

Ultra power generation using waste water

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ABSTRACT

Electrical power is stipulation of human life. Now a day electricity is produced from different renewable and nonrenewable sources like hydraulic energy, coal, steam and nuclear power etc. Electricity generated by hydraulic power is cheapest and pollution free. Distribution generation can be produce by using waste water after giving some chemical treatment or otherwise. Most suitable turbine for such low head hydro power plant is Archimedes turbine. Archimedes screw generator operate as run of river have low pollution effect and a uniquely efficient means of generating electricity at a very low head and slow flow rate. Archimedes screw generators have the capacity to be utilized for rural electrification in emergent regions with dependable low head water resource. The performance of Archimedes turbine is depend upon variable flow rate, depth of turbine inlet flow and turbine shaft slope. While designing the Archimedes turbine different parameter will keep in mind like weather effects, operation and maintenance of installed system, how its ease to install the system, wear and tears. Second part of work consists of modelling of ultra hydropower plant using an Archimedes turbine.

Keyword: - Archimedes screw, generator, trough.

INTRODUCTION

Ultra hydro power plant is more important renewable energy resources and has great important for developing where the government cannot wear expenses of power grid, transmission line and distribution line of ultra hydro power plant system can run as isolate distribution generation system. Ultra hydro power plant systems have a small rating that's way it is for single user or small group of user. The Archimedes screw is a technology that has been use in a variety of implementations since antiquity. An Archimedes screw is a helical array of simple blades that are wrapped around a central cylinder, like a woodscrew. The Archimedes screw may have a single flight or multiple flights this small system get important where the flow rate is fast and head is small or viceversa hydro power plant which has capacity less than 1000 KW are referred as a mini power plant while power plant having capacity less than 100 KW are known as a micro power plant. For ultra hydro power generation system consist of two core components. First is the right selection of turbine is one of the major part of designing a ultra hydro power plant system and in this case Archimedes would be preferred for low head. In ultra hydro power plant system main part are turbine, generator, high speed connecting shaft and low speed connecting shaft. This screw is use either a turbine or a pump an Archimedes can be situated within an open trough, with a small gap between the trough since the distance between the blades are relatively large to pass the debris and even marine life may pass through the turbine itself. The Archimedes screw generator is one of most environmentally friendly.

COMPOENTS

The design of any power is based on matching the theoretical and practical values calculated and simulated respectively. So following parameters shall be used.

A. Archimedes Turbine - the patent of Archimedes turbine is usually attributed to Archimedes of the Syracuse the evidence show that the Archimedes screw was invented in the Assyrian empire under regime of King Sennacherib in

the 7th century. In either case, it was found that turbine is not popular until next reinvention. After reinvention in 1997 the Karl-august radlik applied for a patent of a power generating Archimedes screw, with number of blades, situated within a fixed trough with water flow in the top and into buckets, turning the blades to hold energy in head difference of waterway. As interest in the Archimedes screw generator is increased, it has increased number of experiment and simulation based on investigation. the structural design of Archimedes turbine is shown in figure. The material used for the turbine is galvanized iron for avoiding environmental impact such as corrosion free and weight of galvanized iron is light.

Design parameter of Archimedes turbine is clear from the figure. It consist five blades trunked on its surface and length of turbine is 3 feet. The available data only deals with optimization of geometry with respective their height of inflow water, speed and volume.

The speed of rotation is calculated by $n_{\text{speed}} = 60 * Q / V$.

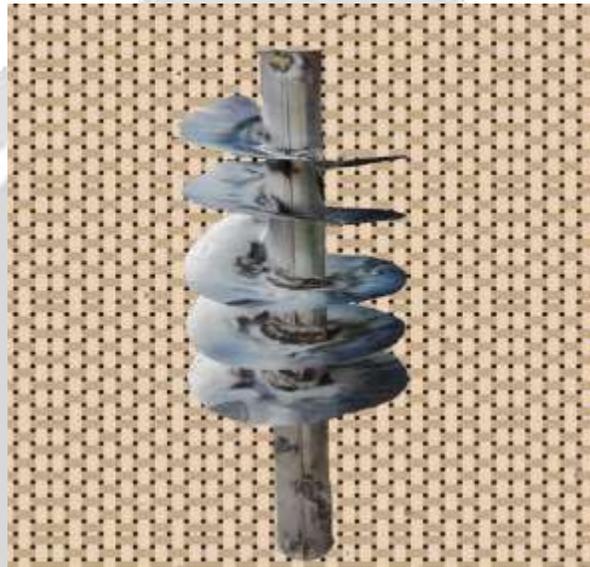


Figure 1: Archimedes turbine

B. DC Generator:-The DC Generator is an electrical machine which converts mechanical energy in the form of motion, into electrical energy in the form of dc voltage and current by using the principles of magnetic induction. The voltage and current output produced by a dc generator depends on its shaft speed and the electrical load connected to it the shaft speed required to reach any particular output voltage is determined by the load. The lighter the load, the lower the rpm needed to reach the particular voltage. Then low rpm dc generators are a popular choice for use in hydro power plant.

The DC Generator gets its energy of motion from the Archimedes turbine blades attached to its rotor shaft. The dc generators are designed to run at low speed. In dc generator no need of gearbox or pulley and complex mechanical item.

Ultra scale hydro power is classification given to a small homemade run of river type scheme that use dc generator design to produce electrical power between a few watt up to hundred watt as part of battery charging. The power extract from the water by dc generator is depends upon flow rate, head gravity and water density.

Working of ultra hydro power generator

When conduit water pass via the Archimedes turbine, due to initial rotation of turbine generator start its excitement is the reason for initial generation of energy. When turbine obtains its desire speed means the kinetic energy of water converted into the mechanical energy and this mechanical energy is converted into electrical energy. A coarse screen found in way of water to pass debris, marine life like branches, leave, fish and stone. For getting strength it's

mandatory to keep minimal distance between screw outer boundary and trough. Ultra hydro power plant system with Archimedes screw has plug with adjustable angle of inclination for different rate of flow of water and droop of height.

The power within the water can be calculated as follows:

$$\text{Power (P)} = \text{Flow Rate (Q)} * \text{Head (H)} * \text{Gravity (g)} * \text{Water Density (\rho)}$$



Figure 2: installation of ultra power generator with Archimedes screw

CONCLUSIONS

In this paper ultra hydro power plant prospective is described for rural areas. An ultra hydro power plant is highly stable, economical and accomplished of generating reliable energy at need because of its erection on small canals/sewage plants which run throughout the year. Main objective of this paper is to present the design and development of ultra hydro power plant with Archimedes turbine and ease of operation and maintenance of ultra hydro power plant by using Archimedes screw.

FUTURE SCOPE

Future work projected for Micro/Nano/Pico hydro generation from upstairs water tanks of kitchen, washrooms and also from the sewage of single home or a building to charge the small batteries.

Its interconnection with existing local grid distribution network in such a way that extra unused energy of ultra hydro power plant is shifted to that grid and ease of operation and maintenance.

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