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GENERATION OF ELECTRICITY BY PICO HYDRO SYSTEM

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Abstract

The energy demand in the World is increasing day by day due to fastly increasing population and advancement in science and technology. But in present era there are so many obstacles which decrease the consumption of electricity for common peoples, high cost of fuel, high demand and low supply of fuel. Fuels like LPG, coal, CNG, petroleum, nuclear energy are depleting day by day and also degrades our eco-system. Installation cost of large hydro power project are very high and cannot be installed everywhere. Due to these reasons; there is a high time to follow such a system which sort out all these difficulty. One such a system is proposed in this paper. The goal of this research paper is to build such a system which gives electricity at low cost, which must be eco-friendly, easy to use and to store the generated power by means of batteries charging for future use particularly during electricity blackouts. The work of this paper is performed by designing a Pico Micro Hydro system by using house hold water supply. In the domestic pipeline the flow of water has enough kinetic energy to spin the blade of a small hydro turbine which in turn rotates the rotor of a generator to generate electricity in addition to the other routine activities such as cook, laundry and bathe.

Index Terms: Pico hydro system, energy storage, renewable energy and small turbine.

1. INTRODUCTION

The hydro power which has a maximum electrical output of five kilowatts (5kw) is come under the category of Pico Hydro system. This system is beneficial than other large hydro system as it have low cost, can be installed anywhere, eco-friendly and easily available to people. New Pico hydro technology have made it more economical power source in the developing country. AC can be produced which can be used to drive standard electrical appliances. Examples of devices which can be run by this system are light bulbs, radios, television, refrigerator and many more. However in this research paper it is shown that house hold water supply also have kinetic energy to rotate a small hydro turbine for energy production. Hence this research is done to show that house hold water supply has additional capability for electrical energy production instead of other routine activities like bath, laundry, cook and cloth washing. Production of the electricity can be done without pay extra charges on the water bill. The main function of this system is to store the generated power by means of batteries charging for future use particularly during

electricity blackouts. available economic source of power even at remote places around the globe. This is a very versatile power source that could be used to generate AC electricity. Radio, bulb, light, television and other similar electronic devices can be easily operated by using the pico hydro power. The need of pico hydro electricity around the world is that it allows electricity generation simply and at no fuel cost.

2. Pico Hydro Home System

In building, depends on the square area of the rooftops and gravitational flow of the rainwater by simply storing water in the high level tank, will be classified as Pico hydro in capacity of providing the energy. The important elements of a Pico-hydro plant, as shown in fig.1, are: water tank and vane; supply pipe; hydro turbine; DC generator and controller. The larger the distance that the water falls before it strike the blade, the higher the head. Pico hydro is a term used for hydroelectric power generation of under 5 kW. It is useful in small, remote communities that require only a small amount of electricity – for example, to power one or two fluorescent light bulbs and a

radio or TV in 50 or so homes. Even smaller turbines of 200–300 W may power a single home in a developing country with a drop of only one meter. Already there existing such systems using renewable energy such as wind, solar etc. So, we have to think another system which produces energy from daily wasted energy. Water is a great source of energy and we use a large amount of water for our daily needs. In multi-stored buildings we install multiple turbines at a distance as per the availability of flow and usage of water. The water flows out of the tank through the pipes in which the end pipe is convergent to a nozzle, which allows high pressure jet. The pipe is made into to an oval nozzle with very narrow mouth, which pushes out the water as a line to a large area for increased efficiency in electricity production. The hydraulic power is transmitted to a turbine runner by which a mechanical power have been generated.

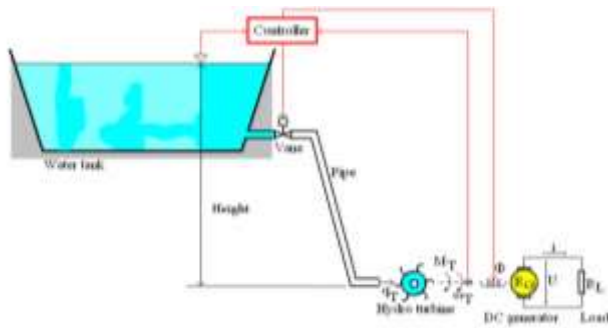


Figure 1 Pico Hydro Home System

3. Methodology

Pico hydro means generating up under 5 KW of electricity through hydroelectric power. Electricity is a basic part of nature and it is widely used in our daily works. A large amount of energy is wasted when our daily used water and rain water is going towards the drains by pipe. In this system turbine is fitted where the water is falling down. The potential energy of water can rotate the turbine and a gear which is connected with the turbine. This is the conversion of potential energy to mechanical energy. A chain drive is connected with the gears which rotate the gears of the dynamo shaft. When dynamo shaft is rotated with a certain rpm, the mechanical energy is converted to electrical energy. The whole system can be shown on Fig 1.



Figure 2. Turbine System

4. System Design

The whole systems can be represented by a block diagram as shown on Fig.2. The potential energy of the water captured by the turbine as rotational energy which is converted to the mechanical energy. This mechanical energy is converted to electrical energy by using generator. This energy is stored in a battery and used it for future home uses.

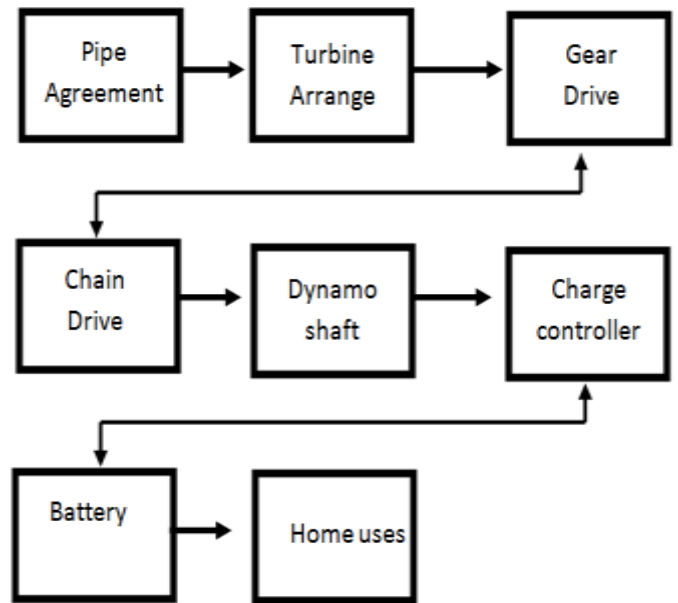


Figure 3 Block Diagram Of Whole System

5. Construction Detail

5.1 Tank

Tank is used for storing water. The roofing water collected in tank by providing pipe tank on height near about 2 to 3m.

5.2 Pipe arrangement

In this system pipe arrangement is very important. The output pipes (without toilet pipe line) of a building is converted to a single pipe which is connected with the building horizontally. The diameter of the single pipe is increasing with the size of the building.

5.3 Turbine arrangement

The turbine of the systems is placed where the water of the single pipe is falling down. The blade length of the turbine is equivalent to the diameter of the single pipe. The mass of the

turbine is inversely proportional to the generating power. So, low mass turbine is suitable to produce power.

5.4 Gear

Gear is a rotating machine part having cut teeth which are connected with another toothed part to transmit torque and produced a mechanical advantage through a gear ratio 5:1.

5.5 Chain Drive

Chain drive is a media of transmitting mechanical power from one place to another. It is used to transmit to the wheels of a vehicle particularly rickshaw, bicycle etc. The gear and chain drive are shown on Fig.



Figure 7. Top View of Gear And Chain Drive

5.6 Dynamo or DC generator

DC generator or a dynamo is a type of electrical generator which produces direct current with the use of a commutator. It converts mechanical rotation into a pulsating direct electric current through it.

5.7 Battery

The generated electrical power is stored in the battery and can transfer to the load. All the equipment's that are used in this system.

5.8 Pico Hydro Turbine Types

1. For higher heads: locally manufactured Pelton turbine.
2. For medium heads: crossflow or pump as turbine - imported or locally made - also uses induction motor as generator.
3. For low heads: propeller turbine (with casing).

6. Advantages

1. Pico Hydropower is fuelled by Water so its a clean fuel sources hydropower doesn't polluted like air power plant that burns fossils fuel such as coal or natural gas.
2. Pico Hydropower is a domestic source of energy produced in the homes.

3. Pico Hydropower relies on the water cycle, which is driven by the sun, thus its renewable power source.
4. Picodropower is generally available as needed; Engineers can control the flow of water through the turbines to produce electricity on demand.
5. Being a non-conventional source of energy its pollution free and helps sustainable development.
6. Can be used as a great back up source of energy during immense scarcity of electricity.
7. Overall it serves as a great way of recovering energy from Waste water with nominal cost.

7. Uses

1. The power generation can operate any electric lodes.
2. The typical uses can be Common homes appliances such as incandescent lamps, tube lights, fans, TVs, Other homes appliances like heater fridge, grinder, mixer, iron etc.
3. Charging battery, running UPS system.

8. CONCLUSION

This system is a simple, save and cost effective project which provides basic needs to the developing countries. By using this system one can charge batteries through which many electric applications can be run. This project can not only be a solution for India, where this study was performed, but could be an option for many regions worldwide. By utilizing this system, the future demands of electricity can be minimized to some extent. It is useful in small, remote communities that require only a small amount of electricity this system is beneficial than other large hydro system as it have low cost, can be installed anywhere, eco-friendly and easily available to people.

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