International Journal of Mechanical and Industrial Technology ISSN 2348-7593 (Online)
Vol. 3, Issue 1, pp: (1-5), Month: April 2015 - September 2015, Available at: www.researchpublish.com

An Experimental Prototype of Micro Hydro Power Generation

[1]G.Maruthi Prasad Yadav, [2]H.Raghavendra, [3]K.Vijay Bhasakar Reddy, [4]M.Ashok, [5]K. Chakridhar Reddy, [6]P S G Chandra Sekhar Reddy

[1]Associate Professor and Head of the Department, [2]Assistant Professor , [3,4,5,6] Final year students ,
[1234]Department of Mechanical Engineering
[1234]St.johns college of Engineering & Technology, yemmiganur (A.P)

Abstract: **Energy from falling water has been converted by man to perform useful work. The turning water wheels converted the energy of the falling water into mechanical energy, or shaft horsepower. Usually, the water wheel turned a shaft the was connected to some work process as a gristmill. Today modern turbines all through they look much different than the old water wheels, represent refinements of similar technology a more efficient way of converting the energy of falling water to mechanical energy, resulting in faster shaft rotation. If the shaft from a turbine is connected an electric generator, the two pieces of equipment become known as hydro turbine generator unit or a hydroelectric generator. With world electricity demand increasing, exploitation of the considerable potential for hydropower generation in many development countries is an attractive prospect. The need for cost-effectiveness, decisions on the scale of new developments are being made one such attempt is micro hydro power generation.**

Keyword: **Pelton Water Wheel, Dynamo, Bearings, shaft, pulley.**

I. INTRODUCTION

In the last decade, problems related to energy crisis such as oil crisis, climatic change, electrical demand and restrictions of whole sale markets have a 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 hydro-electric power plants.

Hydro-electric power is a form of renewable energy resource, which comes from the flowing water. To generate electricity, water must be in motion. When the water is falling by the force of gravity, its potential energy converts into kinetic energy. This kinetic energy of the flowing water turns blades or vanes in a hydraulic turbines, the form of energy is changed to mechanical energy. The turbine turns the generator rotor which then converts this mechanical energy into electrical energy.

II. EXPERIENTAL DETAILS

A. Materials:

Construction of a Micro-hydro power plant is site specific. It is made up of a number of components. Some of them are……

- Intake
- Canal
- Penstock
- Turbine
- Generator (or) Dynamo
- Pulley,v-belt,buckets…….

Intake: is the primary means of conveyance of water from the source of water in required quantity towards the waterways of HPP (Hydro Power Project). Intake could be of side intake type or the bottom intake type.

Penstock: pipes are basically close conduct pipes that helps to convey the water from the tank to the turbine. The materials used in penstock are usually steel, HDPE (High Density Polythene) and increasingly PVC (Poly Vinyl Chloride). at this point that the potential energy of the water is converted into kinetic energy.

Turbines: converts the flow and pressure energy into mechanical energy. Turbines are basically of two types i.e. Reaction & Impulse and Depending upon the head of the available water further divide in three categories i.e. High, Medium & Low head. According to site specification (i.e. head and flow) we choose the turbine to use in mini- hydro power plant

Dynamo: Magnetic coils provide a phase shift between the magnetic field of the rotor and stator, which is necessary to get the motor spinning.

Bearing: Pillow block, also known as Plummer block, is a pedestal used to provide support for rotating shaft with the help of compatible bearings. it is made of cast iron or cast steel.

Shaft: A bar in a machine which holds or turns other parts that move or spin. It is connected to pelton wheel and pulley to transmit the energy.

Pulley: A pulley is a wheel on an axle that is designed to support movement. These are used in a variety of lift loads, transmit power

Fabrication:

- First step is to make the turbine wheel and 2 inches depth cups are fitted to runner.
- Shaft is connected between the turbine wheel and larger pulley, when the wheel rotates the energy can be transmitted to dynamo through v- belt.
- The output power generated by the dynamo (magnet coil) ,which is depends upon the rotation of the wheel.

Working:

Flowing water is directed at a turbine (remember turbines are just advanced waterwheels). The flowing water causes the turbine to rotate, converting the water's kinetic energy into mechanical energy.

The mechanical energy produced by the turbine is converted into **electric energy** using a turbine generator. Inside the generator, the shaft of the turbine spins a magnet inside coils of copper wire. It is a fact of nature that moving a magnet near a conductor causes an electric current

Advantages:

- High efficiency (70 - 90%), by far the best of all energy technologies.

  High capacity factor (typically >50%)

  High level of predictability, varying with annual rainfall patterns
- Slow rate of change; the output power varies only gradually from day to day (not from minute to minute).

  A good correlation with demand i.e. output is maximum in winter
- It is a long-lasting and robust technology; systems can readily be engineered to last for 50 years or more.
- Power is usually continuously available on demand,
- No fuel and limited maintenance are required, so running costs are low (compared with diesel power) and in many cases imports are displaced to the benefit of the local economy.

  It is a long-lasting and robust technology; systems can last for 50 years or more.

Disadvantages:

- It is a site specific technology and sites that are well suited to the harnessing of water power and are also close to a location where the power can be economically exploited are not very common.

- There is always a maximum useful power output available from a given hydropower site, which limits the level of expansion of activities which make use of the power.
- River flows often vary considerably with the seasons, especially where there are monsoon-type climates and this can limit the firm power output to quite a small fraction of the possible peak output.

Application:

- ✓ Domestic purpose
- ✓ Farm and field applications
- ✓ provide power for income generating activities such as wood shops, sewing machines

B. Figures, Graphs and Tables:

Fig1: Pelton Water Wheel.

Pelton waterTurbine *consists of a wheel with a series of split* buckets set around its rim; a high velocity jet of water is directed tangentially at the wheel. The jet hits each bucket and is split in half, so that each half is turned and deflected back almost through 180º. Nearly all the energy of the water goes into propelling the bucket and the deflected water falls into discharge channel.

Fig 2: Dynamo

Magnetic coils provide a phase shift between the magnetic field of the rotor and stator, which is necessary to get the motor spinning.

Fig 3: Bearings

Pillow block, also known as Plummer block, is a pedestal used to provide support for rotating shaft with the help of compatible bearings. it is made of cast iron or cast steel.

Fig 4: Shaft

- A bar in a machine which holds or turns other parts that move or spin.
- It is connected to pelton wheel and pulley to transmit the energy.

Figure 5: Pulley

- A pulley is a wheel on an axle that is designed to support movement these are used in a variety of lift loads ,transmit power.

Table 1: specification

part	material	Dimensions, capacity
Pelt on wheel	Mild steel	Dia-500mm,22mm hole dia
Shaft	Cast iron	600mm lenth,32 shaft dia,
pulley	Mild steel	Dia-203mm,hole dia-18mm
dynamo	-	12 volts,1-7ams
battery	-	-

Table 2: Result and Analysis

Motor capacity **(HP)**	Discharge (m^3/sec)	Speed of wheel (rps)	Voltage output (volts)
0.5 HP	0.0167	8	0.5 to 1
1 and 1 HP series	0.0258	12	2 to 4
2 HP	0.042	19	4 to 7
5 HP	0.058	30	10 to 12

Many case studies were made so as to know the performance of the set up. Numbers of trails were made so as to deduce the following data.

The setup was placed under a 1HP motor whose discharge was 0.0167m^3/sec and the setup was not able to run and produce a small amount of electricity voltage.

Again the setup was placed under a 2HP motor whose discharge was 0.0258m^3/sec and the setup was able to run and produce a small amount of electricity say 2 to 2.5 volts was produce.

The set was once again placed under a 1 and 1HP motor which were connected in series which produced a considerable amount of electricity say 2.5 to 3.5 volts which was measured by a millimeters and was documented.

The setup was placed under a 3HP motor whose discharge 0.042m^3/sec, which produced a considerable amount of electricity say nearly 10 to 12 volts.

Table 3: List of materials

SI No.	**PARTS**	**Qty.**	**Material**
i.	Frame	1	Mild Steel
ii.	Belt o Rope drive	1	Synthetic
iii.	Water turbine wheel	1	Stainless steel
iv.	Smaller and Larger pulley	2	Cast iron
V	Plummer block or journal bearing	2	Cast steel
vi	Rotating shaft	1	Mild Steel

III. CONCLUSION

- Small hydro has proven itself as a major contributor to electrification in developing countries, e.g. China & India as examples where small hydro has been developed in large parts of the countries.
- The challenge upon us now is to maintain the momentum created and ensure that the current interest will be translated into more small hydro plants installed.

REFERENCES

[1] UNDP, 2005. Energizing the Millennium Development Goals. A Guide to Energy's Role in Reducing Poverty, United Nations Development Programmers.

[2] UN-Energy. 2005. The Energy Challenge for Achieving the Millennium Development Goals, United Nations System.

[3] UN, 2001. Road map towards the implementation of the United Nations Millennium Declaration, Report of the Secretary General, General Assembly, United Nations.

[4] Arndt, R. E. A. 1991. Hydraulic turbines. In Hydropower Engineering Handbook, ed. J.S

[5] Gulliver and R. E. A. Arndt, pp. 4.1-4.67. McGraw-Hill, New York.