma thesis, the performance of a linear array of five, semi-immersed, oblate spheroidal heaving Wave Energy Converters (WECs) in front of a bottom-mounted, finite–length, vertical wall under perpendicular to the arrangement regular waves is investigated. The diffraction/radiation problem is solved in the frequency domain by utilizing the conventional Boundary Integral Equation method.

For demonstrating the enhanced absorption ability of this array, results are, initially, compared with those corresponding to arrays of cylindrical and hemisphere-shaped WECs. Next, the effect of critical design parameters on the physical quantities describing the array's performance is investigated. These parameters correspond to the WECs' in-betweendistance, to the array's distance from the wall, and to the wall's length.

The results illustrate that the array's placement at successively larger distances from the wall up to three times the WECs' radius, induces hydrodynamic interactions that improve the array's hydrodynamic behavior and, thus, its power absorption ability. The placement of the WECs to in-between distances equal to four times the radius improves the array's hydrodynamic behavior. On the other hand, the increase of the wall's length does not lead to any significant power absorption improvement. Compared to the isolated array, the presence of the wall affects positively the array's power absorption ability at specific frequency ranges, depending mainly upon the array's distance from the wall.

Finally, characteristic diffracted wave field patterns are presented to interpret physically the occurrence of local minima of the heave exciting forces.

Keywords: Wave energy, Wave energy converters, Arrays, Vertical wall, Oblate spheroids.