Electricity Generation from Waste Water Flow

Dhruv Agarwal

Abstract— Electricity is the most versatile and easily controlled form of energy. We need it every day to do all kinds of work. Generation of electricity can be done by so many ways but here we are introducing hydropower to generate this energy. The goal of this project is to understand hydropower. How waste water of high rise buildings can be used to generate electricity. We need to convert the energy of falling water to mechanical energy to rotate turbine

Index Terms—high rise buildings, hydro electricity, turbines, waste water

1 INTRODUCTION

ON planet Earth, water availability is very high but not usable. According to facts, about 71 percent of the Earth's surface is covered with water and the oceans hold about 96.5 percent of all Earth's water.

Electricity is the most versatile and easily controlled form of energy. We need it everyday to do all kinds of work. Generation of electricity can be done by so many ways but here we are introducing hydropower to generate this energy. The goal of this project is to understand hydropower. We need to convert the energy of falling water to mechanical energy to rotate turbine.

In a turbine generator, a moving fluid, such as water, pushes a series of blades mounted on a shaft, which rotates the shaft connected to a generator. The generator, in turn, converts the mechanical energy to electrical energy based on the relationship between magnetism and electricity

- *Author Dhruv Agarwal is currently pursuing class 12 in Neerja Modi School , Jaipur, India, PH- 9950052446.*
- *E-mail: agarwaldhruv03@gmail.com*

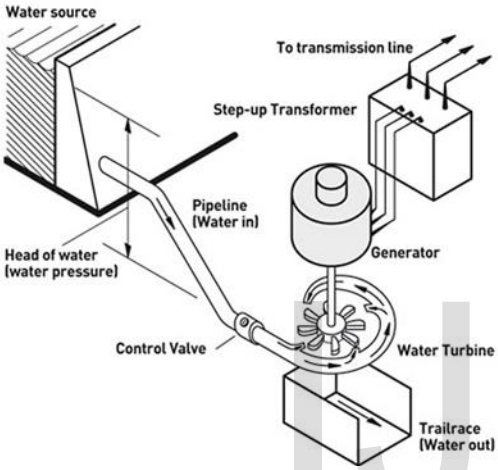
2 INSPIRATION

Humans have been using hydropower for centuries, harnessing the change from potential energy to kinetic energy of water. Potential energy is the energy stored in an object. For example, if you stretch a rubber band, it now has potential energy; it is ready to snap back to its original state as soon as you let go of it. Kinetic energy is the energy of motion. Once you let go of the rubber band and it is moving through the air, it has kinetic energy. The potential energy stored in the stretched rubber band changes to kinetic energy as soon as you let go of it. The Greeks attached waterwheels to grinding wheels and used the kinetic energy in falling water to grind grain into flour. Waterwheels have also been used to saw logs in sawmills and to provide irrigation for farms along rivers. In this project, we will extract energy from water. But this water is not of river or sea but instead Waste Water. We can convert the kinetic energy from falling water into mechanical energy. Falling water can rotate turbine and by that generation of electricity it possible.

3 WORKING OF TURBINES AND HOW ELECTRICITY WILL GO TO ELECTRIC CIRCUIT

- As this project has been proposed for the high rise building, so location of the turbine must be at ground level. So , at some height, all waste water can be collected, after which flow of the water can be used to generate electric energy. According to general survey, approximately 6ft height of water fall is needed to make 12V power generation system.
- After determining the required height, turbine is put under the head from which jet of fluid is likely to impact on impeller of turbine which makes turbine turn due to the kinetic energy of water jet. Due to this rotating motion of turbine impeller, generator starts rotating as it is coupled with turbine impeller with the help of gear box.
- As generator rotates, it will generate electric power, either AC or DC, with the use of suitable attachment to convert it into desired AC or DC power. It can be directly fed to the electric grid. Also, to measure the amount of energy produced by turbine one can use energy meter before feeding the electricity to the grid.

- A 12 V micro PM generator with rated output power 10 W and maximum power output 15 W can be used to produce electricity when the water flow rate is more than 0.1 l/s in the open environment. The survey conducted by New York State Energy Research and Development Authority, 2011 states that proposed hydroelectric generator which is expected to harness the untapped kinetic energy of water flowing inside the pipelines can produce around 10 W of power when the water flow velocity is more than 3.5 l/min which is enough to continuously and safely operate the low-power electrical devices (mobile phones, LED lights, and network routers)

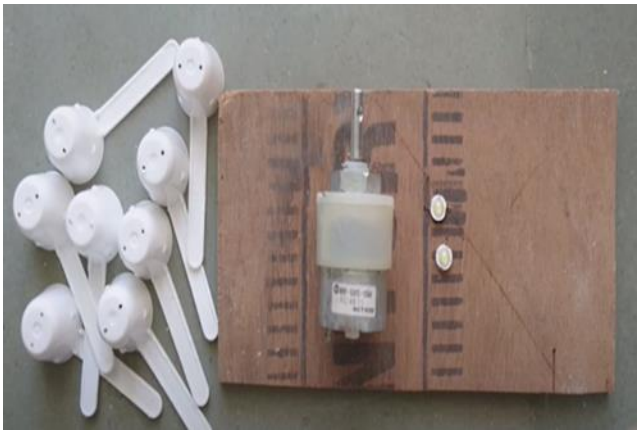


4 PRINCIPLE

Electric generator works on the principle of electromagnetic induction. It converts mechanical energy into electrical energy.
A loop ABCD is rotated in a permanent magnetic field. Its ends are connected with two semi-circular rings as shown in the figure below.
These rings are insulated from each other and can slide while remaining in contact with brushes X and Y. A galvanometer is connected between the two ends of the brush.

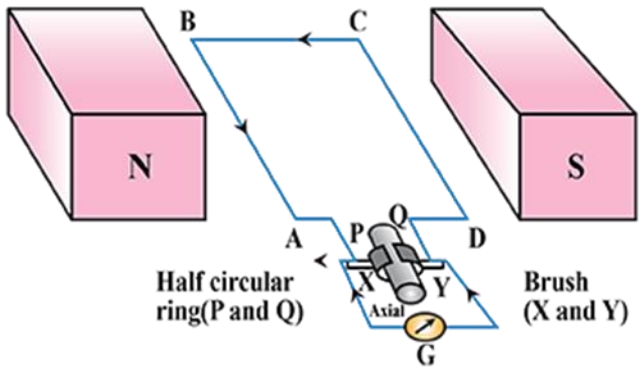
5 MATERIAL REQUIRED

Stationary Items
Ice cream sticks
Solid plastic pipes or Straws
12 V DC Motor
Bottle Caps
Glue Sticks
Araldite Mix
Wooden Piece
Set of Wires
Water Bucket



6 WORKING

On rotating the loop in a magnetic field, the side AB moves upward and the side CD moves downwards. Thus, magnetic flux linked with the loop changes and a current is induced in it whose direction can be determined by Flemings right hand rule.
In the figure, the current is flowing through the path B-A-G-D-C.
After half rotation, the ring P comes in contact with brush Y and the ring Q comes in contact with brush X. Thus, the brush X is always in contact with the side moving upwards and brush Y is always in contact with the side moving downwards, as a result of which the current flows in one direction.
This current is called direct current. This type of generator is called D.C. generator. Similarly, instead of a half ring, if a full ring is used, then A.C. current can be generated and such a generator is called an A.C. generator.



7 UNIQUENESS OF PROJECT

Most high-efficiency washing machines use only 56.8 to 113.6 Litres of water to wash the same amount of clothes as compared to older washing machines which used 109.7 to 170 L. The most efficient washing machine use less than 18.9 L per

cubic meter of capacity. It is noted that 90% of the water used is not useful and it goes in the drainage line and gets wasted.
Same way the water of the Wash Basin also gets wasted. To use this waste water of washing machines, wash basins, etc we have suggested a new way which is to use this waste water to rotate turbine, specially in Highrise apartments where due to height, good amount of kinetic energy can be obtained, using which we can generate energy.
Water can be collected from sewage waste or waste from the outlets of washing machines of Society or wastage of some industry and after chemically stabilizing the waste water, we can feed this water to small turbine to produce good amount of electricity .
Here generation of electricity from household waste water or some industrial waste water is used to utilize the energy of waste water to produce some amount of power needed for regular household work. For this, the size of turbine generator are comparatively small and hence not too much head is required to produce few watt power from waste water. Here the main aim of the project is to utilize the energy of water before it is emptied into a river or sea to produce electricity.

8 FEASIBILITY OF COST

Cost depends on application and amount of energy required to produce electricity. For small version to produce about 20-watt power using waste material, Rs 1200 will be sufficient while for big power plant it would cost more than crores. Cost of the small model as bifurcated:- Impeller Rs 100, Motor act as generator Rs 150, Battery Rs 500 and Cardboard and structure cost make it approximately Rs 1200 .

9 CHALLENGE OF PROJECT

1.This type of water might have some kind of waste particles so keeping filter in the pipelines and having special pipeline for this type of water is required.
2.The amount of electricity generated is quite low, so this method cannot replace regular electricity generation.

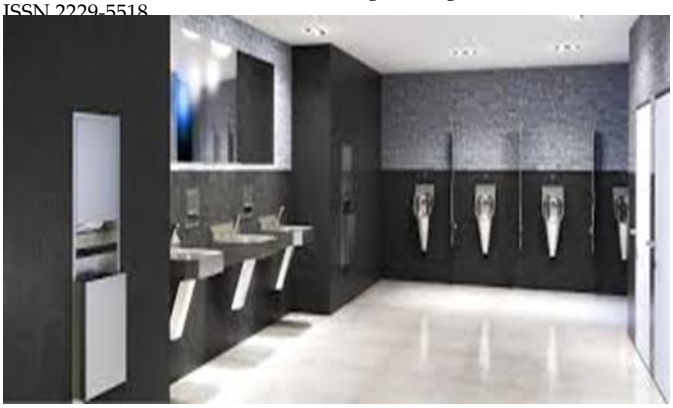
10 APPLICATION

1.By keeping special pipelines in Highrise Apartments, small power generator plants can be installed using this model.
2.Educational institutes and High Scale Corporate Buildings can also use this model.
3.Laundry houses can use this model for power generation.
4.Malls having more restrooms where usage of wastewater is more, can also use this application.

Laundromats

Malls

High Rise Buildings



Toilet, restrooms

12 SOME OTHER USES OF THIS TECHNOLOGY

Rain water Harvesting
Use of small water flow / water fall to generate electricity
Big Societies can have this model too.
Rotation of Turbine can be done using other energy than hydro energy like wind and tide.

7.3 REFERENCES

1.Mohammad O.A. Aqel, Ahmed Issa, Eman Qasem, Hydroelectric Generation from Water pipelines of buildings, International Conference on Promising Electronic Technologies, 2018.

2.Hydropower from Wastewater, New York State Energy Research and Development Authority, 2011.

3.https://www.eia.gov/energyexplained/electricity/how-electricity-is-generated.php

4.Professor Satvik , Silver Oak University , Ahmedabad.