A review of oscillating wave surge converters

Abstract:

In the last decades wave power extraction has become a subject of interest in ocean engineering, due to the high demand for clean energy resources alternative to fossil fuels. A number of different devices have been proposed for an effective solution to extract energy from oceanic waves. Among them, a flap type device hinged at the sea bottom represented by the Oscillating Wave Surge Converter (OWSC) has been studied by our team. The device has one degree of freedom to pitch about the hinge under the action of incoming incident waves. An analytical and a numerical model are applied to study the behaviour of the Oscillating Wave Surge Converter in a channel, under the assumptions of inviscid fluid and irrotational motion. Due to the mirroring effect of the channel lateral walls, the models also describe the behaviour of an infinite array of converters. Both models are successfully validated among themselves and with available experimental data performed at Queen’s University Belfast. Results show that high levels of efficiency are attained, especially when the incident wave frequency is close to the resonant frequencies of the transverse modes of the system. The mathematical model is based on linear theory for perpendicular wave collision. The computational model that our team has developed is able to deal with oblique waves or staggered arrangement of wave farm. These tools have a great potential to study wave impact on oscillating wave surge converters for optimization and design purposes in real sea state. Overall, the mechanisms of wave impact on a bottom hinged flat type wave energy converter are still poorly understood and need further investigations.