Power Generation using Footsteps
Abhishek Suri¹, Amit Panwar², Chetan Prakash Thapliyal³, Mohit⁴, Dr. Kuldeep Panwar⁵
B. Tech Student¹,²,³,⁴, HOD⁵
Department of Mechanical Engineering
Shivalik College of Engineering, Dehradun, India

Abstract:
In this project, we will produce or generate electricity by applying a non-conventional procedure through operating rack & pinion mechanism in footsteps power generation system. Today, Non-conventional methods of energy generation are quite essential, especially in countries like India & China. On-conventional power generation by footsteps require no fuel to operate & give output. This project will use simply rack & pinion drive mechanism. This will convert force energy to electrical energy. The drive mechanism comprises rack & pinion, D. C. generator, Invertor circuit, Rectifier, Battery etc. So far we discussed, more advancement may be possible in future also. Hence we can use this type of assembly in every similar project.

Keywords: Non-conventional, Electricity, Rack and pinion, Generator, Rectifier, Battery, Mechanism

I. INTRODUCTION

In the present scenario, electricity is very essential for the entire world’s population and the demand is still increasing continuously. Today’s modern technologies require very large amount of electricity for many operations. The generation of electricity is the only biggest ever source of pollution in the world. Since, the difference between supply and demand of electricity is increasing, it is important to explore and discover the new alternative resources and methods for energy generation. As we know, walking or running is a common and never ending activity in our daily life. When people are walking, there will always be some loss of energy in the form of vibrations, impact forces etc. This energy can be harnessed and converted in some usable form like electricity. Human always needs and used energy with an accelerating rate today for their developed & to meet future energy requirements. Consequently, many energy sources have been used & exhausted rapidly as a function of time. Therefore, proposal of waste energy utilization from the footsteps of human being is very practical & relevant in densely populated areas lie station, Airport, Temple etc. When piezoelectric technology will be used in floorings, the electricity generated by pressure in captured by sensors & converted into electric charge by piezo transducers & this electricity is stored & used as a power sources.

Need For Non-conventional Energy:

1. After 2020, there will be a lot of fuel scarcity, as the fuel deposits will be depleted. Keeping this factor in major consideration, it is important to find any non-pollutant alternative.
2. The discovery of new sources for low cost electricity generation is very critical as we know that we have only about 25-30 years of oil reserves & 100 years of coal reserves left.
3. We know that mankind will always need energy and with time, man will find other alternatives to meet the energy needs. Today, it’s a liquid form of fuel and coal, tomorrow it can be uranium or thorium. However they are risky to use where there is continuous human activity and energy production is involved. But Uranium and thorium are fossil fuels like coal & petroleum, so it might be possible that they won’t last very long & exhausted very quickly when used as a major fuel. An extremely emphasizing & critical concern is that we have to reduce & minimize our dependency over fossil fuel & other exhaustible resources to meet our energy needs. All we have to use is in exhaustible energy resources for our sustainable and better future. It is also important because the use of fossil fuel pollutes the atmosphere which is very threat full for our future.

II. LITERATURE REVIEW

Power would be generated by footsteps of the mob passing through the floor or stairs. Dynamo with rack & pinion arrangement is installed under the floor or stairs with springs for absorbing vibration force. This will generate power as electric current. This generated electric power will be used for lighting up the street lights or charge the battery, so that we can use it later for other purposes as well. Hence this mechanism gives us faith that our future for harnessing power is dependent on this mechanism as it would be installed at densely populated areas to increase the power production rate.

In this project, one step is enough to generate electricity at this level. As we studied, some other methods for power generation, the steps for power generation from rack and pinion and dynamo mechanism are the following:

- First step is to setup a decent arrangement of electrical system.
- Using this arrangement it is needed to convert mechanical energy into electrical energy.
- When a person walks on stairs the plates press itself in downward direction due to the weight of the person. Consequently, rack & pinion mechanism with dynamo starts working.
- The voltage which is produce by dynamo, is rectified by a rectifier and will get stored in the lead acid battery of 8v. This battery is connected to an invertor circuit.
- This invertor circuit is designed to convert 12v D.C. to 230v A.C. and then this A.C. can be used for charging mobile, laptop and other Charging equipment and also can used for lights by the use of energy saver.
III. MATERIALS & METHODS

The components used in this project are described below:

a. Dynamo
Dynamo is an electrical generator that harvests direct current by the use of a commutator. Dynamo was the electrical generator which is fitted for delivering power to industry and is used as a basic foundation for many other power conversion devices. Some of them include electric motors, D.C. alternator and a rotary convertor. In today scenario, power generation has the simple alternator domination on large scale because of reliability, efficiency and cost reasons. It has a demerits of a mechanical commentator. It converting A.C. to D.C. also by using the power rectification devices, which is effective and economic. Rectification devices like vacuum tube used to get

D.C. power from an A.C. supply, we used:

- Synchronous gear arrangement dynamo
- In this dynamo the generation of energy is produced at very low suspension force.
- The out is going 4v to 5v in both direction.
- When spring in initial & final condition up/down motion.
Dynamo has a stator which provides a fix magnetic field. An armature rotates within stator and commutator is the switch between positive and negative current. It sends current in one direction only.

![Figure 1. Dynamo](image1.png)

ii. Gear Arrangement
We used rack & pinion gear arrangement in this project. Rack and pinion gears are employed where it is required to convert rotary motion into linear motion. Pinion is a small gear mounted on the dynamo shaft. Rack is a long axis gear having teeth along the axis. This gear arrangement used for transmission of speed at different ratio, which is dependent on gear ratio.

![Figure 2. Rack & pinion gear](image2.png)

iii. Rectifier
Rectifier is an electrical devices which is employed for converting alternate current to direct current. Alternate current reverses its direction after each half cycle but direct current is unidirectional, this process is named as rectification. Rectifier has No. of forms like vacuum tube diodes, copper and selenium oxide type rectifier, silicon based semi-conductor switches, silicon controlled rectifier etc. synchronous electro mechanical and motors also used. Rectifier can be employed in many purposes like components of D.C. power supply and high voltage D.C. power transmission system also. Rectification is also used as a power sources for generate D.C. Rectification is also used in gas heating system to find existence of flame, many application of rectifier like supply power to television, radio, computer equipment, needs a constant D.C. current which is supplied by a battery.

![Figure 3. Rectifier](image3.png)

Due to alternating behavior of input sin wave, rectification gives D.C. current comprises current pulses. The output given by the rectifier is smoothened by electronic filter to produce steady D.C. Rectification is the process of clipping the input signals after passing through diode arrangement.

a. Battery
Battery is an element which consist electrochemical cells for storing charge in single unit. Battery convert stored chemical energy into electrical energy. Battery are of two types, one is rechargeable and other is non-rechargeable. Large battery provides stand by operation also.

![Figure 4. Battery](image4.png)

iv. Invertor
Invertor is an electrical part used to convert direct current to alternating current and the constructions of invertor decide the
input voltage, output voltage and frequency. Static inverter has no moving parts for done its conversion process.

So, work done on plate by impact 
=weight of body *distance 
= 50 * 9.81*0.1 J 
=49 J 
So \[ \text{power output} = \frac{\text{work done}}{\text{sec}} \]
=49/60 Watts
=0.81666 Watts

IV. DISCUSSION

India is the 2\textsuperscript{nd} largest densely populated country in the world and may be the first one up to 2021. In India, many places where people are continuously walking in everyday life and these places are always assiduous with people walking, so we can easily find sources such as pressure and vibration to generate electricity from footsteps power generation. We created a mechanical frame for power generation. In this frame or structure we placed a combination of rack and pinion mechanism. By walking on this structure the rack and pinion mechanism start work and generate electricity as output and passing through an electric circuit the charge stored in a battery. We used two different circuit in our project. one we used for direct output and it can use in different place e.g.:- metro station, malls, street lights, airports, temples etc. it is directly glow only when the people passes through stairs. Other mechanism is used for charged battery which we can use as per our requirements.

V. CONCLUSION

Finally concluding our projects in words, FOOT STEPS mechanism for power generation is a non-conventional source of energy. As we discussed before that in our project, possibilities of aggrandize the project is always available by using same arrangement to increase power production rate. in this method of power generation there is no requirement of power from the mains and pollution is inconsequential. It can be used at railway or metro stations, malls, temples airports and as well as all types of footsteps which used to produced non-conventional powers. Because it’s not required any fuel so this project is eco friendly and we can reduce our dependency on conventional sources also.

VI. FUTURE ASPECT

As we discussed, in future it can be extended and can be used at music halls, malls, metro stations, theater, clubs and different places where people are continuously walking, because of this type of continue walking, movement of plate increase and it directly increase power output.

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