



Design-Construction of a Solar Cell Energy Water Pump as a Clean Water Source for People in Sirnajaya Village, Gununghalu District

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ABSTRACTS

The purpose of this study is to analyse the performance of the solar panels and batteries used to operate the water pump. The results will be used for the application of water pump energy sources in Sirnajaya village, Gununghalu district. The method used to analyse is experimental. The data of the voltage generated by the solar cell and the data of the batteries voltage are collected every hour for six days. Then collect the data of the duration for filling up the water container 500 litres. Results show that the solar panels generate the highest voltage at 12.00 with an average voltage of 19,1 VDC, at 13.00 with an average voltage of 19,1 VDC, and at 14.00 with an average voltage of 18,9 VDC. The result related to the batteries voltage when charging shows the highest voltage at 12.00 with an average voltage of 14,0 VDC, at 13.00 with an average voltage of 14,1 VDC, and 14.00 with an average voltage of 14,1 VDC. The duration for filling up the 500-litre water container takes 60 minutes. These results come because of the various intensity of the sun and the position of the sun against the solar panels which give an impact to the voltage value from the solar panels and the batteries. This study gives impacts on the application of solar panels for various uses.

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1. INTRODUCTION

The design of the water pump with energy from solar panels is motivated by the problem of water availability that was conveyed by the people of Sirnajaya village, Gununghalu district. The community needs to travel a considerable distance from their house ± 100 m to get water because there is not yet an adequate water transmission system. On the basis of this, the idea was born to make the main component of the water transmission system, namely the manufacture of an economical water pump system using solar panel energy sources. The use of these energy sources is based on the comparison of the costs of installation, maintenance, refill, and repair between solar, diesel, and electricity energy sources [1] (Helikson & and others, 1995). The manufacture of water pumps with solar panels as a source of energy has been made but with the use of DC water pumps [2] (Khan, Ahmed, Sina, & Shahidul, 2012). To solve the existing problem, an AC water pump will be used to produce a larger water flow. The design of an AC water pump system with energy from solar panels has been simulated beforehand to conclude that this system can be realized with a simulated scheme [3] (Biswas & Iqbal, 2018). This research was conducted by testing the designed system scheme and evaluating the system problems that have been made by making a modification. The difference between this system scheme and the system schemes that have been designed by various researchers lies in the use of three solar panels connected in parallel to a semi-jet pump AC water pump.

2. METHODS

The method used in this study are as follows:

- a. Mechanical and electrical system planning and design
 - b. Manufacture of a mechanical system
 - c. Electrical system assembling and wiring
 - d. Testing the solar panel system by measuring the voltage of solar panel and battery voltage
 - e. Analysis result of the solar panel system testing
 - f. Installation of water pump with solar energy on Sirnajaya Village, Gununghalu District.
- The installation plan is shown in the following figure.

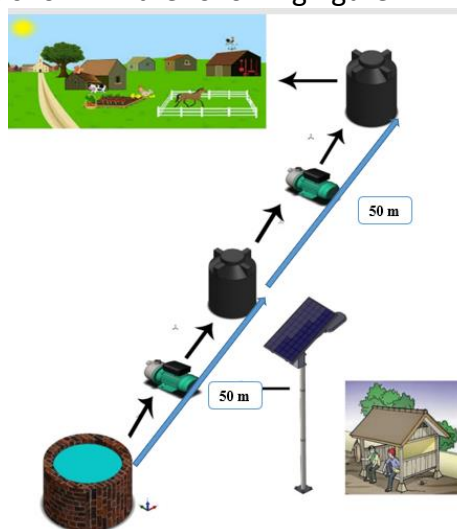


Figure 1. The installation plan

3. RESULTS AND DISCUSSION

3.1. The Performance of The Solar Panel System

The purpose of this study was to analyze the performance of the solar panels system to run a water pump. The study was carried out every hour within six days. The result can be seen from the following tables.

Table 1. The voltage of solar panel

Time	Voltage						Average
	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	
06.00	16.8	16.3	16.5	16.4	16.8	16.8	16.6
07.00	17.2	16.9	17.1	17.0	17.3	17.2	17.1
08.00	17.8	17.5	17.6	17.5	17.7	17.9	17.7
09.00	18.6	18.2	18.2	18.3	18.6	18.7	18.4
10.00	18.7	18.4	18.3	18.4	18.8	18.8	18.6
11.00	18.9	18.7	18.7	18.8	19.0	18.9	18.8
12.00	19.1	19.2	19.0	19.0	19.2	19.0	19.1
13.00	19.0	19.2	19.1	18.9	19.1	19.1	19.1
14.00	19.0	19.0	19.0	18.9	18.9	18.8	18.9
15.00	18.5	18.4	18.6	18.1	18.3	18.0	18.3
16.00	16.8	17.0	17.1	16.9	17.2	16.9	17.0
17.00	16.2	16.3	16.2	16.1	16.3	16.1	16.2
18.00	16.1	16.1	16.0	16.0	16.1	16.0	16.1

From the table, the solar panels generate the highest voltage at 12.00 with average voltage 19,1 VDC, at 13.00 with average voltage 19,1 VDC, and at 14.00 with average voltage 18,9 VDC. And for analyze the performance of the system, we need to check the voltage of the batteries. The result can be seen from the following table.

Table 2. The voltage of the batteries

Time	Voltage						Average
	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	
06.00	12.9	12.7	12.8	12.8	12.9	12.9	12.8
07.00	12.9	12.7	12.8	12.8	12.9	12.9	12.8
08.00	13.0	12.8	12.9	12.8	13.0	13.0	12.9
09.00	13.1	12.9	12.9	13.0	13.1	13.1	13.0
10.00	13.3	13.0	13.0	13.1	13.1	13.1	13.1
11.00	13.5	13.3	13.2	13.3	13.4	13.3	13.3
12.00	14.1	13.9	13.9	13.9	14.1	14.0	14.0
13.00	14.1	14.1	14.1	14.0	14.1	14.1	14.1
14.00	14.1	14.1	14.1	14.1	14.1	14.1	14.1
15.00	14.1	14.1	13.9	14.0	13.9	13.9	13.9
16.00	14.0	14.0	13.9	13.7	13.8	13.6	13.8
17.00	13.7	13.6	13.4	13.4	13.5	13.3	13.5
18.00	13.1	13.1	12.9	12.8	12.9	12.7	13.0

And from table 2, result related with the batteries voltage when charging that showed the highest voltage at 12.00 with average voltage 14,0 VDC, at 13.00 with average voltage 14,1 VDC, and at 14.00 with average voltage 14,1 VDC. These result is due to the various intensity of sunlight due to the position of the sun on the solar panel which has an impact on the voltage value of the solar panel and batteries.

3.2. The Result of System Implementation on Sirnajaya Village

The system has been implemented in Sirnajaya Village, the documentation can be seen in the figures.



Figure 2. Install The Solar Panel



Figure 3. Install The Water Pipe



Figure 4. Install The Controlling System



Figure 5. Install The Water Pump

4. CONCLUSION

Based on the test results, the solar panel system that use three solar panels connected in parallel to a semi-jetpump AC waterpump can function properly to run the water pump so that the system can be applied in Sirnajaya Village, Gunung Halu District for helping people to get water.

7. REFERENCES

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