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FOOT STEP POWER GENERATION

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1. INTRODUCTION

1.1 ENERGY

Energy does things for us. It moves cars along the road and boats on the water. It bakes a cake in the oven and keeps ice frozen in the freezer. It plays our Favourites songs and lights our homes at night. Energy helps our bodies grow and our minds think. Energy is a changing, doing, moving, working thing. Scientists define energy as the ability to do work. Modern civilization is possible because people have learned how to change energy from one form to another and then use it to do work

There are many different forms of energy, including:

- Mechanical
- Electrical
- Gravitational
- Chemical
- Light

Energy is defined as the ability to produce change or do work, and that work can be divided into several main tasks we easily recognize:

- Energy produces motion
- Energy produces light
- Energy produces heat
- Energy produces sound

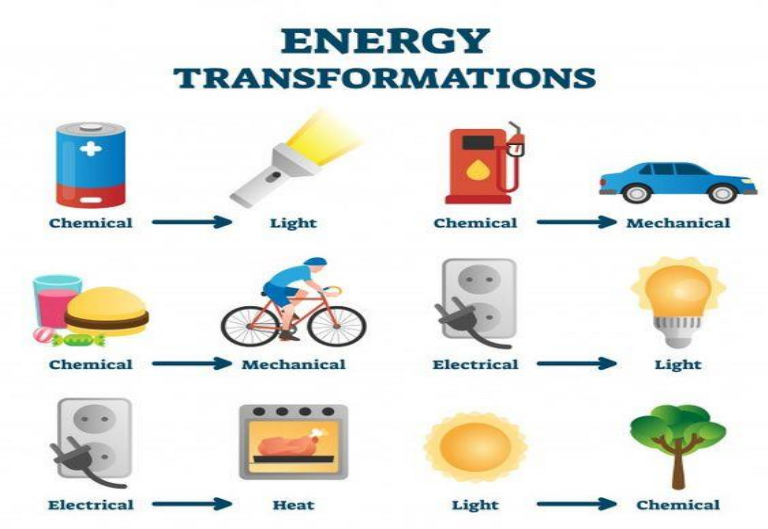


Fig. 1.1. Energy Transformations

1.2 CONVENTIONAL & NON COVENTIONAL ENERGY

1.2.1 CONVENTIONAL ENERGY

Conventional energy sources such as natural gas, oil, coal, or nuclear are finite but still hold the majority of the energy market. However, renewable energy sources like wind, fuel cells, solar, biogas/biomass, tidal, geothermal, etc Conventional energy is the one which cannot be renewed in human time – scale. Due to large population the consumption of conventional energy is increasing day by day. It is an exhaustible energy resource and is depleting at an alarming rate.

Conventional energies are as follows,

- **Fossil Fuel**
- **Hydraulic Energy**
- **Nuclear Energy**

➢ **FOSSIL FUEL :**

Coal, petroleum, and natural gas are called Fossil fuel as these are formed by the decomposition of the remains of dead plants and animals buried under the earth for a long time. These are non-renewable sources of energy, which, if exhausted, cannot be replenished in a short time. Their reserves are limited and are considered very precious. These should be used with care and caution to let them last long. These are also contributing to the global environmental pollution

➢ HYDRAULIC ENERGY

Water power is developed by allowing water to fall under the force of gravity. It is used almost exclusively for electric power generation, in fact, the generation of water power on a large scale became possible around the beginning of the twentieth century only with the development of electrical power plants or Hydro electric plants were usually of small capacities usually less than 100 KW. Potential energy of water is converted into Mechanical energy by using prime moves known as hydraulic turbines. Water power is quite cheap where water is available in abundance. Although capital cost of hydro electric power plants is higher as compared to other types of power plants but their operating Costs are quite low.

➢ NEUCLEAR ENERGY

According to modern theories of atomic structure, matter consists of minute particles known as atoms. Heavier unstable atoms such as U235, Th239, liberate large amount of heat energy. The energy released by the complete fission of one Kg of Uranium (U235), is equal to the heat energy obtained by burning 4500 tonnes of coal (or) 220 tons of oil. The heat produced by nuclear fission of the atoms of fissionable material is utilized in special heat exchangers for the production of steam which is then used to drive turbo generators as in the conventional power plants. However there are some limitations in the use of nuclear energy namely high capital cost of nuclear power plants, limited availability of raw materials, difficulties associated with disposal of radioactive waste and shortage of well trained personnel to handle the nuclear power plants. The Uranium reserves in the world at present are small. These reserves are recoverable but are expensive. Nuclear energy has the potential to meet the future needs of electricity in the country. The capacity of nuclear power in India currently stands at 4120 MW (NPCIL 2007). There are in total 17 nuclear reactors. Of these, the 220 MW Kaiga-3 is the latest addition, which began operation in May, 2007. Another 2660 MW reactor is expected

Fig 1.2 Fossil fuel

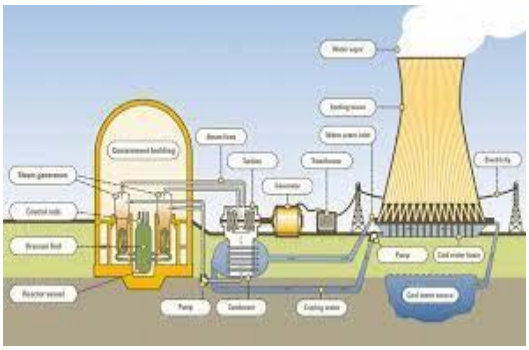


Fig 1.3 Nuclear power plant layout

1.2.2 NON – CONVENTIONAL ENERGY

The sources of energy which are being produced continuously in nature and are in exhaustible are called non-conventional energy. These non-conventional sources are also known as renewable sources of energy. The examples include solar energy, bio energy, tidal energy and wind energy

- **SOLAR ENERGY**

The amount of sunlight that strikes the earth's surface in an hour and a half is enough to handle the entire world's energy consumption for a full year. Solar technologies convert sunlight into electrical energy either through photovoltaic (PV) panels or through mirrors that concentrate solar radiation. This energy can be used to generate electricity or be stored in batteries or thermal storage. Solar radiation is light – also known as electromagnetic radiation – that is emitted by the sun. While every location on Earth receives some sunlight over a year, the amount of solar radiation that reaches any one spot on the Earth's surface varies. Solar technologies capture this radiation and turn it into useful forms of energy

- **TIDAL ENERGY**

Tidal barrage stations are usually installed near coastlines where the tidal range is sufficient for commercial electricity generation since the energy generated is proportional to the tidal amplitude squared. In Europe, the potential tidal energy resource is estimated to exceed 12 GW of installed capacity [4]. Ideal locations with immense currents are found around the coasts of the British Islands and Ireland, between France and the Channel islands, around in Aegean and in the Straits of Messina between Italy and Sicily. There is also prediction of about 90 Gw potential tidal energy along the North West coast of Russia and 20 GW at the inlet of Mezen River into the White Sea [5]. In Asia, China holds a theoretical potential of 13.9 GW unevenly distributed tidal power with about 7 GW around the Estuary of Yangtze River in Zhejiang and Jiangsu Province [6], the West Coast of India is estimated to potentially generate 8 GW of tidal power [5]. Other locations with high tidal amplitudes around the world include the west coast of Malaysia and the Philippines, the west coast of Australia, the East and West coasts of Canada and many other places. The figure below from NASA shows a global semidiurnal tidal amplitude distribution. Although the global reserve of tidal power is tremendous, currently only few locations are exploited.

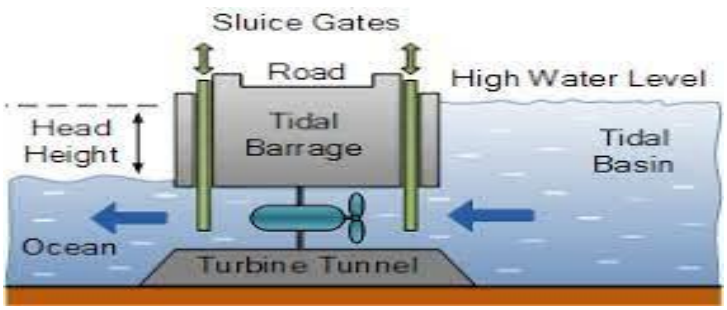


Fig 1.5 Tidal Energy System

1.3 INTRODUCTION TO FOOT STEP POWER SYSYTEM

The system generates voltage using footstep force. The system serves as a medium to generate electricity using non conventional sources(force) and /store/use it. The project is designed to be useful at public places like railway stations where a lot of people keep walking through all day. At such places these systems are to be placed at any entry points where people travel through entrance or exits and they have to step on this device to get through. These devices may then generate a voltage on every footstep and when mounted in series they will produce a sizeable amount of electricity. For this purpose we here use Rack & pinion that use Rack and pinion mechanism in order to measure acceleration force, pressure by its conversion into electric signals. We here attach a voltmeter in order to measure its output and small led lights for demonstration. We also use a battery and weight measurement unit for better demonstration of the system

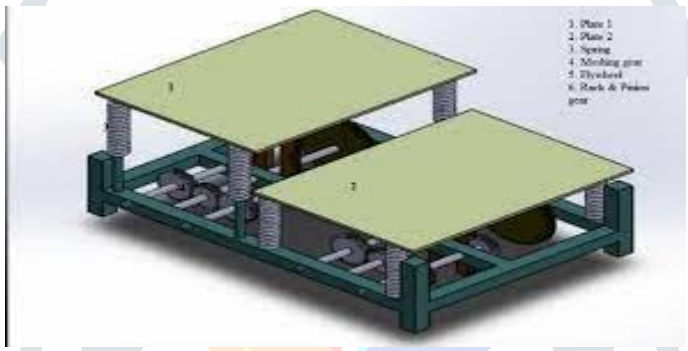


Fig 1.6 CAD Drawing of Foot Step Power System

This non-conventional method is “Footstep power generation Mechanism” here the energy will be produce by moving the human on a moving plates in which rack and pinion gear are used to convert the physical energy into mechanical energy and further they will have converted into electric energy by using the dynamo. By using this method, we will have produced the energy to light up the bulb. I will also represent the simulation of the footstep power generator using the . By the results its seen we will produce the 10.925kw power in one hour. This project will be cost effective and easy to installed in a populated area like railway station, bus stands and in shopping malls. Our project is cost effective and easy to implement

2. OBJECTIVE & WORKING PRICIPLE

2.1 OBJECTIVE

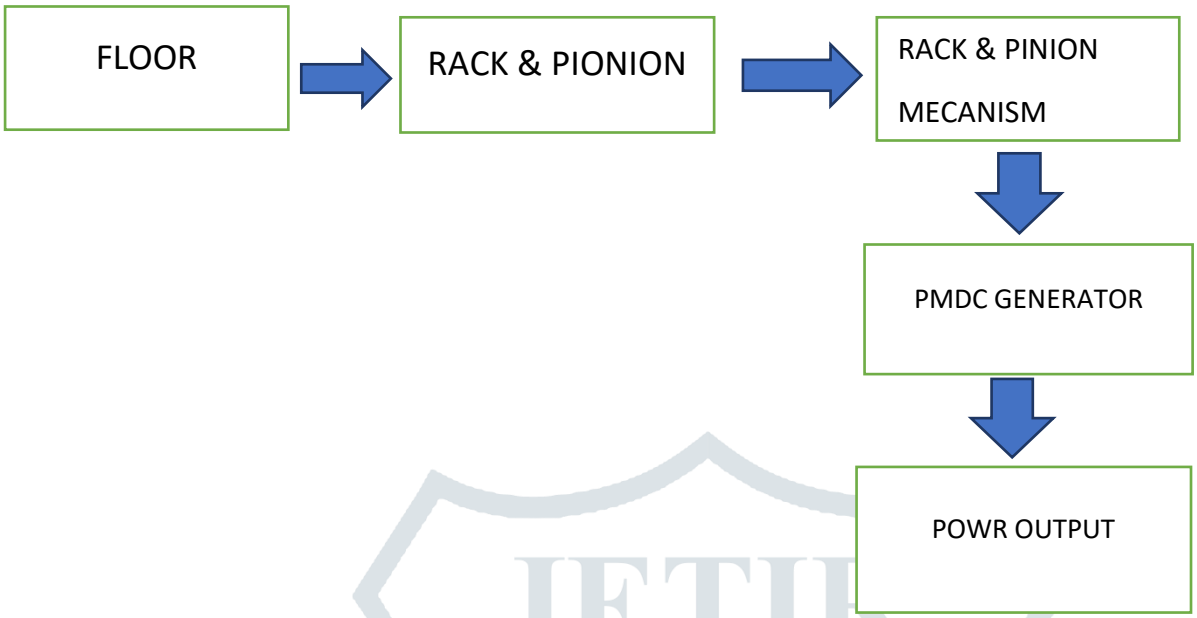
In this project we are converting mechanical energy into electrical energy. We are trying to utilize the wasted energy in the useful way. BY using rack and pinion arrangement we are converting to and from motion of the steps into rotational motion of the dynamo . In the first foot step we are using rack and pinion arrangement is directly to rotate the PMDC generator. But in second step we are using chain drive

mechanism to obtain better efficiency. Through dynamo the rotational energy is converted into electrical energy.This electrical energy output will be shown by glowing LEDs . The output power is expected 3 to 4V in proto-type. Depending upon the above Literature Survey of different papers we have decided to move forward to take this project in practical means. for this purpose we have aimed to construct prototype for footstep mechanism by using rack and pinion rotation. And the storage system along with inverter circuit is arrangement in order to us the produced alternative energy for daily application converting the DC to AC. At last the prototype is assembled with a display unit whose main aim is to show exact amount of power available battery. In simple words we are trying to explaining how man power is converted into electrical energy to desirable voltage/Watt. There are many ways to generate electricity but this is most better method and also cheapest. As the India is most populated country and there are many IT parks, railway stations, offices, theatres etc. we can assemble this generator on steps or entry- exit way.

Main objectives are

- To generate the electricity through the human foot
- To provide electricity in rural area
- To promote the non-conventional energy resources
- To save conventional energy sources
- To store electricity for further use
- To produce electricity at cheapest cost
- To produce electricity from PMDC generator
- To produce electricity when rack move in bi-direction
- To combine two method for more output from one system

2.2 WORKING PRINCIPLE



The General design of the foot step power generation is given in above. In this arrangement we are using two steps. The rack& pinion, spring arrangement is fixed below the steps. We are using four springs for each step. The spring is used to return the step-in same position by releasing the load. The rack is coupled to the foot step.

In the second step, the Rack is connected to the footsteps. From Rack a shaft is provided in which the larger sprocket lies. The larger sprocket is coupled with Rack, so that it is running at the same speed of Rack. The larger sprocket is coupled to the smaller sprocket below in the other shaft with the help of chain (cycle). This larger sprocket is used to transfer the rotation force to the smaller sprocket. A gear is provided there also. The smaller sprocket is running same direction for the forward and reverse direction of rotational movement of the larger sprocket. It running at same speed also is converted into electrical power with proper control unit. The spring and rack & pinion arrangement is fixed below the foot step which is mounted on base. Spring system is used for return mechanism of upper plate after release of load. The shaft along with pinion is supported by end bearings the complete diagram of the footstep power generation is given below. Only one step is inclined

in certain small angle which is used to generate the power. The pushing power is converted into electrical energy by proper driving arrangement. The main phenomenon on which the working of this project is based is that rack and pinion assemble converts the linear motion into rotary motion and vice versa also. The pinion is of finite diameter and gives circular motion when the rack of infinite diameter comes in contact with pinion and gives

linear or translator motion for proper contact between both rack and pinion the should have equal module. The shafts of rack and pinion remains parallel during their motion. The complete and real image of this project and mechanism is shown in given below. The impact load is put on surface on the step. One end

of spring is attached to the other surface of step (plate) and another end is fixed to the stand. Firstly, the spring is compress down due to impact of load. During this process the energy is absorb in the spring. When the weight is removed from thetop of the plate, the spring come back to its original position. By releasing the energy inside it and the plate moves upward and return to its original position. When the spring is compressed due to impact of weight on plate, the energy absorbed in the spring and the rack move downward direction vertically and the rack is in contact with pinion. So, pinion rotates in anti-clock wise direction. The pinion shaft is directly coupled with dynamo (generator). So, PMDC generates electricity. When the spring expends releasing the energy stored inside it, the rack moves in upward direction vertically and the rack is in contact with pinion. So, pinion rotates in clock wise direction. The pinion shaft is directly coupled with dynamo. So, PMDC generates electricity again If we want to store the electrical energy for future use, we connect the dynamo to the inverter which store the energy in the form of D.C in the battery.

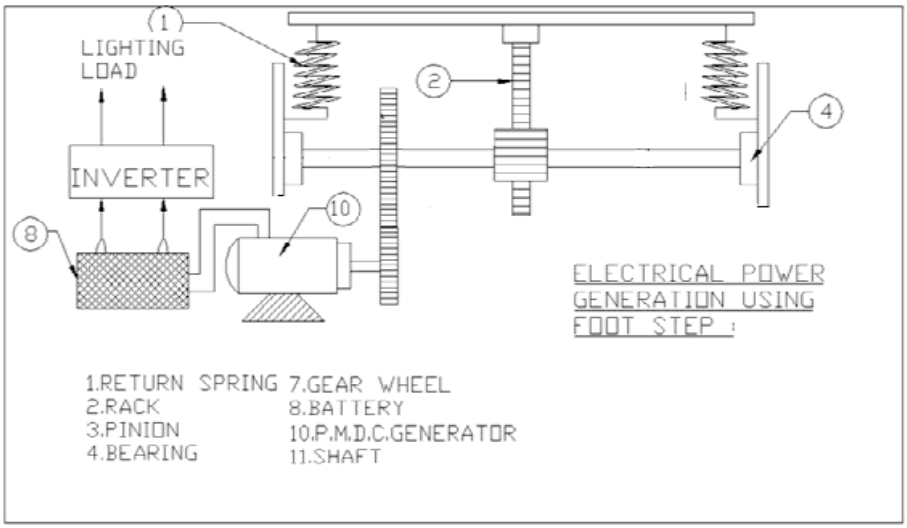


Fig 2.1 Block Diagram of Foot Steps Power System

In the first step the footstep is directly connected to the rack& pinion arrangement. To the pinion shaft PMDC is provided and LEDs are coupled to it. Thus mechanical energy is converted into electrical energy. With the help of block diagram as shown in the block diagram the working procedure is explained in step by step manner.

STEP 1: When force is applied on the plate by virtue on stamping on the plate the force spring gets compressed.

STEP 2: The rack here moves vertically down.

STEP 3: The pinion meshed with the rack gear results in circular motion of the pinion gear.

STEP 4: For one full compression the pinion Moves 1st semicircle.

STEP 5: When the force applied on the plate released the pinion reverses and moves another semi-circle.

STEP 6: The PMDC generator attached to the pinion hence results in the sinusoidal waveform for Single generator.

3. LITREATURE REVIEW

3.1 LITREATURE REVIEW

1. **"Power Generation in Automobile Suspension System" by C. Nithiyesh Kumar, K.Gowtham, M.Manikandan, P.Bharathkanna, T. Manoj Kumar.**

   In this research paper author studied three methods of foot step power generation namely piezoelectric method, rack and pinion method and fuel piston method comparatively and found that the rack and pinion mechanism is more efficient with moderate cost of operation and maintenance.

2. **"Generation of Electrical Energy from Foot Step Using Rack and Pinion Mechanism" by Md.Azhar, Zitender Raj purohit, Abdul Saif, NallaAbhinay, P.SaiChandu**

   In this research paper authors used regulated 5V power, 500mA power supply. Bridge type full wave rectifier is used to rectify the ac output of secondary of 230/12V step down transformer. A rack and pinion is a type of linear actuator including a pair of gears which convert rotational motion into linear motion. The "pinion" engages teeth on the rack. In this paper, since the power generation using foot step get its energy requirements from Non-renewable source of energy. There is no need of power from external sources (mains) and there is less pollution in this source of energy. It is very useful to the places like all roads and as well as all kind of foot step which is used to generate the non-conventional energy like electricity.

3. **"Electrical Power Generation Using Foot Step for Urban Area Energy Applications" by Joydev Ghosh, Amit Saha, Samir Basak, Supratim Sen**

   In this research paper authors used 80 volts and 40 mA from one coil have been generated from a prototype model as first invention. The second invention provides 95 volts and 50 mA from one coil and this generated power can be used to light LED array and to run DC fan after rectifying the AC or can charge batteries. For high efficiency in the axel of the second gear, they fitted a strong magnet vertically, so that when the gear will rotate due to human body weight the magnet also rotate. The magnet is placed in a loop type copper coil. When the magnet start rotating according to the Faraday's law of electromagnetic induction, there will be induced emf in the coil

4. **"Power generation through step" by Vipin Kumar Yadav1, Vivek Kumar Yadav1, Rajat Kumar1, Ajay Yadav**

In these research paper authors used equipment with following specification: Motor Voltage:10 volt Type: D.C. Generator, RPM:1000 rpm, Gear 1-Mild Steel, No. of teeth:59(big gear),No. of teeth:36(small gear),Type: Spur Gear, No. of gear used:2 Spring 1- Load bearing capacity:60-90 kg, Mild Steel, Total displacement:5 inch, Bearing 1- Type: Ball bearing, Bearing no.N35,Shaft 1- Diameter: 15 mm- Material: Mild steel author concluded that with these method energy conversion is simple efficient and pollution free

5. **"Power Generation Footstep" by Shiraz Afzal, Farrukhhafeez**

This paper is all about generating electricity when people walk on the Floor if we are able to design a power generating floor that can produce 100W on just 12 steps, then for 120 steps we can produce 1000 Watt and if we install such type of 100 floors with this system then it can produce 1MegaWattAs a fact only 11% of renewable energy contributes to our primary energy. If this project is deployed, then not only we can overcome the energy crises problem but this also contributes to create a healthy global environmental change. In this project a gear system is attached with flywheel which causes to rotate the dynamo as the tile on the deck is pressed The power that is created is saved in the batteries in addition we will be able to monitor and control the amount of electricity generated When an individual passes it push the tile on the ground surface which turn the shaft beneath the tile, turn is limited by clutch bearing which is underpinned by holders. Primary shaft is rotate 215approx.. Twice by a single tile push. The movement of the prevailing shaft turn the gearbox shaft which builds it 15 times (1:15) then its movement is smoothen by the help of fly wheel which temporary store the movement, which is convey to the DC generator (it generates 12V 40 amp at 1000 rpm)

6. **"POWER GENERATION FROM STEPS" by Ramesh Raja R, Sherin Mathew**

This research paper attempts to show how energy can be tapped and used at a commonly used floor step. The usage of steps in every building is increasing day by day, since even every small building has some floors. A large amount of energy is wasted when we are stepping on the floors by the dissipation of heat and friction, every time a man steps up using stairs. There is great possibility of tapping this energy and generating power by making every staircase as a power generation unit. The generated power can be stored by batteries, and it will be used for slighting the building.

7. **"Electricity Generation from Footsteps; A Regenerative Energy Resource" by Tom Jose V*, BinoyBoban*, Sijo M T***

In these research paper author manufactured a model made from stainless steel, recycled car tires and recycled aluminium, also includes a lamp embedded in the pavement that lights up every time a step is converted into energy (using only 5 percent of the generated energy). The average square of pavement produces about 2.1 watts of electricity. And according to author, any one square of pavement in a high-foot

traffic area can see 50,000 steps a day. Based on this data, only five units of pavement can be enough to keep the lights on at a bus stop all night.

3.2 FORMULATION PROBLEM

Some developing countries and newly-industrialized countries have several hours of daily power-cuts in almost all cities and villages because the increase in demand for electricity exceeds the increase in electric power generation. People in these countries may use a power-inverter (rechargeable batteries) or a diesel/petrol-run electric generator at their homes during the power-cut. The use of standby generators is common in industrial and IT hubs. This ultimately increases the shortage of power. Proposal for the utilization of waste energy of foot power with human locomotion is very much relevant and important for highly populated countries like India where the railway station, temples etc., are overcrowded all round the clock. Design and fabrication of the model of foot step power generation. Also to fabricate the model of the same which would able to show the characteristics of the systems and working according to need.

4. DESIGN ASPECTS AND CALCULATIONS

4.1 DESIGN ASPECTS

We had designed following components

- Springs
- Shaft
- Bearings

➢ **SPRING :**

A Spring is defined as an elastic machine that deflects under the action of the load and returns to its original shape when the load is removed.

Types of spring:

There are four Types of spring,

1. Torsion Spring

2. Coil Spring

3. Helical Compression Spring

4. Conical Spring

1. Shear stress calculation for the circular wire compression spring:

The maximum shear stress for a circular wire helical compression spring is given by

$S_{max} = (8KWC/\pi d^2)$ ……. Eqn.1

Where,

S_{max} is the maximums shear stress to the spring wire

D is the spring coil diameter

D is the diameter of spring wire

W is the applied load

C = D/d

K = Wahl's factor = $\{(4C- 1)/(4C-4)\} + (0.615/C)$

2. Axial deflection calculation for circular wire helical compression spring :

Under applied load, the spring got deflected. The axial deflection of the compression spring can be determined by :

X= (8WC 3n) / (Gd).....eqn2

Where,

X is the axial deflection due to the load

W is load

Nis the action coil number

G is modulus of rigidity

3. Maximum twisting moment calculation:

The maximum twisting moment (T) of the helical compression spring can be calculated by the following equation :

T = (π max d3)/16.....eqn3

4. Buckling calculation for a compression spring : The minimum axial force, which is required to buckle an axial spring can be obtained from :

WB= Kb k Lf.....eqn.4

Where,

Kь is the buckling factor (values available in any design data book)

K is spring rate

L_f is free length of the spring

The basic concept to remember here in buckling is: as long as the spring free length (L_f) is less than four times the mean diameter of thee spring, your spring is safe from buckling.

5. Calculation of free length (Lf) of the spring :

The free length of spring can be calculated by :

Lf=n'd+1.15X.....eqn.5

Where,

n=total number of coils of the spring.

➢ DESIGN OF SHAFT ON THE BASIS OF SHAFT STRENGTH:

Shaft is designed on the basis of following points

a. Shaft subjected to twisting moment only
b. Shaft subjected to bending moment only
c. Shaft subjected to combined twisting and bending moment

a. Shaft subjected twisting moment (torque) moment only:

Here the diameter of the shaft is determined by using basic torsion equation

As we know that,

$$\frac{T}{j}=\frac{\tau}{r}$$

Where,

T= Twisting moment acting on the shaft in N-mm

J= Polar moment of inertia of shaft about axis of rotation in mm^4

τ= Torsion shear stress in N/mm^2

r = Distance of nrutral axis to outer most fiber in mm

r = d/2..... (For solid shaft)

= do/2..... (For hollow shaft)

We have, $\mathbf{J=M=\frac{\pi}{32}\times d^4}$ .....(For solid shaft)

For solid shaft torque :

$$\mathbf{T_e=\frac{\pi}{32}\tau\times d^3}\text{..... (From above eqn.)}$$

Where ,We have used solid shaft , for power transmission.

b. Design of shaft subjected to bending moment :

$\frac{M}{I} = \frac{\sigma b}{y}$ Where,

M= Maximum bending moment on the shaft in N.mm

I = moment of inertia of cross section area of shaft about the axis of rotation in mm^4

σ_b = bending stress in $\frac{N}{mm^2}$

y = distance from neutral axis to outer fibber in mm

For solid shaft,

$$I=\frac{\pi}{64}\times d^4$$

$$M = \frac{\pi}{32} \times \sigma b \times d^3$$

c. Design of shaft subjected to twisting and bending moment:

Where shaft is subjected to combined twisting am]nd bending moment then shft must be designed on the basis of two moment ,

1. **To maximum shear stress theory:**

τ-max= maximum shear stress

$\sigma_b=\frac{32M}{\pi d^3}$

$T_e= \frac{\pi}{16} \times \tau \times d^3$

2. **According to maximum normal stress theory**

We have,

σ_b Max = Maximum normal stress

$$\frac{1}{2}[M + \sqrt{M^2 + T^2}] = \frac{\pi}{32} \times \sigma_{max} \times d^3$$

Expression,

$\frac{1}{2}[M + \sqrt{M^2 + T^2}]$ is called as equivalent bending moment and it is denoted by M_e by limiting maximum normal stress equal to allowable bending stress

We have,

$$M_e = \frac{1}{2}[M + \sqrt{M^2 + T^2}] = \frac{\pi}{32} \times \sigma_b \times d^3$$

➢ DESIGH OF SHAFT ON THE BASIS OF RIGIDITY

Torsional Rigidity:

- **Torsional rigidity means the resistance offered against deflection of a shaft**
- **Torsional stiffness of rigidity of a shaft is given by**

$$S=\frac{torque}{torsional\ deflection\ or\ angle\ of\ d\ twist}=\frac{T}{\theta}$$

- **Torsional deflection can be obtained by using basic torsion equation**

$$\frac{T}{J}=\frac{G\theta}{L}$$

θ= Torsional deflection or angle of twist in radians

T= twisting moment or torque in N-mm

J= Polar MI

L= length of shaft in mm

G= modulus of rigidity in N/mm^2

COMPONENT AND COSTING:

SR.NO	COMPONENT	DETAILS	COST
1	Base plate and upper plate	Mild steel	1000
2	Rack and Pinion	M .S pipes Cast Iron	1100
3	Spring	Allow Steel	400
4	DC motor	12v 1200rpm	1000
5	Fabrication	Cutting Welding etc.	600
6	Assembly	Mounting , Fixing , Motor shaft with Pinion , Adjusting Rack And Pinion etc. with final welding	300

5. FABRICATION OF COMPONENTS

5.1 MAIN COMPONETS

Fig 5.1 Base Plate

Fig 5.2 Side Plate Mounted With Bearings

Fig 5.3 Bearings

Fig 5.4 Shaft Mounted Pinion

Fig 5.5 Rack & Pinion

Fig 5.6 Spring

5.2 TABLE OF MATERIALS

Sr. No.	Component	Details
1.	Base and upper plate	Mild Steel
2.	Fixed Cylindrical pipes	MS Pipes
3.	Springs	Alloy Steel Wire
4.	Rack and Pinion	Cast Iron
5.	PMDC Generator	Electrical Equipment
6.	Full Body Frame	Mild steel

Table No.

Fig 5.7 Pmdc Generator

Fig 5.8 Motor Gear

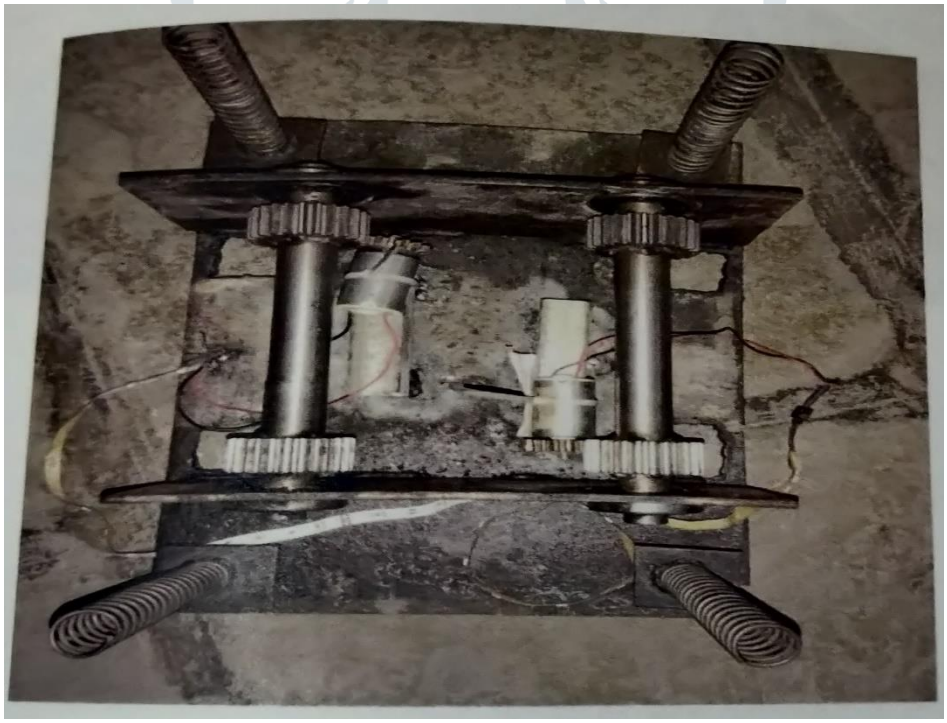


Fig 5.9 Assembly

5.4 PROCESS USED FOR MAKING PROJECTS

GAS CUTTING: We use gas for cutting base and for cutting circular shape inside plate for bearings.

For main assembly base plate needed gas cutting.

Fig 5.10 Gas Cutting

WELDING: We use welding to weld the side plate and base plate in perpendicular direction. To fix the pinion in shaft. To fix bearings in side plate. To fix the support of PMDC and base plate.

Fig 5.11 Welding

TURNING & FACING: We use lathe machines for turning and facing operations. We do turning and facing operations for changing the length and diameter of shaft.

Fig 5.12 Turning And Facing

DRLLING: We use lathe machine for drilling operations to have accurate centre. Hence we perform drilling operations on gears to fix the motors

Fig 5.13 DRILLING

5. DEBURRING We use deburring tool for cleaning and making smooth finish surface of gear used for motor

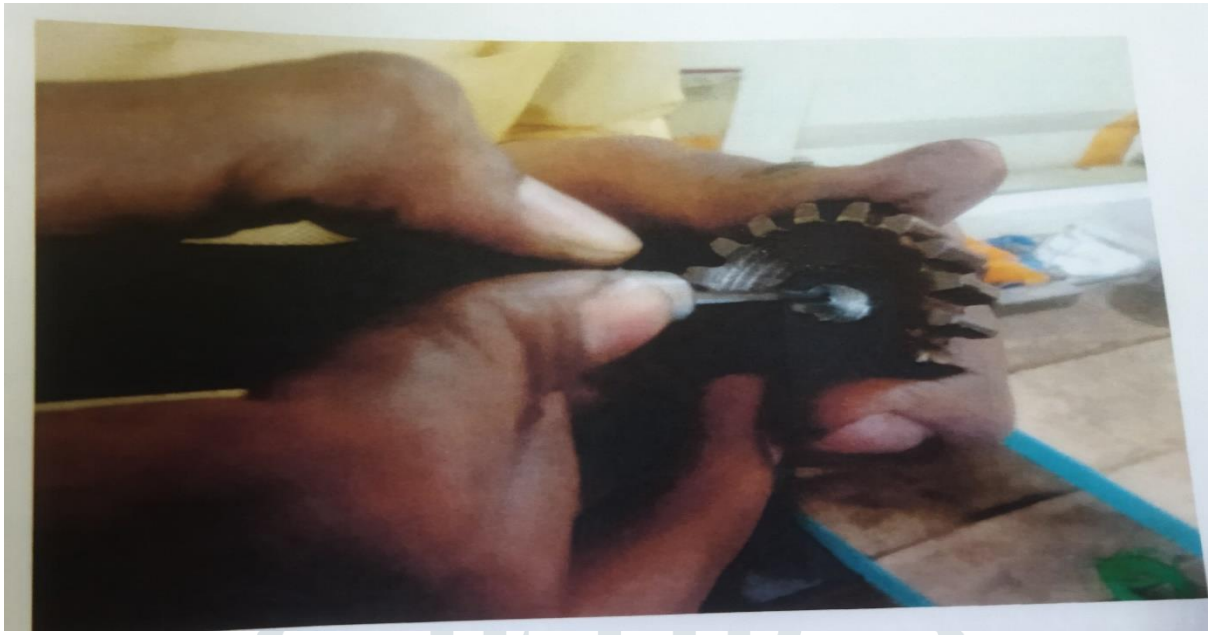


Fig 5.12 Deburring

6. FINISHING We use lathe machine for turning and facing operation. We do turning and facing operations for changing the length and diameter of shaft.

Fig 5.13 Finishing

6. IMPLEMENTATION & MAINTENANCE

6.1 IMPLEMENTATION

For implementation we are going to install this system in weighting scale of the gym in which power will be generated during weight measuring by gym members

- Implementation will be done after the modification of system by combining two methods that are rack and pinion arrangement system and piezoelectric crystals system to get maximum output of the system
- When a person put step on the system power will be generated from the piezoelectric crystals will be stored in the battery simultaneously the rack will move down and make rotation of pinion and hence mechanical energy will be converted in to electrical energy by dc generator and after the modification power will be generated during upward movement of rack by the arrangement of ratchet mechanism inside the pinion and by using two rack and pinion
- At the entry and exit of mall while security check this foot step can be installed and school colleges door step or platform of teachers
- Railway Platforms, Airports, Supermarkets, Metro stations

6.2 MAINTETNCE

Maintenance of anything is very important. Maintenance also refers proper care failing. But our maintenance is related to the foot step power generation system and their each and every part. The system is consists of main following parts:

- Bearings
- Shafts
- Pmdc Generators
- Rack & Pinion
- Spiral Springs

- **BEARINGS:** The rolling-contact bearing is an element of machinery with a very important role, and it dominates the performance of the machine. If one of the bearings breaks or seizes, not only the machine but also the assembly line may stop. If one of the axle bearings of an automobile or a railway car breaks down, a serious accident could occur. To avoid trouble, every bearing manufacturer should make efforts to assure the highest quality for each bearing, and should emphasize that the user carefully handle and maintain all bearings. Every bearing becomes unserviceable in the course of time even if it is installed correctly and operated properly. The raceway surfaces and the rolling contact surfaces of the rolling elements are repeatedly subjected to compressive loads, and the surfaces eventually flake. The life of a rolling-contact bearing is defined as the total number of revolutions (or the number of operating hours at a given constant speed) before flaking occurs. The bearing may also become unserviceable because of seizing, breakage, wear, false brine ling, corrosion, etc. These problems are caused by improper selection or handling of the bearing. The problems are avoidable by correct selection, proper handling and maintenance, and are

distinguished from the fatigue life of the bearing. However, breakdowns due to improper application, bearing design, and maintenance are more frequent than flaking due to rolling fatigue in the field.

- **SHAFTS:** Shafts are round or circle in shape but their shape is irregular due to continuous working they may not rotate properly and it may not transmit power properly. Shaft oiling may Done properly and periodically.

- **PMDC GENERATOR:** The maintenance of a DC motor is conducted monthly. Since the commentator and brush assembly are high wear parts of DC motor extra time should be spent on inspecting, repairing or assembly replacing components. Winding test, Overloading, Visual inspection, Brush and Commentator maintenance, noise and vibration. They are maintaining factor of motor for long life.

- **RACK AND PINION:** Common methods of rack and pinion lubrication include schedule based manual application and automatic lubrication with dedicating greasing. Here, the sets are run until a service schedule indicates that are lubrication is due to signs of trouble appear or adjacent components requiring service justify rack and pinion services. During shutdown servicing the rack and pinion is set and cleaned and then fresh lube oil or greased is applied.

- **SPRINGS:** Springs should maintain properly check the sound of spring. Compression should be neat.

7. GLOBALLY USAGE OF FOOT STEP POWER GENEARTION SYSTEM

7.1 FUTURE SCOPE

The project work “Power generation by foot step” is designed anddeveloped successfully, for the demonstration purpose a proto type module is constructed with lower ratings of devices, &results are found to be satisfactory. As it is a demo module itcannot be used for real applications, but the concept is near to the real working system, to make it more realistic, higher ratingpower generator with suitable gear mechanism is essential to produce more energy. This concept falls under the subject of non-conventional energy resources, out of the many alternative energy resources one dependable source is solar energy, but it is quite costliest affair Therefore alternative cheapest source is to generate electricity from foot step. This technology proven here is the ultimate inexpensive source of all known forms of energy. When it is implemented practically, depending up on the size & traffic flow, each foot step may produce tens of kilowatts power every day, this power can be utilized for many applications. If we are used this project at very busy stairs palace then we produce efficient useful electrical for large purposes. One important advantage of producing energy through this technology is that it does not pollute the environment. Hence these foot step can be altered with this technology, there by all the street lights belongs to a particular city can be energized. Where the rack gear is assembled under the dome and the entire This Project can be

further employed in speed breakers. mechanism is constructed below the road. This concept can also apply at the crowdie areas and output measure per hour, per week or per month.

7.2 INDIA ABOUT FOOTSTEP POWER SYSTEM

India has an energy problem. It currently relies heavily on coal and consumer demand is expected to double by 2040, making its green energy targets look out of reach. Part of the solution could come from harvesting energy from footsteps, say Hariy Aanand and Vinod Kumar Singh from the University of Petroleum and Energy Studies in Dehradun, India.

Their new study, published in the De Gruyter journal *Energy Harvesting and Systems*, shows that Indian attitudes towards power generated through piezoelectric tiles are overwhelmingly positive.Cities like Delhi and Mumbai are famously crowded, especially at railway stations, temples and big commercial buildings. This led researchers to wonder whether piezoelectric tiles, which produce energy through mechanical pressure, could turn this footfall into something useful. Piezoelectric tiles are made using special materials, such as crystals and ceramics, in which electric charge builds up when mechanical stress is applied – such as a foot pressing down Anand and Singh ran a survey in which they explored how people in India view the reliability of their household power and what their attitudes were towards generating their own electricity. They also asked participants how much they walked on average and whether they would consider implementing piezoelectric tiles into their homes.hey found that more than one in five people suffered frequent power-cuts in their area, highlighting the potential benefits of household energy generators such a piezoelectric tiles. Around 40% of respondents said they walked for more than three hours a day, and roughly 70% were willing to produce their own electricity using their feet.

8. CONCLUSION

To generation the power from dynamo by using rack and pinion motion with suspension spring. Design and fabrication the model of foot step power generation. Also to fabricate the model of the same which would able to show the characteristics of the systems and working according to need. Footstep power generation system produces electricity by utilizing energy which is wasted through walking. Mechanism like rack and pinion and piezo-electric material are integrated to produce desired output. Cost of electricity generation solely depends upon the initial cost, maintenance cost and life of system. Maximum advantage of this system can be taken if installed in highly dense area. Since in this project of power generation there is not any fuel input requirement for the generation of electrical power. Thus, it can also be concluded that this mode of power generation system is eco-friendly, i.e., no pollution is caused during the generation of power using this type of model. Hence due to such advantages, this system can be embedded at any of the public places like railway platforms busy foot-paths, malls. Implementing this system, we can easily reduce our dependency on

the conventional sources of energy, thus can be considered beneficial from that point of view. It is able to extend this project by using same arrangement and construct in the footsteps/speed breaker so that increase the power production rate by fixing school and colleges, highways etc. Footstep power generation system produces electricity by utilizing energy which is wasted through walking. Mechanism like rack and pinion and piezo-electric material are integrated to produce desired output. Cost of electricity generation solely depends upon the initial output. Cost of electricity generation solely depends upon the initial cost, maintenance cost and life of system. Maximum advantage of this system can be taken if installed in highly dense area. In all, since the power generation using foot step get its energy requirements from the Non-Conventional source of energy. There is no need of power from the mains and there is less pollution in this source of energy. It is very useful to the places all roads and as well as all kind of foot step which is used to generate the non-conventional energy like electricity. It is able to extend this idea by using same arrangement and construct in the footsteps/speed breaker so that increase the power production rate by fixing school and colleges, highways etc. This can be used for many applications in rural areas where power availability is less or totally absence; as India is a developing country where energy management is a big challenge for huge population. By using this project we can drive both AC as well as DC loads according to the force we apply on the piezo electric sensor. A piezo tile capable of generating 52V has been devised. The weight applied on the tile and corresponding voltage generated is studied and they are found to have linear relation. It is especially suited for implementation in crowded areas. This can be used in street lighting without use of long power lines. It can also be used as charging ports, lighting of pavement side buildings. As a fact only 11% of renewable energy contributes to our primary energy. If this idea is deployed then not we can overcome the energy crises problem by some extent. Moreover, this also contributes to create a healthy global environmental change

9. REFERENCES

- **https://www.youtube.com/watch?v=xliPAZJAVcY**
- **International Journal of Engineering Trends and Application (IJETA)- Volume 5 Issue2,Mar Apr 2018**
- **International Journal of pure and applied Mathematics Volume 116 No.19 2017**
- **International Journal of Engineering Research And Advanced Technology (IJERAT) ISSN: 2454-6135 (Special Volume, 02 Issue.01, May-2016)**
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