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Generation of Electricity using Wind Energy Produced due to the Motion of Trains

Shivank Joshi[1*] Aatmic Mathur[1] Arpit Jain[1] Shashank Gupta[1] Nishyant Jani[1] Bhushan Chhabra[2]
1.Thakur College of Engineering and Technology, University of Mumbai, Mumbai, India
2.Sikkim Manipal University Of Distant Education, Mumbai, India
*E-mail of the corresponding author spar_joshi@yahoo.co.in

Abstract
The aim of this work is to generate free electricity for general use, through wind energy which is created due to the motion of trains. This is achieved by using a low friction ball bearing sensitive dynamo (22V, 100mA) with adjustments such that it can support a fan and using it practically as a small wind turbine. By creating a closely developed arrangements of many such dynamos around tracks, supported by feeding the outputs of all these dynamos systematically to a central electrical transmission line we can feed all the energy produced to a battery for further use.
Keywords: Energy, Free, Electricity, Wind, Trains

1. Introduction
Energy resources in our modern fast paced world are fast depleting, hence it is indispensible that we find new ways of generating energy which is both self sustaining as well as easily manageable. Wind energy has long been used to generate electricity through wind turbines, and has proved to be one of the most reliable renewable source of energy in many countries of the world. However since there are very few regions in the world that experience windy conditions throughout a year, this method becomes restricted to only a few chosen regions. The same concept is used in this project, but with a different perspective .Any locomotive be it train, car or even a bicycle when in motion produces wind currents along the direction of their motion. This happens because of the disturbance in air produced by the moving body of the vehicle. This wind if tapped efficiently over a duration of time can lead to production of substantial amount of power.

2. Method of Operation
2.1 Basic principle
The DC dynamos (22V, 100 mA) are installed on supporting poles adjacent to the tracks. All dynamos work on the principle of converting mechanical energy into electrical energy. Owing to the small size of the specifically designed low friction ball bearing dynamo (usually 5 to 10 inch in length) a number of such dynamos can be accommodated on the supporting poles depending on the height of the poles. All these dynamos act as miniature wind turbines, which have modified fans attached to their rotary end. As a result of very less friction at the rotary joints during motion of the fans, these dynamos are highly sensitive and can effectively operate even at low wind levels. Thus the fans of the dynamos get activated as soon as any train passes by the supporting poles, and are efficiently able to tap the oncoming wind flow by converting the mechanical motion of the fans into electricity which is obtained at their output terminals. Thus free electricity is created using the age old concept but by modifying its application.
2.2 Installation process
The primary feature of the installation process is to provide all the small turbines maximum chances of harnessing electricity by installing them in such a manner that they are exposed to the most suitable windy conditions around the railway tracks. Hence all the turbines are installed on the installation poles with their fans facing the oncoming trains to tap the air current coming along with the trains. This concept requires complete analysis of the routing schedule of all trains within a railway system. Most countries follow the alternate track routing system in which every alternate adjacent tracks carry trains going in opposite direction. Therefore in generalized sense the direction of alignment of the fans will be reversed in each successive adjacent tracks depending upon the direction of oncoming trains.
2.3 Means of tapping
Our research in Mumbai for western railways, involved measurements for voltage and current produced by a single dynamo due to the motion of single train. After a detailed study of the readings obtained from over 60 fast and slow trains we came to a conclusion that on an average a single turbine is capable of generating (6-7Volts), (1.8 -2.5mA) for a fast train and (5-6V), (0.5-1.5mA) for a slow train. The energy thus produced from all such

turbines have to be stored efficiently for future use. Since this project emphasizes on cost effectiveness, simplest and most cheapest means of storage such as DC rechargeable battery is used to store the electricity produced.
The time taken to recharge any battery is dependent on the voltage and current applied. If the recharge current or voltage is too low, then the charging time will be relatively long; if the current or voltage is high then the charging time will be short. Battery of basically any specification can be used, but keeping cost as well as efficiency in mind any battery around the range of (34V-7A) will fit the requirements.

To charge any battery, it must be supplied with an initial trigger voltage slightly higher than its specification and a current of at least 10% of its initial specified value. Therefore for the (34V, 7A) battery used in this project the minimum trigger requirements to charge the battery are roughly (36V) and (700mA). These minimums can be effectively met by developing an integrated parallel and series network of all the turbine outputs. Firstly to achieve the minimum voltage requirements, 6 turbine outputs are connected in series network, hence considering an average 6 volts as the output of each respective turbine the resultant summation of all the respective 6 outputs will be (36V). The current in all these series network of 6 turbines each will be the original current which is an average of 1.25mA.

To achieve the minimum current requirements, all these series networks of 6 turbines each are now connected in parallel to each other so that currents(1.25mA) in each individual series set gets added to each other. Thus the series sets of 6 turbines each are concatenated one by one in parallel till the minimum current requirement of (700mA) is met. All these complex networks of connections are then fed to a centralized underground electrical transmission line, which is connected to the concerned battery. Taking the precise calculations, the total number of turbines which will be hence required to charge a single (34V-7A) battery would be (3360) turbines. Though the number looks staggering, this can easily be implemented in all railway systems as the distances they cover are enormous, compared to the small size of a single turbine (which is so small that it can easily be accommodated in a palm).

3. Efficiency and Application

Any project or research is unsubstantial unless it is efficient and can be applied successfully for general use. Therefore it is of utmost importance that the best suitable and compatible environments be chosen for any research, especially if the research is governed by external factors. In this project the availability of wind energy for generation of electricity through small turbines is a key factor which decides the efficiency of the entire project. Thus for this project, railways where rail traffic is high and the number of operating trains are more, is much likely to provide positive results since more the frequency of trains more will be the generation of air currents due to them.

Hence railway networks such as metros of big cities like Mumbai, New York, London, Berlin, New Delhi etc can be effectively used for implementation of this project. Most big cities have many metro lines operating within them. Also these metropolitan hubs have myriads of stations to serve people living in all localities.

To truly understand the potential of this project if implemented on a grand scale in a big city, let’s take an example of Mumbai where we actually conducted our research. Western Railway of Mumbai extends over 60 Km and comprises of 28 stations. This section handles about 328 trains of which 146 are fast trains and 182 are slow. After a rigorous survey and measurements of approximately 60 fast and slow trains, our research came to a conclusion that on an average a single turbine is capable of generating (6-7 Volts),(1.8 -2.5mA) for a fast train and (2- 5Volts),(0.5-1.5mA) for a slow train.

In order to charge the battery we have already seen that we require around 3360 turbines. An average stretch of distance between any two stations in Western Railways in Mumbai is around 1.5- 2 km. These 3360 turbines required to charge the battery can be easily installed within this stretch on installation poles. Because of the intermittent nature of the charging of the battery depending on the frequencies of oncoming trains, the battery will take a prolonged amount of time to get completely charged which can be approximately taken to be 20 hours or nearly a day.

Since there are 28 such stations and therefore 28 such stretches of distance, 28 (34V-7A) Dc rechargeable batteries have to be allocated to each station(1 battery for each and every station). As these batteries take around a day to get completely charged, the total power which a single battery can deliver in 1 complete day would be around (238Watt). Therefore the total combined power which all the batteries of 28 stations combined can deliver in 1 complete day would be (6664 Watt). The general monthly power produced by all the batteries combined would amount up to slightly lesser than a sum of (199920 Watt) or 200kW, taking losses into consideration. This estimate is derived just for the Western Railways in Mumbai. The combined net amount produced if this research is extended to Western, Central and Harbor Railways, when combined have more than 100 stations within them, would be hugely substantial.

The application of this project can be further extended to the really fast trains like bullet trains, Shanghai maglev trains, French TGV POS etc. The energy produced from these superfast trains would be naturally much greater than a local metro train. This concept with various small modifications can also be applied on motorways, expressways, and even on runways of airports for free generation of energy all around the world.

4. Conclusion

Free accessible energy can be created with the help of this work, which can cater to the growing demands of energy all around the world. The net approximate monthly power of 200Kw which can be supplied by the battery can be used to light many powerless homes in the long run. Thus an alternate means of renewable energy is provided by this project, which will not only help solve the energy problems, but will also to an extent reduce the load on major sources of energy production like thermal power plants and nuclear power plants, which generally consume much of the treasured depleting resources. Therefore positive ramifications of this entire research are manifold and will tend to alleviate the major energy crisis problem faced all over the world.

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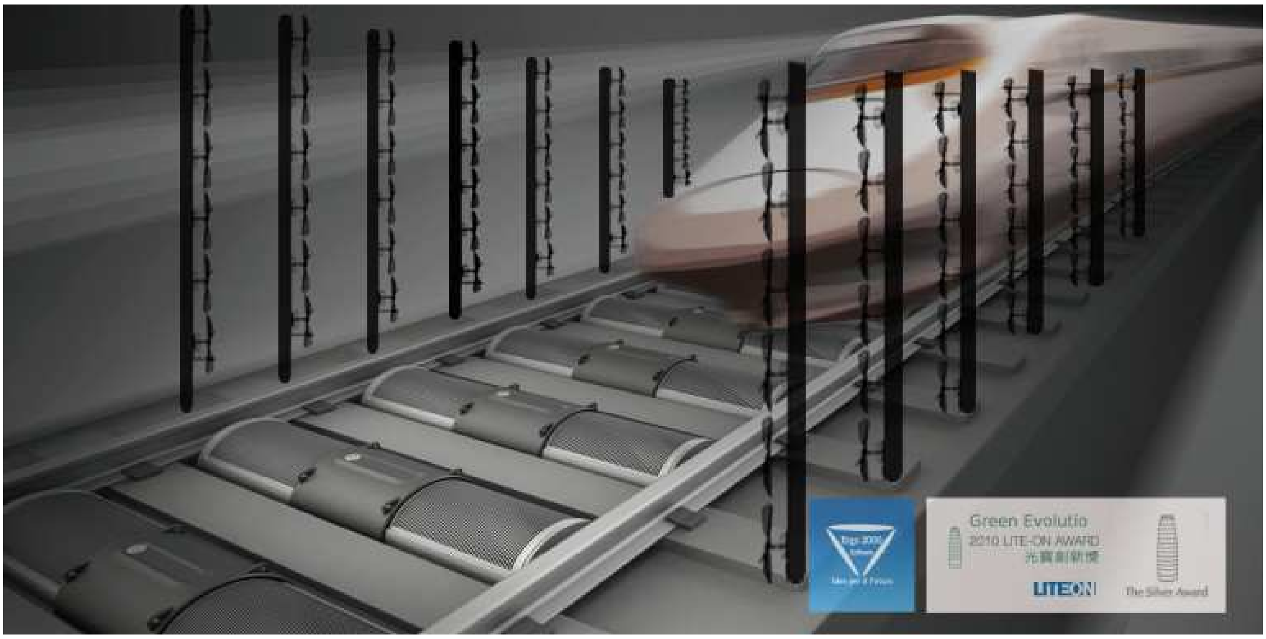
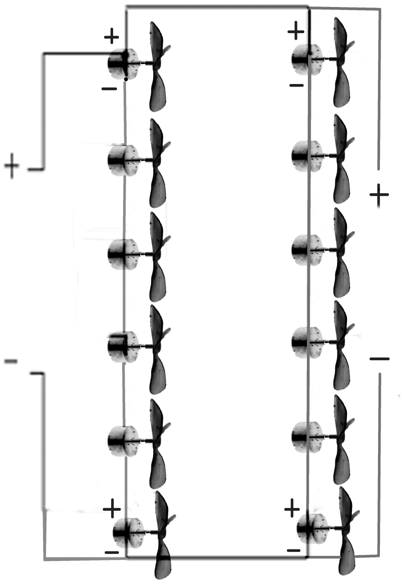
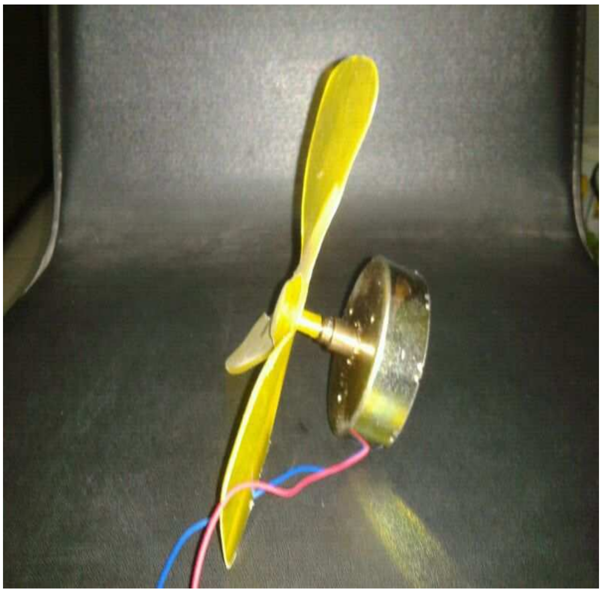


(fig 1 : showing an implemented assembly of turbines on installation poles)





(fig2: A simplified form of parallel, series network)

(fig3:Actual Dynamo with modified fans)

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Authors Biography:

Shivank Joshi, is in final year currently pursuing BE degree in electronics and telecommunications from Thakur College of Engineering and Technology, University of Mumbai .Has previously worked as an intern at Airports Authority of India, (Electronic and Communications Dept). Current field of research includes cost effective means of wireless communication and advancement in green technology (fuel and energy).

Aatmic Mathur, is in third year currently pursuing BE degree in electronics and telecommunications from Thakur College of Engineering and Technology, University of Mumbai .Has previously worked as an intern at Delhi Metro Corporation(Electronic Dept).

Arpit Jain, is in final year currently pursuing BE degree in electronics and telecommunications from Thakur College of Engineering and Technology, University of Mumbai .Current field of research is in integrated embedded systems.

Shashank Gupta, is in final year currently pursuing BE degree in electronics and telecommunications from Thakur College of Engineering and Technology, University of Mumbai .

Nishyant Jani, is in final year currently pursuing BE degree in electronics and telecommunications from Thakur College of Engineering and Technology, University of Mumbai .

Bhushan Chhabra, has completed Bsc –IT from Sikkim Manipal University of Distant Education. Currently working as an Public Relations Officer in American Orthodontics and has applied for pursuing underwater engineering at the underwater centre, Fort William, Scotland.