

Design and Fabrication of Gravity Power Generation

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ABSTRACT: 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.

I. INTRODUCTION

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, Gear And Chain

A. GENERATOR

Electric Generator is a machine that converts mechanical energy to electric energy. An electric generator has two parts Stator and Rotor. The stator comprises of the stationary magnetic poles, whereas the rotating armature is included in the rotor

B. WORKING OF AN ELECTRIC GENERATOR

Generators usually work on Faraday's law of Electro Magnetic induction. This law explains that by rotating an electric conductor in a magnetic field, an emf is induced, which creates a flow of charges.

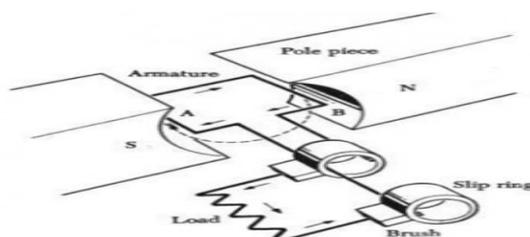


Fig 1.1 Generator

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When the conductor rotates in the magnetic field, a voltage difference is created between its two ends and the flux in it changes and an emf is induced which is proportional to the rate of change of flux ($e = -N \frac{d\Phi}{dt}$) and hence the current flows. The electric conductor rotating is called the armature of the generator. When the side of the conductor is perpendicular to the magnetic fields, the rate of change of flux is minimum in it

C. RECTIFIER



Fig1.2 Rectifier

A rectifier is an electrical device that converts AC to DC. AC occasionally reverses direction and DC flows in one direction only. Rectification produces a type of DC that encompasses active voltages and currents, which are then adjusted into a type of constant voltage DC, although this varies depending on the current's end-use. The current is allowed to flow uninterrupted in one direction, and no current is allowed to flow in the opposite direction.

D. BATTERY

Secondary (**rechargeable**) batteries can be discharged and recharged multiple times; the original composition of the electrodes can be restored by reverse current **secondary cell** or battery is one that can be electrically recharged after use to their original pre-discharge condition, by passing current through the circuit in the opposite direction to the current during discharge. The following graphic evidences the recharging process.

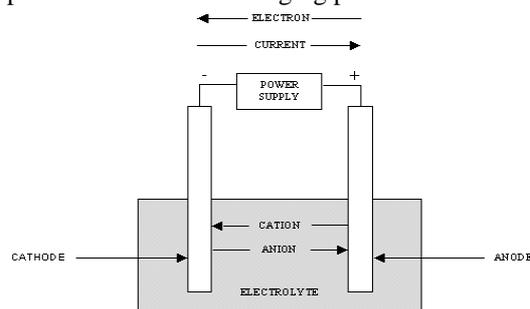


Figure 3: Recharging a Cell

Fig 1.3 Rechargeable Battery

Secondary batteries fall into two sub-categories depending on their intended applications. Cells that are utilized as energy storage devices, delivering energy on demand. Such cells are typically connected to primary power sources so as to be fully charged on demand. Examples of these type of secondary cells include emergency no-fail and standby power sources, aircraft systems and stationary energy storage systems for [load-leveling](#). Cells that are essentially utilized as primary cells, but are recharged after use rather than being discarded. Examples of these types of secondary cells primarily include portable consumer electronics and electric vehicles.

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E. DC-DC CONVERTER

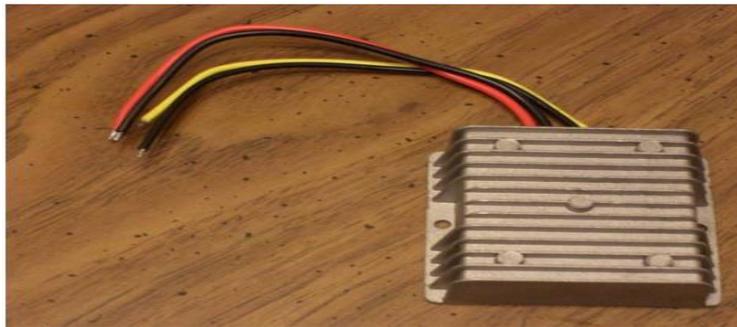


Fig1.4 Dc Converter

Fundamentally, there are two types of DC/DC converters: linear and switched. While a linear DC/DC converter uses a resistive voltage drop to create and regulate a given output voltage, a switched-mode DC/DC converts by storing the input energy periodically and then releasing that energy to the output at a different voltage. The storage can be in either a magnetic field component like an inductor or a transformer, or in an electric field component such as a capacitor. Transformer-based converters provide isolation between the input and the output.

F. SPUR GEAR



Fig1.5 Gear arrangement

These are also called as spur gears the gears having tooth in straight & parallel to the axis of the shaft. These gears are used to transmit the power from seesaw arrangement to chain drive . This type of gears is used to transmit more power.

G. CHAIN



For a given ratio and power capacity, chain drives are more compact than belt drives, but less compact than gear drives. Mounting and alignment of chain drives does not need to be as precise as for gear drives. Chain drives can operate at 98 to 99 percent efficiency under ideal conditions. Chain drives are usually less expensive than gear drives and quite competitive

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II. EXPERIMENTAL SETUP

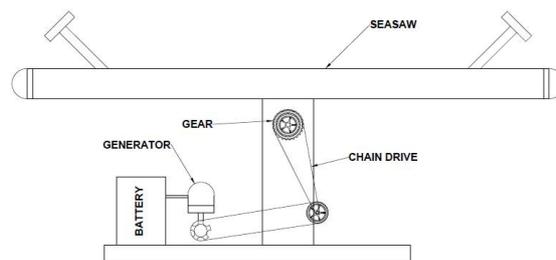


Fig 1.6 project model

A. 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

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 FtLbs

= $0.25 \times \text{Ratio}$

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

T = 0.625 FtLbs

POWER:

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

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

P = 1.83 Watts

III. CONCLUSION

In short, the project was a success in proving the concept that electrical energy can be harnessed from human power, specifically in the act of operating makeshift playground equipment. Moreover, members of the group increased their knowledge and understanding of engineering design concepts, mechanical/electrical systems. The group met design and construction goals for the project which included but were not limited to: seesaw sizing and assembly, gear mechanism design and construction, specification and selection of all electrical components. Additionally, the group met overall

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system goals of operation and basic generation upon final adjustments. Critical system specifications at the following points were met in the final adjustment: the minimum generator terminal voltage of for continuous conduction through the rectifier to the battery, and a regulated/loaded output from the system $P=1.83$ Watts With the work of future groups this proof of concept project will be significantly improved to become an effective one

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