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Archimedean Screw Power Generation

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Abstract— To design a prototype of screw turbine for power generation using principles of velocity vector. The conception of a screw turbine rotor for remote area electricity production. It has a great potential to be used for remote areas to generated power by using low head water source as this research is developed. Energy crisis around the world encourage researcher to pay attention in founding alternate sources of green energy these days. A lot of research has been conducted by using natural energy sources such as solar, wind, wave and water. According to sources of energy from water to run a turbine, there is a rapid change of technology in using such turbine which suitable for definite kind of flow river, much of them are used for high head (differences) to produce electricity.

Micro-hydro power plant based on Archimedes Screw turbine is a type of renewable energy power plant is, easy to be functioned and operates on low costs, etc. The micro-hydro project designed to be a run-of-river type, because it requires no reservoir in order to power the turbine. The water will run straight through the turbine and back into the river or stream to use it for the other purposes. This has a minimal environmental impact on the local ecosystem. The choice of the turbine type depends mainly on the site head and flow rate. The turbine power and speed were directly proportional with the site head, but there were specific points for maximum turbine power and speed with the variation of the site water flow rate. The turbine efficiency could range from 80 to 95 percent and the generator efficiency about 90 percent.

Keywords— **Archimedes screw hydroelectricity, Water turbine technology, Screw generator efficiency, Renewable energy sources, Gravitational potential energy**

I. INTRODUCTION

Micro hydropower is an eco-friendly, fish-friendly, non-polluting renewable source of energy. It is the oldest renewable energy method used for production of electricity known to mankind mechanically. According to Kyoto protocol of 1997, most of industrialized countries agreed to set some emission reduction target in order to maintain environmental & climatic equilibrium of the world exposed by greenhouse effect, ozone depletion etc. To overcome these problems, renewable energy can be utilized to meet those international targets. In current scenario, India is blessed with half a million locations where water mills are serving for centuries. There are nearly 5lac (approx.) potential sites over the entire Himalayan region from Jammu & Kashmir to north eastern states and can generate power as much as of 25000 MW i.e. each can generate at least 5KW. Till date only 25% (approx.) of the total hydro power potential has been tapped to generate power. Water mills are enough to run TV, refrigerator, cooler, fan & light bulbs etc. Small scale hydropower constitutes a cost-effective technology for rural areas in developing countries and, on the other hand, is a quiet growing sector in India. In the last decade, problems related to energy crisis such as oil crisis, climate change, electrical demand and restrictions of whole-sale markets have risen world-wide. These difficulties are continuously increasing, which suggest the need of technological alternatives to assure their solution. One of these technological alternatives is generating electricity as near as possible of the consumption site, using the renewable energy sources, that do not cause environmental pollutions, such as wind, solar, tidal and micro hydro-electric power plants.

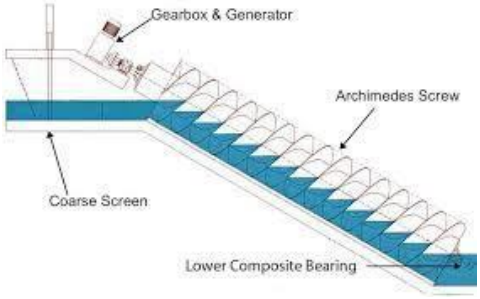

Fig. 1. ARCHIMEDEAN POWER SCREW

A.. PROBLEM STATEMENT

To utilize the energy of flowing water in small streams or channels as a source of power generation and to make low head hydro-plants viable.

B. OBJECTIVES

- Utilization of small ponds, canals and rivers.
- Rural electrification.
- Minimization of losses.

C. PROPOSED WORK

Physical/ practical application of all experimental studies in order to create model and study all parameters. Also focusing on increasing the efficiencies, power output. To get maximum efficiency from minimum costing.

DESIGN

1.1 SHAFT

Material : PVC Pipe, PVC Foam,Acrylic PVC Sheet, Mild Steel.

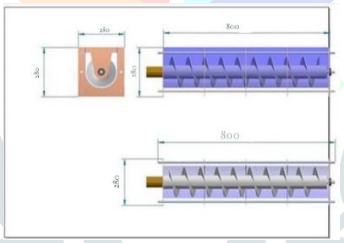

Fig. 2. Shaft

1.2 SCREW CONVEYOR

Material: PVC Foam, PVC Pipe.

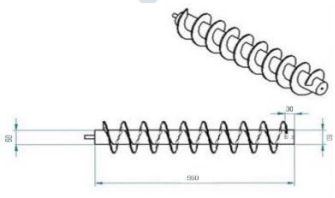

Fig.3. Screw conveyor

1.3 THREADING ROD

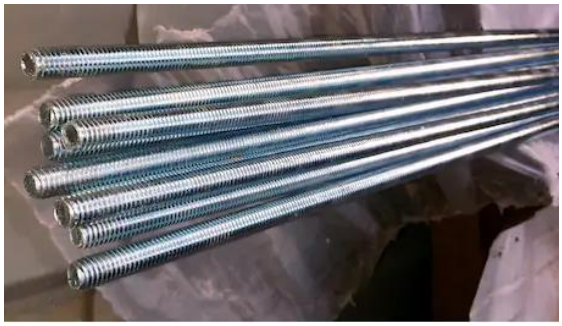

Fig. 4. Threading rod

1.4 SIDE PLATE

MATERIAL: Acrylic PVC sheet

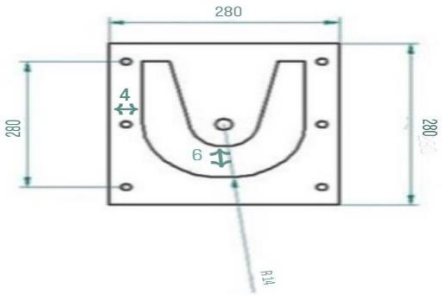

Fig. no. 5. Side plate

1.5 GENERATOR

Fig 6. Generator

1.6 BEARINGS

Fig. 7. Bearing

1.7 Gear

Material : Acrylic PVC Sheet

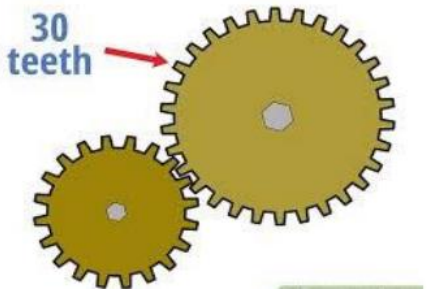

Fig. 8. Spur Gear

1.8 ACTUAL PROPOSED MODEL

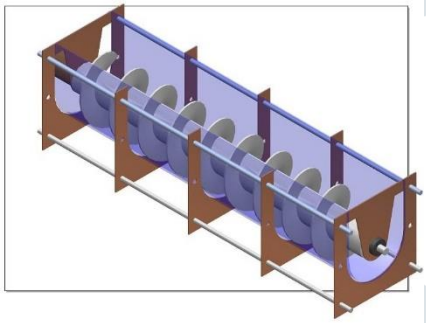

Fig. no.9. Three-D concept model

WORKING

The screw turbine is a water turbine which uses the principle of the Archimedean screw to convert the potential energy of water on an upstream level into kinetic energy. It may be compared to the water wheel, though the screw turbine has a much higher efficiency. The turbine consists of a rotor in the shape of an Archimedean screw which rotates in a semi-circular trough. Water flows into the turbine and its weights presses down onto the blades of the turbine, which in turn forces the turbine to turn. Water flows freely off the end of the turbine into the river. The upper end of the screw is connected to a generator through a gearbox. The Archimedean screw turbine is applied on rivers with a relatively low head (from 1 m to 10 m) and on low flows (up to around 10 m3/s on one turbine). It is used for River and Small River.Cooling water outlets from power stations.Water treatment inlets (Municipal and Industry). Replacement the types of generators and waterwheels. Industrial west water and process water (for example Project or steel mills).Water treatment outfalls (Municipal and Industry).

CONCLUSIONS

Archimedes Screws Turbines (ASTs) are a new form of turbines for small hydroelectric powerplants that could be applied even in low head sites. ASTs offer a clean and renewable source of energy. They are safer for wildlife and especially fish. The low rotation speed of ASTs reduces negative impacts on aquatic life and fish.It is important to note that ASTs are not a uniquely global solution for all energy generation needs. ASTs have their own drawbacks just like any other technologies: using Archimedes screws as generators is a relatively new technology, and in comparison with other hydropower technologies, there are many not well-known things about ASTs. Currently, there are no standards for the design of ASTs, and AST hydro powerplant designs are highly dependent on the experience of the engineer who designs them. For very high flow rates or water heads, a single screw may not take advantage of all available potential due to material, structural, technical, and physical limitations. However, the increasing interest in ASTs, new advancements, and ideas such as multi-AST powerplants offer some solutions to extend AST usability.

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