A PROTOTYPE OF WIND, SOLAR AND HYDRO ENERGY GENERATOR FOR EDUCATION PURPOSES

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ABSTRACT:
Alternative energy sources are becoming increasingly necessary as the cost of fossil fuels rises. The wind, hydro, and solar concept is a sort of generator that uses the renewable energy concepts of wind, water, and solar energy to generate electricity. Turbines are a form of mill that utilises wind energy as a source of renewable energy. Many contemporary wind turbine studies concentrate on large-scale wind turbines. However, in this project, a small-scale wind turbine is being used to generate electricity at low speeds. According to the fan speed study, the blade shape is built with three or four vertical axis wind turbine blades. Hydro energy is obtained from flowing water and is used to generate electrical energy and recharge previously utilised energy. The screw turbine in this project has been constructed primarily to generate electrical energy. To generate electrical energy, a vortex will rotate the screw turbine. Solar energy is a sort of renewable energy that is derived from sunshine. The solar panel will absorb sunlight and convert it into electricity. This project will be an electric generator that will provide electrical energy for residents of flat dwellings. In comparison to non-renewable energy, this renewable energy source generator will lessen environmental pollution.

KEYWORDS: *Wind Turbine; Solar Panel, Archimedes Screw*

1.0 INTRODUCTION

Renewable energy will be the primary source of energy in this era of globalisation, replacing non-renewable energy sources such as fossil fuels and diesel gasoline. Renewable energy is energy that is derived from the natural environment and does not pollute the environment. Renewable energy sources include wind, hydropower, and solar power. Wind Turbines, Solar Panels, and Archimedes Hydro Screws are three sorts of designs that can be used to generate power in residential or industrial environments. The design and efficiency of this prototype have been upgraded over time to boost electricity generation as the population expands. The community can be supplied with electrical energy using a combination of three different forms of energy.

The examination of the feasibility of improving energy catches (wind, solar, and hydro) under their typical conditions (speed and heat), built-up areas, and the creation of a hypothetical generator for home usage in areas such as flats. The major goal of this study is to create a teaching prototype that can demonstrate various electrical energy supply situations and scenarios. It is useful to forecast the future state of electrical energy supply. As a result, the chaos that will happen if the electrical power source fails will be avoided. It can also be used as a decision-making tool for any improvements or modifications that need to be made.

This project consists of the design and development of the prototype fabrications. This project was completed according to the process flow under Section 2.0 Methodology. Among the objectives of this project are:

(i) To design a prototype energy generator using solar energy, wind energy and hydro energy;
(ii) To build a prototype energy generator using solar energy, wind energy and hydro energy; and
(iii) To test the completed prototype of energy generator and analyze the results outcome.

2.0 LITERATURE REVIEW

The most cost-effective method of harnessing wind energy now is. They're set up on land or at sea in a known windy location. Wind energy is a clean resource that has grown in importance in global power production. The increasing number of wind farm developments is due to the global availability of wind resources and technological advancements. Furthermore, wind power is one of the cleanest energy sources available, with strong economic viability due to lowering equipment and installation prices (Leandro Jose et al., 2017). The majority of horizontal axis turbines have two or three blades. The main rotor shaft and electrical generator are located at the top of a tower and must face the wind. A simple wind vane is used to point small turbines, whereas a wind sensor and servo motor are used to point larger turbines. It usually has a gearbox that converts the blades' slow rotation into a faster rotation appropriate for driving a generator.

Solar energy is one of the renewable energy sources that Photovoltaic converters can quickly and instantly convert to electric energy. The conversion of solar energy to electric energy using no moveable devices is known as photovoltaic phenomenon, and the conversion device is known as a solar cell (Partain, 1995). The most efficient method of channelling and supplying energy is to use a solar energy generator. Solar panels often use a sunshine sensor in conjunction with a servo motor. Most feature gearboxes that convert low blade rotation into rapid rotation, which is more suitable for moving the generator in accordance with the 360-degree rotation panel solar to be transformed into electrical energy connected through the generator.

The Archimedes screw turbine is used in rivers and irrigation channels that have open channels. The open channel's primary mover force is gravity's weight of fluid, and its pressure distribution is hydrostatic (Tineke Saroinsong, et al., 2016). The basic idea of an Archimedean screw pump is that if the top handle is twisted anti-clockwise, the water will be drawn up from the lower level to the top. The mechanism is the same when employed as a hydro turbine, however it works in reverse. The water enters the screw from the top and pushes against the helical flights, letting the water to fall to the lower level and rotating the screw. An electrical generator linked to the screw's main shaft can then collect this rotational energy.

3.0 METHODOLOGY

From beginning to conclusion, the design process illustrates the actions required to comply. Starting with the design brief for a "Wind, Solar, and Hydro Energy Generator," it reveals a flaw that must be addressed in order to create a successful product. To find solutions to the difficulties, more brainstorming and ideas were required. Identifying the design challenge is another name for this method. To find the right materials, an analysis is carried out. While certain processes are standard in the development of most product designs, modifications or refinements can be made to the existing concept.

To generate electricity, the Archimedes Screw, Wind Turbine, and Solar Panel designs were merged. The Archimedes Screw prototype is angled because the tubing slopes upward on both sides, forming distinct pockets where water can become trapped (Rorres, 2000). These pockets of water can be seen if you glance at your screw from the side. As the screw is rotated, it captures alternating pockets of air

and water, which migrate up the screw to the higher container. These pockets of water can be seen if you glance at your screw from the side. As the screw is rotated, it captures alternating pockets of air and water, which migrate up the screw to the higher container. If you turn the screw up too far, one edge of each pocket will eventually point downhill, enabling the water to flow back down. If you hold the pipe vertically, you can see them more easily (Kantert, 2008). Because wind speeds tend to rise with altitude and hence have a higher power density, the Wind Turbine design included altitude ground. The abundance of energy in the high-altitude winds is greater, but the fundamental issue in harnessing it is our capacity to construct equipment that can reach such heights and send power back to earth (Elizabeth, 2015). Solar Panels were designed using solar energy, which is a green and renewable source of energy that can be obtained easily during the day. As a result, instead of employing batteries, solar energy is an excellent choice for potential energy in the experiment. The position of sun is important and effect for the solar panel to recharge the energy and generate it (Cynthia, 2015).

This project was completed according to the design process flow shown in Figure 1.

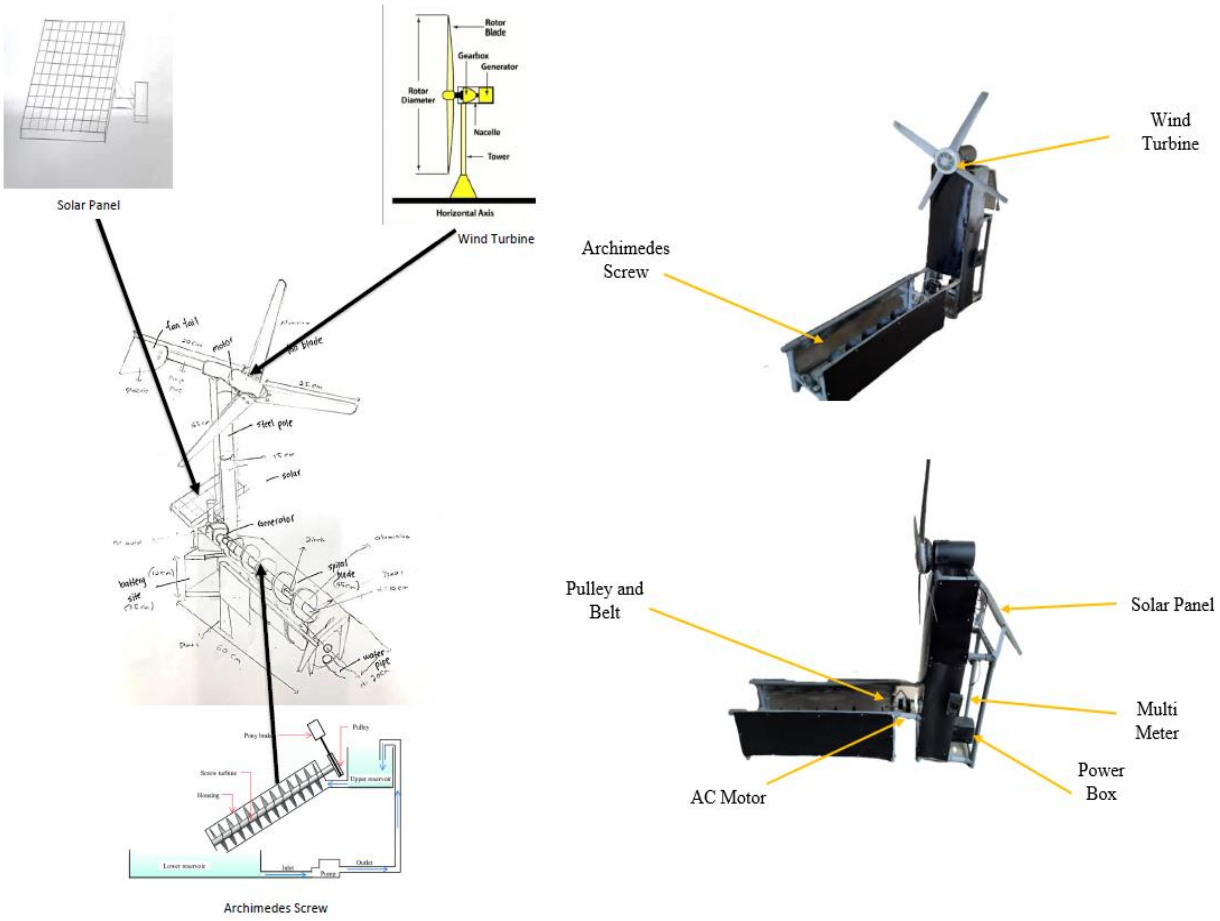


Figure 1: From design stage to finalized prototype

The prototype consists of: -

Table 1: Component and Function

Component	Function
Wind Turbine	The aerodynamic force of the rotor blades, which act similarly to an aeroplane wing or helicopter rotor blade, converts wind energy into electricity in a wind turbine. The air pressure on one side of the blade lowers when wind blows

	across it.
Archimedes Screw	A is made up of an Archimedean screw-shaped rotor that revolves in a semi-circular trough. Water pours into the screw, where its weight pulls down on the turbine blades, causing the turbine to whirl.
Solar Panel	Components that capture sunlight and convert it to electrical energy are situated above the Archimedes screw and below the Wind Turbine. For later use, the electrical energy is stored in batteries or generators.
Multi Meter	A multi meter is a device that can measure a variety of electrical properties. A conventional multi meter can measure voltage, resistance, and current, and is sometimes known as a volt-ohm-milliammeter (VOM) since it has voltmeter, ammeter, and ohmmeter capabilities.
Power Box	The electrical energy contained in the generator.
AC Motor	The rotor is the portion of the AC motor that rotates. These motor components are designed to rotate the rotor, which in turn rotates the motor shaft.
Pulley and Belt	A belt is a loop of flexible material used to physically join two or more spinning shafts. A pulley is a wheel on an axle or shaft that is designed to support movement and redirect tension.

4.0 RESULT AND DISCUSSION

4.1 Wind Energy

Step 1: Prepare all material	Wind Turbine  Multi Meter 

Step 2: Put Wind Turbine at High-Altitude Ground	Complete Design of Wind Turbine 
Step 3: Wait for turbine blade spin follow the wind flow	
Step 4: Read the Voltage on Multi Meter	

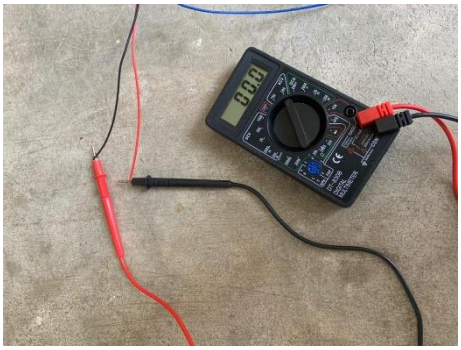
When the pressure declines, the wind speed increases, and the wind speed at the top of the tower approaches zero only then. With increasing wind speed, it was discovered that friction losses through the tower grow, but temperature differences between the inlet and outlet of the tower and heat losses from tower walls decrease. The solar turbine's inlet air velocity and, as a result, its specific power, grew as the wind speed at the top of the tower increased. As a result, during thermosyphon solar tower calculations, the effect of wind speed at the top of the tower must be considered. When comparing the performance of a solar turbine and a free wind turbine located at tower height with the absence of a thermosyphon solar tower, it was discovered that the solar turbine located at tower bottom has a higher mean inlet air velocity and, as a result, a higher specific power than the free wind turbine.

Table 2: Speed of Wind

Speed of Wind (km/h)	Observe Voltage (Volt)
10	9.7V
15	17.1V
20	24.7V
25	45.9V
30	57.3V

4.2 Hydro Energy

Step 1: Prepare all materials i. Archimedes Screw ii. Motor iii. Bearing iv. Pulley v. Belting	Archimedes Screw 

Step 2: Connect the natural wire from motor to positive wire at Multi Meter and the speed wire which is red wire to the negative at Multi Meter	Connected Wire Multi Meter 
Step 3: Connect the Screw to Motor with Pulley, Belting and Motor	Pulley, Belting and AC Motor 
Step 4: Start spinning the screw and observe the Multi Meter	
Step 5: Record data that have been show at voltmeter	

The turbine's rotational speed has a considerable impact on its performance. When the turbine's rotation speed is altered, the flow rate and power fluctuate as well. At the end of these studies, it was discovered that increasing the turbine rotation speed improved the voltages.

Table 3: Rotation of Screw (in rpm) of Hydro Energy

Rotation of Screw (RPM)	Observe Voltage (V)
60	3.9V
120	7.8V
180	11.7V
240	15.6V
300	19.5V

4.3 Solar Energy

Step 1: Prepare all materials i. Solar Panel ii. Power box iii. Bulb iv. Solar Stand	Set Solar Panel 
Step 2: Connect the Solar Panel to Connector	
Step 3: Place the whole system under Sunlight.	
Step 4: Face the Solar Panel to Sunlight	Figure 11 Placing Solar Panel 
Step 5: Till the solar panel at a position of 60 degrees toward the sun.	
Step 6: Switch on the power box to charge the electronic device at output port.	

The sun's beams are strongest at midday, weakest at dawn and twilight, and intermediate for the rest of the day. In the absence of additional circumstances, such as cloud cover, a solar panel's output is highest when the sun's beams are more direct than at other times (Ulanoff Lance, 2015). Because the earth's axis is tilted at 23.5 degrees in relation to the sun, seasons fluctuate as the planet goes through its year-long orbit.

Table 4: Duration of Under Sunlight for Solar Energy

DURATION OF UNDER SUNLIGHT	Observe Voltage (V)
1 Hours	10.0V
2 Hours	11.3V
3 Hours	12.6V
4 Hours	13.2V
5 Hours	14.7V

5.0 CONCLUSION

The sun's beams are strongest at midday, weakest at dawn and twilight, and intermediate for the rest of the day. In the absence of additional circumstances, such as cloud cover, a solar panel's output is highest when the sun's beams are more direct than at other times (Ulanoff Lance, 2015). Because the earth's axis is tilted at 23.5 degrees in relation to the sun, seasons fluctuate as the planet goes through its year-long orbit. Because the speed of the Archimedes screw is faster than two other total hand rotations, 40 times hand rotations are more efficient. It is simple to generate higher volts by rotating the hand 40 times. However, when the Archimedes screw is tested in a real-world condition, such as with 1000 rpm and tank water, it can yield larger voltages. In conclusion, solar panels can absorb sunlight to provide long-lasting electrical energy and produce voltage to compute the temperature at the climax, which is between 12 and 2 p.m. Solar panels are exposed to the elements in order to receive sunlight.

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