

Electrical Energy Generation by using Swing

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Abstract— Now a days conventional energy sources are few in nature, they are decreasing day by day. It is needed to find out new energy sources. Children play is best source to generate electricity. This paper is related to design and fabrication of swing to generate electricity. To convert oscillatory motion of swing into rotary motion of bicycle wheel and dynamo is connected to bicycle wheel and dynamo convert the mechanical energy into electrical energy. This is very useful in the purpose of lightening of garden. Children can enjoy swing and can also be useful in generation of electricity. It will reduce the energy consumption required to lightening the garden at the night. Paper contains design calculations, results for fabrication of swing. Project contains the use of sprocket, chain wheel, bicycle wheel, bearings, dynamo, rectifier, battery and LED bulb etc.

Key words: Electricity generation, Swing, Children's play, Sprocket and power generation

I. INTRODUCTION

Energy is the driving force of modern societies, and generation and utilization of energy are essential for socioeconomic development. Per-capita energy consumption levels are often considered a good measure of economic development. In recent years, energy scarcity has become a serious problem due to depletion of non-renewable energy sources, increasing population, globalization of energy intensive economic development, environmental pollution, and global warming. In this context, the field of renewable energy represents a new frontier for the academic and research community, due to the following factors: 1] Depletion or unreliability of non-renewable energy sources, e.g., oil. 2] Environmental pollution, e.g., due to coal use. 3] Needs of increasing population, especially in resource-scarce developing countries 4] Global Warming/Climate changes 5] New applications in modern, high-tech settings –e.g., wearable computing and portable consumer electronics. Energy in the form of swing play a very important role in the life of a normal human. It has practically revolutionized the world. In Swing Set Irrigation System we convert the oscillatory motion of swing into the reciprocating motion of piston in reciprocating type pump. In this project we use only the half revolution of crank in the place of full revolution. This half revolution is used to reciprocate the piston in reciprocating pump. This project is about a swing, which is used by the children that powered water pump for irrigation and many uses. The swinging activity of swing makes the horizontal member turn through some angles continues to oscillatory motion and this motion is transmitted to the link which transfers this angular motion into reciprocating motion as well as amplifies the same. This link is connected to the piston used in pipe which converts the mechanical energy into hydro energy. The water then pumped can be used for local use. It is free of cost and also ecological friendly.

II. LITERATURE REVIEW

Mithun Gajbhiye et al. [1] explained that with the demand for energy requirements increasing tremendously, it can be met by alternative energy resources such as Gravity. Particularly, it can generate more power compared to the other type of nonconventional energy. In addition, this alternative energy source offers benefits such as easy deploying, low installation cost and maintenance systems, and less operating cost. In terms of operational lifetime, installation cost and reliability, so a Pendulum Power Generator is considered as a promising alternate for traditional power sources. Man has always been in detection of energy to meet his ever increasing demand. In recent times due to effects of pollution and global warming there is a need for generating power from renewable sources. The reason for generating power using gravity is that it is available all over the Earth, rich and reliable too and it cannot be efficiently converted into electrical energy. In this paper we designed a methodology wherein gravitational energy is further amplified in terms of its magnitude by using Perpetual Motion Mechanism and hence can be successfully transformed into usable electrical energy. The basic concept of a gravity power generating mechanism is simple. When a body moves down from a higher altitude to a lower one its potential energy is converted into kinetic energy. This motion is converted into circular motion and is then converted into electricity using a generator.

Rajat Wairagade et al. [2] State that, Energy harvesting is, in itself, an energy resource. At the end of a research we have designed a power generator with a pendulum that employs the concept of reciprocating system. The ambient vibration can be used in an effective way by converting them to electrical energy. It proposes energy conversion system in terms of generating electricity. The technique of implementing the pendulum power generator is to reduce global warming. The compact model not only provides the accurate result but also gave the computational speed-ups of the generation. In future, maximize version of our setup can be installed to produce power.

M. P. Mohurle et al. [3] state that, It is found that human power is an important source of renewable energy in the form of direct and electricity generation. If it is employed in every garden with proper designing it could acquire sufficient power from it. In order to save world from global warming this may be an important step in next few decades. Taking eco-design as a starting point for the design of human-powered products proves to be 'seedlings in fertile ground'. Nevertheless, this differs from the consumer viewpoint. From various literature, environment as such plays no dominant role in the buying behavior of consumers. Only small consumer groups (approx. 5%) can be labeled as 'green buyers'. The majority of consumers are interested in human power due to its other attributes as; long shelf life (in toys/emergency equipment), independent from (energy)

infrastructure, low life cycle costs, convenience (not having to think of batteries) and fun! Eco-design really works in commercial practice if it brings benefits to both users, the environment, the company involved and society as a whole. Rajesh Kannan Megalingam et al. [4] says that, at a time when there is energy crisis casting its shadow all over the world, one has to look into alternate renewable energy resources. One such alternate way to generate power is presented in this paper. The rotational energy of the tires in the bicycle, generated by pedaling can be used to operate small powered devices. Both dynamo and alternator can be used and various options and situations where a dynamo or alternator can be used are provided. The various applications where this power could be used are also discussed in this paper. Villagers who use bicycles are going to be benefitted the most.

People use bicycles as the main medium of transportation in villages. In addition, in cities, where most people use exercise bikes, the energy can be productively used to power electronic gadgets, which require less power. In India, many of the villages are still without electricity and most of them use bicycle as their medium of transportation..

B.Sneha et al. [5] explained that, Electricity was the basic need of all people, the consumption rate was increasing at 10 % every year but there has been no sufficient growth in production rate which leads to load shedding and increase in price levels. While pedal power is not a new concept but it has not been successfully used on a wider scale. A pedal power generator with a lighting system was developed for residential schools in India and tested, it is giving 40 minutes of lighting for 10 minute of pedaling, this will be of a great use in populous country like India. Currently about 10 such lighting systems are in all over India and more are being undertaken.

Rajneesh Suhalka et al. [6] state that, World is a storehouse of energy. And according to energy conversion law, energy neither be created nor be destroyed but can be transformed from one form to another. But we are wasting resources that can produce energy as if they are limited. Humans are able to generate approximately 150W of power while riding bicycle. However, this power goes waste without any use. If this is making use of this energy, would be able to power many electronic devices. A dynamo or an alternator can be used for harvesting the energy generated by a cycle rider while riding. We can charge mobile phones or a small lighting device with the power. Not only in bicycle but also in alternator bikes, cars and exercise bikes use this principle.

R. Matiur et al. [7] explained that, a simple mechanical system has been introduced that can supply electrical energy for charging batteries for small scale domestic usage. The charging unit can provide enough electricity to charge a battery for mobile charging, LED lighting and such small domestic appliances. The system has been found to be very effective for the remote and isolated places where there is no power connection from national grid. The charging system is also very useful for the emergency situation like natural disasters when there is often power failure. A mechanical power driven battery charging system is introduced. Specifically, a hand driven system has been developed to charge rechargeable batteries for small scale electricity supply.

III. DESIGN OF METALIC STRUCTURE

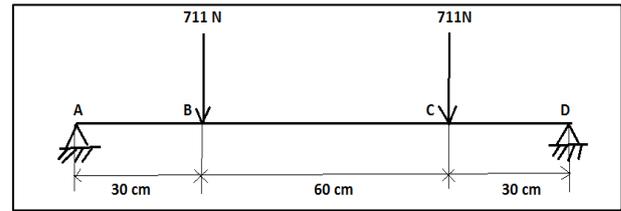


Fig. 1: Simply Supported Rod

From shear force diagram

$$RD * 1200 + 711.22 * 300 + 711.22 * 900 = 0$$

$$RD = 711.22 \text{ N}$$

$$RA + RD - 711.22 - 711.22 = 0$$

$$RA = 711.22 \text{ N}$$

From bending moment diagram,

$$BMA = 0$$

$$BMD = 0$$

$$BMB = 711.22 * 300 = 213.36 \text{ KN.mm}$$

$$BMC = 784.8 * 750 - 784.8 * 450 = 213.36 \text{ KN.mm}$$

$$\text{Maximum bending moment} = \underline{213.36 \text{ KN.mm}}$$

We know the flexure formula,

$$M/I = fs/Y$$

Where,

M = Maximum bending moment

I = Moment of inertia

Fs = Stress

Y = Position of neutral axis

As we are using mild steel rod,

Yield stress of mild steel = 247 MPA

Put all the values in flexure form

$$213366/I = 247/Y$$

$$\text{Diameter of solid bar (D)} = \underline{20.64 \text{ mm}}$$

Selection of ball bearing-

Calculation of life of bearing,

$$L_{10} = 60 * n * L_{10h} / 10^6$$

Where,

L_{10h} = Life of bearing in hrs

$$= \text{Service 8hrs/day (12000-20000hrs)}$$

$$= 12000 \text{ hrs}$$

$$L_{10} = 60 * 10 * 10000 / 10^6$$

$$L_{10} = 7.2 \text{ million revolution}$$

Calculation of load carrying capacity (C) of ball bearing

$$L_{10} = (C/P)^k,$$

$$7.2 = (C/1422.45)^3,$$

$$C = 2746.72 \text{ N}$$

From table, value of d is 20 mm.

IV. EXPERIMENTAL SETUP



Fig. 2:

V. RESULT AND CALCULATIONS

Testing Result

- 1] O/P Voltage from Dynamo = 6 Volt
- 2] O/P Current from Dynamo = 0.4 Amp

Calculations:

Formula to Calculate Current Required for Ignite Tube

Watt = Voltage * Current

$$W = V * I$$

$$3W = 12 V * I$$

$$I = 0.25A$$

So, it is sure that the output current from dynamo is min. 0.25A.

Load (LED Bulb) = 3W

If we use 3watt bulb for 2 hours per day the watt required for per day is equal to,

$$3W * 2h = 6Wh$$

Battery (Rechargeable) = 6V

$$6Wh = 6W * I$$

$$I = 1 Ah$$

The output voltage from dynamo is 6-8 volt so, as per review paper the value of dynamo wheel speed is 660-880 rpm. Compare wheel speed with current & value of current is 0.4 A.

So, O/P current from dynamo is 0.4 A

Battery Charging Current and Battery Time Formula

Charging Time of Battery = Battery Ah / Charging Current

$$T = Ah / A$$

$$T = 1/0.4$$

$$T = 2.5 hrs$$

From calculations, if we use 3watt LED bulb 2 hours per day the battery charging will be done 2.5 hours per day.

VI. ADVANTAGES AND DISADVANTAGES

A. Advantages

- 1) It can be used in remote areas where power supply is not available.

- 2) It does not require no running cost because it does not required any fuel.
- 3) It can installed in any place quickly as compare to solar, wind and other type of plant
- 4) It is portable; it can be use as portable power generator.
- 5) It is simple in construction like other conventional part.
- 6) It required small area for installation
- 7) It required less maintains than other power plant.

B. Disadvantages

- 1) It is intermittent power source i.e. instantaneous power source which depend upon human capacity.
- 2) It has low energy density as compare to conventional power generation resources.

VII. APPLICATIONS

- 1) Lighting garden
- 2) Mobile charging
- 3) Portable FM Radio
- 4) Walkman (play mode)

CONCLUSION

In this study, a new method for human power conversion based on children's play on playground equipment has been proposed. If it is employed in every garden with proper designing it could acquire sufficient power from it. To create awareness of electrical energy conservation in children. It will be a useful device which can be used in countryside area or in the agriculture field where electricity is not easily available. In the coming days the demand for energy resources will be increasing every day's the aim of this research is to develop the world by enriching. By utilizing its resources more. Now time has come for using this type of innovative ideas and it should be brought into practice. It is full independent system. It outlines the need for cost effective technology in rural region.

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