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Abstract. The use of thermoelectric as an energy source has not been optimally implemented, this is the main problem. In this study, using a parabolic reflector as a medium for thermoelectric devices, 6 peltiers, which can be adjusted towards the sun, so that the peltier can absorb the sun's heat energy optimally. The method is carried out by assembling 6 thermoelectric pieces on a parabolic reflector, from the measurement results for 7 consecutive days the voltage and current results are obtained based on the influence of weather factors measured at the highest and lowest temperatures on that day for one week, namely Monday 4,169 V and 0,55 A with a hot temperature of 55 °C and a cold temperature of 32 °C, Tuesday 9,114 V and a cold temperature of 0,59 A with a hot temperature of 70 °C and a cold temperature of 32 °C, Wednesday 16,58 V and 0,71 A with a hot temperature of 110 °C and temperatures cold 32 °C. Thursday 18,207 V and 1,10 A hot temperature 115 °C and cold temperature 41 °C, Friday 22,453 V and 1,42 A hot temperature 118 °C and cold temperature 36 °C, Saturday 18,33 V and 0,85 A with hot temperature 115 °C and cold temperatures of 40 °C, week 14,81 V and 0,95 A with hot temperatures of 95 °C and cold temperatures of 38 °C. From the results of the thermoelectric test, it can be concluded that the findings by using a parabolic reflector obtained a maximum voltage of 22,453 V with a maximum current of 1,42 A.

1. Introduction

The use of thermoelectric media as an energy source has not been optimally implemented, this is the main problem. One of the solutions to overcome the problem of energy utilization is to seek new innovations as an alternative energy source. Thermoelectric is a potential energy source, especially placed on equipment that has a heat element as an effort to create new and renewable energy [1]. My previous research was utilizing motorcycle exhaust heat as an energy source using a thermoelectric. The results obtained from this study through heat transfer of a motorcycle engine, precisely in the exhaust, which is placed in a thermoelectrically connected series to produce a voltage of 6.69 V [2]. Based on the principle of creating environmentally friendly renewable energy, it is necessary to conduct research to determine the design system and characteristics of the Peltier module which takes advantage of the seebeck effect, namely by utilizing solar energy as heating and surrounding air as a coolant, which effects can be found in semiconductor materials. thermoelectric peltier. In general, the use of solar energy conversion in photocell type semiconductor materials is converted

through an inverter for the use of lamp loads [3]. The use of photocell and inverter technology requires a fairly large installation cost and construction compared to the use of peltier or thermoelectric technology [4]. When solar energy is used as heating and ambient air as cooling, the seeback effect can be found in peltier thermoelectric semiconductor materials [5]. So the researchers' idea emerged to take advantage of thermoelectric technology on parabolic reflectors whose function is to reflect signals like mirrors. The reflected signal from the parabolic reflector points to the sun [6].

2. Review of literature

2.1.Thermoelectric (Peltier)

Thermoelectric is a device that can convert heat energy directly into electrical energy. In addition, thermoelectrics can also convert electrical energy into a heat pump / refrigeration process [7], [8]. A thermoelectric module is an integrated circuit in a solid form that uses three thermodynamic principles known as the Seebeck, Peltier and Thompson effect [5], [9], [10]. The construction consists of pairs of p-type and n-type semiconductor materials that form a thermocouple which has a sandwich-like shape between two thin ceramic wafers [5]. This module can be used to generate heat and cold on each side if an electric current is used which is usually applied as a cooling system, for example a vaccine cooler, or to generate electricity when hot and cold are used as the temperature difference [11],[12].

2.2. Effect Seebeck

The effect Seebeck concept illustrates that if two metallic materials (usually semi-conductors) are connected in an environment with two different temperatures, the material will flow electric current or electromotive force [5],[10]. The effect seebeck is a phenomenon that converts temperature differences into electrical energy [10]. If there are two different materials connected to each other then the two ends are made in one loop. If there is a temperature difference between these two connections, an electric current will occur [13]. This principle is used by the thermoelectric as a generator for electricity. Each material has a different seebeck coefficient. The greater the seebeck coefficient, the greater the potential difference generated [10],[14]. Because the temperature difference here can be converted into an electric voltage, this principle is also used as a temperature sensor called a thermocouple [10],[12].



Figure 1. Thermoelectric Module [7].

The writing on the Peltier body shows the series and specifications of the Peltier module, the writing listed on the Peltier body shows that the Peltier module has the following specifications [7],[15] :

1.Size: 40 x 40 x 3.9mm
2. Imax - 7A
3. Umax - 15.4V
4. Qcmax - 62.2W
5. Tmax - 69°C
6. 1.7 Ohm resistance
7. 127 thermocouples
8. Max temperature: 180 ° C
9. Min operating temperature: - 50 ° C

2.3. Thermoelectric Working Principle (Peltier)

The working principle of the Thermoelectric is based on the Seebeck Effect, that is, if 2 different metals are connected to one end, then given a different temperature at the joint, there is a difference

in voltage at one end and the other [5], [10]. Based on the Peltier effect, that is, when two metals are glued together in a circuit, electricity is applied. When an electric current is applied, heat absorption occurs in the two metal joints and heat dissipation at the other connection. This heat release and absorpti reverses once the direction of the current is reversed. This discovery that occu d in 1934 became known as the Peltier effect. The Seebeck and Peltier effect is what later became the basis for the development of thermoelectric technology [5], [16].

2.4. Parabolic

Parabolic antenna is a high-power antenna used for radio, television and data communications and also for radiolocation or radar, in the UHF and SHF portions of the electromagnetic wave spectrum. The relatively short wavelengths of electromagnetic energy at these frequencies mean that the size used for parabolic antennas is still within a reasonable size in terms of the high performance of the response desired for both receiving and transmitting signals [17], [18].

Parabolic has a focal point which is the area where the reflected signal from the satellite is collected, for example when looking at a convex glass when it is in the sun, then there are hot spots, as well as a parabolic antenna which is a point where the reflected signal meets at one meeting point [19], [20]. Basically, the parabolic antenna manufacturer has designed the LNB support post right at the focal point. However, usually when assembling it, it is not necessarily 100% correct at the point, which is why the signal received is sometimes not optimal [21], [22].



Figure 2. Parabolic

3. Research Methods

This study used an experimental method that was carried out in 7 days, based on the heat of the sun reflecting off the parabolic reflector with the procedu carried out in assembling a thermoelectric or 6 peltier system that is placed on a parabolic reflector as shown in Figure 3.

In Figure 4 the diagram of the work system experimentally shows how the heat from the sun is reflected by a parabolic which is directed to the heatshink to heat the hot side of the peltier, in the middle of the heatshink there is a peltier that has been arranged, in the peltier there are hot and cold sides on each side There is a temperature measurement using a thermometer, then the cold side of the Peltier is cooled using a radiator that ha been made, the radiator is initially filled with water using a water tube, to flow to the radiator or to the cold side of the peltier, after which the water flow through the radiator will flow to water usage required.

For the Peltier output with the cold side process it has the potential to produce a negative voltage, on the other hand the hot side has the potential to produce a positive voltage. The process of the results of the positive and negative voltages is in the form of the peltier output current which is measured using an ampere meter leading to the charging system where the output is measured using the voltage then the selector which functions to stabilize the voltage generated by the peltier, then the resulting voltage is stored in the battery which functions to save the voltage that will be used later to charge the cellphone, after that go to the USB charging module which is equipped with a volt meter and ampere meter screen, then the current and voltage measurement output will automatically appear on the screen.

The need for the battery to be connected as backup energy that can store the output voltage from the

peltier. After that remove the spare battery then move the measurement selector (voltmeter and ammeter) to the output side, then the output of the charging system module that has been made will be read, there are 2 charging modules, namely a weak current module 1 A working voltage from 0.9 V - 5V and module for stronger current 1 A working voltage 2 V - 5 V [23]. Once connected, the selector is connected to the output then the spare battery is removed in this system, this means that from the Peltier it goes directly to the module which is directly used to charge the cellphone.



Figure 3. Schematic of the whole system

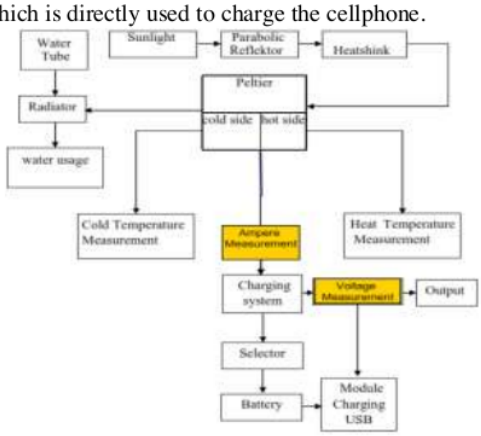


Figure 4. Block diagram of the system

4. Results and discussion

The overall test and measurement results of this study are displayed in the form of a results table, table 1 is the result of Peltier testing based on the sun's heat for 7 days, for table 2 is the calculation result of peltier testing and measurement, the seeback coefficient value so that voltage and current can be generated of peltier or thermoelectric [5], [10]. Based on the results of the observations in Table 1, the seeback coefficient value can be calculated using the formula [5], [10] : $\propto = Vp / \Delta T$
Where:
Vp = Peltier Voltage ; $\Delta T = T_2 - T_1$ (when it's hot - when it's cold)

Table 1. Observation data for 7 days

No	Testing Day	Observation Time (WIB)	Pertier Voltage (V) V_P	Current (A) I	Electrical Resistance (A) R_d	Heat Resistance (K/W) R_P	Hot Temperature (^oC) T_2	Cold Temperature (^oC) T_1	Coefisien Seeback (V/K) α
1	Monday	10.00-12.00	2,25	0,55	3,5	1,1	55	38	0,132
2		12.00-14.00	5,85	0,73	3,5	1,1	55	32	0,188
3	Tuesday	10.00-12.00	6,05	0,78	3,5	1,1	70	32	0,168
4		12.00-14.00	3,05	0,59	3,5	1,1	57	38	0,160
5	Wednesday	10.00-12.00	5,75	0,71	3,5	1,1	60	32	0,205
6		12.00-14.00	11,05	1,50	3,5	1,1	110	36	0,149
7	Thursday	10.00-12.00	9,6	1,10	3,5	1,1	95	41	0,177
8		12.00-14.00	12,5	1,65	3,5	1,1	115	41	0,168
9	Friday	10.00-12.00	11,02	1,42	3,5	1,1	98	36	0,177
10		12.00-14.00	12,7	1,70	3,5	1,1	118	40	0,162
11	Saturday	10.00-12.00	12,5	1,68	3,5	1,1	115	40	0,166
12		12.00-14.00	8,6	0,85	3,5	1,1	90	41	0,175
13	Sunday	10.00-12.00	10,1	1,35	3,5	1,1	95	38	0,177
14		12.00-14.00	8,9	0,95	3,5	1,1	93	41	0,171

The calculation results from table 2 use the following formulas [5], [7] :

$$Q_{sd} = \propto . I . T_1 - \frac{\Delta T}{R_p} - \frac{I^2 . R_d}{2} \quad ; \quad Q_{sp} = \propto . I . T_2 - \frac{\Delta T}{R_p} - \frac{I^2 . R_d}{2}$$

$$V = \propto \Delta T + IR \quad ; \quad P_{el} = VxI$$

Where :

Q_{sd} = Cold side
Q_{sp} = Hot side
$\propto$ = seeback coefficient
I = Current
ΔT = $T_2 - T_1$ (when it's hot - when it's cold)
R_d = Electrical Resistance
R_p = Heat Resistance
P_{el} = Electrical Energy Consumption
V = Voltage

Table 2. Results of the calculation of energy consumption produced

No	Testing Day	Observation Time (WIB)	Cold Side (W) Q_{sd}	Hot Side (W) Q_{sp}	Voltage (V) V	Current (A) I	Electrical Energy Consumption (W) P_{el}
1	Monday	10.00-12.00	6,64	7,88	4,169	0,55	2,29
2		12.00-14.00	12,81	17,07	6,433	0,73	4,696
3	Tuesday	10.00-12.00	4,35	9,37	9,114	0,78	7,10
4		12.00-14.00	11,47	13,27	5,105	0,59	3,011
5	Wednesday	10.00-12.00	18,05	22,12	8,225	0,71	5,83
6		12.00-14.00	17,60	34,63	16,58	1,50	24,387
7	Thursday	10.00-12.00	9,343	20,43	13,4	1,10	14,74
8		12.00-14.00	15	35,515	18,207	1,65	30,041
9	Friday	10.00-12.00	21,012	36,592	15,94	1,42	22,63
10		12.00-14.00	10,24	31,725	22,453	1,70	38,170
11	Saturday	10.00-12.00	14,161	35,081	18,33	1,68	30,79
12		12.00-14.00	6,89	8,186	11,55	0,85	9,817
13	Sunday	10.00-12.00	19,311	32,931	14,81	1,35	19,99
14		12.00-14.00	2,16	10,67	12,217	0,95	11,606

The results of previous research on utilizing motorcycle exhaust heat as an energy source using a thermoelectric, produce the highest voltage of 6,69 V when the working temperature is 90°C [2]. While this research is the use of thermoelectric using parabolic reflectors as an energy source, resulting in the highest voltage 22,453 V when the working temperature is 118 °C. In view of the test table on table 1 and table 2, when the working temperature is 90 °C the resulting voltage is 11,55 V. So it can be concluded that the heat utilization of parabolic reflectors using thermoelectric is better.

5. Conclusions and Recommendations

5.1 Conclusions

From the thermoelectric design using a parabolic reflector, tests and measurements and calculations were carried out in order to obtain the following conclusions:

From the design of the tool that has been made, that the working system of the tool utilizes solar energy as the upper side heater of the peltier and the wind as the lower side of the Peltier cooler [23], the greater the temperature gradient on the peltier side, the greater the electrical energy produced by the peltier [5].

From the measurement results for 7 consecutive days, the voltage and current results were obtained based on the influence of weather factors measured when the highest and lowest temperatures on that day for one week were Monday 4,169 V and 0,55 A with hot temperatures of 55 °C and cold temperatures of 32 °C, Tuesday. 9,114 V and a cold temperature of 0,59 A with a hot temperature of 70 °C and a cold temperature of 32 °C, Wednesday 16,58 V and 0,71 A with a hot temperature of 110 °C and a cold temperature of 32 °C. Thursday 18,207 V and 1.10 A hot temperature 115 °C and cold temperature 41 °C, Friday 22,453 V and 1.42 A hot temperature 118 °C and cold temperature 36

°C, Saturday 18,33 V and 0.85 A with hot temperature 115 °C and cold temperatures of 40 °C, week 14,81 V and 0,95 A with hot temperatures of 95 °C and cold temperatures of 38 °C.
From the results of the thermoelectric test, it can be concluded that by using a parabolic reflector, the maximum voltage is 22,453 V with a maximum current of 1,42 A.

4.2 Recommendation

For further development of this tool to make it more perfect, some suggestions are as follows: The development of this tool is still very possible and can be improved by adding a light sensor and a servo motor so that the parabolic can move automatically according to the position of the sun [6], [24] . It is also necessary to add an automatic cooling device that has a temperature control button so that researchers can set the desired temperature.

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