A Novel, Robust, Near-shore, Wave Energy Converter for Remote Communities

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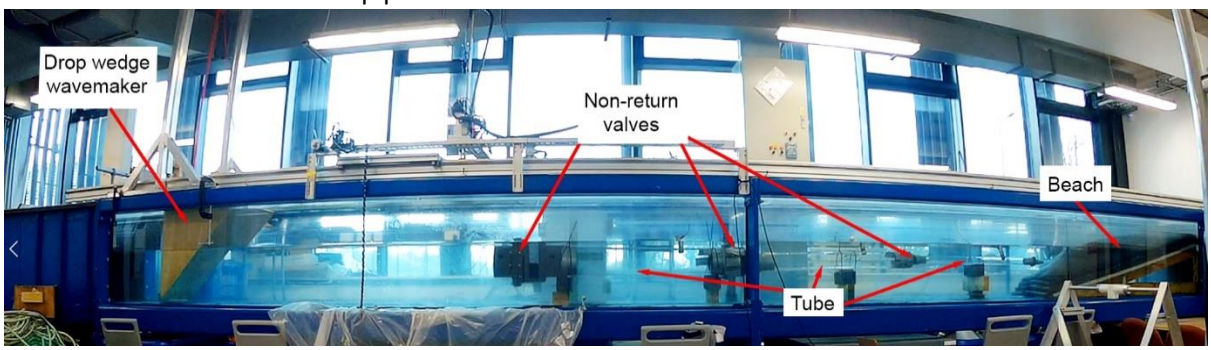
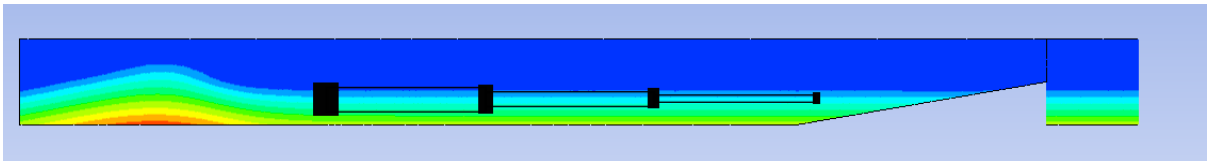
This project tested the feasibility, both experimentally and numerically, of a novel concept for a robust wave energy converter (WEC) operating in the near-shore region. The converter uses a series of non-return valves, constrained by a tapered pipe, where the incoming wave builds up pressure in each compartment and finally drives a turbine onshore with the pressurised water. The device is hoped to be ideal for remote communities to gain energy security and reduce dependence on imports. The device aims to facilitate local engagement, and it is intended that local people are trained to perform most maintenance tasks using low cost, readily available, parts. This work assessed the feasibility of the WEC through physical testing, the results of which were compared to initial numerical models.
Experimental tests of a device were carried out at the University of Exeter. There were challenges obtaining suitable off the shelf parts and compromise was made with readily available components for the non-return valves and pipes.



The experimental set up was replicated numerically in CFD to compare the results and see if the numerical model could be used for future design optimisation.



Considering the accuracy of the pressure sensors, the results compared well. The device captured pressure in each compartment, and this could potentially be used to drive a turbine to create electricity, to pump water or to run a desalination device. The device was fairly low efficiency, however, and due to physical constraints with the sensors and valves did not retain as much pressure as was indicated by the numerical model. There were also concerns regarding marine fouling, as any build up (which is inevitable) would prevent the non-return valves from sealing, further reducing the efficiency of the device. It is also not possible to obtain tuneable non-return valves and tapered pipe as oof the shelf components, which means device costs may increase and maintenance would be more challenging. Unfortunately, it is therefore unlikely that the device would be feasible for real world applications.