UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF SOLAR POWERED WATER SENSOR TO MONITOR WATER QUALITY FOR FISH FARM

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor Degree of Engineering Technology (Industrial Power) (Hons.)

By

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UNIVERSITI TEKNIKAL MALAYSIA MELAKA

BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

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I hereby, declared this report entitled "Development Of Solar Powered Water Sensor To Monitor Water Quality For Fish Farm" is the results of my own research except as cited in references.

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APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Electrical Engineering Technology (Industrial Power) with Honours. The member of the supervisory is as follow:

……

PUAN EMY ZAIRAH BINTI AHMAD

(Project Supervisor)

ABSTRAK

Seperti yang kita tahu projek ini dilakukan dengan melakukan simulasi dan reka bentuk dalam skala kecil untuk tangki ikan. Sistem teknologi hijau adalah tujuan utama untuk projek ini yang direka untuk menjadi bebas dari sistem grid kuasa utama. Komponen utama sistem terdiri daripada panel solar, pam air automatik dan juga sensor suhu. Panel solar digunakan untuk membekalkan tenaga elektrik untuk sistem untuk mikropengawal dan membaca data yang diberikan daripada sensor untuk mengawal pergerakan pam air. Untuk mengelakkan sebarang kerosakan kepada bateri solar pengawal caj dihubungkan dengan panel solar. Tenaga yang disimpan dalam bateri akan dibekalkan kepada sistem untuk mengawal dan memberi kuasa pada pam air. Jika suhu air di dalam sistem melebihi suhu optimum pam air akan diaktifkan. Hasil terakhir akan menunjukkan sistem ini akan dikendalikan dengan sempurna dan menjadikannya bebas daripada sistem grid kuasa utama yang dengan menggunakan panel solar.

ABSTRACT

As we know this project are done by doing the simulation and design in a small scale for fish tank. The green technology system is the main purpose for this project which is designed to be independent from main power grid. The main component for the system consist of solar panel, automatic water pump and also temperature sensor. Solar panel is use to provide electrical energy for the system which is microcontroller read the data given from the sensor to control the water pump movement. To prevent any damage to the batteries solar charge controller are connected to the solar panel. The energy that store in the batteries will supplied to the system to control and powered the water pump. If the temperature of the water in the system exceeds for the optimum temperature the water pump will activated. The last result will show this system will operated perfectly and making it independent from the main power grid system which by using the solar panel.

DEDICATION

To my beloved parents, supervisor and friends

ACKNOWLEDGEMENT

First of all I would like to express my thanks to Puan Emy Zairah Binti Ahmad, a lecturer at Engineering Technology Faculty UTeM to be my supervisor along this semester and also for the next semester.

Deepest thanks also to all lecturer and staffs at Engineering Technology Faculty for their cooperation to guide me and also to share the information and suggestion to completing for this Final Year Project 1.

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CHAPTER 1

INTRODUCTION

1.1 Introduction of the Project

Generally, in a world there are many types of fish which salt water fish and also fresh water fish. For some fish temperature is the most sensitive part for it growth this is because to growth it must get the optimum temperature. Tilapia fish is the best example toward the sensitive of the temperature. The best optimum temperature for this fish to growth are between 27°C to 30°C. This is because to ensure the survival of the fish the optimum temperature are required. (Temprasit et al. 2015) The process of the fish growth will follow the specification needed when the optimum temperature are achieved in the range given.

The main proposes for this project are by using the solar powered water sensor. Generally this system are connected to the automatic water pump which control by the microcontroller based on the temperature system. The design of the system is the green technology system which are independent from the main power grid. To prevent any damage for the batteries solar charge controller are connected to the solar panel. It will powered the water pump and also microcontroller by using energy that stored in the batteries.

1.2 Problem Statement

Aquaculture plays a very important role in Malaysia as it is one of the main sector contributed to the economic growth. However, problem that normally faced is the bad water quality of water.

Majority of fish farms are located in remote regions hence diesel generator is used to provide power demand. Therefore solar powered system is the most feasible.

Normally, now days most of the water pump does not display the temperature of the fish tank or pond. It will make the fish breeder difficult to know what is the current temperature for fish tank. If the temperature of the tank are not in the optimum temperature it will affect the growth the of the fish. Hence water temperature sensor are added to the water pump to regulate the water temperature for the fish tank.

For the most decades to be a dependable method and cost effective are proven for aquaculture system by using the photovoltaic.(USDA NCRS 2010) Generally the water must work efficiently by changing the water into it, through and out of the pond to maintain the optimum temperature of the pond

1.3 Project Scope

The usage of the photovoltaic technology system in aquaculture are the main scope for this project. Briefly, the aspect is highlighted into the proposed the method to solve the problem, analysis the problems, suggested the solution from the expected result and testing result by collecting all the data. Moreover to assembles of the component and design the construction of the prototype the hardware and software are implement for this project.

1.4 Objective of the project

Aquaculture plays a very important role in Malaysia as it is one of the main sector contributed to the economic growth. However, problem normally faced is the quality of water is inferior and insufficient to meet the demand.

Majority of fish farms are located in remote regions so most of power demand is provided by diesel generator. Therefore solar powered system is the most feasible. The objectives for this project are:

a) To develop a water sensor powered by solar.
b) To control the water temperature of the fish tank by using microcontroller.
c) To analyse the performance of the system.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction of Literature Review

In this chapter it tell about previous study from other author or journals about the system. Besides that, it also included market surveys, the background of the project and method in doing this project. It also review the past work that similar that already done by others.

Nowadays, as we know to generate the electrical energy the main sources is the non-renewable sources such as coal and petroleum (Ioakeimidis et al. 2013).This electrical energy will produced and directly supplied by the power grid line to the consumer.

This project are the solution to improve for providing energy to the fish tank. As we know to regulate the system manually and proper control the usage of manpower needed and if the system suddenly breakdown it will take time to maintain it and will affect the condition of the fish.

In this project, main purpose is providing electrical energy to fish tank are by using solar power, the energy that produce can maintain and regulate the water temperature by using the microcontroller and water pump.

2.2 Project operation

The important part to control the water temperature is by using the PIC16F877A and it will read all the data from the temperature sensor. If the temperature of the water are suddenly drops or rises the water temperature sensor will read and transfer to the microcontroller to give the signal to the water pump, the water pump will automatically pump the water from the reservoir tank to replace the water in the tank. This prototype will develop in a small scale for demonstration purpose by using small box container that similar like fish tank.

2.3 Project Component that used

The main part to design this project are implement hardware and software form. To build the prototype for this project that have several step and sometimes it also requires trial an error method. This is because sometimes the hardware that build are not fit with the system.

2.3.1 Type of Photovoltaic (PV) Modules

2.3.1.1 Polycrystalline

Polycrystalline panel are made up from the silicon off cuts, mounded to form a blocks. From the process it creates a cell made up of several bits of pure crystal. The appearances also difference which is for this type has a random crystal arrangement and the panel look a little blue cause of reflect some of the light. The size, price and performances a very similar to mono-crystal type. For the performances, the both type is less efficient caused of the method that produce them and performs slightly better than mono-crystalline in low light conditions. Polycrystalline is easy susceptible to shading like a mono-crystalline type.

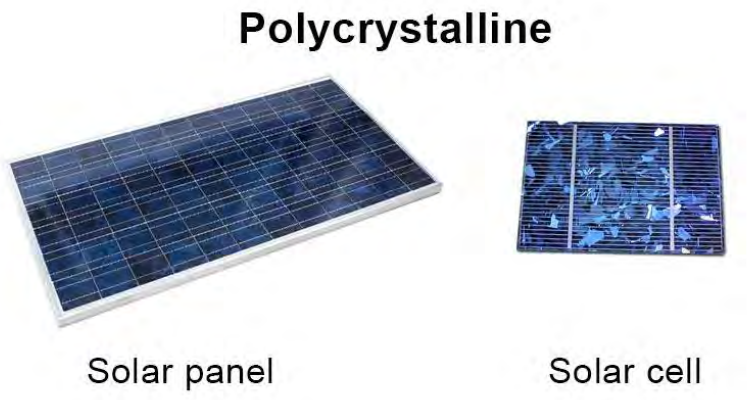

Figure 2.1: Polycrystalline panel and cell

2.3.1.2 Mono crystalline

The solar cells in mono-crystalline panels are slices cut from pure drawn crystalline silicon bars. As PV panel made of single crystal silicon cell manufacturing process they are one of the most complex and expensive. The entire cell is aligned in one direction, which means when the sun is shining brightly on them at the correct angle, they are extremely efficient. This PV are able to convert the highest amount of solar energy into electricity of any type of flat solar panel.

This type have a uniform blacker colour because they are absorbing most of the light. PV panel from Mono crystalline type endure a reduction in output once the temperature from the sunlight reaches around 50°C or 15°F and the losses of efficiency is lower than PV panel made from polycrystalline cells.

Figure 2.2: Monocrystalline panel and cell

2.3.1.3 Thin Film

Thin film are totally different technology to Mono and Poly crystalline panels. This type can be identified as having solid black appearances. These types are made by depositing photovoltaic substances. The example of the most common photovoltaic substances used are; Amorphous Silicon, Cadmium Telluride (CdTe), Copper Indium Gallium Selenide (CGIS) and Dye-Sensitized Solar Cell (DSC).

The thin film offers reliability, long life, and high efficiency. The efficiency of thin film is does affected by shadow like other type of solar panel or modules. It's also very suitable to dull and diffuse conditions. These types take up a lot of space than other type but the price is generally cheaper.

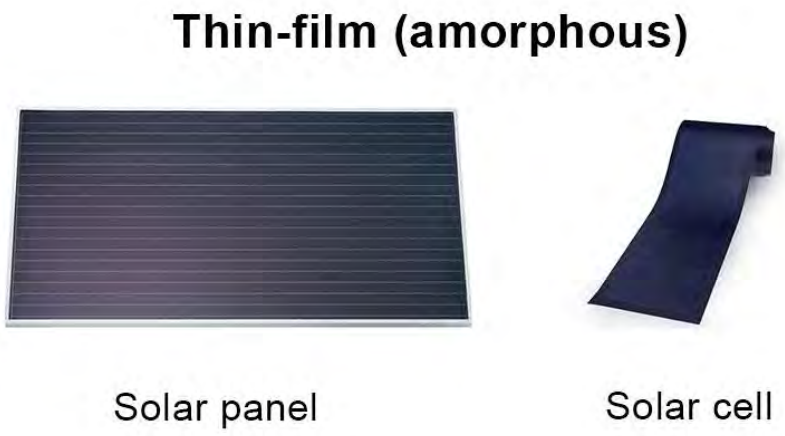

Figure 2.3: Thin-film panel and cell

2.3.2 Solar Charger Controller

The solar charge controller is regulate the voltage and current coming from the solar array going to the battery and in particular to protect the battery from overcharging, subsequent gassing, loss of electrolyte and possible plate damage. It ensures that the batteries are always in good condition.

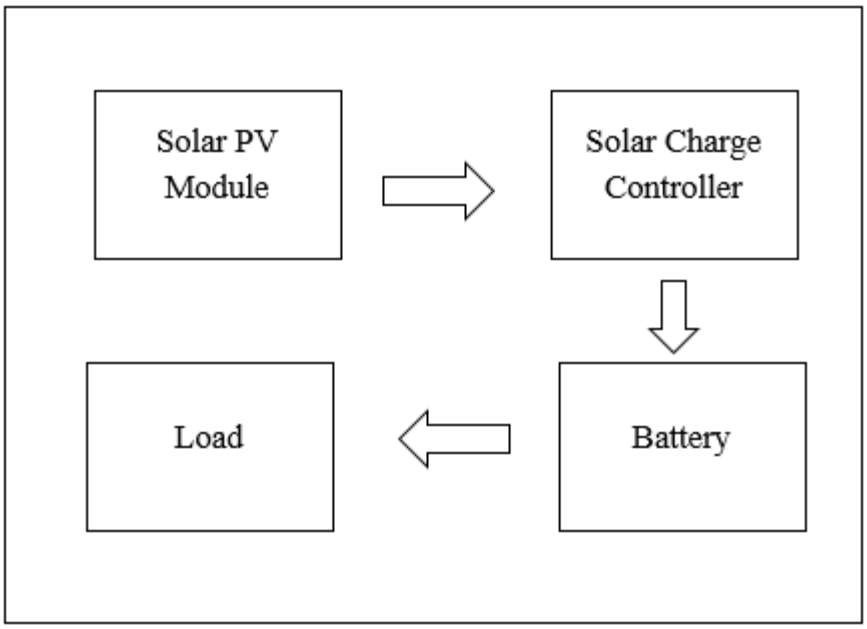

Figure 2.4: Solar charge control flow and Diagram

Solar charge controller has two types that commonly used; Pulse Width Modulation (PWM) and Maximum Power Point Tracking (MPPT). The charging rate for both type is depends on the level of battery charge level which to allow charging is nearly to the maximum capacity of battery and also to prevent overheating. PWM controller is basically a switch that connected to the solar module to a battery and the output voltage of this module will carried out to the battery. The MPPT controller is different from PWM type where this type more expensive and then it will adjust the input sources or voltage to maximum power and convert these sources to supply the varied voltage based on requirement.

Figure 2.5: Solar Charger Controller

2.3.3 Types of Batteries

Batteries in solar applications have to meet the demands of unstable grid energy, heavy cycling (charging and discharging) and irregular full recharging. There's a variety of battery types fitted for these unique requirements. Considerations for choosing a battery include cost, cycle life and installation and maintenance.

2.3.3.1 Traction Batteries

The term footing battery identifies with all batteries used to power electric vehicles. The capacities with regards to portability, for example, bike to a for-lift truck are range from 30 or 40 Ah. .Normally 6 or 12 Volt units are the littler footing batteries where 2 volt cells are the biggest. Sun powered power application are the perfect for the footing batteries as they are expected to be completely released and energized every day. The bigger footing batteries can withstand a large number of release cycles.