



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**DEVELOPMENT OF ELECTRIC GENERATOR BY
USING HYDROELECTRIC**

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

by

MUHAMMAD HILMAN BIN MAT SOHAILI

B071610714

950208145671

FACULTY OF ELECTRICAL AND ELECTRONIC ENGINEERING
TECHNOLOGY

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Tajuk: Development of electric generator by using hydroelectric

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SOHAILI

.....
DR. SAHAZATI BINTI MD. ROZALI

Alamat Tetap:
NO.43, LALUAN MERU PERDANA 7,
TAMAN MERU PERDANA 2,
31200 CHEMOR PERAK.

Cop Rasmi Penyelia

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I hereby, declared this report entitled Development of electric generator by using hydroelectric is the results of my own research except as cited in references.

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Author : MUHAMMAD HILMAN BIN MAT
SOHAILI

Date:

APPROVAL

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

Signature:

Supervisor : DR. SAHAZATI BINTI MD. ROZALI

ABSTRAK

Elektrik adalah sejenis tenaga yang boleh terbentuk pada satu kawasan atau mengalir dari satu tempat ke tempat yang lain. Elektrik juga merupakan salah satu sumber penting untuk kegunaan manusia. Sumber tenaga elektrik ini kerap kali dihasilkan melalui pembakaran arang batu atau tenaga nuclear. Walau bagaimanapun, penghasilan tenaga yang merbahaya adalah daripada pembakaran arang batu atau tenaga nuklear kerana pelepasan toksik ke udara. Banyak loji kuasa yang menggunakan tenaga haba untuk memancarkan tembaga dan magnet untuk menghasilkan elektrik yang hanya 35% kecekapan. Hal ini menunjukkan disetiap 100 unit daripada tenaga haba, hanya 35 yang berubah kepada tenaga elektrik. Oleh sebab itu, hydroelektrik ialah salah satu cara alternatif untuk menghasilkan elektrik. Menurut kajian, hanya 16% sumber elektrik dijana melalui tenaga hydro di Malaysia. Di dalam kajian ini, dengan menggunakan kaedah mudah untuk memantau kecekapan dan tekanan air yang mengalir dicadangkan sebagai penghasilan hydroelektrik. Dengan menganalisis reka bentuk paip dan kecekapan kipas daripada prototaip, hasilnya menunjukkan bahawa reka bentuk paip dan kecekapan kipas mempengaruhi penghasilan elektrik yang produktif.

ABSTRACT

Electricity is an energy that can be generated in a area or flow from one place to another. However, harmful sources of the energy such as coal burning and nuclear energy which release toxic emissions that will affect the environment. Most of the power plants that used thermal energy to spin the copper and magnets are only create electricity with 35% efficient. It shows that for every 100 units of thermal energy only 35 of them are converted into electric energy. Hydroelectric is one of the alternatives ways to generate electricity. According to research, there are only 16% of electricity generated by hydro in Malaysia. In this research, a simple monitoring system of the efficiency and water flow pressure are propose as the hydroelectric generator. The result showed that the piping design and the efficiency of the turbine influence the productivity creating electricity.

DEDICATION

This project and thesis are wholeheartedly dedicated to my beloved parents, who have been my source of inspiration and gave me strength also continually provide their moral, spiritual, emotional, and financial support.

To our brothers, sisters, relatives, supervisor, lecturer and who shared their words of advice and encouragement to finish this study. To my close friends, Muhammad Fikrii Bin Zahari, thank you for helping out throughout completion this project.

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LIST OF SYMBOLS

D, d	-	Diameter
F	-	Force
g	-	Gravity = 9.81 m/s
I	-	Moment of inertia
l	-	Length
m	-	Mass
N	-	Rotational velocity
P	-	Pressure
Q	-	Volumetric flow-rate
r	-	Radius
T	-	Torque
Re	-	Reynold number
V	-	Velocity
w	-	Angular velocity
x	-	Displacement
z	-	Height
q	-	Angle

LIST OF ABBREVIATIONS

TWh	-	Terawatts-hours
DC	-	Direct Current
LED	-	Light-Emitting Diode
RoR	-	run of river
HPP	-	Hydropower Pumped
W	-	Watts
kWh	-	Kilowatts-hours
MWh	-	megawatt-hours
Rpm	-	Rotation per minute
PID	-	proportional integral derivative

LIST OF PUBLICATIONS

CHAPTER 1

INTRODUCTION

1.1 Introduction

Hydroelectric power is one of the renewable green energy source that is currently used in all over the world in order to support the electricity supply or demand. Hydroelectric power was first used in 250BC, and it was used to supply electricity to the clock. Nowadays, hydroelectric power has evolved from supply power and running a small clock to generate enough power supply a large city.

In 2013, China is the largest hydroelectricity producer around Asia-pacific which generates 33 percent of global hydroelectric power. China has produced 920TWh representing 16.9 percent of domestic uses. Compared to coal and gases, the cost of hydropower is relatively low, making it as a competitive source of renewable green energy which is electricity.

It is also flexible source of electricity since the amount produce by the hydroelectric generator can be varied up or down very rapidly. With a dam and reservoir that had been constructed, it will not produces direct waste such as smoke produce by the coal burning and the fossil fuel powered energy plant.

1.2 Problem Statement

A conventional hydroelectric generator is mainly used to generate energy without affect the environment and its life. The efficiency of the turbine also will be affected by the water life in the water. Moreover, in the making of conventional

hydroelectric generator will destroyed our forest, highly increasing the death of animal which had lost their natural habitat and increasing the cost of making a single dam for hydroelectric generator. Thus, the shape turbine with a microcontroller and external passage for the turbine were proposed in this project to design a better performance of the hydroelectric generator.

1.3 Objective

This project embarks into the following objectives:

1. To develop the prototype of hydroelectric generator system.
2. To test the affectiveness of the designed prototype in a small scale application interms of hydroelectric generator.

1.4 Scope

This project focuses on the shape turbine and external passage for the turbine. The purpose of the microcontroller is to detect the efficiency of the turbine. Thus, there will be a hardware part for this project. This project is develop by using arduino uno and arduino nano for tachometer with LED display and combination of spurs gears.

1.5 Methodology

Monitoring system and spherical turbine shape with an external path for the generator have been proposed for this project. The monitoring system used a

microcontroller with a infrared sensor and receiver. The infrared sensor is one of the way to detect the speed of the turbine. Other than detect the speed of the turbine, infrared sensors are also capable of measuring the heat being emitted by an object. The turbine make the water goes whirlpool which allow the movement of the fish to go through the turbine. With an external path, the original path of the river will not been block to make reservoir or a dam. This will not interference the original path of the living water creature. The turbine will generate electricity by using stepper motor generator and charged up the battery.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter present the previous research related to the project. It consist of review on the turbine system and review on the hydroelectric technology.

2.2 Turbine System

There are many ways of the turbine system including in-pipe turbine system. The water flowing vertically through a pipe in a household. From this system, it use the concept pressure energy and kinetic energy. The working system of the in-pipe turbine system occupies a large amount of cross sectional area in a pipe. When the area reduces, it converts pressure energy into kinetic energy which result in increase of velocity. The velocity of the water, utilized in the in-pipe turbine and used for generating electricity.

The in-pipe water generator is an electrical power generating pipeline which can produce renewable energy completely clean, reliable low cost electricity. The in-pipe turbine is setup in the pipe, the flowing water strikes the blades of the turbine and leads to the rotation of it. The vertical shaft of the turbine is coupled to the generator which generates electricity and stores in batteries. [1]

However, the amount of the electricity generate from the in-pipe turbine system it is less than the conventional reservoir hydroelectric generator. This is because the in-pipe turbine system only for reduce the usage of conventional electrical for one house.

Other than the in-pipe turbine system, the sea water turbine system is a system that generates electrical power from sea waves employs a multiplicity of turbine units, preferably disposed in a generally V-shaped array. By properly positioning turbine wheels with respect to the surface of the water and the direction of wave front progression, and in some cases by providing means for diverting the course to water flow, the turbine wheels are caused to rotate in order to drive associated generators and thereby to generate electricity. The vertical position of the turbine wheels is adjusted automatically by a control subsystem to accommodate tidal variations. [2]

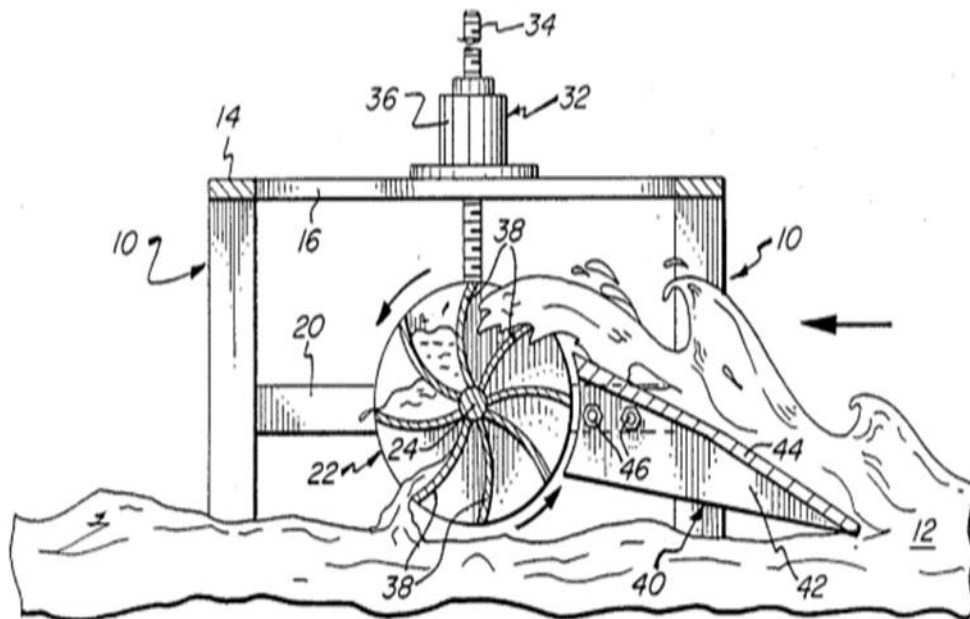


Figure 2.1: Sea wave turbine system [2]

Beside in-pipe turbine system and sea wave turbine system, there are impulse turbine system, turgo turbine system, pump turbine system, free flow turbine system and axial flow turbine or propeller turbine system.