

Seesaw Power Generation

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Abstract – Since the issue of electricity in India is increasing day by day, we plan to design a system that utilizes the energy that is going to waste and convert it into useful electrical energy. In playgrounds, we see a lot of energy going to waste. We have designed a see-saw that utilizes the mechanical energy and converts it into useful electrical energy. Every day, a large number of people visit parks and playground. The idea is to modify few of these rides in such a way that when they are used, the mechanical energy spent on these rides is converted into electrical energy. The proposed idea can eventually result in a concept of green energy which will base on natural energy that no one is utilizing and then converting it into useful energy. This idea can be used as an alternate of any other energy production idea that requires a lot more money and require a lot more resources. Hence this idea can save a lot of energy in the future. The energy that is converted must be sufficient enough to power the park, if not produced on a much higher scale. The paper is based on the theory behind the proposed method and how we have managed to create a prototype of what the people could install in their playgrounds.

Keywords– Playground; Energy; Sustainable

I. INTRODUCTION

The idea of human powered generation has been implemented in many different situations. Some examples include hand-crank radios, shaking flashlights, and receiving power from gym equipment. Through the use of wind, solar, hydro, and human generated power, the system is provided with DC power. The goal of the human powered generator is to implement a seesaw in a playground where we can harness the energy of kids into real power. The use of playground equipment for a clean source of energy would harness the seemingly endless energy of young children. It would provide them a means to exercise while unknowingly supplying power.

Human power conversion is easily achieved from children's play under conditions where the children are static relative the moving playground mechanism, such as seesaw, swing, and merry-go-round. Where the children are in a dynamic state relative to a static mechanism (e.g., slide) it will be difficult to employ cost-effective human power conversion techniques due to considerations of safety and simplicity. A variety of mechanisms are used for conversion of human power to usable electrical or mechanical energy: springs, hydraulic components, electric generators, piezoelectric, compressed air systems, flywheels. But in our paper we are using the components like Generator, Rectifier, Battery Dc-Dc Converter and Gear

II. WORKING PRINCIPLE

This project use to convert the mechanical energy in to electrical energy. Seesaw generally works up and down movement. So here up and down movement possible to gravity force. This cause seesaw centrally attached the spur gear, seesaw linier motion convert to rotary motion. This force converts to chain drive, chain drive attached to generator. Here generator generated the electrical power it is stored in battery. For the continuous movement of seesaw arrangement will produce power to the battery by the rotation of the generator which is connected to gear arrangement

III. LITERATURE REVIEW

Pandian (2004) conducted a study about Human Power Conversion System based on children's play. It proposed a new method for harnessing human power based on children's play in playground and public places, and on devices such as seesaw, merry-go-round, and swing. When large number of children play in playground, part of the power of their play can be usefully harnessed resulting to significant energy storage. This stored energy can then be converted to electricity for powering basic, low-power appliances such as lights, fans, communications equipment, and so on. The method provides a low-cost, low-resource means of generation of electricity, especially for use in developing countries.

• Hardware Description

1. Introduction

In this chapter the block diagram of the project and design aspect of independent modules are considered.



Block diagram of construction of Seesaw Power Generation

The main blocks of this project are:

1. Spur Gear
2. DC Generator
3. Charging Circuit
4. Battery
5. High power led

2. Spur Gear

Gears are machine elements used to transmit rotary motion between two shafts, normally with a constant ratio.

The pinion is the smallest gear and the larger gear is called the gear wheel. A rack is a rectangular prism with gear teeth machined along one side- it is in effect a gear wheel with an infinite pitch circle diameter. In practice the action of gears in transmitting motion is a cam action each pair of mating teeth acting as cams. Gear design has evolved to such a level that throughout the motion of each contacting pair of teeth the velocity ratio of the gears is maintained fixed and the velocity ratio is still fixed as each subsequent pair of teeth come into contact.

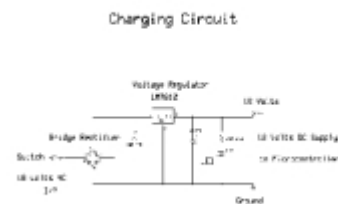
When the teeth action is such that the driving tooth moving at constant angular velocity produces a proportional constant velocity of the driven tooth the action is termed a conjugate action. The teeth shape universally selected for the gear teeth is the involute profile.

3. DC Generator

An electrical generator is a machine which converts mechanical energy (or power) into electrical energy (or power). Induced e.m.f is produced in it according to Faraday's law of electromagnetic induction. This e.m.f causes a current to flow if the conductor circuit is closed. Hence, two basic essential parts of an electrical generator are:

- Magnetic field.
- Conductor or conductors which can move as to cut the flux.

4. Charging Circuit



From the above circuit diagram, we can see that the 18V AC is being converted to 18V pulsating DC which is in turn converted to smooth DC with the help of the Capacitor. This 18V Smooth DC is converted to 12V DC by the Voltage Regulator 7812. At the output of the regulator, we get some spikes which are not desirable. These spikes are removed with the help of another capacitor used. We can get 12V Steady DC at the output terminal which can be indicated if the LED glows.

5. Battery

A rechargeable battery, storage battery, or accumulator is a type of electrical battery. It comprises one or more electrochemical cells, and is a type of energy accumulator. It is known as a secondary cell because its electrochemical reactions are electrically reversible. Rechargeable batteries come in many different shapes and sizes, ranging from button cells to megawatt systems connected to stabilize an electrical distribution network. Several different combinations of chemicals are commonly used, including: lead-acid, nickel cadmium (NiCd), nickel metal hydride (NiMH), lithium ion (Li-ion), and lithium ion polymer (Li-ion polymer).



Rechargeable batteries have lower total cost of use and environmental impact than disposable batteries. Some rechargeable battery types are available in the same sizes as disposable types. Rechargeable batteries have higher initial cost but can be recharged very cheaply and used many times.

6. High Power Led

High power LED's (HP LED) can be driven at currents from hundreds of mA to more than an ampere, compared with the tens of mA for other LED's. They produce up to over a thousand lumens. Since overheating is destructive, the HP LEDs must be mounted on a heat sink to allow for heat dissipation. If the heat from a HP LED is not removed, the device will burn out in seconds. A single HP

LED can often replace an incandescent bulb in a flashlight, or be set in an array to form a powerful LED lamp.

LED's have been developed by Seoul Semiconductor that can operate on AC power without the need for a DC converter. For each half cycle part of the LED emits light and part is dark, and this is reversed during the next half cycle. The efficacy of this type of HPLED is typically 40 lm/W. A large number of LED elements in series may be able to operate directly from line voltage. In 2009 Seoul Semiconductor released a high DC voltage capable of being driven from AC power with a simple controlling circuit. The low power dissipation of these LED affords them to be use used more flexibly than the original AC LED

IV. ADVANTAGES, DISADVANTAGES AND APPLICATIONS

1. Advantages

- Conservation of Non Renewable energy sources.
- Maximum output can be obtained.
- Efficient and low cost design.
- Low power consumption.

2. Disadvantages

- Periodic Monitoring and Maintenance is required.
- A drastic environmental change cannot be tolerated by the equipment.
- Only applicable for the particular place.
- Mechanical moving parts are high

3. Applications

- This energy can be utilized for simple house hold appliances.
- This energy can be stored and utilized as backup power supply mainly in industries

V. RESULTS, CONCLUSIONS AND FUTURE SCOPE

Results

POWER CALCULATION:

Number of teeth on gear A is: 50

Number of teeth on gear B is: 20

Gear ratio = number of teeth on gear A/number of teeth on gear B

Gear ratio is= $50/20 = 5/2$

FOR SPEED:

Speed=total speed/speed ratio= $70 / (5 \div 2)$

N=28 RPM

FOR TORQUE:

Torque on shafts = $0.25 \text{ FtLbs} = 0.25 \times \text{Ratio}$

= $0.25 \times (5 \div 2)$

T = 0.625 FtLbs

POWER:

$$\text{Power } P = (2\pi NT) \div 60$$

$$= (2 \times \pi \times 28 \times 0.625) \div 60$$

$$P = 1.83 \text{ Watts}$$

VI. CONCLUSIONS

Integrating features of all the hardware components used have been developed in it. Presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. Secondly, using highly advanced IC's with the help of growing technology, the project has been successfully implemented. Thus the project has been successfully designed and tested.

VII. FUTURE SCOPE

Our project "SeeSaw power generation" is mainly intended to generate electrical power as non-conventional method by simply walking or running with knee strap using spur gear mechanism. Non-conventional energy using spur gear mechanism is converting mechanical energy into the electrical energy.

For this project the conversion of the force energy in to electrical energy. The control mechanism carries the spur gear mechanism, D.C generator, battery and charging circuit. We have discussed the various applications and further extension also. The D.C generator used in this project is Permanente Magnet D.C generator. The Generator is coupled to the fly wheel Shaft with the help of Spur Gear Mechanism.

We can extend the project by adding rack and pinion mechanism and also using other gear mechanism. We can even add inverter circuit for conversion of DEC to AC power for electrical appliances control.

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