

Research Project

OPTIMISING THE POWER TAKE OFF FOR WAVE ENERGY CONVERTERS



Motivation

Wave power technology is an exciting new development in the renewable energy sector. It has been developed since the mid 1970s but with sporadic progress and government funding. However, in the last few years interest in the area has grown as support for renewable energy in the country has increased. Currently many different design concepts exist, which are all competing for investment and support. Some designs have reached full scale testing but all are still at an early stage compared to other renewable industries, as no commercial projects have been completed to date.

Power take off

Whilst various different designs exist, most use the same principal of a hydraulic power take-off unit to transfer the relative motion of two or more bodies to electricity generation. They generally feature a linear hydraulic actuator, which acts as a pump and a hydraulic motor which drives an electrical generator. There are also check valves to rectify the bi-directional flow and accumulators to provide a smoothing effect for the motor.



Design challenge

The main design challenge is to efficiently convert irregular, slow, high force motion into useful unidirectional rotary motion for power production. This includes optimising the power take-off unit for the hourly, weekly and seasonal variations in the sea states, which vary in each device's location. Therefore the design of an overall device controller is an attractable but complex procedure.



Future work

Simulation work is currently ongoing to determine the most efficient power take-off unit design in simple sea conditions. The ideas produced will then be tested on real sea conditions and finally, experimental work is planned to confirm these concepts using a hydraulic power take-off test-rig.

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