Energy Generation in Water Pipe Lines Savonius Water Turbine Power

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Abstract- Today, not only do we need innovative energy generation techniques which are environment friendly but also cost effective and easy to install. We have seen many small turbine and rotor arrangements that are installed in rivers and dams that can drive motors to generate energy. There are many ways in which this force of water can be used to generate power. In this paper we attempt to demonstratehow a Savonius water turbine placed inside a water pipe can generate power. Since the setup is small and can be installed in existing water pipelines without hassle that makes it a very convenient system, especially in rural regions which are isolated.

Index Terms-Savonius

1. INTRODUCTION

As India is progressing its power needs are increasing day by day. The demand in urban regions is high which causes several power cuts in rural areas. With rampant electricity shortages in outlying villages and remote areas, it would be ideal to exploit the micro-hydro potential of water pipes to produce electricity. No water is wasted here since there is no alteration in the pipe dimensions or water flow. However the use of small turbines generating 1/2 to 1 kW power is desired and such a turbine needs to be designed and put to practical use. This alternate source of power would be available all the time. Water Pipe line network is vast and extensivein areas where farming is done. Pipes are used in conveying water from reservoirs and dams to different parts of the country. This setup aims at using the force of the moving water in pipes to generate electricity that can be either stored or immediately used in nearby areas. This paper shows the technique used for the same. Currently hydro power from rivers and oceans are only tapped. We have included power ratings that were recorded for models of several sizes and water pressures.

2. SAVONIUS WATER TURBINE

The experiment to measure the torque of a Savonius-type turbine, which hitherto has been used for wind energy application, is presented in this paper. It is proposed to use a simple Savonius Rotor water turbine with 20cm diameter and 18cm thick to generate the power. Savonius rotor is a simple turbine made of 2 semi-cylinder scoops which are obtained from the split halves of a HDP pipe. These make an S shape as shown in Fig.1. Savonius rotors are very economical, reliable

and robust, but efficiency is lower when compared to radial, axial or reciprocating pumps.

Eq. (1)

 $R.P.M = V * 60/Dx \prod$ Where, V= water speed in liters/second D= diameter of rotor in feet.

3. WORKING:-



Figure.1. Basic arrangement of motor



Figure. 2. Block diagram of Set up

Above diagram clearly shows the basic working principle of the energy generation with the help of pipeline. Here there are 5 main parts (Turbine, Gear Box, Motor, charge controller, Battery bank).First of all the main part is the selection of the pipeline where the set up is going to be placed. This is the most essential part of the implementation of project. Then the turbine comes into the scenario, which is responsible for the movement of motor to generate energy. So as the water starts flowing into the pipeline, which pushes the blades of the turbine and hence motor moves. Many times it happens that shaft of turbine is directly connected to motor. But in this arrangement a Gear box is added between shaft of turbine and motor which to increase the RPM of shaft (it will increase the RPM from few 100 rpm to or above 1000rpm). So with the help of gear box we can receive maximum output from the movement of turbine. Now as we are receiving maximum amount of energy, we need a charge controller that will maintain the voltage and current level and avoids the battery to get over charged. Thus a battery bank is selected accordingly to store the energy generated.

4. GRAPHS:-



Figure. 3.Graph (liters per second VS RPM)

Above graph explains the basic reading of the project. On X axis it shows liters per sec and on Y axis output in terms for RPM.So we can see that as water flow increases the RPM of

the turbine shaft increases. Thus if we connect a Gearbox to the turbine shaft, it will increase the RPM up to 2000 to 3000 (depends upon the type of gear box we use). As the RPM increases with the help of gear box, thus when Dynamo is connected to the gear we can receive out of about 200 to 300 watts.

Hence we are getting so much of output from a single arrangement. If we introduce this arrangement after every specific distance we can get substantial Energy from the pipeline where the water transmission is done continuously.

5. APPLICATIONS

• The project can be installed in pipe networks which convey water from dams /reservoirs to rural areas.

• It can be used in irrigational canals as well to generate power which can be utilized for domestic use.

6. CONCLUSION

After evaluating the results under various scenarios it has been observed that this setup produces sufficient amount of power to run a small house hold. This project is favorable as it's easy to install and requires no changes in the existing pipe network. Also it can be adapted to several sizes that can fit various pipes.

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