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Design and Build Akatek Billboard Lighting with Solar Cell

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ABSTRACT

The air-conditioning feature has become an essential part of a vehicle. a vehicle. The Air Conditioner system is a system in a vehicle that controls temperature, air circulation, controls humidity, and cleans the air. clean the air. The purpose of the research is to find out how to maintain and repair of car Air Conditioner (AC). The method used by doing checking the temperature, refrigerant pressure, air flow rate, humidity and alsocleaning dirt/ dust attached to components such as evaporators, condensers, electrical components and other components. The results showed that for the results of maintenance and repair, the air temperature is around 30o - 35o, the rotation of the motor engine is 2000 ppm and the maximum cooling setting is sr. 2000 ppm and maximum cooling settings and maximum fan (blower) motor rotation rate. maximum. If at the time of testing the standard conditions are not achieved, then perform the check using the maintenance method.
***Keywords**: Air Conditioner, Maintenance, Repair.*

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Introduction

Nowadays, electricity has become an important need for the community, in line with the increasing growth rate and development activities in all fields. To meet the rapid demand for electricity, the government is determined to continue to improve the program for the development of electric power facilities and infrastructure to reach a wider area. Indonesia has a very wide geographical condition, consisting of thousands of islands and the uneven distribution of the population, so this is the main obstacle to adding to the PLN (State Electricity Company) electricity distribution network to every corner of the country. Therefore, it is not surprising that there are still many people in rural areas, especially those who live in remote areas, who have not been able to enjoy electricity. Aware of the above problems, BPPT (Agency for the Assessment and Application of Technology) has developed and implemented Solar Power Plants (PLTS) in various rural areas in Indonesia.

The application of Solar Power Plants (PLTS) as an alternative to fulfilling solar energy in Indonesia, especially in remote rural areas, is very necessary considering the potential of solar energy in Indonesia which has a flat length of daylight almost throughout the year so that it can be used effectively, besides that scattered population settlements are also a consideration. Until now, many government, private and even housing agencies have implemented and developed solar energy as alternative energy, one of which is used as lighting, yard lights or garden lights. The use of solar energy lighting lights can also be used on billboards or billboards. As a consideration to obtain alternative

sources of electricity and its application, it was finally decided to make AKATEK Billboard Lighting with a power source from solar energy or Solar Cell.

Discussion

1. Akatek Billboard Lighting

Akatek billboard lighting is an independent lighting system that utilizes solar energy through solar cells stored in batteries and is used to turn on LED lights that function as billboard lighting at night. Akatek billboard lighting uses a 50 WP solar cell, battery charge regulator (BCR), light sensor, 32Ah battery type MF (Maintenance Free) and LED lights.

2. Solar Cell

A Solar Cell is a device or component that can convert sunlight energy into electrical energy using the principle of the Photovoltaic effect. The Photovoltaic effect is a phenomenon in which an electrical voltage arises due to the connection or contact of two electrodes connected to a solid or liquid system when obtaining light energy. In general, in Indonesia there are 2 types of Solar Cells, namely Monocrystalline (Si) and Poly-crystalline (Si).

3. Battery Charge Regulator

Battery Charge Regulator is a series of electronic devices that regulate the battery charging process in a solar power generation system. The DC voltage generated by solar cell panels generally varies by 12 volts upwards. This BCR functions as a device to regulate the voltage of the battery so that it does not exceed its power tolerance limit. In addition, this controller also prevents the current from the battery from flowing back to the solar cell panel when the charging process is not taking place (for example at night) so that the charged battery does not drain its power. When the battery or battery circuit is fully charged, the DC flow from the solar panel will be cut off so that the battery no longer undergoes charging so that damage to the battery can be prevented and the battery life can be extended. Controlling the battery charging process by opening and closing the flow of DC current from the solar panel to the battery is the most basic function of a BCR.

4. Light Sensor

A Light Sensor is an electronic network that regulates the on (ON) and off (OFF) of the lighting lights on a solar power generation system. This light sensor will read the light conditions in the surrounding area. If the light conditions have started to get dark (late in the evening), then the light sensor will connect the current from the battery to the lighting lamp. On the other hand, if the surrounding light is bright (morning until late afternoon), then the light sensor will cut off the battery current to the lighting lamp. The light sensor used is based on LDR (Light Dependent Resistor), where when the light is bright, the resistance value of this LDR will be small and vice versa when it is dark the resistance will be large.

5. Battery/Accumulator

An accumulator or often called a battery, is one of the main components in a motor vehicle, whether a car or a motorcycle, all require a battery to be able to start the vehicle's engine (supplying current to the vehicle's starter dynamo). Batteries are able to convert chemical energy into electrical

power. There are two types of elements that are known to be the source of direct current (DC) from chemical processes, namely primary elements and secondary elements. The primary element consists of a wet element and a dry element. A chemical reaction in the primary element that causes electrons to flow from the negative electrode (cathode) to the positive electrode (anode) is irreversible. So if the charge runs out, then the primary element cannot be reloaded and requires the replacement of the reactant material (dry element). So from an economic point of view, the primary element can be said to be quite wasteful. An example of a primary element is battery stones (dry cells). Secondary elements in their use must be charged first before use, that is, by flowing current, unlike primary elements, secondary elements can be reloaded repeatedly. This secondary element is better known as the battery. In a battery, a reversible electrochemical process takes place with high efficiency. What is meant by the reversible electrochemical process is that in the battery when used the process of converting chemicals into electrical power (discharging) takes place. Meanwhile, when charged or loaded, there is a process of electric power into chemical power (charging).

6. Solar Cell Testing

The Solar Cell test aims to determine the amount of output value of the solar cell in the form of voltage, current and maximum power when given various conditions, namely sunny, cloudy and cloudy conditions. Testing the output voltage and current values uses a multimeter to see the magnitude of the change in output voltage and current to a given condition. The parameters tested are V out or voltage out of the Solar Cell, I (Current) measured by the load, where the load used is 1 12VDC 10W Bulb Light, and P (power) or the result of multiplication between V out and I load. The measuring instrument used to measure V out and I loads, respectively, is a digital multimeter type DT-830B.

Solar Cell Testing				
Time	**V out (V)**	**I load (A)**	**P(W)**	**Condition**
08.00	17,40	0,74	12,88	Overcast
09.00	17,60	0,76	13,38	Overcast
10.00	19,00	0,80	15,20	Bright
11.00	19,06	0,95	18,62	Bright
12.00	19,00	0,93	17,67	Bright
13.00	8,60	0,57	4,90	Cloudy
14.00	17,80	0,77	13,71	Overcast
15.00	17,30	0,72	12,46	Overcast
16.00	8,80	0,59	5,19	Cloudy

7. BCR Testing

The Battery Charge Regulator series test aims to determine the performance of the circuit, the charging process and the stability of the voltage. The battery used in this study is a 12 Volt 32 Ah MF (Maintenance Free) type. The test uses PLN voltage which is directed to a DC voltage of 14 V 5A with a power supply.

Time (Hours)	Vdc (V)	Idc (A)	Vbatt (V)
0	14,2	4,69	11,25
1	14,2	4,48	11,55
2	14,3	4,27	11,74
3	14,2	4,02	12,0
4	14,2	3,67	12,27
5	14,3	3,46	12,39
6	14,3	3,24	12,49
7	14,2	3,17	12,59
8	14,2	2,71	12,67

8. Light Sensor Testing

The Light Sensor Circuit Test aims to determine the performance of the circuit, the resistance value at the LDR and the current at the Transistor Base. The resistance value in the LDR will determine the amount of current that will be passed to the base of the transistor to activate the switching function on the transistor itself. The input voltage used uses a 12 VDC power supply (Vcc) instead of a battery.

Condition	LDR Retreat (Ω)	Vbe (Volt)	Ib (mA)	Relay Condition
1	1,3 K	0,68	1,88	ON
2	2 K	0,67	1,69	ON
3	7 K	0,66	0,96	ON
4	160 K	0,59	0,06	OFF
5	278 K	0,56	0,04	OFF
6	332 K	0,56	0,03	OFF

9. Battery Capacity Testing

The Battery Capacity Test aims to determine the ability of the battery to turn on the load and analyze the voltage drop after the test. The previous battery will be charged until it reaches a voltage of 12.6 V using a DC voltage of 14V. The load used for this battery is 4 pieces of 12V LED lights with a power of 3W per lamp, so the total amount of load is 12 W. The parameters measured are the battery voltage and also the measured current at the measured load per hour.

Time	V baterai (V)	I load (A)
0 Jam	12,6	0,69
1 Jam	12,6	0,69
2 Jam	12,5	0,69
3 Jam	12,5	0,69
4 Jam	12,5	0,69
5 Jam	12,4	0,69
6 Jam	12,4	0,69
7 Jam	12,4	0,69
8 Jam	12,3	0,69

10. Overall System Testing

Testing of the entire system. It is carried out to measure the voltage of the Solar Cell, the voltage of the battery and the condition of the lighting.

Time	V Solar Cell (V)	In Baterai (V)	Light Condition
08:00	12,0	11,8	EXTINGUISHED
09:00	12,3	11,8	EXTINGUISHED
10:00	12,4	11,9	EXTINGUISHED
11:00	12,8	11,9	EXTINGUISHED
12:00	14,1	11,9	EXTINGUISHED
13:00	13,9	12,0	EXTINGUISHED
14:00	13,3	12,1	EXTINGUISHED
15:00	9,6	12,1	EXTINGUISHED
16:00	7,2	12,1	EXTINGUISHED
17:00	5,4	12,1	EXTINGUISHED
18:00	1,7	12,1	EXTINGUISHED

19:00	0	12,1	NYALA
20:00	0	12,1	NYALA
21:00	0	12,0	NYALA
22:00	0	12,0	NYALA
23:00	0	12,0	NYALA
00:00	0	11,9	NYALA
01:00	0	11,8	NYALA
02:00	0	11,8	NYALA
03:00	0	11,8	NYALA
04:00	0	11,8	NYALA
05:00	0	11,8	NYALA
06:00	1,1	11,8	EXTINGUISHED

Conclusion

From the test results, conclusions can be obtained, including:

1. The Billboard lighting system with Solar Cell is built from the integration of Solar Panel, Battery Charger Regulator, light sensor and battery.
2. Light and weather conditions greatly affect the effectiveness of the lighting system with Solar Cells.
3. The performance of the Light Sensor is determined by the magnitude of Ib (Base current), if the current flows from the collector to the emitter without impedance and Vce≈0, then the transistor is in a closed switch-like condition.

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