UNIVERSITI TEKNIKAL MALAYSIA MELAKA

EVALUATING ELECTRIC BOAT WITH OUTBOARD ENGINE FOR FISHING VESSEL

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DECLARATION

I declare that this "Evaluating Electric Boat With Outboard Engine For Fishing Vessel" is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature : 

Name : Darrell Esmund ak Ian William

Date : 20 January 2023

APPROVAL

I hereby declare that I have checked this thesis and in my opinion, this thesis is adequate in terms of scope and quality for the award of the Bachelor of Mechanical Engineering Technology with Honours.

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DEDICATION

My heartfelt gratitude and warmest regards for dedicating this effort to my family and friends, especially my devoted parents, Ian William and Angela, who never fail to encourage and support me. I also dedicate this thesis to my family, instructors, and classmates, who generously shared their knowledge and words of guidance with me as I worked on this project. Last but not least, I would like dedicate this thesis to my Supervisor for his effort and knowledge that he gave me.

ABSTRACT

The purpose of the electric outboard engine is to serve as a replacement for the outboard engine that is often used in modern fishing vessels. The primary objectives of this study are to build a solar panel system that is appropriate for outboard engines and investigate the effectiveness of electric engines in terms of both their efficiency by using computer software simulation. The Solar Photovoltaic Array (PV), which is the primary source of power for the solar panel system, plays an essential part in the operation of the electric engine. For the solar panel system to function properly, the solar charge controller, solar inverter, and battery banks are also necessary components. Additionally, solar cells, solar inverters, and solar charge controllers are required. The two-stroke and four-stroke engines are the two types of outboard motors that may be purchased nowadays.There are several sub-categories of fishing boats, each of which is designed to fulfil a specific need in the fishing industry. Some examples are the commercial fishing vessel, the artisanal fishing vessel, and the recreational fishing vessel. It is essential to make an informed choice about the solar panel system that will be used in order to generate an engine that is more power-efficient and uses less electricity. Since monocrystalline solar cells are considered to be made of pure silicon, they have been shown to be the most effective kind of solar cell. Because of its great capacity for charging and discharging, a lithium-ion battery is an excellent choice for use in a system that also contains solar panels. When compared to the PWM solar charge controller, the MPPT solar charge controller has been shown to be much more efficient in converting the DC to AC for the solar panel. There are measurements that is needed to evaluate the effectiveness as well as the amount of electricity that the solar panel system uses and to produce a low cost solar panel system. The energy balance, PV energy and battery energy are determined to find the efficiency of the boat and also the required solar panel cell and batteries to produce the most efficient solar panel system. In order to gather data and also evaluate the data that has been obtained, which is necessary in order to determine the effectiveness of the solar panel system, the use of MATLAB software is also required.

ABSTRAK

Tujuan enjin sangkut elektrik adalah untuk berfungsi sebagai pengganti kepada enjin sangkut yang sering digunakan dalam kapal nelayan moden. Objektif utama kajian ini adalah untuk membina sistem panel solar yang sesuai untuk enjin sangkut dan menyiasat keberkesanan enjin elektrik dari segi kedua-dua kecekapannya dengan menggunakan simulasi perisian komputer. Tatasusunan Fotovolta Suria (PV), yang merupakan sumber utama kuasa untuk sistem panel solar, memainkan peranan penting dalam pengendalian enjin elektrik. Untuk sistem panel solar berfungsi dengan baik, pengawal cas suria, penyongsang suria, dan bank bateri juga merupakan komponen yang diperlukan. Selain itu, sel suria, penyongsang suria dan pengawal cas suria diperlukan. Enjin dua lejang dan empat lejang adalah dua jenis motor sangkut yang boleh dibeli pada masa kini. Terdapat beberapa subkategori bot nelayan, yang setiap satunya direka untuk memenuhi keperluan khusus dalam industri perikanan. Beberapa contoh ialah kapal nelayan komersial, kapal nelayan artisanal, dan kapal nelayan rekreasi. Adalah penting untuk membuat pilihan termaklum tentang sistem panel solar yang akan digunakan untuk menjana enjin yang lebih cekap kuasa dan menggunakan kurang elektrik. Oleh kerana sel solar monohablur dianggap diperbuat daripada silikon tulen, ia telah ditunjukkan sebagai jenis sel suria yang paling berkesan. Oleh kerana kapasitinya yang hebat untuk mengecas dan menyahcas, bateri litium-ion ialah pilihan terbaik untuk digunakan dalam sistem yang turut mengandungi panel solar. Jika dibandingkan dengan pengawal cas solar PWM, pengawal cas solar MPPT telah terbukti lebih cekap dalam menukar DC kepada AC untuk panel solar. Terdapat ukuran yang diperlukan untuk menilai keberkesanan serta jumlah tenaga elektrik yang digunakan oleh sistem panel solar dan untuk menghasilkan sistem panel solar kos rendah. Imbangan tenaga, tenaga PV dan tenaga bateri ditentukan untuk mencari kecekapan bot dan juga sel dan bateri panel solar yang diperlukan untuk menghasilkan sistem panel solar yang paling cekap. Bagi mengumpul data dan juga menilai data yang telah diperolehi yang perlu bagi menentukan keberkesanan sistem panel solar, penggunaan perisian MATLAB juga diperlukan.

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In the name of God

First and foremost, I'd want to express my gratitude to my Supervisor, IR Mazlan Bin Ahmad Mansor for guiding me through these thesis writing. He gave me great guidance and supported me during difficult times. His enthusiasm and assistance made a significant contribution to the project's success.

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LIST OF SYMBOLS AND ABBREVIATIONS

v	-	Voltage
%	-	Percentage
Wh/kg	-	Watt-hour Per Kilogram
KW	-	Kilo-Watt
km/hr	-	Kilometres per hour
Hp	-	Horsepower
kWh	-	Kilowatt hour
kW	-	Kilowatt
hr	-	Hour

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CHAPTER 1

INTRODUCTION

1.1 Background

Prior to the standardization that occurred in the 1950s, fishing vessel designs varied depending on the region. Traditional vessels were constructed of wood; however, as a result of their higher costs of maintenance and shorter lifespans, they had become outdated. Today, alternative materials that are safer and more durable are used in the production of fishing vessels. During that time period, boats were never used for anything other than hunting and fishing. After developing these fundamental watercrafts, the Egyptians went on to build the first multi-oarsman long and thin vessels about 4000 B.C. and carried out other advancements to achieve vessels that were far faster, significantly larger, and perfect for travelling over great distances. Simultaneously, some other countries began creating innovative fishing and commercial boats. Eventually, fishing vessel was finally built operated on steam and had steel hulls. Their subsequent evolution culminates in today's stern trawlers and technologically aided commercial fishing vessels. Development continues to coexist with technological innovation.

A boat or ship that is used for the purpose of fishing in an aquatic environment, such as a lake, river, or sea, is referred to as a fishing vessel. There is a wide range of vessel types used for fishing, including those used for commercial, artisanal, and recreational purposes. Fish and other types of seafood are often harvested aboard commercial fishing vessels for the purpose of financial gain. Meanwhile, artisanal fishing vessel are a small-

scale fishing boat that is normally owned by individuals. Recreational fishing vessel are used for fun and amusement. Fishing boats are critical to marine activities. They provide a critical requirement in the fisheries industry for harmonizing demand and supply, so much so that their absence would bring a very basic but equally important activity to a halt.

Gustave Trouvé created the first known outboard motor, a modest 5 kilograms electric device that was patented in May 1880. Later, American Motors Co. may have developed roughly 25 petrol-powered outboards in 1896, but neither of these two pioneering attempts appears to have had any influence. Ole Evinrude, a Norwegian-American inventor, invented the most successful early outboard motor in 1909. Evinrude produced hundreds of outboards between 1909 and 1912, and the three-horsepower models were marketed all over the world. His Evinrude Outboard Co. was sold to other investors, and he moved on to success with the ELTO firm, which produced a two-cylinder engine - ELTO stood for Evinrude Light Twin Outboard. The 1920s saw the birth of the outboard motor, with Evinrude, Johnson, ELTO, Atwater Lockwood, and dozens of other manufacturers in the sector. Two-stroke powerheads with carburetors have historically been the majority of outboards because of their inherent simplicity, reliability, low cost, and light weight. The disadvantages include increased pollution and louder noise due to the high volume of unburned gasoline and oil in their exhaust.

1.2 Problem Statement

Nowadays, electric transportation is important due to the increasing in fuel prices. In recent years, the pricing of fuels on international markets have been increasingly unstable. Between the end of 2003 and the middle of 2008, the nominal price of foreign fuel increased by more than four times, with the bulk of this increase occurring in 2007 and the first half of 2008. Many countries have been hesitant to completely absorb global pricing increases.

Higher fuel prices have increased the cost of travel for boaters in various countries. Most fisherman will feel the burden of the impact of rising fuel prices. They have to spend more during out in the sea which could cost more than the profit that they will get from fishing.

The increasing desire for urbanization, particularly in undeveloped and emerging nations, has led in a rising worry of the extinction of fossil fuels. This loss not only has a significant negative impact on the country's economy, but it also has a significant negative impact on the fossil fuel industry. In today's world, people's ability to move from one place to another is entirely dependent on the use of fossil fuel. There should be a solution to the depletion of fossil fuels, and that answer should be to search for alternative and renewable sources of energy. This would not only avoid further depletion of fossil fuels, but it would also cut down on the pollution that is now occurring throughout the globe.

1.3 Research Objective

The objective of this project is to:

1. To design a solar panel system for an outboard engine that is used in fishing vessel by using computer simulation software that is efficient and suitable in meeting the design requirements.

2. To analyze the efficiency of an electric outboard engine for fishing vessel by using computer simulation software.

1.4 Scope of Research

The scope of this study is an expansion of the parameter that should be the primary focus of investigation and attention. As a result, the following are the objectives of the work:

1. Investigating and analyzing the parameters on an electric outboard engine and the impact on the efficiency and power consumption of outboard engine.

2. Create and design a suitable solar panel system that can be used to power up an outboard engine for a fishing vessel.

3. Evaluating the efficiency and power consumption of a solar electric boat by using the MATLAB software.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

To fully convert the outboard engine to electric, a solar photovoltaic array is needed and few others important component such as the photovoltaic cell, suitable batteries and also solar cell charge. In this chapter, it will explain each of the important components for the solar panel system which will be used for further research of the final year project.

2.2 Solar Photovoltaic (PV) Array

Because of their clean and renewable nature, renewable energies will become a major substitute for fossil fuels in the next years. Solar photovoltaic (PV) arrays are one of the most significant and quickly growing technologies for the generation of renewable energy. They have a broad variety of potential uses in the years to come (F.Sarhaddi, et al, 2010). A photovoltaic (PV) cell, sometimes referred to as a solar cell, is an electrochemical device that generates electricity by directly converting sunlight into electron flow. Some photovoltaic cells are able to generate electricity from man-made sources of light. The particles of solar energy known as photons are what make up visible light. These photons exhibit a wide range of energy levels that are in direct correlation with the various wavelengths that make up the solar spectrum. Semiconductor material is used during the construction of a PV cell. When photons reach a PV cell, the semiconductor material has the potential to reflect them, let them to flow through, or absorb them entirely. Only photons that are absorbed retain enough of their original energy to produce electricity. When the semiconductor material absorbs enough sunlight (solar energy), electrons are displaced from

the atoms. The front surface of the cell is more receptive to dislodged, or free, electrons that naturally move to the cell's surface due to special treatment of the material surface during fabrication. The Figure 2.1 shows the process flow of a Photovoltaic Cell.

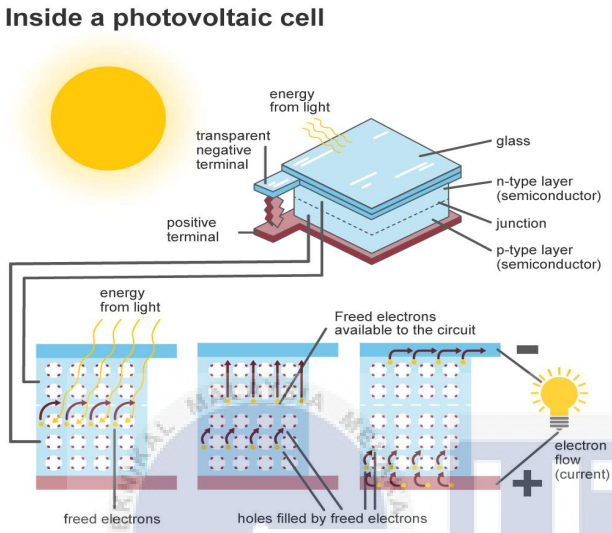

Figure 2. 1 Process Flow of Photovoltaic Cell (U.S. Energy Information Administration)

In the years to come, renewable energy will be a significant alternative to fossil fuels due to the fact that they are both environmentally friendly and endlessly replenishable. Solar photovoltaic (PV) arrays are one of the most significant and quickly expanding technologies for producing renewable energy. These arrays have the potential to be used in a broad variety of contexts in the years to come. With shinning sunlight strikes solar cells, it will energize the electron and convert them into electric current.

A photovoltaic array, often known as a PV array, is a semiconductor device that transforms the kinetic energy of light into usable electrical current. The energy payback time (EPBT) of a PV system may vary anywhere from 10 to 15 years, depending on the performance and insulation of the system. The energy payback period can be lowered if the performance of a PV array can be improved. As a result, determining a PV array's