

**PERFORMANCE EVALUATION OF A NEW  
WAVE ENERGY CONVERSION SYSTEM  
(WECS) FOR LOW WAVE HEIGHT AT THE  
EAST COAST OF MALAYSIA SHORELINE**

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**MASTER OF SCIENCE  
UNIVERSITI MALAYSIA TERENGGANU**

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**Thesis Submitted in Fulfilment of the Requirement  
for the Degree of Master of Science in the School of  
Ocean Engineering  
Universiti Malaysia Terengganu**

**August 2016**

## **DEDICATION**

I dedicate this Master dissertation to my husband Mohd Hasbullah bin Kadir, my father Mat Daud bin Musa and my mother Ramlah binti Jusoh. I extend the dedication to my siblings, my children Damia Humaira binti Mohd Hasbullah and Muhammad Hanif bin Mohd Hasbullah, relatives, my supervisor, friends and well-wishers for their endless support in each and every of my endeavours.

Abstract of thesis presented to the Senate of Universiti Malaysia Terengganu in fulfilment of the requirement for the degree of Master of Science.

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**Main Supervisor : Associate Professor Mohd Zamri Bin Ibrahim, Ph.D.**

**School : School of Ocean Engineering**

Wave power is form of alternative energy which harnesses the power of the ocean's waves and can be used to generate electricity. The machinery that able to exploit wave power is generally known as a wave energy conversion system (WECS). This WECS was comprised of two joined vessels, mechanical racks, pinion gears, driver pulleys, belts, generator pulleys, electric generators and anchors. When the floaters are experience the oscillatory motion, the vertical oscillatory movements of floaters will move the mechanicals racks, pinions gears and driver pulleys. The driver pulley is connected to generator pulleys via belts and automatically rotate the electric generators which are finally generate electricity. The vessels are provided with piping and ballast tank to adjust the buoyancy of the vessel. The location of the device could be adapted either shoreline or near shore by moving the anchors. Hence, the device can harvest the wave energy regardless of various wave height levels. The average significant wave height during a week experimentation is 1.57 m which is generated 127.51 W of power with the total average rotation speed of generator is 242.75 rpm. The experiment results in Universiti Malaysia Terengganu

shoreline on 1-7/2/2014 clearly show that wave energy can be harnessed into useful work to drive a generator for electricity power generation.

Abstrak tesis yang dikemukakan kepada Senat Universiti Malaysia Terengganu  
sebagai memenuhi keperluan untuk ijazah Sarjana Sains

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**Penyelia Utama : Profesor Madya Mohd Zamri Bin Ibrahim, Ph.D.**

**Pusat Pengajian : Pusat Pengajian Kejuruteraan Kelautan**

Kuasa ombak adalah bentuk tenaga alternatif yang menggunakan kuasa gelombang lautan dan kuasa ini boleh menjadi kegunaan untuk menjana elektrik. Peranti yang dapat mengeksploitasi kuasa ombak adalah dikenali sebagai Sistem Penukaran Tenaga Ombak (*WECS*). *WECS* ini terdiri daripada dua gabungan kapal, rak mekanikal, gear pinan, takal pemandu, tali sawat, takal penjana, penjana elektrik dan sauh. Apabila pelampung mengalami gerakan ayunan, pergerakan pelampung secara ayunan menegak akan menggerakkan rak mekanikal, gear pinan dan takal pemandu. Takal pemandu disambungkan kepada takal penjana melalui tali sawat dan secara automatik memutarakan penjana elektrik yang akhirnya menjana tenaga elektrik. Kapal ini disediakan dengan paip dan tangki pengimbang untuk menyesuaikan keapungan kapal. Lokasi peranti yang boleh diguna pakai sama ada di pesisir pantai atau dekat pantai dengan menggerakkan sauh. Peranti ini boleh menjana tenaga ombak tidak kira pelbagai peringkat ketinggian ombak. Purata ketinggian ombak yang ketara dalam seminggu eksperimen adalah 1.57 m yang menghasilkan 127.51 W kuasa dengan purata jumlah kelajuan putaran penjana adalah 242.75 rpm. Keputusan eksperimen di pesisir pantai Universiti Malaysia Terengganu pada 1-

7/2/2014 jelas menunjukkan bahawa tenaga ombak boleh dimanfaatkan kepada kerja yang berguna bagi memandu generator untuk menjana tenaga elektrik.