UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF HYDRO POWERED ENERGY HARVESTER FROM WATER FLOW RATE

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electrical Engineering Technology (Automation and Robotic) with Honours.

By

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BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

Tajuk:**Development of Hydro Powered Energy Harvester from Water Flow Rate**

Sesi Pengajian: **2019**

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This report is submitted to the Faculty of Electric and Electronic Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Electrical Engineering Technology (Automation and Robotic) with Honours. The member of the supervisory is as follow:

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ABSTRAK

Tenaga amat penting untuk mejana kuasa kepada pengguna untuk kegunaan elektrik seharian. Tenaga pada asalnya boleh di dapati daripada tiga punca utama iaitu matahari, cahaya dan air. Tetapi pada masa kini sudah terdapat lagi tenaga yang boleh dihasilkan sebagai contoh tenaga terbiar. Projek ini menggunakan pembangunan penuai tenaga hidro berkuasa dari kadar aliran air untuk menghasilkan tenaga kecil. Tenaga yang dihasilkan dalam projek ini adalah dari bangunan talian paip. Dalam membina talian paip, kadar aliran air bergantung kepada ketinggian bangunan yang digunakan oleh prinsip graviti. Di samping itu, analisis dari kuasa tenaga boleh diperoleh dengan perbezaan kadar aliran air. Hasilnya kadar aliran air dapat digunakan oleh sensor aliran air dan hasil tenaga tenaga oleh penjana turbin air yang digunakan. Oleh itu, tenaga yang dihasilkan daripada kadar aliran air adalah melalui penjana turbin air. Jika tenaga tidak mencukupi untuk mencapai matlamat, maka kadar aliran air mestilah kena tinggi atau menggunakan lebih banyak generator turbin air secara selari atau siri. Arduino Uno digunakan untuk menjalankan program dan mengawal keseluruhan projek untuk mendapatkan hasilnya.

ABSTRACT

Energy is crucial for generating power for consumers for daily electricity use. Energy can originally be derived from the three main causes - sun, light and water. But today there is more energy that can be produced as an example of energy harvester. This project used development hydro powered energy harvester from water flow rate to produced small energy. The energy are produced in this project is from building pipelines. In building pipelines, a water flow rate is depending on height of building used by a gravity principle. Besides that, the analysis from power energy can get with difference water flow rate results. The result water flow rate can get used by water flow sensor and result power energy by used water turbine generator. So, the energy are produced from water flow rate is through in water turbine generator. If the energy is not enough to achieve the objective, so the water flow rate will be high or use more water turbine generator in parallel or series. The Arduino Uno used to run a program and control a whole of project to get the result.

DEDICATION

I would like to thanks to God with blessed and grace because I can prepare this report without any problems. To my beloved parents, Ahmad bin Ahmad Rusdi and Rohaiza binti Rohani. I would like to thanks my supervisor En. Ahmad Muzaffar bin Abdul Kadir and don't forget to my friends to support and help through this report.

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I take this opportunity to express gratitude to all of the member class and housemates for their help and support at Universiti Teknikal Malaysia Melaka. I also thank my parents for the unceasing encouragement, support and attention. I am also grateful to my partner who supported me through this venture.

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LIST OF ABBREVIATIONS

PVC	Polyvinyl chloride
VS	Versus
NGO	National Government Organization
SYABAS	Syarikat Air Berjaya Selangor
SAMB	Syarikat Air Melaka Berhad
LAP	Lembaga Air Perak
V	Voltage
mA	miliampere
L/min	Liter per minutes
FYP	Final Year Project

CHAPTER 1

INTRODUCTION

1.1 Background

Hydropower has performed a key position in the worldwide power combination as the biggest clean and renewable power source. Small hydropower energy is regarded a renewable option that meets the need to decrease reliance on fossil fuels while lowering greenhouse gas pollution significantly. Then, small hydropower is also regarded to be one of the most cost-effective and environmentally friendly techniques for generating electricity. The project is purpose to generate electric energy from water flow rate as renewable source. This project implements building pipelines to get water flow energy. Water pump used to produce water flow rate in the pipelines. This water flow rate can be measure by water flow sensor. The water turbine generator is produces power and voltage to supply small energy.

In building, to guarantee continuous availability throughout the framework, the water in the tubes is placed under elevated stress. The elevated stress on the lesser surfaces is discharged with valves, offering a chance by attaching a generator to exploit otherwise wasted electricity. For now, the number of electricity produced is nowhere near the complete energy usage of the building.

The power generator concept in this project is a small scale to charge battery as energy storage. It generate from energy harvester from building pipelines or canal.

1.2 Problem Statement

There are now several problems and difficulties that influence the growth of tiny hydropower in Malaysia. This growth is hampered by the absence of field knowledge and technical abilities, and economic organizations are also unfamiliar with risk assessment for tiny hydropower initiatives. (1)

The primary problem is the price, not the technology. The price is about 10 cents per kilowatt-hour for traditional generating techniques, such as coal-powered power generators. According to the International Renewable Energy Agency, renewable power sources such as wind pay 20 to 40 cents, while small-scale hydropower initiatives cost up to 50 cents per kilowatt hour. That makes in-building hydropower less attractive. (Alex Frew McMillan 2013)

Some building and house area have a problem, if blackout the power electric is not supply because the supply is cut off. So, a renewable energy can be used to make a power electric in short time until supply is on. Each building has to pay a high electricity bill in energy usage at night time. This will result in wastage of money to companies and consumers.

The concept this project is pressure water from tank to users. The result water flow rate is difference every time, so the energy electric a different too. A suitable use a type of turbine is important to make water is always same flow rate. It is to make energy electric an enough to storage power supply.

The challenge we will face in this project is to find the appropriate water flow rate to use to get the desired power. The desired power is the power necessary to save energy to generate energy for the required supply. So to solve this problem, we need to make an analysis for every water flow rate to know the energy that comes from water flow rate.

1.3 Objective

1. To generate energy harvester to make small hydro powered in building pipelines.

2. To produce a renewable small energy for create a small power.

3. Analysis power energy with difference flow rate water.

1.4 Scope

By following the objectives of this research, the scope of this project is:

1. This energy focus at high building for building pipelines.

2. The energy comes from energy harvester water.

3. Make a small energy using water turbine generator.

CHAPTER 2

LITERATURE REVIEW

2.1 Solar Energy

Our earth is an atomic bomb of nature. It produces small power packets called photons that move from the earth to Earth in about 8.5 minutes over the 93 million miles. Every hour, enough photons affect our planet to produce enough solar power for a whole year theoretically to meet worldwide power requirements. They shake electrons loose from their atoms when photons reach a solar cell. It shapes an electrical circuit if drivers are connected to a cell's favorable and negative ends. They produce energy when electrons pass through such a circuit. The more boards you are able to install, the more power you can expect to produce. (Martin Debono 2017) Solar modules operate by capturing sunlight with photovoltaic cells, producing immediate present (DC) power, then using inverter technology to convert it to usable alternating present (AC) power. Then AC power passes through the electrical panel of the home and is circulated appropriately. (Powering Utah 2018) Here are the primary steps in how your house works with solar panels: (Luke Richardson 2018)

1. Solar boards receive heat from the sun and transform it into electricity from DC.
2. The solar inverter transforms DC energy into AC energy from your solar panels, which is used by most house devices.
3. Powering digital equipment, electricity flows through your house.

4. The electrical grid receives excess energy generated by solar panels.

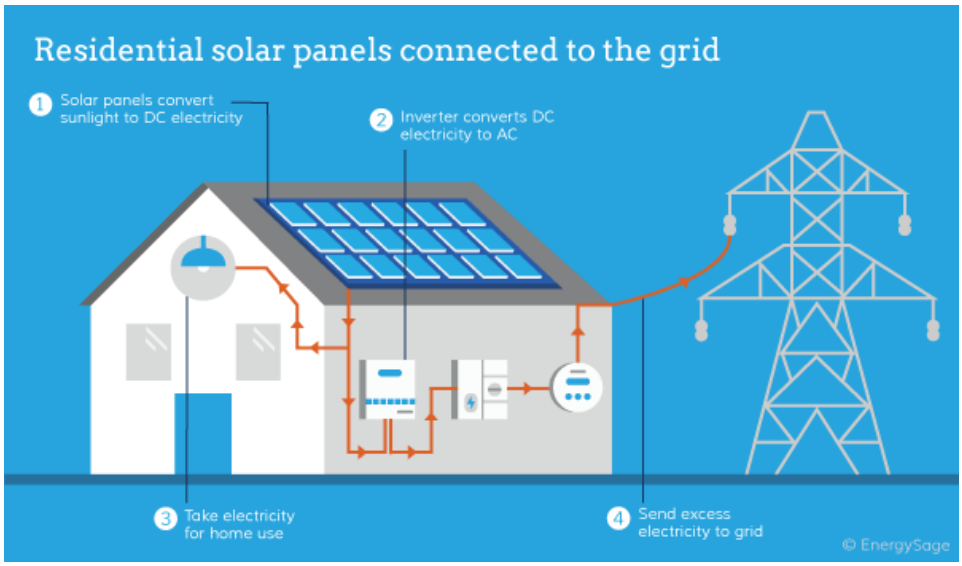

Figure 2.1: Step solar panel work at home

2.2 Wind Energy

Wind energy is related to the technique of producing electricity through wind, or the natural occurrence of air disturbances in the earth's setting. Modern wind turbines are used to obtain kinetic energy from wind and generate electricity. (1) A wind engine transforms power in the wind into electricity using the rotor blade aerodynamic strength that works similar to an aircraft wing or helicopter rotor blade. The air pressure on one hand of the blade was decreasing when the wind moves across the blade. Air pressure distinction across the blade's two ends produces for both lifting and dragging. The lift's power is greater than the wind, resulting in the rotor spinning. The engine is linked to the engine either straight) or via a shaft and a sequence of gears that accelerate the spin and enable a physically larger engine. This aerodynamic force conversion into a generator's

rotation generates energy. (1) On the front of a wind turbine, the enormous rotor blades are the "turbine" component. The blades have a particular curved shape, comparable to a plane's airfoil wings. When wind flows past the bones of a plane, it lifts them up with a power that we call lift; instead, when it flows past the blades of a turbine, it swings them around. The wind loses some of its kinetic electricity and just as much is gained by the engine. (Chriss Woodford 2018)

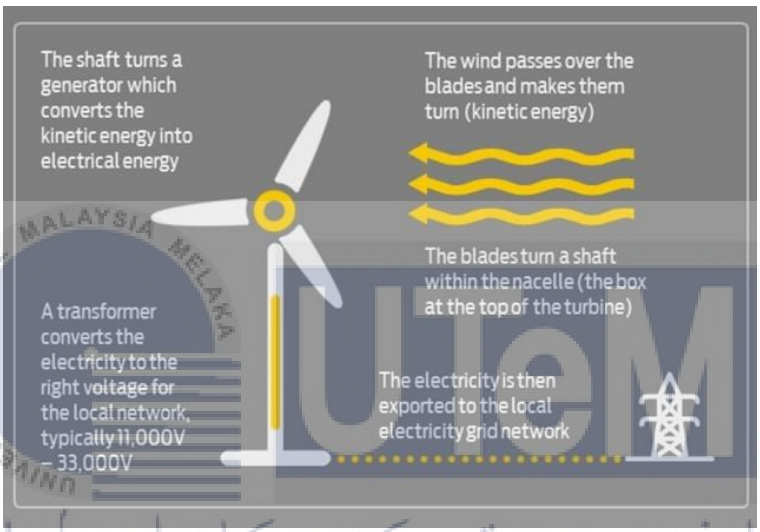

Figure 2.2: Wind Turbines work

2.3 Hydropower Energy

Water flowing produces energy capable of being caught and converted into electricity. A dam on a stream is used by the most prevalent sort of hydroelectric facility to store water in a tank. Water produced from the tank passes through a pump, rotating it, activating a generator for power generation. But a big dam does not necessarily involve hydroelectric energy. Some solar energy stations can channel the stream water through a pump using a tiny canal. (2) With shifting water, hydroelectric energy is generated because water is the origin of hydroelectric energy. Usually hydroelectric energy stations

are situated on or close a source of water. The water stream quantity and the location (or drop) shift from one stage to another determine the quantity of power required in shifting water. (3) Four major components in part of hydroelectric (4):

- Dam- Increases the river's water level to produce dropping water. It also regulates water flow. In impact, the tank being created is stored power.
- Turbine- The force of dropping water pressing against the blades of the propeller leads the propeller to rotate. A water engine is much like a windmill, with the exception of dropping rain instead of wind providing the power. The engine transforms dropping water's kinetic power into mechanical electricity.
- Generator- Using engines and potentially engines connected to the engine, it also leads the engine to rotate when the engine moves. Converts the turbine's mechanical power to electrical electricity. Generators in hydropower crops operate in other kinds of energy crops just like turbines.
- Transmission lines- Conduct energy to households and company from the hydro power facility.

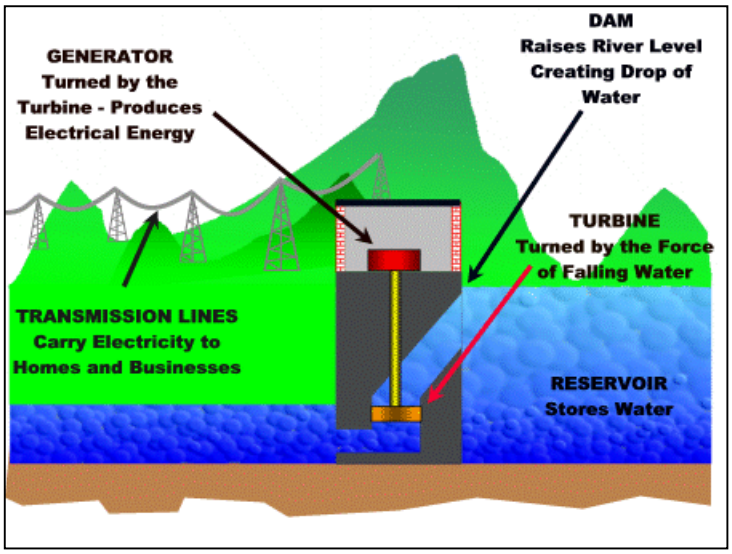

Figure 2.3: Part of hydropower plant

2.4 Types of Hydropower

Historically, hydropower devices have transformed power to mechanical job in water. Such technologies have carried out a range of agricultural operations, such as grain milling. Present-day hydropower technologies instead of mechanical operate transform stored power in water into electricity. The energy production ranges from a few kilowatts to gigawatts for hydropower facilities. Hydropower is the major supplier of renewable energy at 1,064 gigawatts of installed capability and accounts for 71 percent of all renewable energy (World Energy Council, 2016). Overall, hydropower structures generate 16.4 percent of the world's complete energy (World Energy Council, 2016). Hydropowers have four main types: pumped-storage hydropower, offshore hydropower, run-of-river hydropower and pipeline hydropower.

2.4.1 Pumped Storage Hydropower

Pumped storage hydroelectricity is a form of electricity storage that is used for load balancing by electrical power schemes. The process stores power pumped from a reduced altitude tank to a greater altitude in the form of gravity prospective air electricity. Typically, low-cost electricity excess off-peak is used to operate the pumps. The stored water is discharged through motors during phases of elevated electrical demand to generate electrical energy. Although the pumping process losses make the factory a net

power user generally, the scheme improves income by selling more electricity during peak demand phases when electricity costs are lowest. (Rehman, 2015)

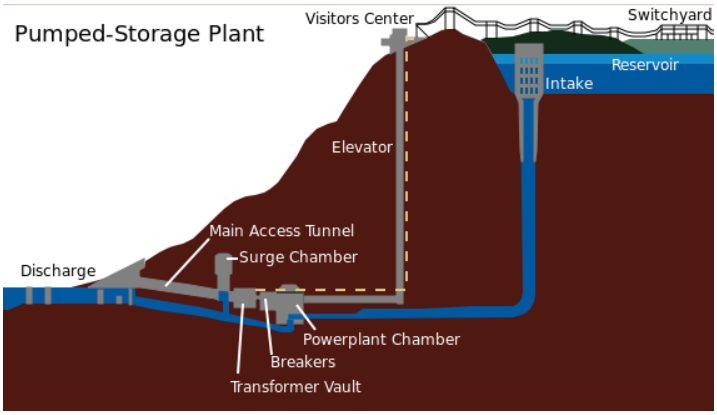

Figure 2.4: Pumped Storage Plant

2.4.2 Offshore Hydropower

Offshore hydropower systems use waves and tidal currents in the ocean to produce electricity. Among the different types of hydropower, offshore is the least established, but still growing. This category includes technology such as underwater turbines (tidal), buoys (wave), and oscillating water columns (wave) (Tester, Drake, Driscoll, Golay & Peters, 2016, p. 700).

2.4.3 Run-of-River Hydropower

Run-of-river hydropower produces electricity as the flowing water, typically from a river or channel, spinning a turbine. Unlike storage hydropower schemes, where prospective power is the driving variable, the kinetic power of the moving air is used to