



In-pipe water power generator from spherical turbine

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ABSTRACT- An environmental protective electrical power generating system is the need of this generation. This project relates to an innovative approach for generating electrical power utilizing the flow of sewer waste liquid, as the energy source for operating turbines which in turn, drive electrical power generators. The objective is to create self-sustainable system to generate electricity with the help of the kinetic and pressure energy of the flow of water which runs the turbine assemblies including spherical turbines coupled to generator, sequentially located in the subsequent channel of water. In this project activity, we will be studying the required process parameters, design requirements, operational parameters, cost of implementation and power generating capacity of a spherical turbine in-pipe water power generator for ten households in a street.

KEYWORDS- Electrical power generating system, Sewer waste liquid, Self-sustainable system, Spherical turbines

I. INTRODUCTION

1.1 AIM

To extract the pressure energy of the flowing water from the pipes with the application of in-pipe turbine for lighting purposes.

1.2 OBJECTIVES

- Harnessing the energy which does not harm the eco-system.
- Energy security and to generate consistent, predictable energy 24/7.
- Generate clean, reliable, low cost electricity.
- Eliminate dependency over fossil fuel.

Turn kinetic energy into a revenue stream through power purchase agreements.

1.3 LITERATURE SURVEY

Water possess a lot of energy which is in the form of kinetic and pressure energy flowing vertically through pipe. The turbines working till date occupies a large amount of cross sectional area in pipe. When the area reduces, it converts pressure energy into kinetic energy which results in increase of velocity. This velocity of water is utilized in in-pipe turbine and used for generating electricity.

The in-pipe water generator is an electrical power generating pipeline which can produce renewable energy completely clean, reliable low cost electricity.

The in-pipe turbine is setup in the pipe, the flowing water strikes the spherical blades of the turbine and leads to the rotation of it. The vertical shaft of the turbine is coupled to the generator which generates electricity and stores in batteries.

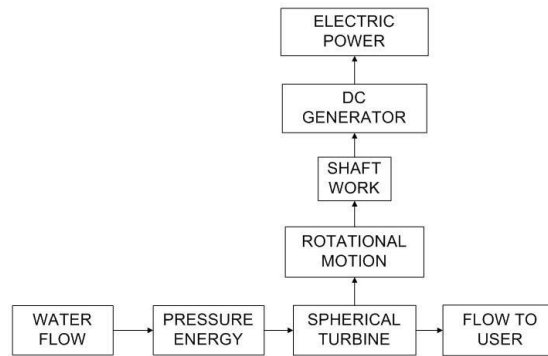


Fig.1 Basic flow chart

II. COMPONENTS & ITS REQUIREMENT

2.1 PVC TEE JOINT

The tee joint of polyvinyl chloride provide housing for the in-pipe turbine. The pipe diameter and the tee joint's inner diameter is same for smooth accommodation of turbine.

The web of joint is covered with a PVC cap. A hole is drilled through the cap and bottom portion of the PVC joint. The vertical shaft of the turbine is mounted in the bearings fixed in the hole, which reduces the friction.

2.2 IN-PIPE TURBINE

The turbine consists of a rotatable shaft which has its own axis of rotation and the set of the blades are fixedly attached to the rotating shaft. The turbine shaft is coupled with the assembly of generator. A gearbox is provided in between to increase the RPM of the generator. The electricity generated is stored in a storage battery for the lighting application when needed.

III. DESIGN CALCULATION

Assumptions:

1. Each household consists of four persons.
2. Each household generates a constant volume of sewage water.
3. Each household consumes a constant amount of electricity.
4. The inlet volume remains same throughout and after treatment (recycling)

Average generation of sewage water per household per day = 7500 litre approx.

Therefore, generation of sewage water of 10 households = 75000 litre = 75 m³ per day approx.

Average discharge capacity of Sequence batch reactor = 65 m³ per day approx.

Average consumption of electricity per household per year = 131 kwh approx.

Average consumption per capita consumption = 31 kwh approx.

Therefore, One month consumption = 11 kwh

One day consumption = 0.36 kwh

One minute consumption = 0.00025kwh

Estimated power production by a single unit of in-pipe water power generator consisting of 4 turbines is 18 kw per day.

Similarly, one minute production can be = 0.00125 kw

Soon after the final stage of treatment or recycling process, the water needs to pump from the collector chamber to the subsequent channel (pipe) of water consisting turbines.

Therefore, for producing 0.00125kw of power, a centrifugal pump is required with flow rate of 306 m³ per hour working at 1440 rpm. The working pressure of pump will be 2.5 kg per m².

IV. RESULT AND CONCLUSION

Selection of in-pipe turbine to generate power from the flowing water is an innovative approach towards renewable energy. This new scheme has provided us with a low-cost electricity generation which is big assistance in helping the world. Unlike other renewable energy source, it can be utilized in both day and night time with the application of flowing water's energy.

V. REFERENCE

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