

# Design and implementation of Hybrid power plant for power generation and its application

<sup>#1</sup>D.R.More, <sup>#2</sup>Kore Pankaj, <sup>#3</sup>Jadhav Sawpnali, <sup>#4</sup>Patil sayali

<sup>2</sup>pankajk1795@gmail.com

<sup>1</sup>Assistant Professor, Department of Electrical Engineering,  
<sup>2 3 4</sup>Students, Department of Electrical Engineering,

DYPCET, Talsande, Kolhapur, India.



## ABSTRACT

The main motive of the project is to generate power from sewage water. This dc generated power is used for street lighting and garden lighting using LED bulbs. For power generation we develop micro hydro turbine because it is having dam less, small scale and very low cost, effective power generation. amount water is stored at one place. It is based on Moving water fall on turbine blades the turbine rotates the generator and electricity is produced. But when water is not available, we use solar panel for generation. solar panel can be absorb the energy to a maximum point this can be done only if the panel are continuously placed towards the sun direction and this can be done by use of maximum power point tracking (MPPT). Now a day it is important to save the energy because the energy demand is increase day by day. So to solve this problem and to save the other energy or fuel we design this model. Consumer wants to reduce the electricity bills so we use this type of power generation. This paper is based on the continuous generation of electrical energy by use of sewage water and solar energy. Due to this generation, saving and reuse of water is takes place by use of filter.

**Key Words:** Micro hydro turbine, DC generator, MPPT.

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## I. INTRODUCTION

Micro-hydro power plant and MPPT is a type of renewable power plants that is environment friendly, easy to be operated and low operation cost .A small scale power plant generates electricity using the energy potential of water micro hydro power plant convert the energy of flowing water into electrical energy. the energy produced by them is renewable and the process does not emit polluting gases. water is stored in tank.It is based on Moving water fall on turbine blades the turbine rotates the generator and electricity is produced. It is like the oldest renewable energy technique everyone known. The mechanical energy is converted into electrical Energy generation. In this work by using micro hydro turbine with dc generator generate electricity and it distributes to the domestic use. It consists of water storage, pipe, nozzle, turbine, dc generator, filter; pump etc. the produced electrical energy at both side of the generator. At one side the filter and pump is used due to this water is filtered and reuse of water is done. And at other side the electricity is produced which is used for the illumination purpose in the complex or industry.

But when water is not available we use solar panel for continuous generation. And the Combination of the output is added in charge controller and gives to the load.

Therefore we have to generate continuous generation of electricity from solar and hydro power plant.

## II. LITERATURE REVIEW

The main motive of the project is to generate DC power from low head water source [1].

Harvest water energy inherent in tall building using micro-pelton turbine at the ground from grey and rain water. Purified water is collected in separate tanks and the control system is designed for optimum power output from the micro turbine which is analyzed computationally [3].

Small hydro power (SHP) plants have many advantages over large scale hydro power generation. SHP has been identified as a good alternative to conventional electricity generation for many developing countries around the world. Run-off-the river type SHP plants contain

considerable economic advantages. However these are affected by various technical and economical challenges. Large scale power generation is affected by lack of potential sites, capital cost, long development times etc. however these problems are curbed by small hydro power development [4]

The dynamic characteristics of hydro turbine power depend on set input parameter and load condition. In this paper the study of dynamic analysis of the pelton wheel turbine is presented [5].

There is a pressing need for a unified treatment of their causes, failure modes a practical troubleshooting. In this paper the significance causes of problems relating to axial compressors and turbine bleeding are covered [6].

The aim of this controller is an achieved and optimum MPP operation without the need of atmosphere condition measurement and to enhance the efficiency of PV power system [7].

MPPT is gaining very much popularity now days for its high capability of power extracting from solar panel. This paper presenting here and improved design of MPPT solar charge controller using Arduino[8].

The performance of microcontroller based charge controller coupled with a solar photovoltaic system for improving the charging/discharging control of battery [9].

The solar tracking system –tilted single axis tracker and azimuth altitude dual axis tracker are designed implemented. The design of TSAT and AADAT are described which detect the sunlight using LDR sensors [10].

### III. PROBLEM DEFINING

1. The turbine blade is designed by heavy material but by using heavy material the speed of turbine did not get properly because of due to heavy material of turbine the rotation of turbine blades was low. That is why we use light weight material for turbine blades by using light weight material the rotation of turbine is increase.

2. If one valve is used the speed of rotation will low to overcome this problem we use two valves to increase the speed of turbine. Due to this the output of the generator is increases.

3. Generally in the micro power plant use one generator only due to this the output is obtained at one side only this is not sufficient for the application. Hence we use two generators at both the sides for getting more output.

4. Other hydro power plant uses the water for generating electricity but after that this water is not used. So we use sewage water for generating electricity and this water is filtered and this is reused for plant irrigation system.

5. And in addition when sewage water is not available we use the MPPT for generation of electricity and increase the efficiency.

### IV. RESEARCH AND METHODOLOGY

#### 4.1. Theory

The available of sewage water in the industry or in commercial buildings that coming from any process it is used as a source of input. This water possesses potential energy because of head created it can be converted into mechanical energy with the help of turbine. By using

velocity or water force a turbine can be rotated and electrical energy is generated. In this project we are going to generate a DC power by using DC generator at both ends of the pelton turbine. This method of generation of electrical energy has become very popular because it has low production and maintenance cost. And after generator we use booster for constant voltage output and it is given to charge controller. And in addition we have to use solar panel. For the continuous production of electrical energy. Solar panel reference to a panel designed to absorb the sun rays as a source of energy for generating electricity”.solar panel can be absorb the energy to a maximum point this can be done only if the panel are continuously placed towards the sun direction and this can be done by use of maximum power point tracking (MPPT). The output of solar panel is given to the charge controller and also battery is connected to this and the output from charge controller is given to load.

The charge controller is used for combine the output of solar panel and hydro power plant and to charge the battery. And use battery whenever and whatever required, and at the second generator also booster is connected and output of this is connected to the filter. Filter is used to filter the water and given to plant irrigation system.

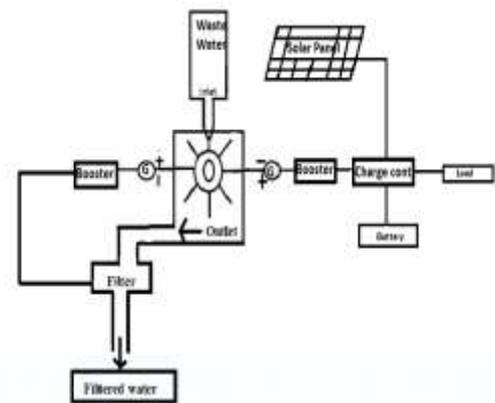


Fig -1: Design configuration

#### 4.2. Pelton turbine

The force of falling water pushing against the turbines blades causes the turbine to spin. The turbine converts the kinetic energy of falling water into mechanical energy working principle of pelton turbine is simple when high speed water jet injected through nozzle hits buckets of pelton wheel; it introduce an impulsive force This makes the turbine rotate. The rotating turbine rotates. The rotating shaft runs a generator and produce electricity. In short, pelton turbine transforms kinetic energy of water jet to rotational energy.



Fig 2: Pelton Turbine

### 4.3. DC generator

Dc motor works as a dc generator. A dc generator is an electrical machine which converts mechanical energy into dc electricity. This energy conversion is based on the principle of production of dynamically induced EMF. A geared DC Motor has a gear assembly attached to the motor. Generator is connected to the turbine by shaft **and** possibly gear so when the turbine spins it causes the generator to spin also. Converts the mechanical energy from the turbine into electrical energy. Generator in hydropower plants work just like the generator in other type of power plants.



Fig 3: dc generator

### 4.4. Filter

Filter is used in this project for the purpose of the sewage water filtering to save the water and reuse of water. The size of filter is depends on the sewage water available and electricity generated.

### 4.5. Pump

Pump is itself a motor it is used for to lift water for the reuse and to save the water. The size of pump is depends on the filtered water available.

### 4.6. Voltage Booster

The voltage booster is dc-dc power converter that steps up the voltage from its input to its output. It is class of SMPS containing at least one energy storage element. To reduce voltage ripple filter made of capacitor are normally added to such a converter output and input.



Fig 4: Voltage booster

### 4.7. Solar panel

Solar panel refers to panel designed to absorb the suns ray as a source of energy for generating electricity or heating. A photovoltaic (PV) module is a packaged; connect assembly of typically 6x10 solar cells.

A solar panel or module is series of interconnected silicon cells joined together to form a circuit. In greater numbers the amount of power produced by these interconnected cells can be increased a used as an electricity production system. Solar panel is used in this project for the continuous operation if when the water is not available then solar panel is used.

## V. ADVANTAGES

- Fuel is not burned so there is minimal pollution.
- Hydropower plays a major role in reducing greenhouse gas emissions.
- Relatively low operations and maintenance costs.
- The technology is reliable and proven over time.
- It's renewable.
- In hydro power plant to increase the output when the available water source has relatively high hydraulic head at low flow rates.
- The constant supply of electricity.

## VI. APPLICATION

- It is used in industry, for generation of electrical energy.
- Used for residential purpose.
- Street lighting.
- Mobile charging.
- Garden lighting.

## VII. CONCLUSION

We conclude here that by using this technology we can get electricity in continuous manner. Hydro power has always been an important part of the world electricity. We are reusing sewage water it is more efficient. Also generating electricity from solar panels which is conventional method for generation of electricity.

## REFERENCE

1. Design and implementation of micro hydro turbine for power generation and its application by N. J. Kumbhar, Patil Pravin, Zunjar Aditya, Salokhe Rohit, Patil Sonam.
2. Pelton Turbine Deflector Over speed control for a small power system by Randell M. Johnson, Joe Chow, Michael V. Dillon. 2 may 2004.
3. Simulation and analysis of energy harvesting from grey water and rain water in high rises by Krishna Ramesh Kumar, Sutej Pramod Kulgod. 2016 IEEE.
4. Small Hydro Power Plant analysis and development by Anuradha Wijesinha and Loi lei lai.
5. Vibration analysis of pelton wheel turbine by theoretical, numerical and experimental approach by Akshay D Shinde, Dr S N Shelake.
6. Blading vibration and failure in gas turbines by cyrus B. Meher-Hamji boyce engineering international.
7. Maximum power point tracking controller for photovoltaic system using sliding mode control by

department of electrical engineering and electronics,  
university of Liverpool, U.K.

8. Design and implementation of maximum power point tracking solar charge controller. By MD Rokonzaman and MD Hossan –E-Header.

9. Design of charge controller for solar PV system by Nupur Khera, Nancy Rana.

10. Design and development of tilted single axis and azimuth-altitude dual axis solar tracking system by ICPEICES.