

## Portable Hydro Generator

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DOI: <https://doi.org/10.30880/mari.2023.04.02.032>

Received 01 October 2022; Accepted 30 November 2022; Available online 15 January 2023

**Abstract:** A remote farm in the village's interior that is frequently disturbed by animals. Therefore, we conspired to produce a portable hydro generator that generates electricity for the electric fence to prevent animal disturbance. However, the farm is very suitable to carry out our project because it is close to the river water flow, which is in line with our goal of creating a portable hydro generator using water flow. As a result, the primary goal of selecting the appropriate portable hydro generator type and designing a system that can be implemented in Persian Ayer Hitam geographical location sites. The manufacture of portable hydro generators is also intended to channel electricity to LED bulbs and fences so that agriculture can continue at night. Therefore, electricity generation is highly recommended nowadays because it is very important and can be used over a long period of time. The design study revealed that the building of a micro-hydroelectric project on the project site was possible, and there were no major issues discovered during the design and implementation stages.

**Keywords:** Turbine, Portable Hydro Generator, Water flow

### 1. Introduction

A hydro generator, often known as a watermill or water turbine, is a device that converts water's potential energy into mechanical energy. A motor generator then converts mechanical energy into electrical energy. Hydro generators were invented in the nineteenth century and are now commonly used to generate electricity. The hydro generator, in addition to the generator, is the essential equipment for the generator of hydroelectric power [1]. The hydro generators are split into two classes based on the working principle of the turbine in converting potential energy into kinetic energy: impulse turbines and reaction turbines [2]. There are various countries that are well known and advanced in their usage of turbines, particularly Japan, which is highly developed and innovative in its hydro generator production. Furthermore, because it is said to be capable of supplying endless energy, the use of this hydro generator is becoming more well-known and prevalent around the world.

A hydro generator is commonly employed as a source of electricity in today's world in a variety of ways. A hydro generator was chosen because it is a technology that can generate electricity indefinitely without needing to be charged or replaced if there is water flow. A hydro generator is commonly used by animal breeders to keep animals in enclosures and by farmers to keep their crops or farms from being eaten or damaged by animals or thieves in inland locations with rivers or lakes [3]. Because Malaysians still rely on batteries for power, Japan has become a role model for the usage of hydro generators in the country. As a result, hydro generators were implemented in Malaysia to save money and minimize the strain on society. However, some rural communities have yet to be exposed to the sophistication of hydro generators as a source of electricity.

## 2. Literature Reviews

Hydroelectric power plants provide significant contributions to global power generation. It is famous because to its efficient and dependable clean renewable energy source. It has the potential to be an outstanding technique of capturing renewable energy from small rivers and streams [4]. The mini-hydro project is designed to be implement, as it requires little or no reservoir to operate the turbine [5]. The water will flow directly through the turbine and back into the river or stream, where it will be used for various purposes [6]. This has a negligible influence on the local ecosystem. The basic notion of hydro power generating is demonstrated in this project. Solid Works software was used to create a prototype turbine.

The turbine power and speed were proportional to the site head, but there were specified spots for maximum turbine power and speed as the site water flow rate varied [7]. The turbine is turned by utilizing the velocity of water thrust. Because two dynamos are connected to the turbine shaft, the rotation of the turbine results in the rotation of both dynamos [8]. This idea greatly improves overall efficiency. This mini hydro power generator's power generation is calculated. To summarize, if this concept is implemented in a hydropower plant, the output of power generation will grow.

## 3. Materials and Methods

The materials and methods section, otherwise known as methodology, describes all the necessary information that is required to obtain the results of the study.

**Table 1: Materials list**

No	Materials	Description
1	PVC pipe	PVC pipe is used to make the design of portable hydro generator
2	PVC tee	PVC Tee is used to make the design of portable hydro generator connected with PVC Pipe
3.	Generator Motor	As a power supply to the LED bulb
4	Capacitor	For stability of current flow.
5	Pulley	For movement support and transfer the power from propeller to the motor generator by using a belt.
6	Propeller	As a turbine for force from the hit of water flow.

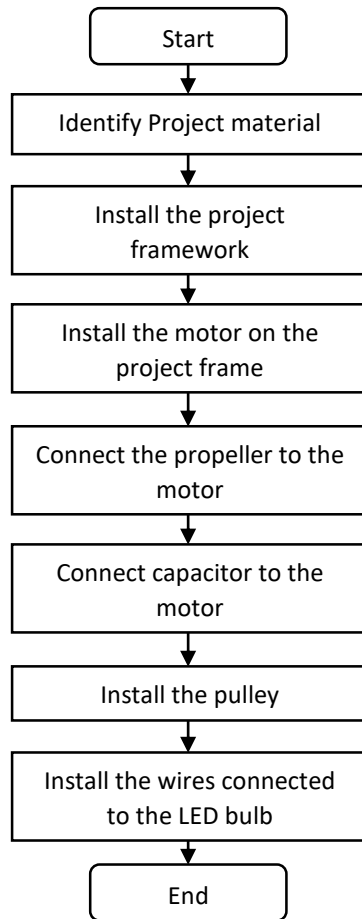
Specifications and properties of materials, equipment, and other resources used in the current study should be described in this section. Should a bulleted list be required, it may be included and listed in **Table 1**.

Next in the fabrication of the Portable Hydro Generator, there are various types of tools or equipment used throughout the fabrication process, among them are handsaws, Soldering iron, drilling machine, and hot glue gun.

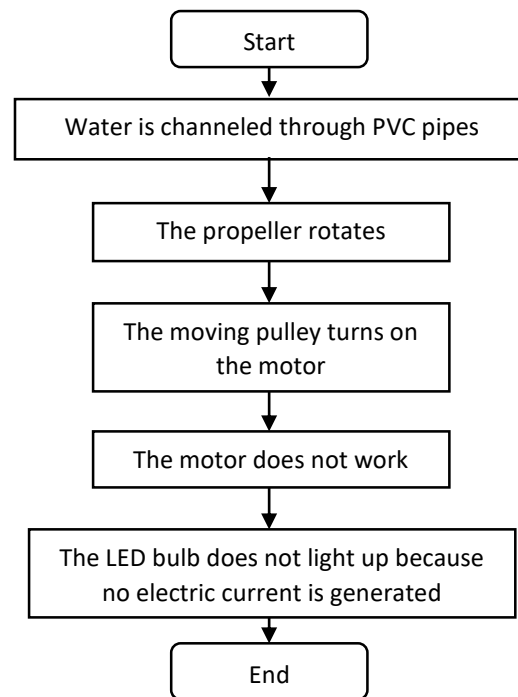
### 3.2 Introduction

This project follows the mechanical design process framework. As followed, the project starts with Design Formulation, followed by Concept Design, Product Architecture, and Configuration Design. Then we do the Parametric Design stage, Part Sizing, and Product Assembly Drafting, where we have to use SolidWorks as we learned in the Engineering Design subject. We also do material selection, analytical design analysis, prototyping, and experimental design analysis. We finalized it with the detail design stage.

In design formulation, we began by knowing the customer requirements from the problem definition, which also needed assessment. In order to make our work easier and follow the flow, we do a mind map called "Design Objective Tree." It really helps in producing the best product as per customers' requirements. Actually, concept design is an early phase of the design process as in **Figure 1** in which the broad outlines of the function and form of something are articulated. This includes the development of the interactions, experiences, processes, and strategies represented in **Figure 2**.



**Figure 1: Flowchart**



**Figure 2: Design approaches.**

### 2.3 Project Design

After choosing the title, we have designed this portable hydro generator as **Figure 3**.



**Figure 3: Prototype mini hydro generator.**

It is easier to build and has a design that looks stable to use, which is a key factor in choosing a design concept for a portable hydro generator design project. On the other hand, the project cost for the design was affordable and not too extravagant to spend according to the final year project budget for our group. Several important issues need to be studied to ensure that the model will operate properly and safely. The type of materials and components used, appropriate application procedures, objective product analysis, and the cost of each material and component used are some of the aspects that need to be looked at.

The material used in the production of this project is PVC pipe because it is lightweight and durable. Therefore, we chose PVC pipe as the main material for producing the body frame of the project. In addition, we use PVC Tee pipe for the rest of the material because there are some other components,

such as a propeller, that will be moved when the water flows. There is also a motor that will produce electrical energy due to the rotation of the propeller. With that, we have chosen PVC Tee pipe to be used as a place-to-place other component.

The portable hydro generator in the figure is an improvement in terms of the addition of better accessories so that the project goes smoothly. Next, the propeller is made of lightweight material so that it is easy to rotate according to the moving flow of water [9]. However, the production of this portable hydro generator needs to be studied repeatedly to be able to withstand high water currents and not be easily damaged [10]. In addition, the PVC Tee pipe will be part of the site to be piled into the ground in the water, and water will enter through it and move the propeller as well as generate electricity.

Next, we used a 38V motor generator to channel power to the LED bulbs. Then, we also use capacitors to stabilize the power flow.

#### **4. Results and Discussion**

After the portable hydro generator was produced, we performed several tests to test its effectiveness in terms of fan rotation, power flow, and lifespan, i.e., the length of time the portable hydro generator can be used for a certain period.

When turned by water that is fed downhill into the turbine, propeller or fan-shaped blades placed radially around a central axis operate a rotor or other electricity-generating device within the turbine [11]. To find the rotational velocity of the fan, we have made a test against it by finding the number of rotations the fan requires to produce the power flow.

In the power flow test of a portable hydro generator, power cannot be generated due to several factors, such as shaft type, no bearing on the shaft, and rubber strap friction [12]. On observation, the portable hydro generator did not run smoothly because the fan rotation did not move well even though there was adequate water flow. Subsequently, the project continued with the modification of the portable hydro generator to meet the scope of the project. In the test observations, there are some modifications and experiments that need to be done, such as the power on the motor generator and the capacitors need to be increased so that the fan rotation can work and produce good electrical energy [13].

#### **5. Conclusion**

The project could not work properly because the fan rotation did not run smoothly and caused power flow to not occur to the LED bulbs. Therefore, power energy cannot be determined and calculated because of a nonfunctioning project. In addition, improvements need to be made, such as the addition of pulleys to move the fan and generate electrical power flow. fan rotation. In addition, portable hydro generators do not produce electricity because there is no rotation from the fan despite getting adequate water flow. In addition, the production of this portable hydro generator is also cheaper than what is available on the market because our project is more focused on small-scale agriculture. In addition, this portable hydro generator runs smoothly according to the design produced but cannot function properly.

#### **Acknowledgement**

The authors would like to thank the Centre for Diploma Studies, Universiti Tun Hussein Onn Malaysia for its support.

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