Technische Universiteit Delft

Experimental setup of the dry test for a gyroscopic-pendulum wave energy converter

Oceans account for 71% of the earth's surface, marine resources and energy are abundant. Therefore, making full use of marine energy is a good choice for humans to solve the energy crisis. One way to capture ocean energy is converting wave energy to electrical energy, by means of devices called wave energy converters (WECs).

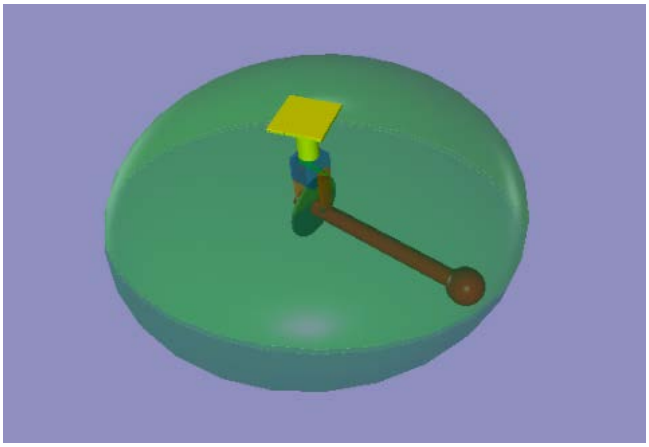
This project introduces a new type of wave energy converter named "Gyroscopic-Pendulum Wave Energy Converter (GP WEC)". Compared to the classical vertical axis pendulum WEC, a flywheel is added in the system. In combination with the floater motions it creates a gyroscopic effect on the pendulum causing it to rotate, a power take-off device is connected directly to the rotating pendulum shaft in order to harvest the wave energy and generate electrical energy.

To investigate whether this new type of WEC will generate more energy than the classical one, this thesis proposes a dry test setup for the gyroscopic pendulum allowing for systematically investigating the gyroscopic effect on its power output.

This thesis starts from the design of the GP WEC dry experiment and then provides the clear definition of all the components of equipment, along with the applicable scaling laws of all the components and parameters. Also, the requirements as to limits of the equipment are studied with a parameter study.

Using the results of the parameter study a numerical model of the GP WEC is used to simulate the dry-tests. Based on these simulations the range and number of parameters that will be tested in the future experiment are confirmed, and test matrices defined. Some interesting observations from the numerical simulations are further studied looking into the time domain response.

This thesis concludes with the definition of a test setup for dry experiments to be executed at TU Delft in a follow-up study, test matrices for investigating the gyroscopic effect on the power output are defined, and simulation results are presented which can be used for later validation of the physical model.



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