IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Rail-Box A new form of Renewable Energy Source

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Abstract: **Rail-Box a new form of renewable energy source refers to the generation of electricity by the rotation of wind turbine and the wind is caused due to the movement of train. The electricity will be produced or generated through the wind energy astrain runs over the railroad tracks.**

The generated electric power is one of the non conventional sources of energy generated by moving train. This electrical energy generated can be stored in batteries and can be utilized for running various loads connected to train cabin. Rail-Box energy generation is a new attempt to generate the electricity via renewable energy sources which is the up thrust created by moving train

Index Terms - ***Power flow, Wind energy conversion,Wind turbine, Moving train, Wind rotation, Rail-Box,T-Box***.

I.

II. Introduction: The device, called a Rail-Box, differs in that it is designed to be installed within the actual railing track itself. It is made up of a durable metallic cylinder with vents, which helps air to flow through and rotate turbine blades housed inside. This Rail-Box is implemented or place between the two slippers (rails) at the centre of railway track. As soon as the train passes over the track, due to the pressure of the wind this is exerted on the capes of turbines. Thus, the moment of the train rotates the Rail-Box turbine blade and generates the electricity. The electricity generated due to the T- box is utilized for the operation of the remote countryside areas and in rural areas where electricity is not provided.

II.WIND TURBINE

A wind turbine is a device that converts the wind's kinetic energy into electrical power. There are two types of wind turbines they are vertical and horizontal axis types. For applications such as battery charging for auxiliary power for boats or caravansor to power traffic warning signs the smallest turbines are used. Whereas larger turbines are used to satisfy the need of adomestic power supply while selling unused power back to the utility supplier via the electrical grid. Now a days a rray of large turbines, known as wind farms, are becoming an important source of intermittent renewableenergy and are used by many countries as partof a strategy to reduce their dependence on fossil fuels. Wind power is a vast source of renewable energy. Wind energy is an indirect form of solar energy. Wind is formed due to heating of air by solar radiations during the day. Movement on the earth surface is influenced by the terrain, water, reserve etc. Wind turbine converts the kinetic energy present in moving wind or air into mechanical energy. Wind turbine is coupled to a generator for producing electricity. At present there are different ways of electricity generation, but some of these power generation techniques results in pollution. So, Power generation using renewable sourceis essential. The proposed work provides electricity generated by wind turbine mounted bottom a train at inclined position. Thus amount power generated can provide the electricity to the various types of loads connected inside the train. Wind energy is one of the fastest growing non-conventional source of electricity and also one of the fastest growing methods of electricity generation in the world today. The growth in the electricity generation by wind turbine is linked with the multi- dimensional benefits associated with wind energy such as green power, sustainable, affordable and economic development. There are basically two types of wind turbines

They are

- Vertical axis wind turbine (VAWT)
- Horizontal axis wind turbine (HAWT)

Vertical axis wind turbine has the horizontal main rotor shaft. Here the generator and gearbox can be placed at the bottom or near the ground. It is not necessary to point the turbine towards wind. Wind turbines differ significantly from the most common types turbines in use. The most common type of wind turbine is the six-bladed upwind horizontal-axis wind turbine (HAWT), In HAWT turbine rotor is placed at the front of the nacelle and facing the wind upstream of its supporting turbine tower. Another type of turbine is also classified by its axis, the vertical-axis wind turbine (VAWT). In VAWT blades are extended upwards that are supported by a rotating framework. Due to the large growth of the wind power industries and the length of its historical development dating back to windmills, many different wind turbine designs exist, which are in current development, or have been proposed due to their unique features. The wide variety of designs reflects ongoing commercial, technological and inventive interests in harvesting wind resources both more efficiently and to the greatest extent possible, with costs that may be either lower or greater than conventional six-bladed vertical axis wind turbine designs.

Train Mounting Rail-Box for Wind Power Generation Some turbine designs that differfrom the standard type have had limited commercial use, while others have only been demonstrated or are only theoretical concepts with no practical applications. Such unconventional designs include a wide area of innovations such as different types of rotors, basic functionalities, supporting structures and form-factors.

Rail-Box Installation for Power Generation:

The device, called a Rail-box, differs in that it is designed to be installed within the actual railing track itself. Rail-box consists of a durable metallic cylinder with vents, which provide path for flow of air through and causes rotation of turbine blades housed inside. Yanko claims that a 1000 meter length of railroad can be retro fitted by 150 T-boxes. Considering that a train barreling is placed down at a speed of 200 kilometers per hour which creates winds of roughly 15 miles a second, the T-boxes could generate near about 2.6 Kwh of electricity. But we are installed Rail-Box on train soit continues rotate with train generates more energy than installed on track. But like many similar ideas, the Rail-Box currently exists in the pristine world of concepts where issues like debris, dirt and maintenance issues are absent, which isn't the case in the real world. So there's a strong likelihood that train passengers will never see one in operation a speeding train, for instance, produces tremendous gusts that can just as easily be converted into electricity.

III.PROBLEMS FACING WHEN RAIL-BOX INSTALLED ONTRACK

1. After passing of train sudden high pressure air applied on Rail-Box gives mechanical Damage.
2. As half part of Rail-Box there is no chance to air from turbine so turbine fail to Rotate.
3. More number of Rail-boxes is required for trackelectrification.

IV.CHANGES TO OVERCOME PROBLEMS

To overcome this problem, we attached Rail-Box at the bottom of the rail. Due to this Rail- box gets the input energy in the form of wind pressure from train and start rotating at slow speed when train is slow. And gradually increases the speed according to train speed. In this way mechanical damage is avoided. Train Mounting Rail-Box for Wind Power Generation Also there is space to the air from turbine so it works satisfactory. We can connect number of Rail-Box to generate required energy. All Rail-boxes are worked in parallel to meet the demand.

V. INVENTION

The proposed model is a method for generating electricity using high wind pressure generated by fast moving train the direction of the wind turbine. A fast moving train compresses the air in the front of it and pushes the air from its sides there by creating a vacuum at its rear and its sides as it moves forward. Take Rail-Box assembly and fix it bellow the train, with nut-bolt are the mechanically couple & make output connection.

VI. LITERATURE SURVEY

"Vrushali thok[1], minal kapgate[2],prajkta gawali[3],shraddha kolhe, Ankita Singh[4] 1,2,3Student, Department of ElectricalEngineering, SVIT, Nashik, Maharashtra, India. [4]Assistant Professor, Department ofElectrical Engineering, SVIT, Nasik, Maharashtra, India". This paper refers to the generation of electricity by the rotation of wind turbine and the wind is caused due to the movement of train. Theelectricity will be produced or generated through the wind energy as train runs over the railroad tracks. Alternative form of wind energy produced by train concept is very unique and it will be utilized to run the various loads connected to the train cabin and access generated power will be utilized by storing the power in the batteries. This proposed work is an attempt to generation of electricity via renewable energy sources.

"DARRIEUS VERTICAL WIND TURBINE THE FIRST AERODYNAMIC VERTICAL AXIS WIND TURBINE WAS DEVELOPED BY GEORGES DARRIEUS IN FRANCE AND FIRST PATENTED IN 1927".

Its principle of operation depends on the fact that its blade speed is a multiple of the wind speed, resulting in an apparent wind throughout the whole revolution coming in as a head wind with only a limited variation in angle. From the prospective blade, the rotational movement of the blade generates a head wind that combines with the actual wind to form the apparent wind. If the angle of attack of this apparent wind on the blade is larger than zero, the lift force has a forward component that propels the turbine. An angle of attack between zero and 20 degrees requires asufficiently high blade speed. A Darrieus turbine can't self starting; it needs to be brought to asufficiently high blade speed by external means.

"VARIABLE GEOMETRY VERTICAL AXIS WIND TURBINE P. J. MUSGROVE IN 1975 LED A RESEARCH PROJECT AT READING UNIVERSITY IN THE UK WHOSE PURPOSE WAS TO ATTEMPT TO RATIONALIZE THE GEOMETRY OF THE BLADES BY STRAIGHTENING OUT OF THE BLADES OF A DARRIEUS TYPE WIND TURBINE".

This led to design of straight blade vertical axis wind turbine designated as the H rotor blade configuration. At the time it was though that simple H blade configuration could, at high wind speeds, over speed and become unstable. It was thus proposed that reefing mechanism beincorporated into the machine design thus allowing the blades to be feathered in high winds. These machine earlier machines with feathering blades were known as Variable Geometry VerticalAxis Wind Turbines.

"IMPULSE SAVONIUS VAWT THE SAVONIUS TURBINE IS A VERTICAL AXIS MACHINE WHICH USES A ROTOR THAT WAS INTRODUCED BY FINNISH ENGINEER S. J. SAVONIUS IN 1922".

In its simplest form it is essentially two cups or half drum fixed to a central shaft in opposingdirection. Each cup or drum catches the wind and so turns the shaft, bringing the opposing cup or drum into the flow of the wind. This cup or drum then repeats the process, so causing the shaft to rotate further and completing a full rotation. This process continues all the time wind blows and turning of the shaft is used to drive a pump or small generator. These types of windmills are alsocommonly used for wind speed instrument such asthe anemometer. Modern savonius machine have evolved into fluted bladed device, which have a higher efficiency and less vibration than the older twin cup or drum machine.

VII. PROBLEM STATEMENT

The RAIL-BOX is to be setup between the rail sleepers by making only a concave space and by using two brackets it can be easily install. It is very small in size as compared to Wind Mills and also don't need extra space. Design of this prototype model could generate power of 1Watt.

VIII. OBJECTIVE

To utilize the up thrust created by train around it to move the alternator turbines for generation of electrical energy.
To provide a solution for power generation, this won't require the extra costly land and disturbance to existing structure.

IX. METHDOLOGY

The device, called a T-Box (Rail-box) as shown in fig.1, differs in that it is designed to be installed within the actual railing track itself. It consists of a durable metallic cylinder with vents, which allow air to flow through and rotate turbine blades housed inside considering that a train barreling down at a speed of 200 km/hr creates winds of roughly 15miles/sec, the Rail-boxes could generate 2.6 KwH ofelectricity. But like many similar ideas, the Rail-Box currently exists in the pristine world of concepts where issues like debris, dirt and maintenance issues are absent, which isn't the case in the real world. So there's a strong likelihood that train passengers will never see one in operation.

X. BLOCK DIAGRAM

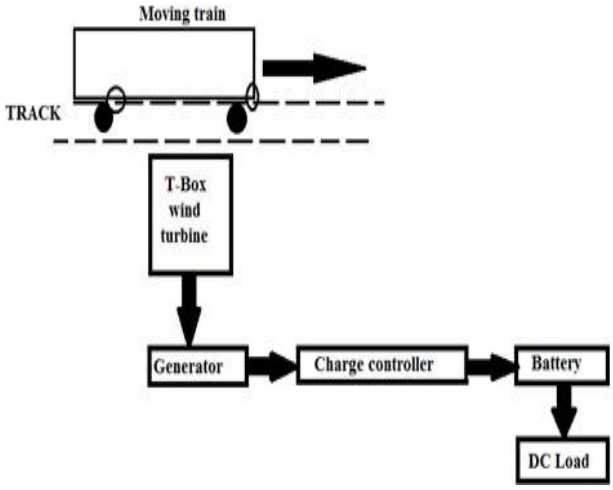

Fig1: Block Diagram of Rail-Box Wind Power Generation

XI. WHAT IS RAIL-BOX WIND POWER GENERATOR?

The Rail box (T- box) is a power generated device thatharnesses wind energy as trains run over railroad tracks.
This alternative form of wind energy produced by trains is very unique, as it does not depend on any natural energy sources. Instead, the energy generated from this device is produced as a consequence of human activity. The Rail-Box device generates energy without any interference of the normal train operation – the device is installed between railroad ties, and is partially buried underground. As the train passes over the device, the wind generated from the train spins the turbineinside the Rail- box to generate electricity. The T- box contains all the mechanical components required for harnessing, storing and supplying converted power. Hence, the power generated from this device can be supplied to public facilities along the railway and also to remote areas where electricity has not yet reached.
The device called a Rail-Box differs in that it is designed to be installed within the actual railing track itself as shown in fig.2. It is made up of a durable metallic cylinder with vents, which permits air to flow through and rotate turbine blades housed inside. The 1000 meter stretch of railroad can be retrofitted with about 150 T-boxes. Considering that a train barreling down at a speed of 200 kilometers per hour creates winds of roughly 15 miles a second, the Rail-boxes could generate 2.6 KwH of electricity.

Fig2: Rail-Box

XII. PROCEDURE

Movement of wind on the earth surface is influenced by the train, water, reserve etc. Wind or air in motion contains the kinetic energy whichis converted into mechanical power by means of wind turbine which is coupled to a generator for producing electricity. At present there are different ways of electricity generation, but some of these power generation techniques results in pollutionand so for power generation using renewable source in essential. Turbines are placed either side of dynamo. Dynamo converts mechanical energy into electrical power. Power generated by the dynamos is direct current in nature, In which power generation is done by using two side shaft dynamos. Dynamo is placed between two turbines and it is coupled to turbine with the help of rigid shaft coupling.
The whole assembly is installed at the bottom side of train. When train start moving,air pressure is developed which rotates turbine and ultimately turbine rotates dynamo as they are coupled. As a result electrical power is developed at terminals of dynamo.

XIII. OUTCOME

Fig3: Prototype of Rail-Box

Fig.3 shows the prototype of a Rail-Box, in which Turbine, Generator, Buck-Boost converter and a Battery are the key components. Turbine is made up of 36- blades of nylon material, each having a length of 320mm, adjacent gap of 10mm. A PMDC Generator of 5Watts, 4.5V, and 1.1A is mounted on the shaft. A Lead acid Battery of 4.5V, 1.5Ah is charged using a Buck-Boost converter XL6009.

Applying the various wind speed using a blower we made the turbine to rotate at different speeds and the output voltage of generator is noted at different wind pressure. Observations of this experimentation are tabulated as shown in Table 1.

Table 1: Observations

Sl. No	Wind pressure (KPa)	Shaft speed (rpm)	Output voltage (volt)
1	20	30	4
2	40	75	8
3	80	150	16

XIV. ADVANTAGES AND DISADVANTAGES

Advantages:

1. It is very easy to install.
2. It has less chances of failure.
3. It gives pollution free energy
4. Simple construction.

Disadvantages:

1. It requires regular cleaning.
2. Implementation needs little modification

XV. CONCLUSION

Rail-Box A new form of Renewable Energy Source

In the present energy crises scenario, Rail-Box can serve as renewable source of electricity generation. Rail-Boxes can be connected in combination to achieve significant electricity generation for auxiliary power supply or it can also be connected to grid. These Rail- box needs less capital investment compared to the solar panel installation of same capacity.

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[2] Darrieus Vertical Wind Turbine The first aerodynamic vertical axis wind turbine was developed by Georges Darrieus in france and first patented in 1927.

[3] Variable Geometry Vertical Axis Wind Turbine P. J. Musgrove in 1975 led a research project at reading University in theUK whose purpose was to attempt to rationalize the geometry of the blades by straightening out of the blades of a Darrieus type wind turbine

[4] Impulse Savonius VAWT The savoniusturbine is a vertical axis machine which uses a rotor that was introduced byFinnish engineer. S. J. Savonius in 1922.