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# IN-PIPE SPHERICAL WATER TURBINE

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**ABSTRACT-An environmental protective electrical power generating system is need of this generation. This project relates to inventive approach for generating electrical power utilizing the flow of liquid, as the energy source for operating turbines. Earlier practices used turbines, but to meet the requirement of task, we choose a different approach in hydral power generation, in small scale power generation and environmentally friendly. In this project we develop blades by trial and error method. In which we use D.S. CATIA V5 R21 software to design the blades and other design parameter and analyses them with the help of mechanical APDL (ANSYS). To design the parameters, we used dimensions provided by LUCID Technologies' document which are standardizing by them. To manufacture these blades, we use material called Poly Lactic Acid (PLA). After the completion of analytical work, we will manufacture setup and test it according to the process parameters. We generate current by using D.C. generator.**

**Key Words: Hydropower, Design of Turbine, Electricity Generation, Spherical Turbine etc.**

## I. INTRODUCTION

As India is progressing its power needs are increasing day by day. With uncontrolled electricity shortages in outlying villages and remote areas, it would be ideal to exploit the micro-hydro potential of water pipes to produce electricity. However, the use of compact turbines generating half ½ 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 extensive in 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.

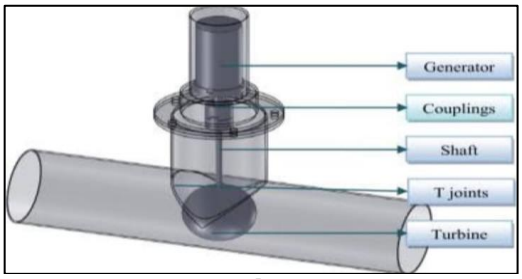



**Fig.1: In-Pipe Turbine System Setup**

Water possesses 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.

## II. PROBLEM STATEMENT

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 project we attempt to demonstrate how a spherical 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.

## III. OBJECTIVES

i. Harnessing the energy which does not harm eco-system
ii. Energy security and to generate consistent, predictable energy 24/7
iii. Generate clean, reliable, low cost electricity
iv. Eliminate dependency over fossil fuel
v. Turn kinetic energy into a revenue stream through power purchase agreements
vi. To extract the pressure energy of the flowing water from the pipes with the application of in-pipe turbine for lighting purposes.

## IV. LITERATURE REVIEW

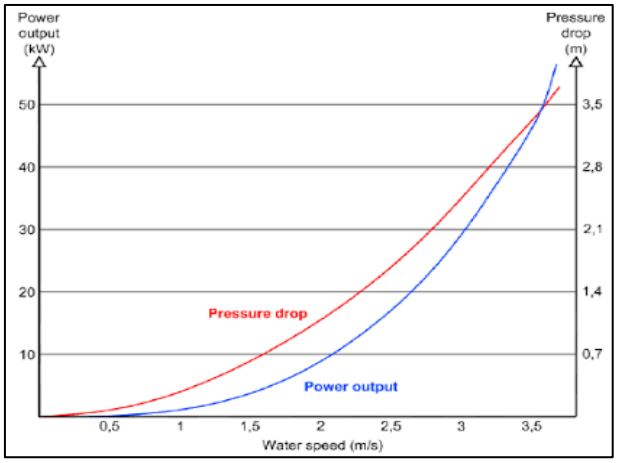
[1] Peter Bachant and Martin Wosnik-In this study we measured the power output from and drag forceon a cylindrical-helical and a spherical-helical cross-flow turbine ina towing tank, motivated by the scarcity of data in the literature forhelical turbines. Results showed that in a low-blockage tow tank or channel environment the cylindrical GHT outperformed the spherical LST in terms of power coefficient, which was accompanied by a higher drag coefficient. [1]

[2] C.P. Jawahar and Prawin Angel Michael–The present review is a comprehensive one on the research progressmade in the turbines in the published literature, used for micro hydelpower applications. The present work also highlights the availability ofturbines with the manufacturers both in India and abroad. The salientfeature that can be drawn from this work is that efforts have been madeby researchers to enhance the efficiency of the turbine used for microhydro resources. However, there is a research gap from the viewpointof design of turbines that large powered turbines are currently beingused for low power generation in hydro power plants.This research gap presents a great challenge to the researchers asturbines which are designed to cater to these specific needs only wouldbe cost effective and reliable for the implementation in hydro powerplants. Since most power plants now-a-day's use large turbines for the low power production, losses and overall cost increases, hence this survey will be helpful to reduce the cost of the plant.[2]

[3] Tarik Efe Kendir and Aydogan Ozdamar- Load changes occurring in water turbines often result in pressure waves at hydroelectric power plants. Load reduction or the sudden closure of the turbines used for hydroelectric power plants were investigated. For this purpose, four basic surge-tank systems were numerically investigated. A inclined straight V-type surge tank was found to be the most optimum configuration. Both rigid and elastic water column calculation methods were used for this study. Following this approach, an experimental model of a hydroelectric power plant with an optimised surge tank was created based on the model. This experimental model and prototype were numerically investigated. Finally, the results were compared and were found to be in agreement [3]

[4] J.A. Laghari et. Al- Mini hydro schemes can be adapted as the most economical option for rural electrification than any other available renewable energy sources such as solar and wind. New designs in propeller turbine and alternative option such as PAT, induction generator and intelligent controllers can successfully make these schemes more economical and cost-effective options. This paper provides survey of all these alternative options and new designs in the controller, hydraulic turbine and generators that have been implemented in different countries of the world. Owing to depletion of fossil fuel and environmental pollutions it produces many utilities have switched their generation sources to renewable energy. Among the renewable energy sources, mini hydro has gained the highest attraction due to its environment friendly operation. It can be the best economical option for rural electrification in developing countries.[4]

## V. GRAPHICAL REPRESENTATION




## VI. SPECIFICATIONS OF MATERIAL USED

1) Tank
   i. Size: 250 X 250 X 250 Mm (L X W X H)
   ii. Material: M. S. Sheet
   iii. Thickness: 5mm
2) Pipe
   i. Material: PVC
   ii. Size: 1 Inch
3) Dynamo
   i. To Produce Electricity
   ii. Power: 12 Watt
   iii. Voltage: 12 Volt
   iv. Amp: 0.5 – 1 Amp.
4) Shaft
   i. Material: M. S
   ii. Dia.: 8.5 mm
   iii. Length: 5 - 7 Inch
5) Bearing

i. Material: S. S
ii. Size: OD: 35 Mm, ID: 15 Mm
iii. Wt.: 0.04 Kg

## VII. DESIGN OF TURBINE

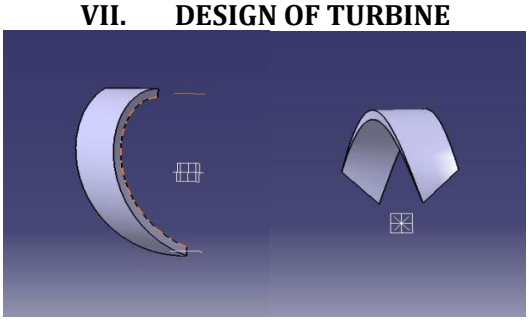


**Fig 1: side views of turbine blades**

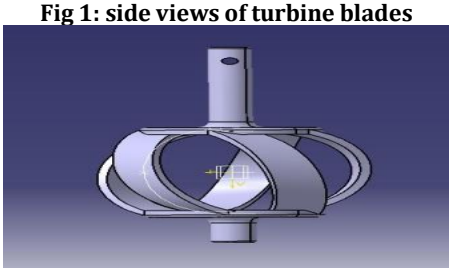


**Fig 2: front view of turbine**

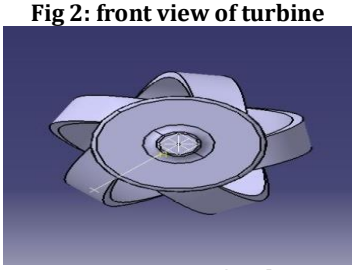


**Fig 3: top view of turbine**

## VIII. APPLICATION OVERVIEW

i. This project a successful utilization of hydro power. This pipeline power generation is to overcome the existing model of hydro power generation. By considering the future needs this project can be implemented in many ways. Some of them are as listed below.
ii. In city: if we use the system in pipes providing water to different areas of city in series at particular distance, the generated energy can be used for street lights.
iii. Agricultural field: this proposal can be used in irrigational canals as well to generate power which can be used for domestic use.
iv. The system can also be used in drainage pipelines.
v. The system can be used in pipelines providing water to industrial areas.

## IX. ADVANTAGES

i. Doesn't harm ecosystem.
ii. It can generate consistent, predictable energy.
iii. No impact on delivering.
iv. This is cost effective.
v. It will produce comparable amount of electricity.
vi. This system is weather independent.
vii. From this clean electricity can produce.

## X. CONCLUSION

By implementing this system in the pipe lines form generating a small hydroelectric power plant it is efficient than conventional Hydal power plants.
We can use the s-spherical turbine because this 'S' shape makes the turbine more efficient.

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