ISSN 2229-5518

Performance Analysis of BPL/PKL Electricity module

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Abstract— Bryophyllum Leaves (BPL/PKL) malt or juice is one of the most important topics in the recent world as it can generate electricity. So now a day it is one of the most significant sources of renewable energy in the form of Biomass energy. If the generated electricity from Bryophyllum Leave's malt or juice can be stored in the battery then it can be a useful source for power and energy and can be used in the day to day life. Prosperously the BPL/PKL Electricity module can be used off grid or can be used for on grid connectivity for larger picture. This research paper shows the result of performance testing of BPL/PKL Electricity module and shows some important characteristics of BPL/PKL electricity.

Index Terms BPL/PKL(Bryophyllum Leaves) , Biomass energy,Fill Factor, On grid connectivity.

1 Introduction

FROM the very beginning of the human civilization the proper utilization of the energy and power is one of the most important concerns of the scientists. Because it is not that difficult to predict that the reservation of the conventional energy sources are limited and are going to extinct to meet up the rapidly increasing demand of power and energy with rapidly increasing population, advancement in technology. So to keep cope with the demand of energy and power the most meaningful topics to search for energy is renewable energy or non conventional energy. There are many forms of non-conventional or renewable energy. Biomass energy or bio energy is one of the most important forms among all of them. The main theme of this research paper is to introduce with a new form of biomass energy source and performance testing means observing its characteristics of electricity generation and behavior with the load and no- load condition

2 Biomass energy and BPL/PKL (Bryophyllum Leaf)

2.1 Biomass energy

Biomass energy is one of the most important forms of non conventional energy. The energy from Biomass is carbon, hydrogen and oxygen based. Biomass energy is derived from some distinct energy sources: garbage, tree, waste, landfill gases, and alcohol fuels. In this research paper Bryophyllum Leaf is used as the source of biomass energy [1].

2.2 Bryophyllum Leaf (Some important chemical parameters)

Bryophyllum Kalanchoe (Genus: Kalanchoe) [2] is the source of the biomass energy in this research paper. The malt or juice of this leaf has some important chemical characteristics. They are given below:

a. The existence of the main constituent elements of the leaf is Fe^{++} and Cl^{-}

b. The P^H of the juice without water is 4.6

c. The P^H of the juice with water is (10% solution) 4.8

BPL/PKL Cell is the structural Unit or building block. It is made of BPL/PKL malt/juice. The fabricated Unit cell of BPL/PKL electric voltage around 1.5 Volt. The BPL/PKL electricity depends on various parameters. The parameters are given by the following:

A. Concentration of the malt
B. Area of the electrodes.
C. Distance between two electrodes
D. The constituent elements of the electrodes.
E. The volume of the BPL/PKL malt/juice.
F. The temperature of the BPL/PKL malt.
G. The age of the BPL/PKL.
H. P^H of the BPL/PKL juice.

2.3 BPL/PKL Electric Module

It is more than one Unit cell. The BPL/PKL Unit cells are connected by wires. The voltage of the electric modules is more than 1.5 Volt.

2.3 BPL/PKL Electric Pannel

It is made of more than one BPL/PKL electric modules by physically and electrically connected. The voltage of the BPL/PKL electric panel is higher than the BPL/PKL electric modules.

2.4 BPL/PKL Electric Array

BPL/PKL electric array is made of more than one BPL/PKL electric panel. In the similar way the voltage of the BPL/PKL electric array is higher than the BPL/PKL electric Panel.

3 Studies of I-V characteristics of BPL/PKL

The behavior of a BPL/PKL cell is displayed by plotting its current vs. Voltage characteristics. A typical characteristics curve is shown in the fig 1. The intercepts of the curve on the X-axis and Y-axis are called the short circuit current I_{SC} and the open circuit voltage V_{OC}.The maximum useful power corresponds to the point on the curve which yields the rectangle with the largest area. We denote the values of current and voltage yielding the maximum power by the symbols I_m and V_m.The ratio (I_m $M_m/I_{SC}V_{OC}$) is called the fill factor (FF) of the cell. Its value obviously ranges between 0 and 1:

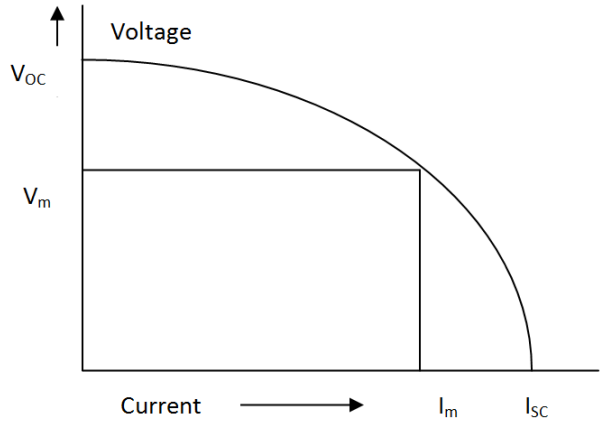

Figure:I-V Characteristics

3.1 Maximum Energy Conversion Efficiency

The maximum conversion efficiency of a Solar cell is given by the ration of the maximum useful power to the incident solar radiation. Thus

$$\eta_{max} = \frac{I_m V_m}{I_T A_C} = \frac{FF I_{SC} V_{OC}}{I_T A_C} \quad [3]$$

Where I_T= Incident solar flux and A_C= Area of the cell,FF=Fill Factor, I_{SC}=Short Circuit Current,V_{oc}=Open Circuit Voltage. For an efficient cell, it is desired to have high values of fill factor, short circuit current and open circuit voltage. From solid state physics theory, the expressions can be derived for each of these quantities. The expression shows that high values of I_{SC} are obtained with low band gap materials, while high values of V_{OC} and FF are possible with high band gap materials. Thus if theoretical values of η_{max} are calculated for different values of E_g it is obvious that a maximum value would be obtained at some value of E_g.

3.2 Studies on Fill Factor(FF)

It is the ratio of the peak power to the product of I_{SC} and V_{OC}.It is generally denoted by FF [4].

$$\text{Viz. FF} = \frac{V_{opt} I_{opt}}{V_{OC} I_{SC}}$$

Where,
V_{OC}=Open circuit voltage
I_{SC}=Short Circuit Current
Volt=Optimum voltage
I opt=Optimum current
Its value is higher than to 0.7 for good cells. The Fill Factor is a useful parameter for quantity control tests.

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6 Practical Testing of BPL/PKL Electricity

To determine the practical behavior of the BPL/PKL electricity panel different values of generated voltages, currents over a long period of time have been recorded, tabulated, plotted on the graph and compared with the Ideal behavior.
Recorded values of voltages and currents with a fixed time interval is represented by the tables drawn below.
First data table represents the current vs. Voltage relations with variation of time with load. Here time interval between two recordings of data has been taken 5 minute of local time. Power, room temperature and BPL/PKL juice temperature has been recorded.

Table 1: Variation of voltage with the variation of local time for without load condition

Time Interval	V_{OC}	I_{SC}	Volt (V)	Amp (I)	Watt (P)	Temp	Juice Temp
5 Min Interval during each Obser-vation	6.67 Volt	1.35 Amp	4.06	0.45	1.827	28	26
			4.06	0.45	1.827	28	26
			3.91	0.44	1.7204	27	26
			3.73	0.43	1.6039	28	25
			3.51	0.43	1.5093	28	26
			3.31	0.42	1.3902	27	26
			2.99	0.41	1.2259	27	26
			2.77	0.40	1.108	28	26
			2.65	0.39	1.0335	28	26
			2.51	0.37	0.9287	27	25
			2.38	0.36	0.8568	28	25
			2.22	0.34	0.7548	28	25
			2.09	0.33	0.6897	28	26
			2.08	0.33	0.6864	28	26
			1.96	0.32	0.6272	28	26
			1.89	0.30	0.567	27	25
			1.69	0.29	0.4901	27	25
			1.60	0.28	0.448	27	25

Table2: Variation of voltage with the variation of Local time with load condition.

Time Variation	Current,I (without load)(Amp)
Each data has been taken having 5 minute interval.	1.35
	1.34
	1.34
	1.35
	1.32
	1.31
	1.34
	1.33

	1.33
	1.32

Table3: Variation of current with the variation of Local time with load (Fan)

Time Interval	Voltage,V(With Load)(Volt)
Each data has been taken having 5 minute interval.	4.30
	4.15
	1.07
	4.02
	3.89
	3.75
	3.68
	3.62
	3.55
	3.50

Table4: Variation of maximum voltage BPL/PKL module with the variation of different dates of the month for fan.

Time Interval	Current, I(With Load)(Amp)
Each data has been taken having 5 minute interval.	0.74
	0.73
	0.72
	0.70
	0.68
	0.65
	0.62
	0.60
	0.58
	0.55

Table5: Variation of minimum voltage BPL/PKL module with the variation of different dates of the month for fan.

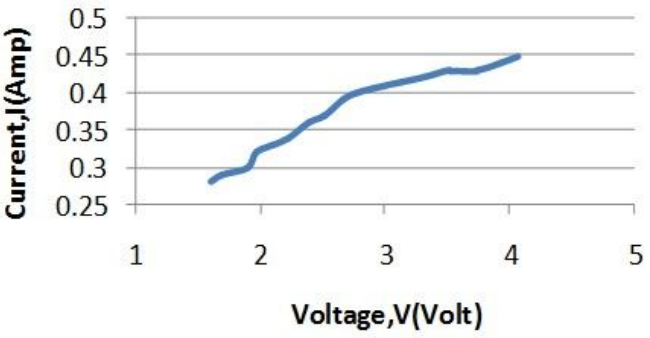
Date interval	Maximum Voltage with load(Volt)
Each data has been taken having a day interval.	4.40
	4.26
	4.00
	3.89
	3.61

Table6: Variation of minimum voltage BPL/PKL module with the variation of different dates of the month for fan.

Date interval	Minimum Voltage with load(Volt)
Each data has been taken having a day interval.	3.65
	3.55
	3.50
	3.40
	3.55

4 Graphical Representation

The tabulated data for different date of the month which observed on the above table's has been represented graphically as bellows:



Figuer: Current Vs Voltage Curve with load

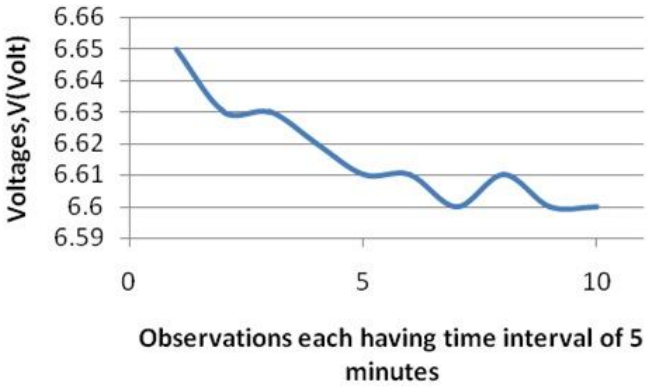


Figure : Voltage VS Time Curve

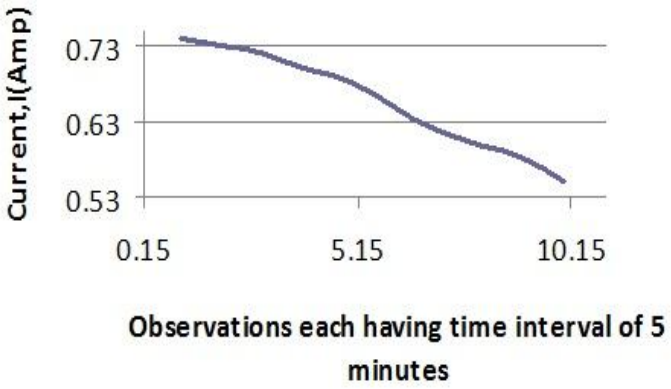


Figure: Current VS Local Time Curve

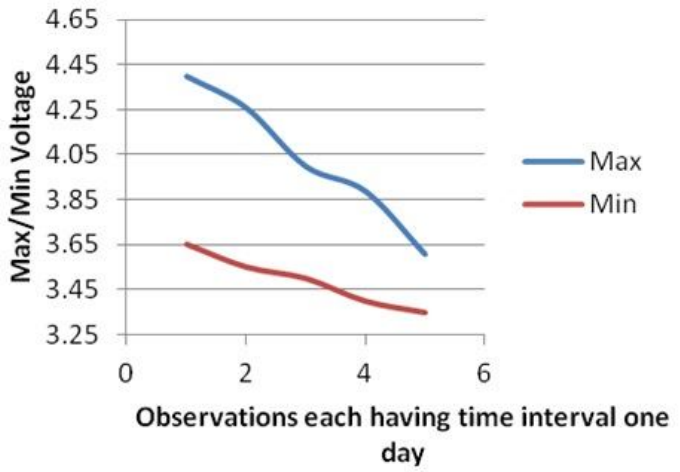


Figure: Maximum / Minimum Voltages vs Time interval with loaded condition

5 Results and Discussion

From figure Fig1 it is shown that the current decreases with the voltage directly. The voltage ranges between (4.06-1.60) volt. The current ranges between (0.45 – 0.28) amp. Finally it is shown that after two days current decreases 0.15 amps with the voltage 1.77 volt. From table2 it is shown that the open circuit voltage of BPL/PKL module was 6.67 volt and short circuit current was 1.35 amps. Here a fan is used as a load. When the fan was connected as a load the voltage and current of the BPL/PKL module suddenly decreases to 4.06 volt and 0.45 amps. It is shown that the voltage and current after five minutes interval decreases slowly. From figure2 and table3 shows the variation of the voltage (Volt) with the local time (min).The voltage was taken by 5 min interval and it is seen that the voltage decreases directly with the increasing of local time.

Figure: Preperation of BPL / PKL Electricity Module

6 Suggestions for Future Work

If the BPL / PKL electricity module can be used industrially it can make an effective contribution in on grid connectivity. Even, off grid Hybrid BPL / PKL and Solar Thermal or Solar Photovoltaic module can also make an tremendous effect in the solution of future energy crisis. As it is a biomass energy source it is free of environment pollution. So it can be applied in rural electrification network also

References

[1] http://en.wikipedia.org/wiki/Biomass

[2] http://en.wikipedia.org/wiki/Kalanchoe_sect._Bryophyllum

[3] Yasuo CHIBA, Ashraful ISLAM, Yuki WATANABE, Ryoichi KOMIYA, Naoki KOIDE and Liyuan HAN ,"Dye-Sensitized Solar Cells with Conversion Efficiency of 11.1%" Japanese Journal of Applied Physics , Vol. 45, No. 25, 2006, pp. L638–L640

[4] http://en.wikipedia.org/wiki/Fill_factor

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