

# Modeling of A Biomass Energy Based (BPL) Generating Power Plant and its Features in Comparison With Other Generating Plants

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**Abstract.** In renewable energy world, Biomass energy is gaining its position day by day. Recently invented BPL electricity which is mainly generated from the malt or juice of the Bryophyllum Leaves can be a significant source of energy as it has many features and importance to use. The existing electricity generating power plants are of great use though they have many limitations and harmful effects to the environment. But a power plant can be structured based on BPL malt as primary fuel source. This type of electricity generating plant can be of many significant features including cost effectiveness, environment friendly, fuel availability etc.

**Keywords:** BPL, BPL Electricity, Hydro power plant

## 1. Introduction

This material provides an proposal and design of a biomass energy based electricity generating power plant .The fuel to generate electricity is mainly BPL ( Bryophyllum Leaves) malt. From the early ages of civilization people wanted to be civilized through gaining more efficiency in using power and energy properly for meeting the rising demand of increasing population. In this case biomass energy based electricity generating power plant can be of great use to a nation both environmentally and economically. This research paper shows the result of electricity generation from the BPL malt in terms of voltage and current and the features of BPL power plant in comparison with the other power plants. This paper will also lead to some fruitful future works using renewable energy source like BPL.

## 2. BPL Electricity

### 2.1. Introduction to BPL Electricity and BPL Electric Panel

BPL electricity is the new form of biomass energy which is a significant part of renewable energy. Bryophyllum Kalanchoe (Genus: Kalanchoe) [1] is the source of the biomass energy in this research paper. BPL Cell is the structural Unit or building block. It is made of BPL malt/juice. The fabricated Unit cell of BPL electric voltage around 1.5 Volt. BPL electricity module is formed by more than one BPL Unit cells connected by wires. BPL electric panel is formed by more than one BPL Electric modules. And BPL electric arrays are built with more than one BPL electric panels. Mainly BPL electric Arrays are used to generate electricity from the BPL electric module.

### 2.2. Ideal Characteristics of BPL Electricity

If the Current vs. Voltage curves of the BPL electricity can be plotted in the graph the following curve can be found. 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 ISC and the open circuit voltage VOC. The maximum useful power corresponds to the point on the curve which yields the rectangle with the largest area. We denote the

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values of current and voltage yielding the maximum power by the symbols  $I_m$  and  $V_m$ . The ratio ( $I_m V_m / I_{sc} V_{oc}$ ) is called the fill factor (FF) of the cell. Its value obviously ranges between 0 and 1. [2]

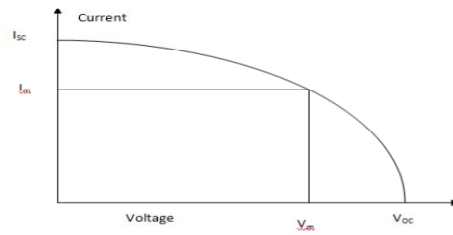


Fig. 1: Ideal Characteristics Curve of BPL electricity

### 2.3. BPL Electricity Generation

To determine the practical behavior of the BPL 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 values with variation of time with load. Here time interval between two recordings of data has been taken 5 minute of local time.

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

Fig. 2: Current variation with time

Thus the result of voltage variation with time in the loaded condition can be shown in the table below:

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

Fig. 3: Voltage variation with time

Thus the generated output of the BPL electricity can be passed and transmitted to the distribution areas for distribution purposes.

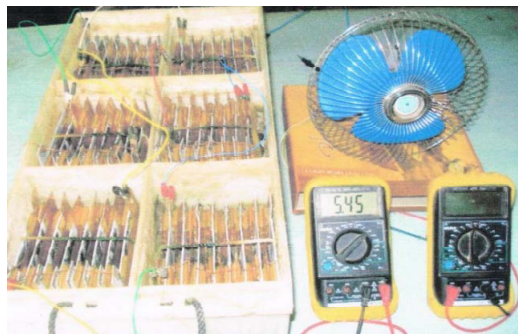


Fig. 4: BPL electricity generation

### 2.4. BPL Electricity Power Plant

Using the electricity generated by BPL malt a successful power plant can be constructed. As soon as the electrodes will get the electrolytic juice or malt it will start producing electricity. The most beneficial thing is that the electricity generated by this BPL malt can be used to drive any DC and AC load (inverter needed). The generated electricity have to pass through the inverter to supply to ac loads. Parallel way, it can feel DC loads also.

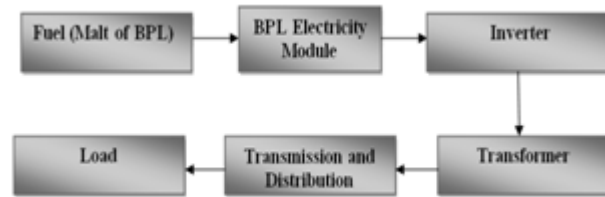


Fig. 5: A simple flow diagram of BPL electricity generating power plant

## 2.5. Site Selection

There is no limitation to build such kind of generating stations. They can be built anywhere. But as the main fuel supply is the malt of BPL (Bryophyllum Leave) it would be better if the cultivation land of the BPL is nearer to the plant so that the transportation cost can be minimized.

## 2.6. Advantages and Disadvantages

Advantages:

- Very Low cost of fuels
- Constant flow of electricity
- Can be plant in any local areas too
- Not Harmful to environment and Human friendly
- Low cost of operation and maintenance

Disadvantages:

- Cannot produce that much power to feed a entire city(Single Generating Station)
- Need maintenance every single week

## 3. Other Generating Plants

### 3.1. Hydro Power Plant

Hydro Electric Power Plants are that kind of plant which use the Hydro Electric Power. Hydro Electric Power is the power obtained from the energy of falling water where as hydro-electric power plant is the power plant utilizing the potential energy of water at a high level for generation of electrical energy. There are some criterions which must be fulfilled to establish a Hydro-electric power plant. Such as, there must be an ample of water at sufficient head and secondly a suitable site must be available. The amount of power that can be developed depends on the quantity of water available. The amount of power that can be developed depends on the quantity of power available, the rate at which it is available, the head etc.

#### 3.1.1. Site Selection

The site selection of Hydro Electric Power plant depends on some important factor [4]:

- Availability of water
- Water Storage
- Geological Investigations and Head of Water
- Water Pollution and Sedimentation

#### 3.1.2. Advantages and Disadvantages of Hydro Electric Power Plant

Advantages:

- No fuel is required by such plant as water is the source of energy.
- Low Operating Cost and no problem of handling and storage of fuels and disposal of ash.

Disadvantages:

- It requires large area

- Cost of Construction is enormously high and takes long time for erection
- Long Transmission lines are required as the plants are located in hilly areas which are quite away from the load center

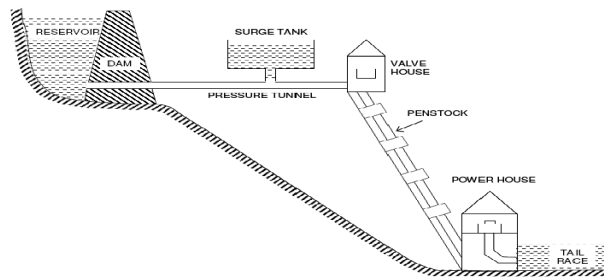


Fig. 6: Schematic Arrangement of a Hydro Electric Power Plant

### 3.2. Gas Turbine Power Plant

Gas turbine power plant is a power plant in which a gas turbine is used as the prime-mover for the generation of electrical energy. In the gas turbine power plant, the products of the combustion are directly expanded in the turbine whereas in the steam power plant, the products of the combustion (which is used to produce steam do not form the working medium for driving the turbine [5]. The gas turbine is different from the diesel engine in this respect that the combustion region is external to the prime mover.

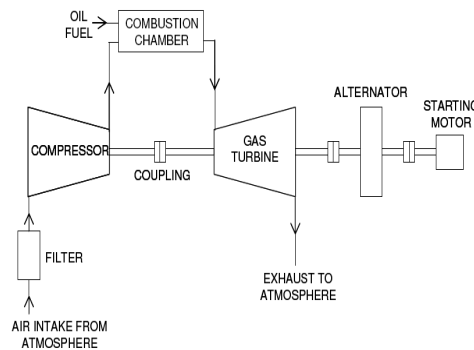


Fig. 7: Schematic diagram of a Simple Gas Turbine Power plant

#### 3.2.1. Site Selection

The factors upon which the site selection of Gas Turbine Power Plants depends:

- Distance from the load center
- Availability of land and Fuel

#### 3.2.2. Advantages and Disadvantages

Advantages:

- Construction cost is lower than Hydro and Steam power plant
- No standby losses
- Requires lesser area than a steam plant of same capacity

Disadvantages:

- The operating cost of a Gas turbine plant are high as compared to other plants
- It has low net power output
- Overall efficiency is low

### 3.3. Steam Power Plant

A steam power plant continuously converts the energy stored in fossil fuels (coal, oil, natural gas) or fissile fuels (uranium, thorium) into shaft work and ultimately into electricity. The working fluid is water which is sometimes in the liquid phase and sometimes in the vapour phase during its cycle of operations. In this type of plant, the products of combustion do not form the working medium for driving the turbine. These are utilized to produce steam which is expanded in the turbines.

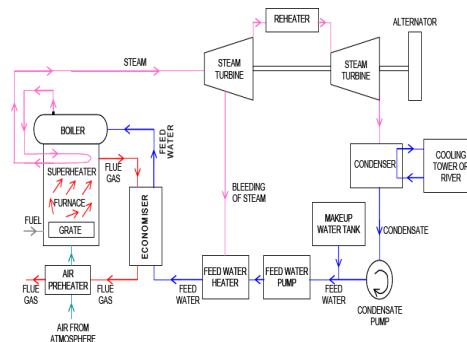


Fig. 8: Water, Steam and Fuel Gas flow diagram of Steam Power Plant.

### 3.3.1. Site Selection

Site selection factors for a Steam Power plant is given below:

- Transmission of Energy
- Fuel delivery & Water Supply
- Realty value and taxes

### 3.3.2. Advantage and Disadvantages

Advantages:

- Operating costs are low in comparison to the gas turbine power plant
- Efficiency is better
- Low graded fuel can be used

Disadvantages:

- Handling and storage of fuels and disposal of ash create a big problem in steam plants
- It requires huge area (about 250 acres of land is needed for a 2000MW coal fired system plant)
- It is difficult to maintain the cleanliness of the plant mainly because of the fuel and ash handling problem

## 4. Comparison and Discussion

Comparing all the stated site selection process, advantages and disadvantages it is clear that the operation is so simple to describe in BPL Electricity Power Plant compared to the other power plants. The features are like less noise, low cost of fuel, operation, maintenance, low conversion cost, less equipments required etc. Though there are some limitations like the generated power is not that much bigger to be supplied to an entire city, it should be maintained every single week in can be said that this kind of power plant can be built for a small range of loads. More over the fuel is very much environment friendly and not harmful to any kind of living being. This type of power station can be built for individual household use also.

## 5. Future Works

This kind of environment friendly green power plant for off grid connectivity and off grid connectivity can be built. Also the hybrid model of solar/wind or any kind of hybrid power plant can also be introduced. Though there is hybrid model of solar and wind energy conversion module[6], BPL electricity module can easily be used with them to build a high performance hybrid power plant.

## 6. References

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