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**INTERNATIONAL RESEARCH JOURNAL OF MODERNIZATION IN  
ENGINEERING TECHNOLOGY AND SCIENCE STUDY OF SWING  
MOTION POWER GENERATION**

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**ABSTRACT**

Energy need of the world is growing day by day because of consumption of energy at a larger extent with the population growth. This paper is about generating power by using a swing in such a way that when it swings the mechanical energy is generated and it is converted into electrical energy by commutator. The construction is such a way that the swinging action makes the horizontal beam rotating through an angle. Shaft is connected to dynamo for transfer motion which rotates proportionally with respect to angle of motion of swing. The angular movement is converted into a complete rotation with help of chain drive connecting both small pulley and big pulley. The big pulley is connected to shaft which in turn rotates dynamo arrangement to generate electricity.

**Keywords:** Energy, Dynamo, Swing.

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**I. INTRODUCTION**

Renewable energies mainly refer to the wind, solar, biomass and marine currents which are less harmful to environment, attracting a wide attention of researchers in design and development of renewable energy conversion systems. Although improvement of renewable energy converters is in a fast rate, the systems to extract the wasted energy in conventional energy conversion systems are not developed as much as its technologies. In many systems and processes, dissipation of energy is inevitable whatever renewable or conventional energy was used.

Energy is the ability to do work. It is a driving force of modern societies and generation and utilization of energy are essential for the socio economic development. Per capita consumption of energy 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 paper, it is proposed to harness the human muscle power of children playing in public spaces such as school playgrounds, on equipment such as teeter totters, swings, and merry-go-rounds. Such an energy conversion is playful and hence does not require deliberate effort.

For human power conversion systems to be useful in the context of developing countries, several constraints need to be considered like low cost, low-resource and limited-skills requirements, low-maintenance, safety and comfort to humans, and environment-friendliness. Human power conversion is easily achieved from children's play under conditions where the children are static relative to 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., swing) 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 like springs, hydraulic components, electric generators, piezoelectric, compressed air systems, flywheels, and so on. The factors affecting the choice of the most suitable conversion mechanism are similar to those for the general energy conversion problem. Human power was perhaps the earliest source of energy known to mankind. Its first uses were in tool-making, rowing boat, and so on. Mechanized uses of human power were achieved in the form of hand cranking by the Romans. However, pedaling which is a simpler and less tiresome means of human power conversion did not come about until the 19th century with the invention of the bicycle.

## II. REVIEW OF LITERATURE

**1] Electrical Energy Harvesting By Using Pendulum Power Generator Mithun Gajbhiye, Mayuri Boke, Akshay Kelwadkar, Prof. Sandeep Mude Volume: 03 Issue: 02 | Feb-2016**

**Abstract: -**

The more power demand has been occurring now a day in India. The main reason of the power demand is due to the lack of improper energy utilization and conservation. The pendulum generator deals with the power generation from the mechanical energy that has been wasted in many day today real time applications. The pendulum setup has been made, that is whenever it has been kicked off the kinetic energy of ball makes the pendulum to oscillate, generates the electrical energy. We can implement the pendulum based power generation system in real time application wherever the vibration produced. We can implement a pendulum based power generation system in such dynamic application we can generate power from it. The pendulum power generator is most efficient & eco friendly power generator. The pendulum power generator is the machine which converts the motion of pendulum i.e. mechanical energy into electrical energy. This is most helpful source or machine for power generation in today.

**2] FOOTSTEP POWER GENERATION Abhinav C Raj, Basil Baby, Krishnapriya K B , Vishnumaya T S , Neema S Volume: 06 Issue: 06 | June 2019**

**Abstract -**

The demand of energy is increasing day by day, so the ultimate solution to deal with these sorts of problems is just to implement the renewable sources of energy .Humans are using the renewable energy which are solar, wind etc. but we still could not satisfy our power needs, because of that we have to generate electricity through each and every possible ways. The objective of this work is to produce power through footsteps as a source of renewable energy that we can obtained while walking or standing on to the certain arrangements like footpaths, stairs, plate forms and these systems can be install specially in the more populated areas. In this project the force energy is produced by human foot step and force energy is converted into mechanical energy by the rack and pinion mechanism and electricity is produced by DC generator. We are studying existing methods of foot step power generation that are rack and pinion arrangement and supposed to modify the existing system.

**3] Gravity Based Power Generation R.S. Shinde, Manish Kasare, Kishan Kande, Rohit Pande, Sumit Vishvambhare Volume: 07 Issue: 07 | July 2020**

**Abstract -**

Conserving energy has become the biggest issue in the scenario. Due to the development and modernization, the electricity demand is increasing to a high extent. to fulfil this demand globally which is without any harmful effect on the environment is possible by using gravity-based power generation. There are many energies around us like solar power, wind energy, tidal energy, hydro energy, thermal energy, gravity energy. And during this project, we are employing gravitational energy to get electric energy. With the assistance of this energy, we will generate power for light loads like street lamps in colonies because of an outage of power. This power is reliable compare to solar energy we'd like to store that power and this power can access any time anywhere like lift, on the terrace of the building. The basic concept of using gravity base power generation mechanism is when a body moves from higher altitude to lower one its potential energy is converted into kinetic energy. This motion is converted into circular motion and this motion is converted into electrical energy.

**4] Fabrication of Pendulum Machine for Generation of Electricity through Oscillation Motion Dhawal Bodhankar, Ankit Chauvhan, Santosh Rahangadale, Gaurav Uprikar, Sangram Deshmukh, Prof. Swapnil Choudhary Volume: 07 Issue: 04 | Apr 2020IRJET**

**Abstract -**

Energy requirement of the world is increasing day by day for the reason that of utilization of energy at a generously proportioned size with the population enlargement. This paper is about generating power by using a move backwards and forwards in such a way that when it swings the mechanical energy is generated and it is converted into electrical energy by pendulum and is stored in a battery. The manufacture is such a way that, the

swinging action makes the horizontal beam rotating through an angle. This paper explains the effect of creating the free energy in the device made of:

a) Oscillating pendulum-lever system.

b) System for initiating and maintaining the oscillation of the pendulum

c) System which uses the energy of the device by damping the oscillation of the lever. Serbian inventor has invented, patented and developed series of such machines based on two-stage oscillator for producing energy. The operation of the machine is based on forced oscillation of the pendulum, since the axis of the pendulum affects one of the arms of the two-armed lever by a force which varies periodically. Part of the total oscillation energy of the pendulum-lever system can be changed into work for operating a pump, a press, rotor of an electric generator or some other user system. The effect of creating the free energy is defined in this study as the difference between the energy which is the machine transfers to the user system by the lever and the energy which is input from the environment in order to maintain the oscillation of the pendulum. Appearance of the free energy is not in accordance with the energy conservation law.

**5] Design, fabrication and experimentation of swing electricity power generation system Juntakan Taweekun ,Saba arif ,Mas Fawzi ,Nor Zelawati Binti Asmuin , Mohd Faizal Mohideen Batcha, Zamri Noranai sciencepubco.com/index.php/IJET**

#### **Abstract**

Energy need of today's world is growing day by day because of consumption of larger extent of electricity due to growing population. Project is about generation of electricity by swing. Large number of children play in a playground, part of the power of their play caused by swing can be usefully harnessed resulting in significant energy storage. Yielded energy can be converted to electrical energy to be utilized for many applications. Oscillatory motion of swing is transferred to shaft attached, which further transfers its angular motion to rotary motion of the flywheel, rigidly connected at the end. The flywheel is connected to a generator by specific transmission to conserve and increase the speed at generator end. The generator converts the mechanical energy into electrical energy to be utilized for many applications. Current swing is able to generate enough electricity to power a 15 W DC fan and a 9 W DC bulb. The method provides a lowcost, low-resource means of electricity generation, especially for use in developing countries.

### **III. ENERGY – THE KEY TO HUMAN PROGRESS**

The earliest human beings evolved 2 million years ago, lived in forests and like the other living creatures, their activities were confined to gathering food for living. Man developed small tools and implements that made his hunting and food gathering simpler. Some where while making his crude stone tools he discovered means of making fire by rubbing flint stones against each other.

He used the heat from the fire to keep himself warm and to cook his food. This was the first time man exploited energy derived outside food and that distinguished him from animals.

Agriculture was the earliest human activity and for that he drew on the power of animals he domesticated. Invention of the wheel soon enabled man to move larger volumes of material over longer distance. Several important and useful inventions followed the wheel but his demand for energy remained extremely low and was met by bio-mass, wind, and at later stage coal.

The turning point in the history of man dawned with the invention of the steam engine in the industrial age. He moved from the slow and inefficient animal power to machines driven by steam to do many jobs easily and efficiently. Weaving cloth which was then the second major occupation after agriculture was mechanized and first mechanized mass manufacture came up.

Thus in 19th century people started moving away from agriculture and got engaged in manufacturing and producing goods that made human life easier, comfortable and enhanced quality of life. Industrial revolution also gave rise to unending succession of discoveries and inventions - oil, combustion engines, electricity, motor cars etc. All of which, transformed the human live as never before. It is incredible that so much progress has been achieved in the past.

#### **GLOBAL ENERGY SCENARIO**

Energy is so essential part of our everyday life that we cannot imagine a day without it. Our dependence on

energy is so complete that any grid collapse can bring all our activities to a grinding halt. Essential services like rail transport, hospital services etc. will be paralyzed, production schedules will be disturbed, comfort at home will get affected and the list goes on. If the grid collapse is to take place at the same time when gas stations are hampered by shortage of gas supplies, it needs no great effort to imagine the woe that would follow.

The economy of a nation is measured in terms of the per capita energy consumption and as many nations aspire to become industrialized, the demand for energy is growing at an enormous rate. At present the world consumes 80 million barrels of oil, 280 billion cubic feet of natural gas & 5261 million tons of coal every day.

As per the International Energy Outlook (IEO 2004), the world wide energy demand is likely to grow by 54% between 2001 and 2025. While the industrialized nations' consumption rate would be 1.2% per year, the emerging economies like China, India, Brazil is expected to grow at double that rate whose present per capita consumption is 350 KWh/day.

### **EINSTEIN' S MASS ENERGY EQUATION**

As per Einstein, mass energy equation can be given as:

$$E = mc^2$$

Where; E = Energy released in "Joules".

m = mass in kg.

c = Velocity of light =  $3 \times 10^8$  m/sec.

### **TYPE OF ENERGY**

#### **CONVENTIONAL AND NON CONVENTIONAL ENERGY**

Based on the energy resources available and their usage, energy is classified into two types:

1. Conventional energy resources
2. Non-conventional energy resources

Conventional energy resources are of depleting type in nature i.e. Fossil fuels - coal, petroleum, natural gas; Nuclear Fuels - Uranium, Thorium, Deuterium etc.

Non-conventional energy resources are non-depletable and thus they are called Renewable types, i.e. Solar, Wind, Tidal, Ocean-thermal, Geothermal, Biomass and plants.

#### **CONVENTIONAL ENERGY RESOURCES**

**FUELS** - Fuels are broadly classified as

- a) Solid fuels - various solids are wood, coal (Bituminous, Anthracite, lignite, Peat etc).
- b) Liquid fuels - They include Petroleum and its derivatives.
- c) Gaseous fuels - Gaseous fuels consist of natural gas, producer gas, blast furnace gas, coal gas etc.

#### **NON - CONVENTIONAL ENERGY RESOURCES**

The conventional energy resources of fossil fuels like coal and Petroleum product are used to produce energy. These sources are all depleting in nature, and after some time, the availability of fossil fuels may cease to exist. Hence mankind is in search of a new source of energy to harness like non conventional energy resources viz., Solar, wind, Tidal, Oceanic temp differences, Geothermal and biomass products.

#### **WIND ENERGY**

Wind power can be made use of at a suitable velocity. Wind power is capable of generating small amounts of electric energy. It is successfully employed for pumping water from deep wells. Wind power has served many countries as a source of power in early days and was called wind mills. The propulsive power of wind can be used to drive multi bladed turbine wheel. Wind is a cheaper source of power.

#### **TIDAL ENERGY**

Ocean waves and tides contain large amount of energy. Such tides rise and fall, thus water can be stored during rise period and it can be discharged during fall. Due to low head of water available, low hydro-electric plants can work successfully. During high tides, the height of tide is above that of tidal basin and the turbine unit operates and generates power. During low tides, the height of tide is lower than that of the tidal basin. At this time, water is allowed to flow out to drive the turbine unit. The turbine does not operate if the tidal level and basin level are

equal.

### GEOTHERMAL ENERGY

According to various theories, the earth has a molten core. The fact that volcanic action takes place on the surface of the earth supports these theories. The steam vent and hot springs come out of earth's surface. The steam from such natural wells is used for the generation of power.

### HYDEL - ENERGY

The Potential energy of water at higher level is utilized for the generation of electrical energy. Water power is cheap as it is available in abundance. Although capital cost of a Hydel power plant is higher than other types of power plants, its operation cost is quite low.

### SOLAR ENERGY

The heat contained in the rays of the sun is utilized to boil water and generate steam, which can be used to drive the prime movers to generate electrical energy. Due to the excess demand for energy the reserves of coal, oil and gas will get exhausted in a few decades. Atomic energy involves considerable hazards and nuclear fusion has not yet over come all the fundamental research. The technical utilization of solar energy in India is preferred, since it lies in the temperature region of the world where sunlight is for a major part of the year. The basic research problems of in hot abundant in solar energy is being carried out in universities, educational and research institutes.

## IV. DYNAMO /D.C GENERATOR

### Voltage Production

DC Circuits, that there are three conditions necessary to induce a voltage into a conductor.

1. A magnetic field
2. A conductor
3. Relative motion between the two.

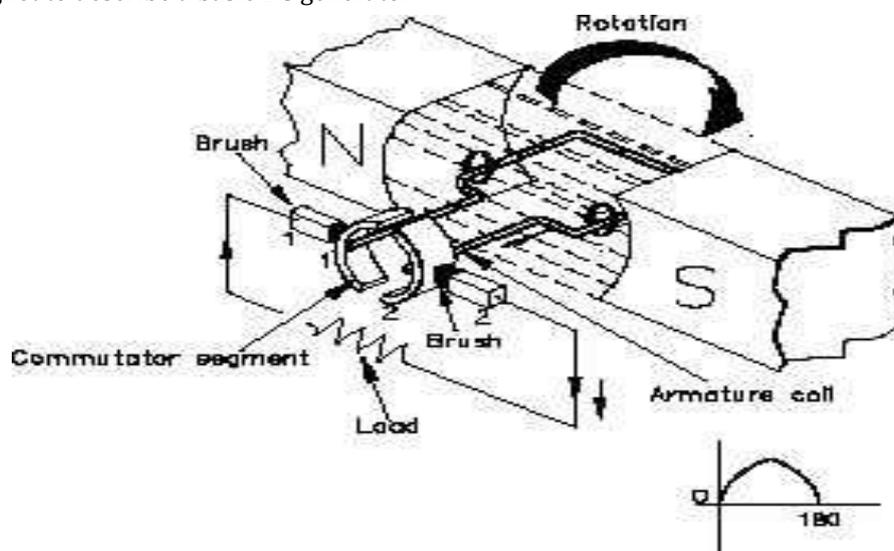
A DC generator provides these three conditions to produce a DC voltage output.

### Theory of Operation

A basic DC generator has four basic parts:

- (1) A magnetic field;
- (2) A single conductor, or loop;
- (3) A commutator; and
- (4) Brushes

The magnetic field may be supplied by either a permanent magnet or an electromagnet. For now, we will use a permanent magnet to describe a basic DC generator.



Basic Operation of a DC Generator A single conductor, shaped in the form of a loop, is positioned between the magnetic poles. As long as the loop is stationary, the magnetic field has no effect (no relative motion). If we rotate the loop, the loop cuts through the magnetic field, and an EMF (voltage) is induced into the loop.

When we have relative motion between a magnetic field and a conductor in that magnetic field, and the direction of rotation is such that the conductor cuts the lines of flux, an EMF is induced into the conductor. The magnitude of the induced EMF depends on the field strength and the rate at which the flux lines are cut.

The stronger the field or the more flux lines cut for a given period of time, the larger the induced EMF.

$$E_g = KFN$$

where  $E_g$  = generated voltage

$K$  = fixed constant

$F$  = magnetic flux strength

$N$  = speed in RPM

The direction of the induced current flow can be determined using the "left-hand rule" for generators. This rule states that if you point the index finger of your left hand in the direction of the magnetic field (from North to South) and point the thumb in the direction of motion of the conductor, the middle finger will point in the direction of current flow.

For example, the conductor closest to the N pole is traveling upward across the field; therefore, the current flow is to the right, lower corner. Applying the left-hand rule to both sides of the loop will show that current flows in a counter-clockwise direction in the loop.

#### DC GENERATOR CONSTRUCTION

Output Voltage-vs-Load Current for Shunt-Wound DC Generator the shunt-wound generator, running at a constant speed under varying load conditions, has a much more stable voltage output than does a series-wound generator. Some change in output voltage does take place. This change is caused by the fact that, as the load current increases, the voltage drop ( $I R$ ) across the armature coil increases, causing output voltage to decrease.

As a result, the current through the field decreases, reducing the magnetic field and causing voltage to decrease even more. If load current is much higher than the design of the generator, the drop in output voltage is severe. For load current within the design range of the generator, the drop in output voltage is minimal.

#### PULLEY AND CHAIN DRIVE:-

There are two pulleys are used in our project. One is coupled with motor shaft and another one is coupled with spur gear shaft. These two pulleys are connected by belt drive.

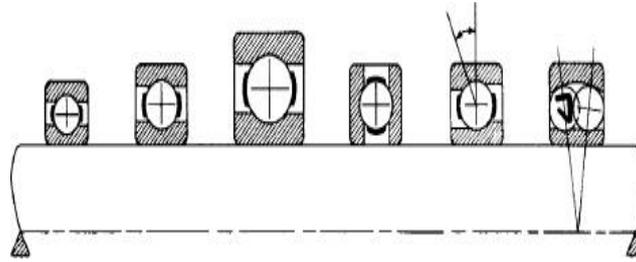
#### CHAIN/BELT DRIVE:

This is used to transmit the power from one place to another place. In our project this is transmit power from motor to the grinding stone. In our project, we are using one motor and one generator and two belt drive mechanism. he sources which supplied the material presented here.

#### Construction and Types of Ball Bearings

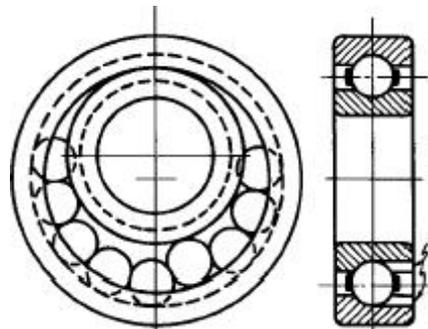
A ball bearing usually consists of four parts: an inner ring, an outer ring, the balls and the cage or separator. To increase the contact area and permit larger loads to be carried, the balls run in curvilinear grooves in the rings.

The radius of the groove is slightly larger than the radius of the ball, and a very slight amount of radial play must be provided. The bearing is thus permitted to adjust itself to small amounts of angular misalignment between the assembled shaft and mounting. The separator keeps the balls evenly spaced and prevents them from touching each other on the sides where their relative velocities are the greatest. Ball bearings are made in a wide variety of types and sizes. Single-row radial bearings are made in four series, extra light, light, medium, and heavy, for each bore, as illustrated in Fig. 1-3(a), (b), and (c).



100 Series 200 Series 300 Series Axial Thrust Angular Contact Self-aligning Bearing Fig. 1-3 Types of Ball Bearings.

The heavy series of bearings is designated by 400. Most, but not all, manufacturers use a numbering system so devised that if the last two digits are multiplied by 5, the result will be the bore in millimeters. The digit in the third place from the right indicates the series number. Thus, bearing 307 signifies a medium-series bearing of 35-mm bore. For additional digits, which may be present in the catalog number of a bearing, refer to manufacturer's details.



Some makers list deep groove bearings and bearings with two rows of balls. For bearing designations of Quality Bearings & Components (QBC), see special pages devoted to this purpose. The radial bearing is able to carry a considerable amount of axial thrust.

However, when the load is directed entirely along the axis, the thrust type of bearing should be used. The angular contact bearing will take care of both radial and axial loads.

The self-aligning ball bearing will take care of large amounts of angular misalignment. An increase in radial capacity may be secured by using rings with deep grooves, or by employing a double-row radial bearing. Radial bearings are divided into two general classes, depending on the method of assembly. These are the Conrad, or non-filling-notch type, and the maximum or filling-notch type.

In the Conrad bearing, the balls are placed between the rings as shown in Fig. 1-4(a). Then they are evenly spaced and the separator is riveted in place. In the maximum-type bearing, the balls are a (a) (b) (c) (d) (e) (f) 100 Series Extra Light 200 Series Light 300 Series Medium Axial Thrust Bearing Angular Contact Bearing Self-aligning Bearing Fig. 1-3 Types of Ball Bearings Fig. 1-4 Methods of Assembly for Ball Bearings (a) Conrad or non-filling notch type (b) Maximum or filling notch type

**ADVANTAGES**

- 1) Easy in operation.
- 2) Low cost
- 3) Simple construction.
- 4) Adaptable.
- 5) High capacity.
- 6) Performance.
- 7) Manually operated.
- 8) Environmental friendly.
- 9) Easy to setup
- 10) Light weight.

- 11) Easy maintenance.
- 12) No operated required.
- 13) Children will have great fun.
- 14) With the perspective of entertainment.
- 15) Kid's energy is utilized to obtain current.

#### **V. CONCLUSION**

To make a complete mechanical device which does not uses any electrical power so that it is wholly independent of its own, Beneficial for people staying in hilly stations, where the power is main problem and for household uses which results an easy way of generation of power

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