Faculty of Electrical and Electronic Engineering Technology

WATER WHEEL WITH SMART WATER LEVEL GATE AND NIGHT SOLAR LAMP FOR GARDEN

NUR KAMALIAH BINTI MOHD EFENDY

Bachelor of Electrical Engineering Technology with Honours

2022

WATER WHEEL WITH SMART WATER LEVEL GATE AND NIGHT SOLAR LAMP FOR GARDEN

NUR KAMALIAH BINTI MOHD EFENDY

A project report submitted
in partial fulfillment of the requirements for the degree of
Bachelor of Electrical Engineering Technology with Honours

Faculty of Electrical and Electronic Engineering Technology

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2022

UNIVERSITI TEKNIKAL MALAYSIA MELAKA
FAKULTI TEKNOLOGI KEJUTERAAN ELEKTRIK DAN ELEKTRONIK

BORANG PENGESAHAN STATUS LAPORAN
PROJEK SARJANA MUDA II

Tajuk Projek : WATER WHEEL WITH SMART WATER LEVEL GATE AND NIGHT SOLAR LAMP FOR GARDEN

Sesi Pengajian : 2022/2023

Saya NUR KAMALIAH BINTI MOHD EFENDY mengaku membenarkan laporan Projek Sarjana

Muda ini disimpan di Perpustakaan dengan syarat-syarat kegunaan seperti berikut:

1. Laporan adalah hakmilik Universiti Teknikal Malaysia Melaka.
2. Perpustakaan dibenarkan membuat salinan untuk tujuan pengajian sahaja.
3. Perpustakaan dibenarkan membuat salinan laporan ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4. Sila tandakan (✓):

☐	**SULIT*** (Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia seperti yang termaktub di dalam AKTA RAHSIA RASMI 1972)
☐	(Mengandungi maklumat terhad yang telah ditentukan oleh organisasi/badan di mana penyelidikan dijalankan)
☑	**TIDAK TERHAD**

Disahkan oleh:

(TANDATANGAN PENULIS)
Alamat Tetap: NO.23 JALAN 3/60 DAMAI PESONA SEKSYEN 3 43650 BANDAR BARU BANGI, SELANGOR DARUL EHSAN.

(COP DAN TANDATANGAN PENYELIA)
PROF. MADYA MOHD ARIFF BIN MAT HANAFIAH
Pensyarah Kanan
Jabatan Teknologi Kejuruteraan Elektrik
Fakulti Teknologi Kejuruteraan Elektrik Dan Elektronik
Universiti Teknikal Malaysia Melaka

Tarikh: 13/1/2023

Tarikh: 13/1/2023

*CATATAN: Jika laporan ini SULIT atau TERHAD, sila lampirkan surat daripada pihak berkuasa/organisasi berkenaan dengan menyatakan sekali tempoh laporan ini perlu dikelaskan sebagai SULIT atau TERHAD.

DECLARATION

I declare that this project report entitled “Water Wheel with Smart Water Level Gate and Night Solar Lamp Garden” is the result of my own research except as cited in the references. The project report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature : 

Student Name : NUR KAMALIAH BINTI MOHD EFENDY

Date : 13/1/2023

APPROVAL

I approve that this Bachelor Degree Project 2 (PSM2) report entitled “Water Wheel with Smart Water Level Gate and Night Solar Lamp For Garden” is sufficient for submission.

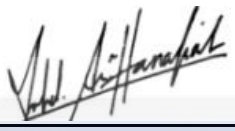
Signature : 

Supervisor Name : PROF. MADYA MOHD ARIFF BIN MAT HANAFIAH

Date : 13/1/2023

APPROVAL

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

Signature : 

Supervisor Name : PROF. MADYA MOHD ARIFF BIN MAT HANAFIAH

Date : 13/1/2023

Signature :

Co-Supervisor :

Name (if any)

Date :

DEDICATION

In honour of my devoted parents, Norazlina and Mohd Efendy, who have always encouraged and supported me throughout my entire life and throughout my time at UTeM as a student. To my beloved siblings, Nur Kamilia and Mohd Alif who are always willing to offer advice, suggest solutions, and aid me. Additionally, by demonstrating their tenacity in pursuing their education and landing a successful position, they serve as an inspiration. To my closest friends, Luqman Nulhakim and Azimah, I would like to express my gratitude for their encouragement in helping me complete my project, which is challenging due to the unfamiliar surroundings, as well as for the time they spent with me while I was stressed out studying and finishing my assignment.

WATER WHEEL WITH SMART WATER LEVEL GATE AND NIGHT SOLAR LAMP FOR GARDEN

ABTRACT

Today's global research trends are pointing toward more environmentally friendly outcomes. Electricity is crucial for human growth as a result of rapid technological advancement in all domains. Rural areas in developing countries are sometimes at a disadvantage when it comes to access to electricity. Rural electricity systems are often more expensive to establish than urban schemes because of the high cost of offering this service in sparsely populated, distant places with challenging terrain and minimal demand. Although the water wheel and solar power is one of the most environmentally friendly methods of generating power, it is not without environmental issues. Nowadays, waterwheel-generated hydropower is one of the most cost-effective ways to generate electricity. Modern water wheels are built of steel and have numerous purposes as a new technology that promises no negative effects on the environment. The need currently is for effective energy utilisation in order to diversify energy sources and reduce waste. Other than that, by installing a Smart Water Level Gate allows for IoT-based monitoring and management to be implemented. It either opens the gate to let water out directly into the plant or closed. Next, solar garden lights are little lights that capture the sun's energy and convert it to light in the evening. During the day, they generate and store their own energy, which they subsequently release at night. It will illuminate the front garden of your home yard. This project shows that the use of renewable energy will further save electricity costs and facilitate activities in rural areas.

ABSTRAK

Aliran penyelidikan global hari ini menunjukkan hasil yang lebih mesra alam. Tenaga elektrik adalah penting untuk pertumbuhan manusia hasil daripada kemajuan teknologi yang pesat dalam semua domain. Kawasan luar bandar di negara membangun kadangkala berada dalam keadaan yang kurang berkemampuan apabila melibatkan akses kepada elektrik. Sistem elektrik luar bandar selalunya lebih mahal untuk dibina berbanding skim bandar kerana kos yang tinggi untuk menawarkan perkhidmatan ini di tempat yang kurang berpenduduk, jauh dengan rupa bumi yang mencabar dan permintaan yang minimum. Walaupun roda air dan kuasa solar adalah salah satu kaedah penjanaan kuasa yang paling mesra alam, ia tiada isu alam sekitar. Pada masa kini, kuasa hidro janaan kincir air adalah salah satu cara yang paling menjimatkan kos untuk menjana elektrik. Roda air moden dibina daripada keluli dan mempunyai pelbagai tujuan sebagai teknologi baharu yang tidak menjanjikan kesan negatif terhadap alam sekitar. Keperluan pada masa ini adalah untuk penggunaan tenaga yang berkesan untuk mempelbagaikan sumber tenaga dan mengurangkan pembaziran. Selain itu, dengan memasang Smart Water Level Gate membolehkan pemantauan dan pengurusan berasaskan IoT dilaksanakan. Ia sama ada membuka pintu pagar untuk membiarkan air keluar terus ke dalam tanaman atau ditutup. Seterusnya, lampu taman solar ialah lampu kecil yang menangkap tenaga matahari dan menukarkannya kepada cahaya pada waktu petang. Pada siang hari, mereka menjana dan menyimpan tenaga mereka sendiri, yang kemudiannya dilepaskan pada waktu malam. Ia akan menerangi taman hadapan halaman rumah anda. Projek ini menunjukkan penggunaan tenaga boleh diperbaharui akan menjimatkan lagi kos elektrik dan memudahkan aktiviti di kawasan luar bandar.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

V	-	Voltage
A	-	Ampere
W	-	Watt

CHAPTER 1

INTRODUCTION

1.1 Background

Electricity has become increasingly crucial for human growth as a result of significant technological advancements in all domains. Electricity is a crucial aspect of modern life for us. Today's energy is primarily generated from renewable sources such as sunlight, wind, tides, and other natural phenomena, reducing reliance on non-renewable sources such as hydroelectric, fossil fuels, and others. People utilise electricity for lighting, heating, cooling, and refrigeration, as well as to power appliances, computers, electronics, machinery, and public transit systems. Malaysia consumed just under 143 billion kilowatt hours of electricity in 2020, down slightly from the previous year. During the monitored period, the country's electricity usage reached a high point in 2019.

Total electricity usage comprises both retail sales to consumers and direct use electricity. The customer produces and consumes direct use power. Reduced energy expenses are one of the most obvious ways that renewable energy may save money. They can also use renewable energy to power their activities by installing solar panels, micro hydro, and other kinds of renewable energy on their premises.

Furthermore, the recent increase in demand for electrical energy supply in developing countries' rural areas has given increased weight to studies of small hydroelectric power generation as a renewable energy source and the feasibility of hydroelectric power plant construction, with particular reference to the construction of a water wheel to meet the electrical needs of villages in rural areas. Nowadays, solar power and hydropower watermill generation is one of the most cost-effective ways to generate electricity. Figure 1.1 below shows the Pitchback Water Wheel.

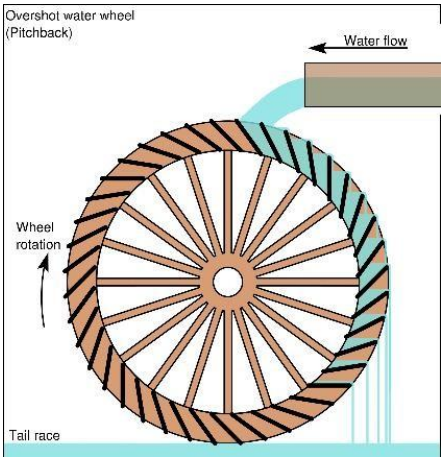


Figure 1. 1 Water Wheel

Now, everything is just at your fingertips. Controlling water flow by creating a smart water level gate by using an Internet of Things (IoT). An Internet of Things (IoT) has become a popular trend to be used and create as an intelligent digital system among users. By installing a Smart Water Level Gate allows for IoT-based monitoring and management to be implemented. It's either open the gates to let the water out for direct to plants or keep them closed. Figure 1.2 below shows the technology of an Internet of Things (IoT).

Figure 1.2 Internet of Things (IoT) technology

1.2 Problem Statement

Residents in rural areas are regularly confronted with limited electricity and power outages. Although electricity may not be able to provide all of the prerequisites for economic growth, it is unquestionably necessary for basic human needs and economic activities. The impact of rural electrification is frequently assessed for a one country or region.

Rural areas in developing countries are sometimes at a disadvantage when it comes to access to electricity. Because of the high expense of delivering this service in sparsely populated, distant areas with rough terrain and little usage, rural electricity systems are typically more expensive to install than urban schemes. Furthermore, low rural incomes might cause economic issues, and long distances mean higher electricity losses and higher customer support and equipment maintenance costs.

In addition, access to electricity has the potential to improve socioeconomic conditions in developing nations by influencing important components of poverty, such as health, education, income, and the environment. Renewable energy is a solution that can be introduced in rural areas. The need currently is for effective energy utilisation in order to diversify energy sources and reduce waste.

1.3 Project Objective

The objectives that need to be achieved for the project:

a) To create a small – scale vertical axis water wheel with an additional solar panel for electrical garden lighting without polluting nature.

b) To analyze the effectiveness of the systems in rural area.

c) To implement a system that has no negative impact on the environment.

1.4 Scope of Project

To accomplish this project, the scope has been outlined to be able to design and develop Water Wheel with Smart Water Level Gate and Night Solar Lamp for Garden. The project is to use renewable energy that can further save electricity costs and facilitate activities in rural areas. This project use DIY Water Wheel, Water Tank, RS-775 DC Motor 12V 80W 8000RPM, GT2-400mm Closed Loop Timing Belt, GT2 Timing Pulley 60 Teeth Bore 8mm and GT2 Timing Pulley 16 Teeth Bore 5mm, SG90 Micro Servo, ESP8266 WiFi Module, Solar Module Mono-Crystalline 10W 18V with 5-meter cable, Solar Charger Controller 10A and Sealed Lead Acid Battery 12V 7Ah.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter expounds about information and research on previous works that have been conducted concerning to the engage topic.

2.2 Past Studies

Jamal A. Hameed, Amer T. Saeed, Mugdad H. Rajab (2018) have proposed Hydroelectric power is generated using procedures that rely on natural water flow. Construction turning point for river water or tank water. The advancement of hydraulic engineering in conjunction with new materials, such as wrought iron instead of wood, allows for more acceptable hydraulic shapes. The individual components used are the prototype of a fully functioning power plant water wheel installed with generator, gearbox, power converter and measurement group [1].

Ayesha Zaman and Taslima Khan (2012) proposed methods for a low head micro hydropower system with a fixed water source and design of a water wheel for the system. During off-peak hours, water is pushed up to the upper reservoir, and when needed, water is discharged from the upper reservoir through the turbine to generate energy. The basic components of a typical micro-hydro system are mostly civil works components (headwork, intake, headrace canal, fore bay, penstock/pipe, and tailrace) and powerhouse components (turbines, generators, drive systems, and controllers) [2].

Hindawi (2020) have proposed the importance of solar and hydro resources in ensuring the reliability of electricity supply in rural areas of Central Java, Indonesia. Micro hydro has a scale power lower than 100 Kw. The electrical energy that can be generated is proportional to the flow capacity and height of the system. They used three-phase synchronous generator. For Solar Photovoltaic power generation system is designed using a battery bank as a storage of electrical energy. They also created the Power Inverter. A power inverter is a power electronic device that converts direct current (DC) voltages from solar panels or batteries to alternating current (AC) [3].

Farid Ullah Khan, Adeel Ahmed, Uzair Khan Jadoon, Fahim Haider (2015) proposed modeling, simulation and fabrication of an undershot floating waterwheel for power generation for run-of-the-river applications. They used Shaft, Blades Frame, Rotor, Floats, Generator Pulleys, Pump Pulleys, Electric Generator, Pump and Battery [4].

Prashobh Karunakaran, Alvin KS Lau and Reddy ANR (2016) have proposed hydropower over photovoltaic electricity generation in non-grid connected regions of equatorial Sarawak, Malaysia. In Sarawak better to focus on perfecting MHEP which is much cheaper and reliable for equatorial regions. The listed methods are using Solar Panel, micro-HEP turbine and Generator [5].

Ramadoni Syahputra and Indah Soesanti (2021) have proposed Renewable energy systems based on micro-hydro and solar photovoltaic for rural areas: A case study in Yogyakarta, Indonesia. The government have encouraging people to empower environmentally friendly renewable energy and also want to increase supply and guarantee the availability of electricity. The listed methods are using Solar PV Plant, Solar charge controller, Battery bank, Power inverter, Micro-hydro plant, Voltage control and Synchronizing [6].

Gusri Akhyar Ibrahim, C.H. Che Haron and C.H. Azhari (2010) proposed Sustainable rural energy: Traditional water wheels in Padang (PWW), Indonesia. It's the most cost-effective energy technologies and the low cost of construction, operation, low maintenance and the availability of materials. They used Wheel, Water chamber, Bearing, Blade, Shaft and Tunnel and piping [7].

Yohannes Tesfaye (2014) proposed Application of Micro-Hydro/PV Off Grid Hybrid Energy System for Ethiopian Rural Area. This application limit global warming. The most promising and less costly and Hybrid systems provide a high level of energy security. They used Turbine, Generators, Drive Systems, Electrical Load Controllers, PV modules, Battery bank, Charge Controller, Inverter and Loads [8].

N. I. Faruqui (2013) proposed Small Hydro for Rural Development. It's no fuel to produce energy and it can also be flood control or irrigation. The turbines are normally of very simple design, such as Pelton turbines or centrifugal pumps operated in reverse [9].

Ong Chian Shen (2011) have proposed Prototype of An Efficient Hydropower Plant. It's environment friendly and safe. Hydropower Plant is the small sources that are appropriate in many cases for individual users or groups. The listed methods are using Drive shaft, Turbine blade, Bearing, Generator, Gear and Water Tank [10].