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REVIEW ON DEVELOPMENT OF POWER GENERATION FROM WATER PIPELINE IN HYDRO POWER GENERATOR

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ABSTRACT

Picohydroelectricity is a dependable and effective type of clean, renewable energy. In this work, the design and development of a pico-hydro generation system that draws water from residential buildings' water tanks are discussed. The kinetic energy of the water flowing through household pipes has the potential to produce electricity for energy storage. For better operation and energy production, three novel mechanical arrangements are included: an air bladder for maintaining water pressure, U-tube piping, and a large nozzle pipe end. It uses no fuel and requires little maintenance to produce power. We could create a mechanical system that would use the potential energy that a water storage tank has from a water head to generate power. Therefore, the goal of this project is to create a small-scale hydro production system that uses water from a water tank to generate electricity for domestic usage.

Keywords: Renewable Energy, Hydroelectricity, Turbine, Diaphragm Pump, Portable Etc.

I. INTRODUCTION

In essence, hydro-electricity combines vertical drop (often called) and water flow. Pressure is created by a vertical drop, and a hydroelectric system's continual water flow provides a reliable source of pressurised liquid energy. Because the resource is trapped in the pipes or the flame, pressed, flowing water is a particularly dense resource that hydroelectric systems convert into power at a high rate. For ages, people have used the energy of flowing water to create the first mechanical power, and for the past 100 years, electricity. Early uses included driving machines, pumping, and milling. Correct water supplies, in contrast to wind and sun, may be made available every day of the year, 365 days a year. Due to this, early settlers could power irrigation pumps and grain mills, and today individuals can produce clean, renewable energy at a fair price. In this technique, domestic water is held in a tank and then flows via a conduit (a penstock) that slopes downward. It is possible to generate electricity without incurring increased water bill costs. This system's primary purpose is to store power produced during battery charging for later use, particularly during an electrical blackout. Compared to existing Pico micro hydro systems, the suggested system provides much less electricity (8W), yet it is still affordable, simple to use, and environmentally friendly and easy to install anywhere.

1. Problem Identification

One of the most fundamental components of our universe is energy. Promoting education, health, transportation, and infrastructure in order to achieve a livable standard of living is essential for survival and important for development activities. It is also a crucial element for economic growth and employment. The previous ten years have seen an increase in global issues relating to the energy crisis, including the oil crisis, climate change, electricity demand, and limits on whole sale marketplaces. Since these problems keep getting worse, technological solutions are needed to guarantee their resolution.

One of these technological options is producing electricity as close as possible to the point of consumption utilising renewable energy sources, such as wind, solar, tidal, and hydroelectric power plants, which do not pollute the environment. A renewable energy source that derives from moving water is hydroelectric electricity. Water needs to be moving in order to generate power. The potential energy of the water transforms into kinetic energy as it falls due to gravity. In hydraulic turbines, the kinetic energy of the moving water is

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converted to mechanical energy by turning blades or vanes. The generator's rotor is turned by the turbine, and this mechanical energy is subsequently transformed into electrical energy.

Many different uses, including the milling of grains, the sawing of wood, and the pumping of water for irrigation, have made use of the power that falling water generates. The water wheels that turned slowly were employed to capture the mechanical energy of moving water. These early water wheels' design and efficiency advancements paved the way for the development of hydroelectric turbines. In the 1880s, the first hydroelectric power systems were created. The international energy agency (IEA) estimates that 16% of the world's electricity is currently produced by large-scale hydroelectric dams. However, these kind of projects necessitate massive amounts of land impoundment, dams, and flood control, and they frequently have an adverse influence on the environment.

2. Objective

Energy is regarded as a prime mover for many factories and industries in India. The best solution to these issues will be found in renewable energy sources in a nation where both income and energy are painfully low.

- This project's goal is to focus on pipeline power generation utilising a hydro generator.
- Analysing existing turbine designs to develop the most effective power-harvesting turbine to produce a cheap and clean source of energy.

The purpose of this project is to develop an electricity-generating pipeline turbine system while focusing on the ideal rotor.

II. LITERATURE REVIEW

P. Padmarasan et. al. 2016, The project's objective was to convert waste energy found in drinking water systems in cities and towns into usable electricity. The technology behind hydroelectric electricity is not new. But the idea was to use the same idea on a smaller scale. Instead of employing the larger turbines seen in dams, the water turbine project will use smaller turbines that will link to water mains leading into cities and towns. Unused extra energy can be collected by strategically positioning these turbines at the base of hills or tall water towers. The fact that this water turbine project was completed successfully demonstrates the existence of energy in our daily lives that may be harnessed and put to good use. We must do everything in our power to be resourceful because it is predicted that energy will become increasingly difficult to come by in the future years. The current water turbine project is a prime illustration. Instead of letting excess energy go to waste, we are converting it into useful electrical energy. The project is a fantastic illustration of an interdisciplinary endeavour combining electromechanical engineering and renewable energy.

Hani Muhsen et. al. 2019, For the in-pipe hydro system, various turbine designs have been put forth in this work. By putting the proposed ideas into a functioning prototype that resembles an in-pipe system with a gravity-fed structure, the performance of the various designs was compared. In order to generate green power that may subsequently be used to power secondary applications like lighting or other loads, surplus water pressure in the in-pipe system must be converted to energy. A 3D printer and the SolidWorks programme were used to implement the six turbines that were suggested and investigated. The number of blades, angle of attack, and thickness of the blade were design factors that have been addressed in this work phase. The pressure drop and output power of each turbine were measured independently. According to the experimental findings, because the spherical turbine design's blades had a bigger frontal area than hybrid H-Egg designs, it performed better than the latter. As a result, there were more water streamlines striking the blades, increasing rotational speed. The four blade spherical turbine produced 16 W of output power, which is a good performance for a small prototype.

Marco Casini et. al. 2015, Future smart cities' integrated and intelligent power systems use a distributed energy generating concept to maximise the use of renewable energy sources in urban areas. In-pipe systems are highly advised whenever water grid conditions permit their installation because analysis has shown that they can provide many benefits in terms of the amount of energy produced and supply continuity without the issues with architectural integration and dependence on weather conditions typical of photovoltaic and wind systems. Therefore, it is advised to broaden, coordinate, and disseminate results of in-pipe micro and pico hydro technology development to improve operational performance, lower costs, and foster technologies to

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better support the grid integration of large amounts of variable renewable energy, in order to promote these promising renewable energy systems. This will help to achieve a clean and resilient electricity system that supports efficient, flexible, reliable, and affordable operational.

Pushpender Kumar et. al. 2017, Global energy demand has risen quickly as a result of urbanisation. Which renewable energy system can supply this demand for clean, dependable, secure, and affordable electricity? We require modern, environmentally friendly energy generation methods that are not only affordable but also quick and simple to implement. Any energy savings, no matter how tiny, help protect the environment. metropolitan growth depends heavily on the availability of water, so in order to provide a steady supply of water throughout the metropolitan region, the overall pressure in urban fresh water pipelines is typically relatively high. The turbine in the water pipe rotates owing to the water's flow and pressure, and the revolving turbine is connected to a generator to produce electricity. In this study, a plan is put out and investigated for generating electricity from the pipes' high head water levels. An alternative to energy efficiency and conservation that is technically achievable is hydraulic energy recovery in water supply systems for electricity generation. Given that a large portion of the necessary hydropower system's components already exist, there are a number of models for its deployment that can be implemented without having a negative impact on water treatment and distribution processes and with lower deployment costs. The advantages of the energy recovery system can be increased by combining the numerous models that have been examined and suggested.

III. BLOCK DIAGRAM

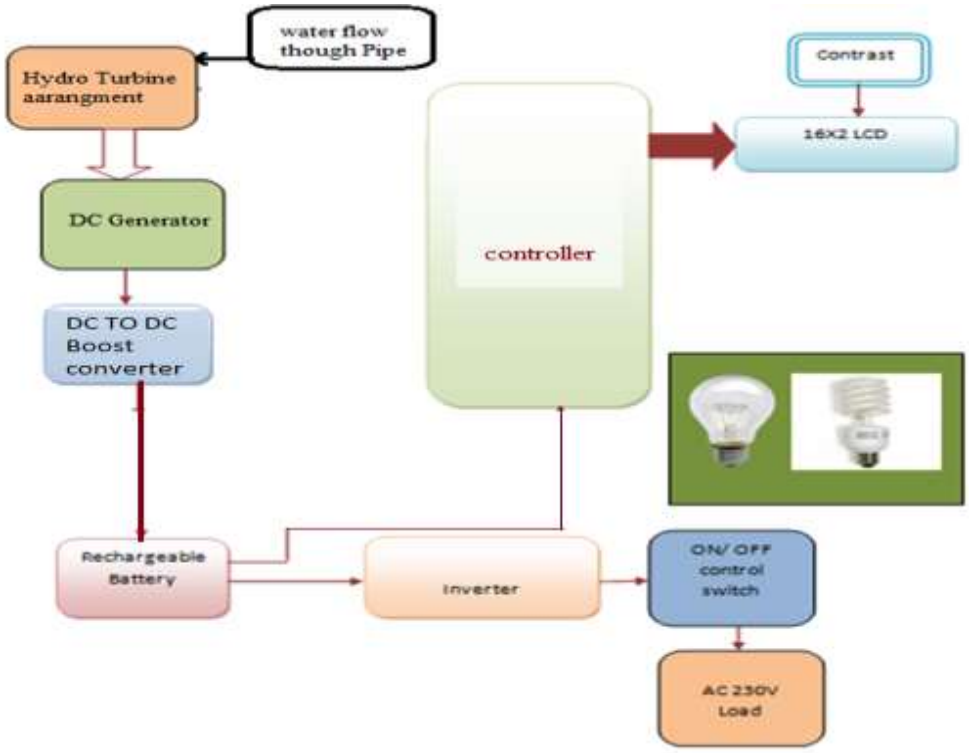

Figure 1: Block Diagram

IV. EXPERIMENTAL WORKING

Water storage tanks are positioned at specific heights to simulate residential buildings. First, we need take into account residential structures like apartments and villas, which are densely occupied with many people in a little space. The water tank that is initially built in the residential structure will have a large capacity. The maximum flow rate is then attained when the volume rises.

The morning hours from five in the morning to ten in the morning are when residential buildings like apartments will use the most water. For the duration of this time, practically everyone will be using one or more water sources for cooking, bathing, or washing purposes.

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Since water is being continuously consumed, we reach our maximum flow rate at this time. Every day before the start of consumption time, the water tank needs to be filled so that water pressure and head are both maintained.

Following are the working of total system;

- Three hydro turbine generators are installed in the pipe, and they operate when water flows from the pipe at a specified height. At output, whole water is discharged is fall on big hydro turbine generator, forcing water flow in one direction, causing turbine generator to start rotating, and producing energy. A generator begins to run and generate power when water is used to rotate a turbine.
- through increase the dc voltage, the entire electric energy is sent through a DC to DC boost converter. Additionally, it goes via a unidirectional current controller before being stored in a battery.A control board with an LCD display uses a controller. The output voltage is measured using this control board.
- A further inverter board is utilised to change the voltage from DC to AC. Finally, an AC load is connected at the output.
- By doing so, the pipeline work will use a prototype hydro power generation model.

Advantages

- It generates neat and clean energy (it has no negative environmental effects).
- It does not rely on the weather in the same way that the solar system and the wind system do.
- It has no impact on the water's quality for drinking.
- It is one of the least expensive ways to generate electricity (as opposed to solar and wind, which cost three or four times as much to generate the same amount of energy). • It can also be put in wastewater, agricultural, and industrial pipelines.
- The constant flow of water can generate electricity.

Installation is quick.

- Recovers energy from processes.

V. FUTURE SCOPE

- There are no carbon emissions when producing electricity.
- Electricity is produced without the usage of coal or oil. Natural resources have a longer lifespan.
- It will lower the per-unit consumption rates, allowing for the provision of power to all areas.
- When compared to nuclear power and fossil fuels, it is safer. These techniques make use of chemicals that, when regularly ingested, can cause a number of health issues.

VI. CONCLUSION

A pico-hydro production system that uses water from residential buildings' water tanks is to be developed as an alternative energy source. This might be a dependable and environmentally acceptable source of energy that can be produced to expand small-scale hydro generating. This is an incredibly adaptable power source that can be utilised to provide AC electricity even in remote areas of the world.

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