Cover Page

DOI: http://ijmer.in.doi./2021/10.08.66

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY EDUCATIONAL RESEARCH
ISSN:2277-7881; IMPACT FACTOR :7.816(2021); IC VALUE:5.16; ISI VALUE:2.286
Peer Reviewed and Refereed Journal: VOLUME:10, ISSUE:8(4), August: 2021
Online Copy of Article Publication Available: www.ijmer.in
Digital certificate of publication: http://ijmer.in/pdf/e-Certificate%20of%20Publication-IJMER.pdf
Scopus Review ID: A2B96D3ACF3FEA2A
Article Received: 4th August
Publication Date:30th August 2021

SMALL SCALE HYDRO POWER PLANT IN TALL BUILDINGS

[1]Dr. Vishal Deshmukh, [2]Ms. Supriya Sarjerao Mathane and [3]Ms. Aarti Sunil Chavan
[1]Associate Professor and [2&3]MBA Student
[1,2&3]Bharati Vidyapeeth Deemed to be University
Yashwantrao Mohite Institute of Management, Karad
Maharashtra, India

Abstract

Almost all of our modern conveniences are electrically powered. Electricity is the most versatile and easily controlled form of energy. At the point of use it is practically loss-free and essentially non-polluting. At the point of generation, it can be produced clean with entirely renewable methods, such as wind, water and sunlight. So, taking into consideration the importance of electricity generation by renewable methods we will design and manufacture a system that will generate electricity with the help of Pelton wheel turbine. For a multi storage building when we supply water for different floors from top of the building. So, taking into consideration the importance of electricity generation by renewable methods we will design and manufacture a system that will generate electricity with the help of Pelton wheel turbine. For a multi storage building when we supply water for different floors from top of the building. the force of water downwards we attach a setup containing Pelton wheel turbine and alternator and with the help of this we generate electricity.

Keywords: Small Hydro Power Plant, Pelton Turbine, Renewable Sources, Small Scale Power Generation.

Introduction

In hydro power plant we use the gravitational force of water to run the Pelton turbine which is coupled with electric generator to produce electricity. There an iore various types of turbines used for hydro power generation. Among them Pelton turbine is use on medium to high head sites. Energy from flowing water has been exploited from time immemorial to meet some of the energy requirements. The oil embargo of 1972 triggered the search for alternative energy 22 sources. Small scale hydro energy which had hitherto given way to the development of medium and large hydro projects, engaged the attention more than any other renewable source of energy. [1] Essentially, on the account of the versatility and convenience of the electrical energy on one hand, and the cheapness and renewability of hydro energy on the other, small hydroelectric power plants have a definite role to play in today's energy scene. The concept of generating electricity from water has been around for a long time and there are many large hydro-electric facilities around the world. What is new to most people is the idea that this same concept will work on a smaller – and even individual – scale. [2] Worldwide there are literally hundreds of thousands of micro-hydropower sites (up to 100 kW) that could be developed to supply environmentally friendly renewable energy. With the right location, hydro systems can produce many times the power a similarly priced wind or solar system could generate. With special precautions, they can be used virtually year-round, summer or winter. Even a modest output from a hydro system, producing steadily 24 hours a day, will add up to a large cumulative total. Often, peak power use is in the evening when the sun isn't shining and the wind is not necessarily blowing. Batteries can be completely drained by morning with a solar or wind system. With a hydro system located on a year-round creek or river, power is produced steadily around the clock. These are just some of the benefits of hydropower.

Literature Survey

1.Nasr Al Khudhiri

Nasr Al Khudhiri Designed and investigated hydro power plant functionally and feasibly for energy generation for a mid-size farm with insufficient water distribution networks that is located in UAE. "Design of Hydro-power Plant for Energy Generation for a Mid-Size Farm with Insufficient Water Distribution Networks" (2018) for rural areas such as a farm, the electricity tariff rate during the on-peak periods is considered as high rate compared to the off-peak periods. So, the idea came to design a hydro-power plant as an alternative energy source that can be used in such farms in to be operated during on-peak periods. From the conceptual general design of the hydro-power plant, a micro-Pelton wheel turbine based on the available head and flow rates that will be operated through pumped-storage technique was selected. Then, the turbine section has been designed to have eight turbine buckets that contain the curved reflectors. From the analytical calculations, the functionality of the designed micro-hydropower plant is evaluated, which the results indicate the design is able to deliver the required electrical power to the farm with high overall efficiency. From the feasibility study, it was proven that the project is economically feasible based on the small value of the simple payback period. Applying this project will help to decrease the dependency on conventional energy sources and open the local market and people to the renewable energy sources.

Cover Page

DOI: http://ijmer.in.doi./2021/10.08.66

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY EDUCATIONAL RESEARCH
ISSN:2277-7881; IMPACT FACTOR :7.816(2021); IC VALUE:5.16; ISI VALUE:2.286
Peer Reviewed and Refereed Journal: VOLUME:10, ISSUE:8(4), August: 2021
Online Copy of Article Publication Available: www.ijmer.in
Digital certificate of publication: http://ijmer.in/pdf/e-Certificate%20of%20Publication-IJMER.pdf
Scopus Review ID: A2B96D3ACF3FEA2A
Article Received: 4th August
Publication Date:30th August 2021

2.Audrius Zidonis

Audrius Zidonis Studied "Development of hydro impulse turbines and new opportunities" (2015). Hydro impulse turbines are often referred to as a mature technology having been invented around 100 years ago with many of the old design guide lines producing machines of a high efficiency. However, with recent advances in Computational Fluid Dynamics (CFD) it is now possible to simulate these highly turbulent multiphase flows with good accuracy and in reasonable timescales. This has opened up an avenue for further development and understanding of these machines which has not been possible through traditional analyses and experimental testing. This paper explores some of the more recent developments in the hydraulic design of Pelton and Turgo Impulse turbines and high lights the opportunities for future development.

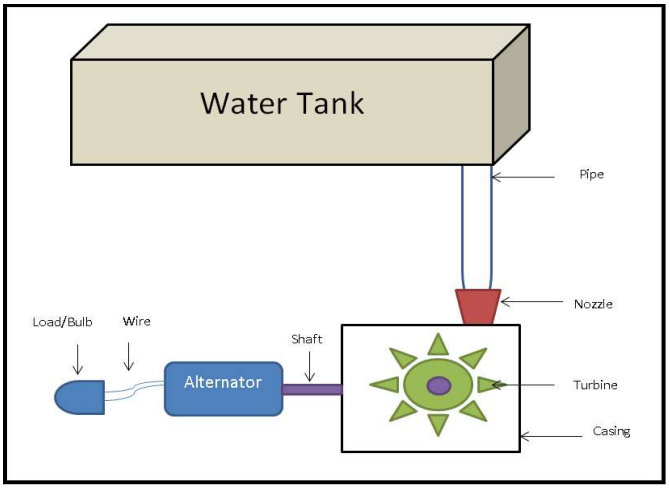
METHODOLOGY

First, we will design the Pelton wheel turbine system suitable to our application. We can use the following methods for generation of electricity.

Analytical: Firstly, we need to analyse Pelton wheel turbine system taking into consideration the applications and operational conditions.

Theoretical: Theoretically we will calculate all parameters of Pelton wheel turbine as it is the main component of the system.

Block Diagram



Principal of Operation

It works on the principle of converting the kinetic energy of water into mechanical energy which is obtained by rotational movement of impeller and is further converted into electrical energy.

Components

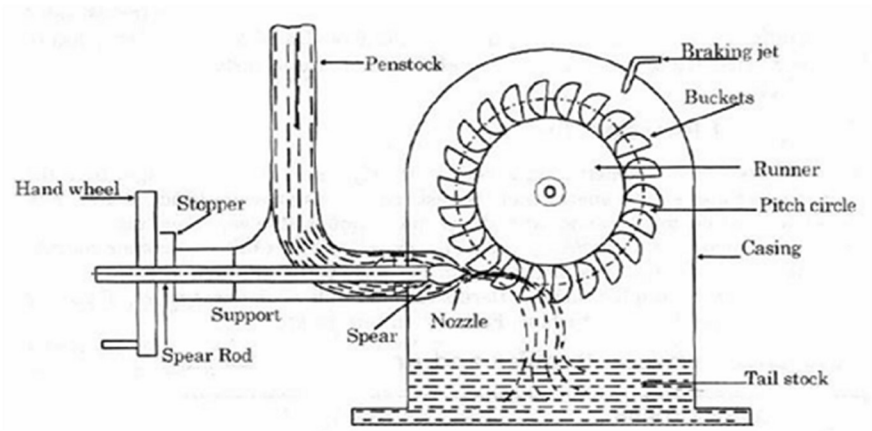
1.Pelton Wheel Turbine

Pelton turbine (or Pelton wheel) is among the most efficient impulse turbines and has retained its existence in hydropower for well over a century since it was invented by Lester A. Pelton in 1880.The turbine produces power by utilizing water momentum impinging on buckets mounted on the periphery. Despite its age, the design of Pelton turbine keeps improving and this development is driven by a tough commercial competition between turbine manufacturers and availability of new tools for analysis and optimization. The guidance for designing of Pelton turbine available in the public domain is based on existing know-how. This means that any design improvements were mainly conducted after extensive experimental testing by the trial-and- error approach. However, experimental testing is a very complex task itself.

Cover Page

DOI: http://ijmer.in.doi./2021/10.08.66

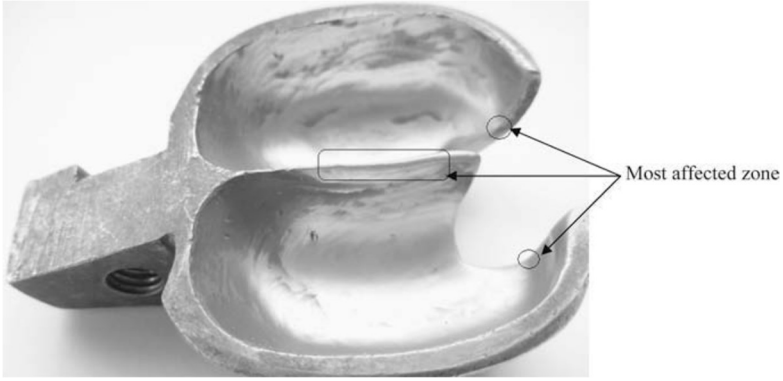
INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY EDUCATIONAL RESEARCH
ISSN:2277-7881; IMPACT FACTOR :7.816(2021); IC VALUE:5.16; ISI VALUE:2.286
Peer Reviewed and Refereed Journal: VOLUME:10, ISSUE:8(4), August: 2021
Online Copy of Article Publication Available: www.ijmer.in
Digital certificate of publication: http://ijmer.in/pdf/e-Certificate%20of%20Publication-IJMER.pdf
Scopus Review ID: A2B96D3ACF3FEA2A
Article Received: 4th August
Publication Date:30th August 2021



Pelton Wheel Turbine

2 Bucket

Most vital component of Pelton wheel is its bucket. Buckets are casted as single solid piece, in order to avoid fatigue failure. Water jet is split into 2 equal components with help of a splitter. The special shape of bucket makes the jet turn almost 180 degrees. This produces an impulsive force on bucket. Blade outlet angle close to 180 degree is usually used in order to maximize impulsive force. This makes sure that water jet will not get interfered by other incoming buckets.



Bucket of Pelton Wheel

3 Nozzle

Generally, nozzle is used to control the flow rate of water. It converts the total head at the inlet of the nozzle into kinetic energy. Connected at the end of pipe to convert flow of water into jet pressure to strike on curve buckets.

Nozzle

Cover Page

DOI: http://ijmer.in.doi./2021/10.08.66

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY EDUCATIONAL RESEARCH
ISSN:2277-7881; IMPACT FACTOR :7.816(2021); IC VALUE:5.16; ISI VALUE:2.286
Peer Reviewed and Refereed Journal: VOLUME:10, ISSUE:8(4), August: 2021
Online Copy of Article Publication Available: www.ijmer.in
Digital certificate of publication: http://ijmer.in/pdf/e-Certificate%20of%20Publication-IJMER.pdf
Scopus Review ID: A2B96D3ACF3FEA2A
Article Received: 4th August
Publication Date:30th August 2021

4 Alternator

An alternator is an electrical generator that converts mechanical energy to electrical energy in the form of alternating current. For reasons of cost and simplicity, most alternators use a rotating magnetic field with a stationary armature. Occasionally, a linear alternator or a rotating armature with a stationary magnetic field is used.

Alternator

CONCLUSION

From above literature survey we conclude that the electricity can be generated by using Pelton wheel turbine in commercial and residential buildings. The flow of water is sufficient to generate the electricity The generated electricity is totally hazardless and can be utilized to run small household appliances like fans etc.

FUTURESCOPE

Further to build a more conductive and inclusive ecosystem for small hydro power plant to flourish, government backing into vital. Small hydro sector should in fact be natural allies for governments to partner with as their primary goal is to deliver clean and sustainable energy with minimum to negligible effects on available natural and renewable resources.

REFRENCES

1. Nasr Al Khudhiri Department of Mechanical Engineering Abu Dhabi University Abu Dhabi, United Arab Emirates has worked on “Design of Hydro-power Plant for Energy Generation for a Mid-Size Farm with Insufficient Water Distribution Networks” (2018).
2. Emanuele Quaranta, Roberto Revelli published a review based on the “Gravity water wheels as a micro hydropower energy source” (2018).
3. Caiyong Ye, Jiangtao Yang, Xin Liang, and Wei Xu, Senior Member, IEEE published a paper on “Design and Research of a High-Speed and High-Frequency Pulsed Alternator” (2017).
4. Audrius Zidonis, David S. Benzon, George A. Aggidis published a Maxine on “Development of hydro impulse turbines and new opportunities” (2015).