

M.Sc. DIPLOMA WORK

CorPower Ocean AB & WavEC

Title: Hydrodynamic investigation of wave power buoys
Time: January 2013 – June 2013
Examiner: Jakob Kутtenkeuler, KTH Naval Architecture
Supervisor: CorPower Ocean
Place: CorPower: Osquars Backe 31 & WavEC Lisbon/Porto

Project Description:

The purpose of the project is to investigate hydrodynamic properties, energy absorption and survivability for two different types of wave energy buoys designed for a novel Wave Energy Converter (WEC) system developed by CorPower Ocean AB (CPO). The WEC combines hydraulic and mechanical elements with advanced simulation and control methods, aiming at maximizing efficiency of energy conversion while minimizing size and weight. The project includes the following steps:

- a. Problem statement, review of tools and methodology for performing the wave buoy investigation
- b. Calculation of hydrodynamic and viscous loss parameters using the panel method (WAMIT) as well as CFD tools.
- c. Use of dynamic simulation model to predict buoy-WEC dynamics and power absorption in collaboration with the Wave Energy Centre, Lisbon.
 - i. Existing time domain model for simulating system dynamics in Matlab includes functions
 1. Wave generation. Regular & irregular wave spectrums
 2. Wave-buoy interaction – Forces, dynamics & energy absorption. Model taking high order non-linear hydrodynamic effects including radiation force into account using a State Space model.
- d. Formulation and test of model code to describe the specific Power-Take-Off (PTO) characteristics of the CPO system. Motion equations including event definitions for engagement/disengagement.
- e. Formulation and test of model code to describe specific control methods of the CPO system.
- f. Preparation of wave tank experiments to verify calculated data with physical measurements on scale 1:30 wave buoys.
- g. Performance of wave tank experiments in Porto.
 - i. Experiments to be performed during March-April 2013.
 - ii. Verification of hydrodynamic parameters such as excitation force, decay tests and viscous losses. Acquisition of force, excursion, velocity and acceleration data during tank tests in representative wave environments.
 - iii. Survivability in extreme waves to be tested using scale 1:50 buoys.
- h. Analysis of results
 - i. Measured data vs calculated hydrodynamic parameters
 - ii. Calibration of dynamic simulation model
 - iii. Creation of power output matrix based on calibrated model.
- i. Conclusions and reporting

For more info contact: Patrik Möller: patrik@corpowersocean.com