**PRODUCTION OF ELECTRICITY BY FAST MOVING VEHICLES (ESPECIALLY TRAINS)**

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**Abstract**— In this project we attempt to explain an innovative and new method of generating energy in a fast moving vehicle (especially train). The wind energy produced by trains is wasted and can be utilized for generation of electricity. Due to the movement of train, the wind will flow in the opposite direction of train which will collide on the blades of the turbine, which will further spin the shaft connected to it. The shaft is further connected to the alternator. Thus kinetic energy of the wind which is created is used to generate electricity. The second part of our project is to generate electricity by utilizing vibrations created by the movement of the train. This vibrations will produce electricity due to piezos placed beneath the tracks and thus energy will be created.

**Keywords**— Innovative, New Method Fast Moving Vehicles, Especially Trains, Kinetic Energy, Piezos.

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**I. INTRODUCTION**

Energy resources in our world are depleting quickly, hence it is indispensable to find new ways to generate energy which are self-sustaining, easily manageable, and available freely and easily. Wind energy is used widely and most prominently to generate electricity through wind turbines, and it has been proved to be one of the most reliable renewable energy source across the world. However, there are very few regions in the world that experience windy conditions throughout a year so this method becomes restricted to few regions only. This concept of wind is implemented in this project, but with a different idea. Locomotive when in motion produce wind currents due to the disturbance (vibrations) in the air caused by the locomotive let it be train or car. We are also going to use the principle of piezoelectric which converts the mechanical vibrations into equivalent electrical energy which can be stored in batteries and used whenever and wherever required.

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**II. FIELD OF INNOVATION**

This project explains about generating energy in a fast moving vehicle (especially train) by various sources. Two methods are used to produce energy one is from wind, and other by utilizing vibrations created by train (piezo electric effect).

**A. Wind**

In the prior art, the energy is generated from fixed wind mills. But the wind is not available at all places also the force of the wind is sometimes not adequate and also due to varying direction of wind it becomes difficult for generation. Therefore, we have attempted to use the wind which is created due to the movement of trains, which is available throughout the year at various places. In our project the wind turbine is connected in parallel to the bogey of the train. One inlet and outlet will be provided alongside of the turbine for the proper ventilation of air without producing disturbance or difficulty in the rotation of the turbine. The shaft is then connected to the alternator. Due to the motion of the train the air flowing in the opposite side of the train will strike on the blade of the turbine which will lead to rotation of the turbine. As it is coupled to the alternator through the shaft the electricity will be produced by the rotation of turbine.

**B. Piezos**

A railway track undergoes huge mechanical vibrations when a train passes. The weight of a train is very large almost in tons. The general weight of the train can be considered as 80 tons then the mechanical vibrations produced are high. So, if we can convert these mechanical vibrations into electrical energy. Here we can use piezoelectric crystals which will be able to convert these mechanical vibrations into equivalent electrical energy. We are going to implement the principle of piezoelectric which will convert the mechanical vibrations into electrical energy, which can be further stored in batteries and can be used further. As the vibrations produced on the tracks are very high and hence it is difficult to convert these mechanical vibrations into electrical energy. Thus we are trying to convert the vibrations which we get on the sleepers beneath the railway tracks which are quite less than that produced on the tracks.

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**III. USE OF WIND TURBINE IN THE PROJECT**

The wind turbine which is used in the project is used in a new and very innovative manner, the turbines will not rotate due to the natural movement of air. Instead wind turbines will rotate due to the wind currents which are created due to the movement of train. The wind currents which will be created due to
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motion of train would be directed towards the blades of the turbines. The turbines would rotate as the air strikes the blades. This turbine is further connected to a shaft which is then further connected to a generator where the electricity is generated and can be used.

The wind turbine is connected in parallel to the bogeys of the train. The bogeys of the train will be modified or restructured, the turbines would be placed on the outermost surface of the bogeys, taking into consideration the aerodynamics of the bogeys. There will be an opening provided for the air to pass (an inlet) then inside there is a turbine placed in it and the air will come out through an outlet provided. This mechanism of inlet turbine and outlet is provided to keep the balance of train and for free movement of turbine.

IV. USE OF PIEZOS IN PROJECT

A railway track undergoes large mechanical vibrations when a train passes through. The weight of a train (per bogey) is around 40 – 240 tons depending on the type of the train. Assuming that the general weight of the train will be around 80 tons then there will be no doubt that the mechanical vibrations produced are high. So, if we try to convert these mechanical vibrations into electrical energy, a lot of energy can be created. Here we will use piezoelectric crystals which will convert these mechanical vibrations to electrical energy. But the stress directly on the tracks can be very large to use by the piezoelectric crystals. The piezo materials will be placed beneath the sleepers of the track as if we place piezos beneath the tracks the pressure which will be created can be high and the piezos may not take this huge amount of pressure. So we try place the piezos beneath the sleepers of the tracks. To get optimum amount of energy. In this we are trying to generate electricity by using the vibrations on the sleepers which are beneath the railway tracks. The electricity can be stored in batteries or storage hub and can be utilized as and when required. Large amount of power is wasted on railway stations. The power which will be generated can be used at railway stations thereby saving energy, eliminating transmission losses and saving money as the power is now generated at a cheaper rate. This power generated by this concept can also be used at farms near railway tracks. The power thus generated is pollution free.

The weight of train is in certain tons almost varying from 60-100 tons or can be more which depends upon the type of train, and thus vibrations which are created may also vary due to weight of the train and also due to the speed of the train.

The Green Optimistic Industry in Israel.

The flat plate piezos will be used for this purpose.

V. BLOCK DIAGRAM OF WIND TURBINE

Input-
We are using the wind energy to generate electricity, the flow of air which is created due to the movement of train is used.
Turbine-
A wind turbine is a device that converts kinetic energy to electrical power. As the wind currents created due to disturbance in air molecules because of movement of train, will strike on the turbine and turbine will rotate. The turbine which are used are bidirectional wind turbines. Further the turbine is connected to the alternator through shaft where we will get the electrical output.

Alternator-
An alternator is a generator that converts mechanical energy to electrical energy in the form of alternating current.

Rectifier-
The process is known as rectification. A rectifier is a circuit that is used for converting AC supply into unidirectional DC supply. The electrical energy which is generated from an alternator in the form of ac current is then passed through the rectifier for rectification.

Grid-
The term grid refers to a network, Grid may also be used to refer to an entire electrical network. In our project the grid which we are implying are the grid or the electrification system in the train such as the fans and tube lights inside the train or coaches of the train.

Battery-
The energy from the rectifier will supplied to the grid and the extra energy which is remaining will be stored in the batteries.

VI. BLOCK DIAGRAM OF PIEZOS

Pressure or Vibrations $\rightarrow$ Piezoelectric Sensor $\rightarrow$ Battery

Pressure or vibrations-
As the moving trains creates lot of vibration or pressure on the track. The pressure or vibrations created by the motion of the trains on tracks is taken as input for the piezoelectric sensors.

Piezoelectric sensors-
A piezoelectric sensor is a device that uses the piezoelectric effect, to measure changes in pressure, acceleration, temperature, strain, or force by converting them to an electrical charge. In our project these piezoelectric sensors are placed beneath the sleepers of the track to get the optimum amount of pressure.

Battery-
The electricity which is generated by piezos are stored in the battery and can be utilize for various purposes in and around the platform or station. We can have a storage hub near the station for use of electricity for various purposes. This hub can be placed near the station or near the tracks where the piezos are placed.

VII. ADVANTAGES

There are almost 14,300 trains operating daily on 67,000 route kilometers of railway in India. This technique would be capable of producing power in almost 100,000 to 200,000 megawatt (MW) of power in India alone. Even small turbines require a fast wind to operate. Small turbines can be used to generate more power and can be used for commercial applications and this wind can be obtained by movement of vehicle. By utilizing the weight of train we can produce electricity. Which can add up to further more production of power and utilizing it as per need.

CONCLUSION

Therefore there is an urgent need for transition from non-renewable energy systems to one based on renewable resources to decrease dependency on depleting resources. Thus an alternate form of renewable energy will be provided by this project, which will help us solve many energy problems. We can also utilize the wind energy which is going in vain and can be used for electrification of train. We can also generate energy from vibrations created by train on sleepers beneath the railway tracks by using piezoelectric crystals. The energy requirement can be fulfilled by this method. The energy which will be created will be at cheaper cost and pollution free.

REFERENCES


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