Development Of Pico-Hydro Turbine For Domestic Use

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Abstract

Asmany research and study were conducted worldwide in order to explore the different alternatives and renewable energy resources, this work come out with the descriptions of the initial testing conducted on the prototype of pico-hydro generation system for the purpose of investigating its performance. The kinetic energy hold by water flow in the domestic pipes was obtained to have potential in generating electricity power for energy storage purposes while conducting routine activities such as laundry, cook and bathe. The water pressure and water flow inside the pipe from utility's main tank that used for those usual activities are used to rotate small scale hydro turbine to drive a generator for electrical power generation. Results from the test significantly show the convinced reading in recorded voltage as it is a count to propose the system is feasible for electrification of energy storage purpose and indicate the prospect for further improvement and future research.

Keywords:-*Pico-hydro Turbine, Hydropower, Alternative energy, Domestic use.*

1. Introduction

Pico is a term used to describe a small characteristic, particularly in size of mechanism. In term of hydro power generation, Pico-hydro is a system with a maximum output capacity of five kilowatts (5 kW). The smaller size hydro generation is the most suitable devices to be used for rural electrification and it is also a cost-effective method to generate electricity. The high cost for surviving in today living style including the high paid for utilities's bill had drived people to think about a way on how to save the usage of energy at home. In general, the usage of energy at home are caused by doing daily activities such as ligthing, ironing, operating the washing machine, and so much more. As the original purpose of creating the pico-hydro system is to supply the electricity for rural area, this technology are now spreading widely to be used as alternative way to generate electricity in form of storage energy from regulating process of water flow in domestic pipes for modern resident area.

The prototype of pico-hydro system is intentionally designed so that it can be installed at the residential water pipeline. Distributed water at residential area has potential as an alternative energy for electrification but the generated power is very limited .On the point of hydropower been considered as one of the oldest known renewable energy in history and was the first sources that been used to produced electric power, this factors had placed Picohydro turbine as developed technology.

Performance Testing

The performance testing which covers functional evaluations on the proposed Pico-hydro system emphasizes on the measurable performance characteristics based on the following tests [6]:
i. Open circuit test.
ii. Maximum power delivered test.
iii. Battery charging ability test.

A. Open Circuit Test -

In general, the open circuit test is used to observe the generator performance when no load is connected to the generator output. The test is conducted at residential area in order to determine the actual performance when distributed water is used. During the test, the generator output voltage is measured instantly after we open the water tap.

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B. Maximum Power DeliveredTest-
The objective of this test is to measure the maximum output power that can be generated by the Pico-hydro system when using the residential consuming water as the prime mover. The method used is by using a variation of water flow rate. The maximum output power at the highest water flow rate the system can handle is recorded.

C. Battery Charging Ability Test -
This test is carried out to determine the ability of the Pico-hydro system to store energy. Thus, a 6V, 4.5Ah lead-acid rechargeable battery has been tested. The time taken for the battery to reach maximum storage is recorded.

4. CONCLUSION
In conclusion, the pressure of the main pipeline water supply that representing the head (falling water) and the water supply flow rate are needed to be measured during open circuit test prior to measuring the maximum power delivered. Both parameters are important to be determined at early stage to verify the actual system performance range.

5. FUTURE SCOPE
In-pipe systems can offer many advantages both in terms of quantity of energy produced and supply continuity without the problems.
In-pipe power systems can provide municipalities with an opportunity to reduce costs and reliance on grid-based power by using their existing water infrastructure to generate cost-effective renewable energy.
These systems can help improving the management of water networks, allowing to monitor and adjust the water flows and to optimize overpressure, thus lengthening service life of all equipment.

REFERENCE:-

[1] N. Smith and G. Ranjitkhar, “Nepal Case Study–Part One: Installation and performance of the Pico Power Pack,” Pico Hydro Newsletter, April 2000.

[2] P. Maher. “Kenya Case Study 1 at Kathamba and Case Study 2 at Thima.” Available at: http://www.eee.nottingham.ac.uk/picohydro/documents.html#kenya

[3] P. Maher and N. Smith, “Pico hydro for village power: A practical manual for schemes up to 5 kW in hilly areas,” 2nd ed., Intermediate Technology Publications, May 2001.

[4] J. Mariyappan, S. Taylor, J. Church and J. Green, “A guide to CDM and family hydropower,” Final technical report for project entitled Clean Development Mechanism (CDM) project to stimulate the market for family-hydro for low income families, IT Power, April 2004.

[5] A. Williams, “Pico hydro for cost - effective lighting”, Boiling Point Magazine, pp. 14-16, May 2007.

[6] H. Zainuddin, M. S. Yahaya, J. M. Lazi, M. F. M. Basar and Z. Ibrahim, “Design and Development of Pico-hydro Generation System ForEnergy Storage Using Consuming WaterDistributed to Houses”, International Conference on Computer, Electrical, and Systems Science, and Engineering 2009 (CESSE '09) at Bali, Indoneisa, 25-27 November 2009.

[7] Wind stream Power, Permanent Magnet Dc Generator, [online]. Available at: http://www.windstreampower.com/443540_PMDCG.php

[8] A. Harvey, A. Brown, P. Hettiarachi and A. Inversin, ‘Micro hydro design manual: A guide to small-scale water power schemes,’ Intermediate Technology Publications, 1993.

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