



# DESIGN AND FABRICATION OF POWER GENERATING USING RAILROAD TRACK

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## ABSTRACT

In this project we are generating electrical power as non-conventional method by simply running train on the railway track. Non-conventional energy system is very essential at this time to our nation. Non-conventional energy using locomotive path needs no fuel input power to generate the output of the electrical power. The main aim of the concept is to utilize the train crossing time on a railway track. The power is produced by the railway track power generation equipment. Here the train flat is rubbing the roller held on the axle with the gear set which rotates the generator to generate electricity during the roller rolling. The roller will be rolling for the entire length of the train moving on it, and the energy generated will be stored in the battery and also showing the output by glowing a set of LEDs. The stored energy is shown by glowing a set of street lights.

**Keywords:** Locomotive, Power generation, LEDs, Railway track

## INTRODUCTION:

Commuter rail and subway are including railway transportation which play an important role in the economy and quality everyday life. To facilitate policymakers and transportation into making informed decisions on operating transportation systems, it is essential that railway trackside equipment (signal lights, wireless communication monitoring devices, positive train control, etc.) are well maintained and operated. When train moves over the track, the track deflects vertically due to load exerted by the train's bogies. The vertical displacement of the track under the weight of a passing train can connected regenerative devices i.e. a vibration energy harvester. The generated power can be stored into the battery and used to power track side equipments. Railroad energy harvesting is no trivial disturbance. The mechanical motion converter in

our design feature a flywheel integrated along output shaft. Given typical track input, the flywheel is designed for maintain the generator speed close to optimal value.

When a train move over the track, the track deflects in downward direction due to the load exerted by the train's bogies. Also due the deflection of track there is a deflection of timber which is place below the track and therefore the flap is moving in downward direction as the flap is moving in a downward direction the spring which is attached to flap get compress in downward direction and hence rack is also move in downward direction and due to these pinion 2 get rotates and therefore Bigger freewheel rotated because both are mounted on same shaft. As there is a rotation of bigger freewheel then the smaller freewheel is also rotated through chain drive. The freewheel and flywheel are mounted on same shaft therefore the flywheel also rotated. The flywheel is attached to the shaft of the generator so if the flywheel will rotate then there is a rotation shaft generator and power get generated and that power is stored into the battery

- To design and fabricate the railway track mechanism on which the train assembly is moved by their wheels.
- To design and develop roller and gear arrangement which connect to generator through drive and driven gear to produce the electricity.
- To generate electricity to charge the battery, and simultaneously show the power generation during the movement of the train done manually will be rotating the generator at the high speed.

## LITERATURE REVIEW

Singh, Deepak S., Madhawendra K. and V. Pandit Rack and Pinion by Aswathaman. V, Priyadarshini. M, Shakun Srivastava , Ankit Asthana in "Produce electricity by the use of rail road s" and by Ankit Gupta, Kuldeep Chaudhary & B.N Agrawal in "An Experimental study of Generation of Electricity using Rail road ". Slide crank by Noor Fatima and Jiyaul Mustafa in "Production of electricity by the method of road power generation" have been suggested for producing electricity. Electrodynamics based models by Ankita and MeenuBala in "Power generation from rail road " have also been suggested, but are not only expensive to fabricate but involve complicated calculations and can't be used a large scale very easily. Totaram uses a platform plate which is kept inclined on a raised base level to allow vehicles to pass over the raised surface. Electricity is the most varied and widely used form of energy. An energy crisis is any excellent bottleneck (or charge rise) inside the supply of power sources to an economy. Energy disaster can develop due to Overconsumption, Overpopulation, Delay in Commissioning of Power Plants, Wastage of Energy. Sometimes bottlenecks at oil refineries and port centers limit fuel supply. An energy crisis can rise up because of over use of the sources and wastage of energy generated. Another major problem, which is becoming the exiting topic for today is the pollution. Power stations and automobiles are the major pollution producing places. So nonconventional power source is needed to reduce this problem.

The second part of this paper is an efficient use of simple electronics. Many times the street lights are kept ON in broad daylight or when there is no traffic on the road at midnight. Energy can be saved by switching ON the lights whenever and wherever necessary. Half of the lights can be switched OFF when there is no vehicle on the road and all can be switched OFF in broad daylight. LDR's are used to detect day and night and two infrared sensors are used at the two ends of the road to detect any activity the road. The idea was first implemented in South Africa due to their electrical energy crisis, has made them to light up small villages on the highways. The idea of basic physics to convert kinetic energy into electrical energy that goes waste when the vehicle runs over the speed break was used. Since then a lot has been done in this field. Author [1] Aniket Mishra - "Electricity generation from rail road". This paper explains the mechanism of electricity generation from rail roads. The load of the vehicle is acted upon the rail road system is transmitted to the rack and the pinion arrangement. Rack and pinion can convert rotary to linear or from linear to rotary motion. Rack is a linear gear and pinion is a circular gear. Applied force on rack is converted to rotation by pinion. The mechanical force is converted into rotational force.

This mechanism has is more used than other mechanism, due to its high efficiency compared to 58,8 million vehicles were operation on roads in 2002, which better to 72.7 million 7 vehicles in the day 2004 [2]. We can capture this kinetic energy by using flip plate machinery. An electro mechanical entity is permanent on street which is explained in the paper. This element converts reciprocating indicate into revolving motion [3]. The revolving strength is converted into the electrical energy by gear planning and a generator which generates electricity. And this generated electricity be able to be second-hand in countless applications. It contributes significantly to the initiation of electricity and like so it will announcement the stack on authorization plants and for the reason that of this bigger equivalent of electricity will be existing for industries foremost to progressive advance of the nation. Basically, street lightning is one of the important parts. Therefore, the street lamps are relatively simple but with the development of urbanization, the number of streets increases rapidly with high traffic density [4]. At the beginning, lane streets were prohibited by guidebook monitor everyplace a direct change is prearranged in all of the in all of the boulevard street which is called the first generation of the original street lights. After this new method was invented, optical control done by using high pressure sodium lamp in there system. The advantages of LED are likely to replace the traditional street light such as the fluorescent lamp, high pressure sodium lamp, in upcoming years the technology of LED is difficult process that requires a combination of advanced production lines, top quality material and high precision manufacturing process [5]. This paper highlights the efficient system of street light system using IR sensor for controlling and managing. other mechanism. Author [6]: Prathibha Arun "Eco-friendly electricity generation using scintillating piezo" This paper explains that the electricity is produced from the mechanical stress on the crystals due to Piezoelectric effect. The piezoelectric effect exists in two domains, the first is the direct piezoelectric effect and it describes the material's ability to transform mechanical strain into electrical charge. In second form it has the ability to convert an applied electrical potential into mechanical strain. Thus in this paper it generates the energy needed for charging batteries to light the street at night and also for the city consumption of electricity. It is

very encouraging to get good voltage and current at such a low cost at the same time utilising the waste energy. Author [7]: Akashay Tank – “Eco-friendly energy generation through rail road ”. This paper emphasises on the idea that the kinetic energy getting wasted while vehicle moves can be utilised to generate power using special arrangement of spring or piston assembly with water tank. As the vehicle runs on the rail road due to its weight the top portion of the rail road moves downwards hence moving the spring or piston arrangement., due to this force applied on the piston or spring mechanism in the water tank the water comes outside of the tank. This water is passed on rotor blade which rotates the chain belt which inturn rotates the generator. Author 4: Pranay Vijay Ashtankar “Road power generation by flip plate mechanism”. It is on idea that the vertical motion on top of the flip plate is converted into rotational motion for generation of electricity. The flip plate mechanism is very simple. It is based on the principle as in the case of electricity generation in hydroelectric power plant ,thermal power plant, nuclear power plant, geo-thermal energy, wind energy, tidal energy etc. The research about energy recovery from vehicle suspensions began more than ten years ago, first as an auxiliary power source for active suspension control, and later also as energy regenerating devices in their own accord. Zhongjie Li et.al [8] has presented innovative design of regenerative shock absorbers, which helps to reduce impact forces and improves energy harvesting efficiency. It consists of unique mechanism called as mechanical motion rectifier. It converts oscillatory vibration into unidirectional rotation of generator. Shaiju M. B [9] described partially use energy stored in the springs for compressed air generation through a single acting positive displacement pump. Zhang Jin Qui et.al [10] reviewed that conventional vehicle suspension dissipates mechanical vibration energy in the form of heat which waste considerable energy. Y. Zhang et.al [11] presented design; modeling and performance study of novel hydraulic pumping regenerative suspension on an energy recovery unit and a hydraulic actuator. It can harvest energy from suspension vibration; in addition, variable damping force can be achieved by controlling electrical load of energy recovery unit. Martande S. et.al [12] presented that Shock absorbers are a critical part of a suspension system, connecting the vehicle to its wheels. The need for dampers arises because of the roll and pitches associated with vehicle and from the roughness of roads. Thus focuses on to develop new correlated methodologies that will allow engineers to design components of shock absorbers by using FEM based tools. Bhoite R. et.al [13] describe that regenerative shock absorber is a type of suspension system that converts parasitic intermittent linear motion and vibration into useful energy, such as electricity. This energy was used to charge the battery and this stored energy was used for different vehicle accessories like power window, lights and air conditioner etc. This energy was applicable in most of the military vehicles, race automobile and maximum suspension systems. Sethu P S et.al [14] described regenerative braking systems become increasingly popular, recovering energy that would otherwise be lost through braking. The system was designed in SOLIDWORKS. When used in an electric vehicle or hybrid electric vehicle the electricity generated by the shock absorber can be diverted to its power train to increase battery life. Analysis was performed in CFD and values are determined. Suda Y. et.al [15] studied consumption of fuel has been an important consideration since the beginning of the transportation facility. The system design was done considering the actual measured data on a go ods vehicle at various road and traffic conditions in city, highway and offroad for both laden and un-laden applications. Lei Zuo

et al [16] presented a comprehensive assessment of the power that was available for harvesting in the vehicle suspension system. The results suggest that road roughness, tire stiffness and vehicle driving speed have great influence to the harvesting power potential, where the suspension stiffness, absorber damping, vehicle masses. System for Rail Road Safety Based On Running Vehicle". (12 November 2014). [17] Ajith Kumar, "Rail Road Vehicle with Energy Regeneration". (12 January 2006). [18] Y. Lethwala, R. Jain, A. Akotkar, "Generation of Electrical Energy from Railway Track", SSRG International Journal of Mechanical Engineering (SSRG - IJME) 10 – October 2018 [19] R.J. Hill. Sch. of Electronics & Electrical Engineering, Bath University, UK, "Electric railway traction" (6 August 2002). [20] Zhongping Yang, Xianjin Huang, "Traction technology for Chinese railways" (21-24 June 2010). [21] Ajith Kuttannair Kumar, "Multimode hybrid energy railway vehicle system and method" (7 October 2008). [22] Xin Yang & Xiang Li, "A Cooperative Scheduling Model for Timetable Optimization in Subway Systems" (10 October 2012).

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## EXPERIMENTATION

**RACK AND PINION GEARS** The rack and pinion used to convert between rotary and translator motion. The rack is the flat toothed part, while the pinion is the gear. Rack and pinion can convert rotary to linear or from linear to rotary motion.

**BALL BEARINGS** A roller-element bearing is a bearing which carries a load by placing round elements between the two pieces. The relative motion of the pieces causes the round elements to roll(tumble) with little sliding. They reduce the friction and transmit the motion effectively

**SPUR GEAR** It is a positive power transmission device with definite velocity ratio. It is preferred for adjusting some linear misalignment. It should have high wear and tear, shock-absorbing capacity.

**MECHANICAL ENERGY** It is a device, which converts mechanical energy into electrical energy. The generator uses rotating coils of wire and magnetic fields to convert mechanical rotation into a pulsing direct electric current through "Faraday" s law of electromagnetic induction".

**SHAFTS** It is a rotating element, which is used to transmit power from one place to another place. It supports the rotating elements like gears and sprockets. It must have high torsional rigidity and lateral rigidity. **3.6 SPRINGS** It is defined as an elastic body whose function is to distort when loaded and to recover its original shape when the load is removed. It cushions, absorbs or controls energy either due to shocks or due to vibrations.

**ELECTRIC DYNAMO** It is a device, which converts mechanical energy into electrical energy. The dynamo uses rotating coils of wire and magnetic fields to convert mechanical rotation into a pulsing direct electric current through “faraday’s law of electromagnetic induction”. A dynamo machine consists of a stationary structure, called stator, which provides a constant magnetic field, and a set of rotating winding called the armature which turns within that field. as shown in the figure below 3.8 Fabrication model construction The fabrication of project is shown in below figure 3.13

Roller motor 12v 1000rpm Sproket we found difficulty in testing this setup in an automobile, So that we made a separate setup consists of sproket and an alternator coupled to it. The sproket is designed to store certain energy and the experiment is done based on how much input current should be given to nullify the energy to stop the sproket.

The results were theoretically compared with other application of automobile.

Energy stored in a sproket

Weight of the sproket = 5kg, Velocity of rotation =  $\pi DN/60$ , Speed of rotation = 60 RPM Diameter of sproket = 20cm = 0.2m, Energy stored =  $mv^2 = 10 \times 11.5132 = 0.662$  KJ

**CONSTRUCTION DETAILS:** The various machine elements used

**SPRING:** A spring is defined as an elastic member, whose main function is to select under the action of load and recover it original shape when the load is removed.

**Electric Dynamo:** This electricity generating device that produces principle of electromagnetic induction. The coils of conductor wires are rotated in magnetic fields which cause a potential difference across its two ends by induction Electricity is produced when a conductor goes through a caring field. Energy is the primary need for survival of all organisms in the universe. Everything what happens in the surrounding is the expression of flow of energy in one of the forms. But in this fast moving world, population is increasing day by day and the conventional energy sources are lessening. The extensive usage of energy has resulted in an energy crisis over the few years. Therefore to overcome this problem we need to implement the techniques of optimal utilization of conventional sources for conservation of energy. This paper includes how to utilize the energy which is wasted when the vehicles passes over a rail road . Lots of energy is generated when vehicle passes over it. We can tap the energy generated and produce power by using the rail road as power generating unit. The kinetic energy of the moving vehicles can be converted into mechanical energy of the shaft through rack and pinion mechanism. Then, this mechanical energy will be converted to electrical energy using generator which will be saved with the use of a battery.

**METHOD SELECTED – RACK AND PINION MECHANISM** Electricity is a basic part of nature and it is one of our most widely used forms of energy. A large amount of energy is wasted at the rail road s through the dissipation of heat and also through friction, every time a vehicle passes over it. In this research, a roller is fitted in between a rail road and some kind of a grip is provided on the rail road so that when a vehicle passes over rail road it gets displaced in vertically downward direction distance 7 cm. The rack which is connected to the rail road also moves down simultaneously with same distance 7 cm. The rack is in mesh with the pinion which is coupled with the shaft of gear which have 72 teeth which then meshed with pinion with 32 teeth which is coupled with the generator motor. This whole mechanism converts linear

displacement in rotary motion. Hence shaft of generator rotates which generates current proportional to the number of revolutions of pinion. This produced current is stored in battery for future use. Later the rack gets displaced to the original position due to spring mechanism. **CONCEPT**

This project explains the mechanism of electricity generation from rail roads. The vehicle load acted upon the rail road system is transmitted to rack and pinion arrangements. Then, reciprocating motion of the speed-breaker is converted into rotary motion using the rack and pinion arrangement where the axis of the pinion is coupled with the sprocket arrangement. The sprocket arrangement is made of two sprockets. One of the sprocket is larger in dimension than the other sprocket. Both the sprockets are connected with chain which transmits the power from the larger sprocket to the smaller sprocket. As the power is transmitted from the larger sprocket to the smaller sprocket, the speed that is available at the larger sprocket is relatively multiplied at the rotation of the smaller sprocket. The axis of the smaller sprocket is coupled to a gear arrangement. Here we have two gears with different dimensions. The gear wheel with the larger diameter is coupled to the axis of the smaller sprocket. Hence, the speed that has been increased at the smaller sprocket wheel is passed on to this gear wheel of larger diameter. The smaller gear is coupled to the larger gear. Therefore, as the larger gear rotates it increases the speed of the smaller gear which is following the larger gear and multiplies the speed to more intensity. Though the speed due to the rotary motion achieved at the larger sprocket wheel is less, as the power is transmitted to gears, the final speed achieved is high. This speed is sufficient to rotate the rotor of a generator and is fed into the rotor of a generator. The rotor which rotates 17 within a static magnetic stator cuts the magnetic flux surrounding it, thus producing the electric motive force (emf). This generated emf is then sent to an inverter, where the generated emf is regulated. This regulated emf is now sent to the storage battery where it is stored during the day time and can be used in night time for providing power to street lights.

#### MODIFICATIONS

This project attempts to show how energy can be tapped and used at a commonly used system, the road rail roads. The number of vehicles passing over the rail road in roads is increasing day by day. A large amount of energy is wasted at the rail roads through the dissipation of heat and also through friction, every time a vehicle passes over it. There is great possibility of tapping this energy and generating power by making the speed-breaker as a power generation unit. The generated power can be used for the lamps, near the rail roads. The present work an attempt has been made to fabricate a bump, which can utilize the kinetic energy of vehicles in power generation. This type of bump is best suited for the places where the rail road is a necessity. The places like Toll bridges or on vehicle parking stands are best for its utilization. The work also discusses the shortcomings of existing methods and the ways it is countered by this method. The DC motor is the motor which converts the direct current into the mechanical work. It works on the principle of Lorentz Law, which states that “the current carrying conductor placed in a magnetic and electric field experience a force”. And that force is the Lorentz force.

## TYPES OF DC MOTOR:

There are 4 major types of DC motor and they are, i) Series DC Motor ii) Permanent Magnet DC Motor iii) Shunt/Parallel DC Motor iv) Compound DC Motors

**INSIGHT – HOW GEARED DC MOTOR WORKS:** Geared DC motors can be defined as an extension of DC motor which already had its Insight details demystified here. A geared DC Motor has a gear assembly attached to the motor. The speed of motor is counted in terms of rotations of the shaft per minute and is termed as RPM. The gear assembly helps in increasing the torque and reducing the speed. Using the correct 18 combination of gears in a gear motor, its speed can be reduced to any desirable figure. This concept where gears reduce the speed of the vehicle but increase its torque is known as gear reduction. This Insight will explore all the minor and major details that make the gear head and hence the working of geared DC motor.

**EXTERNAL STRUCTURE:** At the first sight, the external structure of a DC geared motor looks as a straight expansion over the simple. The lateral view of the motor shows the outer protrudes of the gear head. A nut is placed near the shaft which helps in mounting the motor to the other parts of the assembly.

**Lateral View of Parts of Moto 19** The cap that accommodates the gear has an arc cut from its side to avoid frictional resistance forces with the bottom gear assembly.

**Shape of Cap that Accommodates Gear** The bottom houses the gear mechanism which is connected to the DC motor through screws. This mechanism rotates the gear at the top which is connected to the rotating shaft.

**BOTTOM GEAR ASSEMBLY** A closer look at the bottom gear assembly shows the structure and connection with other gears

**WORKING OF THE DC GEARED MOTOR:** The DC motor works over a fair range of voltage. The higher the input voltage more is the RPM (rotations per minute) of the motor. For example, if the motor works in the range of 6- 12V, it will have the least RPM at 6V and maximum at 12 V. In terms of voltage, we can put the equation as:  $RPM = K_1 \times V$ , where,  $K_1 =$  induced voltage constant  $V =$  voltage applied

**Functional Mechanism of Gear Assembly** The working of the gears is very interesting to know. It can be explained by the principle of conservation of angular momentum. The gear having smaller radius will cover more RPM than the one with larger radius. However, the larger gear will give more torque to the smaller gear than vice versa. The comparison of angular velocity between input gear (the one that transfers energy) to output gear gives the gear ratio. When multiple gears are connected together, conservation of energy is also followed. The direction in which the other gear rotates is always the opposite of the gear adjacent to it. In any DC motor, RPM and torque are inversely proportional. Hence the gear having more torque will provide a lesser RPM and converse. In a geared DC motor, the concept of pulse width modulation is applied. The equations detailing the working and torque transfer of gears

The project gear assembly placed in gear head as shown in the figure below **Figure 3.19: Gear Assembly Placed in Gear Head** In a geared DC motor, the gear connecting the motor and the gear head is quite small, hence it transfers more speed to the larger teeth part of the gear head and makes it rotate. The larger part of the gear further turns the smaller duplex part. The small duplex part receives the torque but not the speed from its predecessor which it transfers to larger part



of other gear and so on. The third gear's duplex part has more teeth than others and hence it transfers more torque to the gear that is connected to the shaft.

**CONSTRUCTION OF DC MOTOR:** Before understanding the working of DC motor first, we have to know about their construction. There are two main parts of the DC motor. → Armature → Stator The rotating part is the armature and the Stator is their stationary part.

**WORKING PRINCIPLE OF DC MOTOR:** A DC motor is an electrical machine which converts electrical energy into mechanical energy. The basic working principle of the DC motor is that whenever a current carrying conductor places in the magnetic field, it experiences a mechanical force. Fleming's left-hand rule and its magnitude decide the direction of this force. The Commutator is made segmented to achieve unidirectional torque. Otherwise, the direction of force would have reversed every time when the direction of movement of the conductor is reversed in the magnetic field. This is how a DC motor works!

**BACK- EMF OF DC MOTOR:** According to the fundamental law of nature, no energy conversion is possible until there is something to oppose the conversion. In case of generators, magnetic drag provides this opposition, but in the case of dc motors, there is back emf. Presence of the back emf makes a dc motor 'self-regulating'. When the armature of a motor is rotating, the conductors are also cutting the magnetic flux lines and hence according to the Faraday's law of electromagnetic induction, an emf induces in the armature conductors. The direction of this induced emf is such that it opposes the armature current ( $I_a$ ). The circuit diagram below illustrates the direction of the back emf and armature current. Significance of Back-EMF Magnitude of back emf is directly proportional to speed of the motor. Consider the load on a dc motor is suddenly reduced. In this case, required torque will be small as compared to the current torque. Speed of the motor will start increasing due to the excess torque. Hence, being proportional to the speed, magnitude of the back emf will also increase. With increasing back emf armature current will start decreasing. Torque being proportional to the armature current, it will also decrease until it becomes sufficient for the load. Thus, speed of the motor will regulate. On the other hand, if a dc motor is suddenly loaded, the load will cause decrease in the speed. Due to decrease in speed, back emf will also decrease which allows more armature current. Due to increase in armature current the torque will increase to fulfil the load requirement. The conductors located on the other pole are subjected to a force of the same intensity but in the opposite direction. These two opposing forces create a torque that causes the motor armature to rotate. The project is shown in Fig 1.



1.a Frame cutting pipes



1.b Single pipes



1.c Pipes Cutting



1.d Welding frame



1.e Welding frame



1.f 12mm Shaft bush



1.g Racks



1.h Racks



1.i Inch spur gear



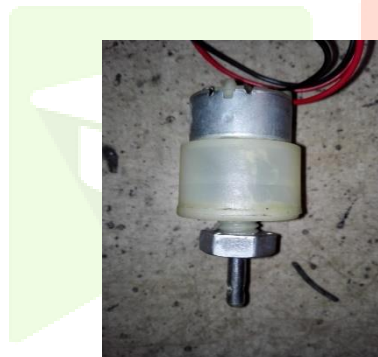
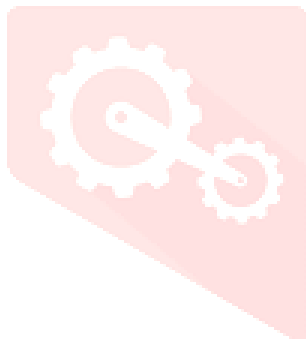
1.j Railway Rack



1.k Railway rack



1.l Railway rack



1.m Roller motor 12v 1000rpm

## RESULT AND DISCUSSION

- The fabrication of the system for generating power using railroad track was successful and resulted in a working prototype. The system utilized the motion of passing trains to generate electricity through electromagnetic induction.
- The prototype was tested and produced a consistent and stable supply of electricity. The power output was found to be directly proportional to the speed of the passing train. The amount of power generated was also affected by factors such as the weight and length of the train.
- The system was designed to be modular, allowing for easy installation and scalability. Multiple units could be installed along the railroad track to generate more power.

- One of the key advantages of the system is its cost-effectiveness. Unlike traditional power generation methods, the system does not require any fuel or maintenance, resulting in lower operating costs.
- However, there are also limitations to the system. It requires a high volume of train traffic to generate significant amounts of power. Therefore, it may not be suitable for areas with low train traffic. Additionally, the system is affected by weather conditions, such as heavy rain or snow, which can reduce its efficiency.
- The successful fabrication of the system demonstrates the potential for sustainable energy generation through innovative solutions. Further research can be done to optimize the efficiency of the system and explore potential applications in other transportation systems.

#### POWER CALCULATION:

While implementing, Load applied by one wheel of the train is 8.125 tons on a load train.

Finally, the load on the beam is 16.25 tons. Height of the beam track fitted 15cm.

Weight of the body =  $16250 \times 9.81 = 159412.5 \text{ N}$

Distance = 15cm. Power = work done/second =  $(159412.5 \times 0.15)/60 = 398.53$

Our project, Load is applied manually 5-10 kg. Height of the beam fitted 2cm. Since manual load weight is same as applied load 1 kg (approx.) Weight of the body =  $10 \times 9.81 = 98.1 \text{ N}$  Distance = 2cm. Power =  $(98.1 \times 0.02)/60 = 0.327 \text{ W}$ .

However, power generation from the project is very less but it will not create any pollution and environmental hazards. Our project is a purely eco-friendly one and with the help of our project it is possible to green energy

ADVANTAGES i. Pollution free power generation. ii. No fuel storage is required. iii. Energy available all year around. iv. Maximum utilization of energy.

APPLICATIONS Power generation using flip plate mechanism can be used in most of the places such as:  
a. This technique can be used in all highways. b. Street Lights. c. Road Signals. d. Signal boards on the roads. e. Lighting of the bus stops. f. Lighting of the check post on the highways etc.

#### CONCLUSION

- The system for generating power using railroad track was successfully fabricated and tested.
- The system utilized the motion of passing trains to generate electricity by means of electromagnetic induction.
- The system was found to be a cost-effective and efficient way of generating power, particularly in areas with high train traffic.
- The system has the potential to reduce the reliance on traditional sources of energy and promote sustainable energy generation.
- The fabrication process involved the use of high-quality materials and adherence to safety protocols to ensure the safety and reliability of the system.
- The system was found to be scalable, meaning it could be implemented on a larger scale to generate more power.

- vii. The fabrication of the system was a collaborative effort involving engineers, technicians, and other stakeholders.
- viii. The successful fabrication of the system highlights the importance of innovation and the potential for creative solutions to address energy challenges.
- ix. Future research could focus on optimizing the efficiency of the system and exploring its potential applications in other transportation systems.
- x. Overall, the fabrication of the system for generating power using railroad track represents a significant step towards promoting sustainable energy generation and reducing the dependence on traditional sources of energy

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