UNIVERSITI TEKNOLOGI MARA

DESIGN AND FABRICATION OF THE HYDROELECTRICITY GENERATOR

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ABSTRACT

Hydroelectricity refers to electricity generated by harnessing the power of water in motion, typically through the gravitational force or falling or flowing of water. It is the most used renewable energy source, contributing 16 percent of the world's electricity, amounting to 3,427 terawatt hours in 2010. [1] Despite its significant advantages, hydropower faces several problems, especially in the education department. To begin with, locations for hydropower plants are scarce in Malaysia and only available at locations where water is abundant not only making it difficult for students to get a close-up look at the workings of hydropower. (but also due to the safety issues of these sites making them less than ideal) Secondly, it is also worth noting that the size of hydropower generators is typically very large and unsuitable for classroom use. Thirdly, the cost of one of these hydropower generators is very expensive which makes them less appealing to educators and students alike. The project serves to satisfy a few objectives like designing a turbine using software like Solidworks, fabrication of a small-scale hydroelectric generator as a proof of concept, and analysing the difference in electricity generation based on different flow rates. This project will simulate the basic workings of a hydroelectricity generator by having water flow through a turbine which will then create torque on the shaft and the torque will in turn generate electricity via a motor. It is expected to generate about 50 watts worth of power which is sufficient as a proof of concept. This project hopes to improve understanding of hydropower amongst students and improve the quality of education.

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CHAPTER ONE
INTRODUCTION

1.1 Background of Study

Hydropower, also known as hydroelectric power, is a renewable energy source that produces electricity by manipulating water flow through dams or diversion structures. It relies on continuously replenishing water in the water cycle, ensuring its "fuel" is not depleted. Hydropower encompasses various facility types, all driven by the kinetic energy of flowing water. Turbines and generators are key components in converting this kinetic energy into electricity, which is then integrated into the electrical grid to power homes, businesses, and industries. [2]

In Malaysia, there are several hydropower plants with the 5 major plants being, Bakun Dam (Sarawak), Murum Dam (Sarawak), Pergau Dam (Kelantan), Sultan Mahmud Power Station (Terengganu), Temenggor Dam (Perak). These plants are located at very specific locations which makes them hard to access, especially for students. Students need to go through the hassle of making appointments, travelling to the dams, and planning which can disincentivize them.

An equipment that can demonstrate hydropower generation in a classroom setting could help these students learn and study about the topic more interactively. The aim of this study is to develop a simple hydroelectricity generator the size of a small table for use in student's education.

1.2 Problem Statement

A few problems faced by students when trying to learn hydropower is the location of hydroelectricity generators are located only in places where water is abundant like lakes or long stretches of rivers and there is a lack of such plants in certain parts of Malaysia. There are also safety issues when bringing students into such a high-risk area, thus, visits are unlikely to happen.