UNIVERSITI TEKNOLOGI MARA

DESIGN AND DEVELOPMENT OF AN SMALL-SCALE OCEAN WAVE ENERGY CONVERTER

MUHAMMAD NOR AKHMAR BIN AMLAN @ AMRAN

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ABSTRACT

The wind that blows across the ocean's surface creates waves, which have a vast amount of potential energy. Ocean wave energy, the most plentiful sustainable power source, has a high energy density, which makes it a desirable option for supplying the growing annual need for electricity. But there is still a lot of work to be done to consistently and efficiently harness this energy. The aim of this project is to design, build, and test a cost-effective, long-lasting, and efficient prototype small- scale ocean wave energy converter (WEC). A complete strategy that includes the optimization of power electronics, materials selection, and hydraulic systems will be used to accomplish this. A thorough examination of the prototype's performance will likewise be carried out as part of the project. This evaluation will cover its capacity to transform ocean wave energy into electrical power, its ability to operate in challenging oceanic conditions, and its affordability in comparison to current WEC designs. An dependable and sustainable power source is what this initiative aims to achieve, which will decrease reliance on conventional energy sources and contribute to climate change. Ocean wave energy will eventually be widely adopted as a renewable energy source thanks to the project's results, which will offer insightful information for the creation of more dependable and efficient WEC designs.

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TABLE OF CONTENTS

CHAPTER ONE
INTRODUCTION

1.1 Background of Study

Widespread continuous wave power has long been recognized one of the most attractive renewable energy sources. Ocean wave energy, also known as ocean wave power, is produced by several types of natural phenomena, such as wind, waves, earthquakes, and the sun's and moon's attraction to the earth. The goal is to uses the power of ocean waves to convert into a useful form. These waves, created by wind, can be captured and converted into electricity using various technologies. Besides that, the design for wave energy converter was proposed as early as 1799. Since then, several hundred designs have been considered [1].

However, many nations and areas that are frequently subjected to the oceans both within their borders as well as internationally of them have begun to recognize the way wave energy may assist them to reach their energy needs. Malaysia is the one of the countries that are investing significantly in this research area, optimizing the production from the ocean [2]. Wave energy is related to solar energy where the wind generated by thermal heat reacts with the surface of the sea. The process of turning ocean wave energy into electrical power is still in its infancy and faces many obstacles. The severe marine environment, the high unpredictable nature and variability of wave energy, the low conversion efficiency of the current WECs, and the high costs for building and maintaining are a few of these difficulties. Through the design and development of a small-scale WEC with increased durability, efficiency, and cost effectiveness, this project needs to address these issues.

The ocean is being utilized for expensive, time-consuming, and unpredictable testing of wave energy converters. The numerous drawbacks of the present small- scale WECs in use hinder their general adoption. For example, nearly all of these devices operate by mechanical parts that move, which are subject to wear and corrosion in an oceanic environment. These devices also have relatively low conversion efficiencies