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THE RECORDS OF THE POWER PRODUCE OF SOLAR CELL OF 50 WP AS LONG AS MARCH 2016 AT KENTEN AREA

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ABSTRACT

Solar cell of 50 WattPeak capacity is used on this research. The measurements are conducted for eight hours a day from 9.00 o'clock a.m. till 5.00 o'clock p.m. This research is mainly aimed at to find out the electric power outcome of the solar cell at varies weather conditions in March of 2016 year. All of the equipments and measurements apparatus is stationed at Kenten BMKG Station of Palembang. The solar cell position is facing to the north at an angle of 10º. The total output of electric power is 4384,99 Watt and the total solar light intensity 134062,91 W/m² along March 2016. On full shinny and clear day the maximum power obtained is 49,2 W/hr and the sun light intensity is 1464,6 W/m². On cloudy day, the maximum power obtained is 42,8 W/hr and the sun light intensity is 1216,9 W/m². On rainny day the maximum power obtained is 34,1 W/hr and the sun light intensity is 1042,5 W/m². The results shown the relations between the power obtained and the light intensity, atmosfir temperatur and clouds in the sky

Keywords: solar cell, 50 watt peak, north facing, 10º inclination.

1. INTRODUCTION

Solar energy is a limitless source of energy in the world. The total solar energy accepted by the earth is about 174 PW (PetaWatt) where 89 PW of it is absorbed by the earth surface and the ocean. The rest are absorbed by the atmosphere and the remaining is reflected back to the sky.[1] Solar cell is a panel developed to convert the sun light by the instrument surface into electric energy. Regarding the first thermodynamic law that the energy cannot be annihilated but could converted into other form of energy. In this case the heat can be converted into work.[2].

Solar energy is a friendly energy uniformly spread out on the earth surface. The most abundant site of solar energy of the world is on tropical area such as Indonesia. Solar energy is predicted to extensively used in human life regarding the easiness to convert and the enviroment friendly. The prediction is based on the strong effort of the world leaders to stop greenhouse gases emissions in order to prevent the worst tendency of climate change, global warming and the thinning of ozone layer. One point of the international agreements named Kyoto Protocol on 11 December 1997, is reducing the GHG emissions to the atmosphere, mainly by reducing the use of fossil fuels and start to apply the renewable energy in industries and daily activities. One of the energy source is the solar energy. On the base of the above reasons, the development of solar cell or photovoltaic cells in the coming decades is predicted will raised significantly.

Some studies have shown that the of cost of electric generation will relatively go down regarding the depletion of fossil fuel and the price ascend of fossil fuel. The solar energy application is predicted will raised significantly in Indonesia, related to the country geometric position and many remote sites which is out of state electric network throughout the country. [3] In Indonesia, the sun shinny along the year, and this climate support the photovoltaic technology applications.

Solar cell is consist of two layer of semiconductor with different charge. The upper level layer with negative charge and the lower level with positive charge. Silicon is the most

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semiconductor materials used for solar cell. When the light hit the solar cell surface, some foton of lights will absorbed and semiconductor will release electrons from its atoms. The movement of these electrons create the electric current.

Solar cell characteristics can be seen from the relation between the electric current (I) and the output voltage (V) of the solar cell when the sun light hit its surface. The output of electric current depends on the voltage and the resistance available when the hit on it surface. When the voltage of solar cell is zero, or called as short circuit current or Isc. The value of Isc will ascend by the raise of temperature. When the current is zero, the solar cell is called open circuit voltage or Voc.

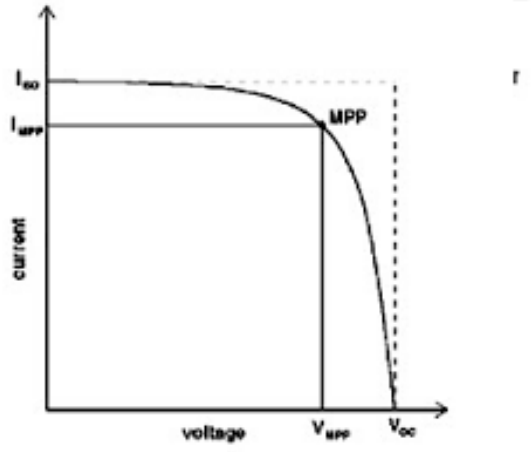

Figure 1: Solar cell characteristic curve

The temperature of solar cell influence the fill factor of the device by increasing the resistance of semiconductor materials and cause the decreasing of the voltage from the standard at 25 °C, and the consequnce is decreasing the efficiency of some percent. Fill factor (ff) basically is the value of solar cell quality. The relation between the fill factor and the maximum theoritical power is as follows:

2. METHODOLOGY/ EXPERIMENTAL

All of the research activity is done on the area of BMKG Kenten - Palembang. The data observation is conducted from 9.00 am till 17.00 pm. The research is conducted with the following block diagram.

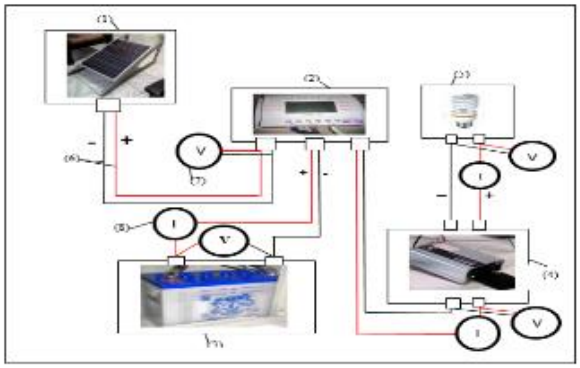

Figure 2. Block diagram of solar cell apparatus.

The research is conducted descriptively, i.e. doing by observation, noting and measuring as a fact found on the field.[3].

$$PMAX = VOC \,.\, I.\, \mathrm{F}f \qquad (2.1)$$

Where:
P_{max} is maximum power produced.
V_{oc} is oven circuit voltage
I is electric current
Ff is fill factor.

The efficiency of solar cell is define as the following relation:

$$\eta = (P_{MAX} : P_{lght}) \text{ x } 100\% \qquad (2.2)$$

Where:
P_{max} is maximum power produced.
P_{light} is the power of the incoming light.

2.1 *Battery Charge Regulator* (BCR)

Battery Charge Regulator (BCR) is a battery controller to protect the battery from the exceeds of filling. BCR has some indicators showing the battery conditions. The use of BCR capacity depends on solar cell output capacity.

2.2. *Inverter*

In order to maximize the inverter efficiency the inverter specification should align with the load capacity and the battery charge regulator used. The percentage of energy supplied and energy applied is as the following relationship:

$$E_A = \% \text{ x } E_B \qquad (2.4)$$

3. RESULTS AND DISCUSSION

The data measured from 1 March to 31 March 2016 and noted. The variable observed and noted is the sun light intensity (W/m²), short circuit current (Isc), Oven circuit voltage (Voc), maximum current produce (Impp), maximum voltage produce (Vmpp) and Power (P) create by solar panel daily . The results are as follows:

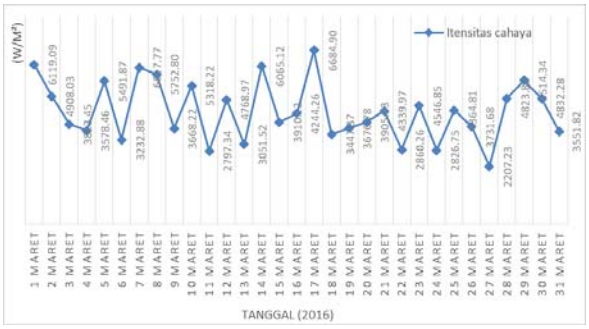

Figure 3. The sun light intensity graph as long as March 2016

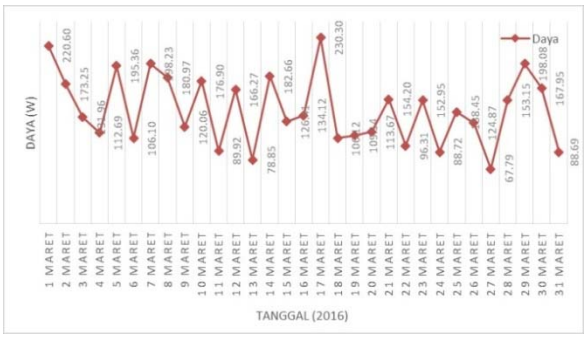

Figure 4. Power produce graph as long as March 2016.

From data above, the power produce by the solar cell is proportional to the sun light intensity. The higher the light intensity, the higher the power produced. The total power produced as long as one month is 4384.99 Watt and the total light intensity collected is 134062.91 W/m². The average power produce daily is 141.45 Watt and the average sun light intensity is 4324.61 W/m². The maximum power produce is on March 17th,2016 where the power produce is 230.3 Watt and the total day light inensity is 6684.9 W/m2. On the other hand, the lower power produce is on March 27, 2016 where the power produce is 67,79 Watt and the light intensity is 2207,23 W/m².

Tabel 1. The average sun light intensity, the current, the voltage and the power produced As long as March 2016.

No	Jam	itensitas cahaya matahari (W/m²)	Isc	Voc	Arus (Impp)	Tegangan (Vmpp)	FF	Daya (P)
1	9:00	447.84	1.18	19.73	1.05	13.66	0.62	14.47
2	10.00	534.16	1.41	20.03	1.25	13.84	0.61	17.51
3	11.00	654.38	1.72	20.59	1.55	14.03	0.61	22.02
4	12.00	709.89	1.87	20.42	1.65	14.65	0.63	24.56
5	13.00	691.41	1.78	20.14	1.58	14.46	0.64	23.35
6	14.00	562.71	1.44	20.07	1.31	14.26	0.64	19.01
7	15.00	419.61	1.00	19.62	0.89	13.89	0.64	12.51
8	16.00	200.18	0.44	19.35	0.39	13.44	0.60	5.33
9	17.00	104.42	0.23	18.75	0.20	13.23	0.61	2.70
rata-rata		480.51	1.23	19.85	1.10	13.94	0.62	15.13

4. CONCLUSION

On the base of results and discussions above, we can take some conclusions as follows:

1. The position of solar panel facing to the north with the inclination of 10º could effective absorb the light of the sun and convert it into energy.
2. Total energy produced as long as March 2016 is 4384,99 Watt and the total light intensity is 134062,91 W/m²
3. The power produced on clear and shinny day is 49,2 Watt and on cloudy day the power produced is 34,1 Watt.
4. 4. The highest light intensity caught is on 30 March 2016 pukul 12.00 which is about 1464.576W/m^2 with the temperature at the viccinity of solar panel is 42.2 ºC and the output current is 11,73 A with voltage of 38,52 V.
5. On the base of economic, the photovoltaic system for the time being is still expensive where the photovoltaic price is Rp 4823,44 /KWh while the state electric price is Rp. 1.457,14 /KWh.

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