Session 18

Wave Energy Converter Hydrodynamic Modelling 3

Room 1, Thursday, 13th September, 11:00-12:40

Chair: Chiang C. Mei, Massachusetts Institute of Technology, USA
Co-Chair: Kai-Uwe Graw, Technische Universität Dresden, Germany

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Experimental validation of the performances of the SEAREV wave energy converter with real time latching control

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Abstract

In this paper, the two campaigns of experiments made on the SEAREV wave energy converter are presented. These campaigns happened in year 2006 in the "Ecole Centrale de Nantes" (ECN) wave tank. Purposes of these campaigns were to verify the numerical models and the efficiency of latching control applied to the SEAREV WEC. The system was tested both in regular waves and in random waves. Comparisons were made between the numerical models and the experiments. A good agreement is found while the wave remains small. When amplitude of the wave becomes larger, non linear effects such as slamming and parametric roll appears. These phenomena limit the motion of the buoy and consequently the energy absorption. It has been shown numerically in previous papers [4] that latching control is an efficient way of improving the global efficiency of the SEAREV. So, latching control was implemented in the model and was tested in the wave tank. In regular waves, we observed that the amplification of the energy production by the control can be up to 10 times the energy production without control. In random waves, we achieved an improvement of the energy production by 50 to 86 %.

Performance of a point absorber heaving with respect to a floating platform

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Abstract

A linear frequency domain model has been developed to simulate the behaviour of a heaving point absorber, moving with respect to a floating reference. A linear external damping coefficient is applied to enable power absorption and a supplementary mass is introduced to allow for tuning the point absorber to the incoming wave conditions. Two motion restrictions are applied to the buoy. The first restriction decreases the occurrence probability of slamming; the second one limits the stroke of the relative motion between the buoy and the platform. The influence of the motion restrictions on power absorption is examined. Optimal values for the external damping and motion control parameters are determined under the given conditions. A sensitivity analysis on these values is conducted to know the effects of less optimal tuning and/or damping on power absorption. The forces associated with these parameters have to be realized by the power take-off and motion control system respectively. The sensitivity analysis allows for assessing the influence on the power extraction of restrictions applied on these forces.