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"Generation of Electrical Energy from Railway Track"

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Abstract

In this research paper, I have come across the problem faced by many villages in India, i.e., the shortage of electricity. India has a huge railway network connecting almost all the cities and villages of all the states. With the help of railway tracks, we have developed the system to generate electricity from the moving train over the tracks. This system can be installed underground under the railway tracks where ever there is a shortage of electricity. In India, many villages still are not covered by the electricity supply. To power those villages with electricity, our system can be the one solution that can be installed under the nearby railway tracks, and the system will generate the electricity. The system developed is also capable of storing the electricity for later use. The system developed by us is strongly recommended to solve the problem faced by the Indian villages.

Keywords - *Electric energy by railways, generation of electrical energy by the railway track, and electrical energy production.*

I. INTRODUCTION

While undergoing a survey on Indian railways, the survey's outcome was "Indian railways" are called the lifeline of our country in which around 2.3 crore passengers travel daily. We have seen that Indian railways. We have also seen that Indian railways are also improving their services, official website, modification in coaches, gaining in speed and other several criteria with their hundred percent effort day by day. We came to the research that several villages are facing a lack of electricity even though railway tracks pass through them. By knowing such condition, we decide to build a typing project that will provide electricity using those railway tracks with less cost, named "free energy from railway track."

These projects include a simple gear and pulley mechanism, so there is no complexity in it and once it's been installed, it may long for many years but will require slight Maintenance.

Besides this project, the main reason was to provide such electricity facilities to those argotic people, which will help them run all the agricultural equipment. The net income of the farmer will increase. Besides agricultural purposes, such electricity generated can also be used for several purposes.

A. Expected Outcome Of Research Paper

1. Plan and identify materials, processes and other resources optimally required for manufacturing of Pulley and Main shaft.
2. Developing creative and innovative ideas.
3. Develop leadership, interpersonal skills and teamwork to achieve the goal.
4. Develop a sense of environmental responsibility.
5. Purchase raw material/Standard parts like gear, L Channel, Dynamo, Belt, Fixed wheel etc.
6. Interpret the drawings, manufacture, assemble, inspect &, if necessary, modify the project work's parts/unit/assembly.
7. Familiar with the fast change in technology.

II. COMPONENTS

From our survey, we identified suitable material for all the above parts. Such a mechanism is to be mounted on some base which is of wooden material. The entire frame, such as the Railway track, supports, C Channel, is made from mild steel. Here the coach is made of galvanized steel. All the assembly is done through welding and some use of nuts. Gears and pulley used are of Cast Iron. The fan used here is made up of hard fiber.

- Wooden Ply
- Railway Track
- Train Coach
- Gear Mechanism
- Pulley Mechanism
- Fan
- Dynamometer
- Belt Drive
- C Channel
- Fixed wheel

WOODEN PLY: This is the one type of supportive member. It supports the whole mechanism. As its name suggests, it is made of wood.

RAILWAY TRACK: It is an L-section channel that includes a shaft mounted on its bottom side. Train coach run on such L-Section Channel which makes contact with such a mechanism.

TRAIN COACH: It is one type of box made of galvanized steel that runs on the L-section Channel. A C-Section channel is provided on its bottom side, making contact with a fixed wheel mounted on the shaft.

GEAR MECHANISM: It is a rotating disc type structure having several teeth cut on it. Here two gears are used made from Cast Iron. Big gear is mounted on the main shaft, and another pinion is mounted on the Countershaft, which continuously meshes.

PULLY MECHANISM: It is a wheel on a shaft designed to support movement and change of direction of a belt or transfer of power between the shaft and belt.

FAN: It is made of hard fiber material mounted on one side of the main shaft. It is a type of Condenser fan. This fan rotates when a vacuum is created when a train passes nearby such a mechanism.

DYNAMOMETER: It is one type of electrical motor which converts mechanical energy into electrical energy. A small pulley is mounted on the shaft of the dynamometer.

BELT DRIVE: It is a mechanism in which a continuous flexible belt movement transmits power. It is generally used to connect the Countershaft to the shaft to the motor.

C Channel: It is one type of C-Section channel which is made from mild steel. Generally, it is fitted on the bottom of the coach.

FIXED WHEEL: It is one type of hard rubber wheel mounted on the main shaft in contact with the C Channel, which rotates.

- **SPECIFICATIONS OF COMPONENT:**

Wooden ply Dimension	**1574.8 × 457.2 × 18mm**
Distance Between L Channel And Wooden ply	**254mm**
No. Of Coaches	**2**
Dynamo Output	**12 Volt**
Diameter Of Main And Counter Shaft	
Pitch Circle Diameter Of Big Gear And Pinion & No. Of Teeth	**Big Gear:- 101.6mmø {53 Teeth} Pinion:- 38.1mmø {20 Teeth}**
Diameter Of Big And Small Pulley	**85mm & 18 Mm**
Diameter Of Fan	
Net Weight	**16.5 Kg**
Diameter Of Shaft Of Dynamo	**6mm**

III. EXPERIMENTAL WORKING

This Research Model includes a simple gear and pulley mechanism. Here on the main shaft, a fixed wheel is mounted, and C Channel is fitted on the coach's bottom part. C Channel comes in contact with a fixed wheel when the train passes near such a mechanism, which rotates. Hence, the gear mounted on one side of the main shaft also rotates. A small pinion is provided, mounted on Countershaft, which continuously meshes with the big gear.
Hence such Countershaft also rotates. Here one big pulley is mounted on one side, which rotates as the Countershaft rotates. Thus, the small pulley is provided on the shaft of Dynamo, which is connected through a belt drive. As the shaft of Dynamo rotates, the mechanical energy of the shaft gets converted into electrical energy.

Here the main drawback of such a project was the friction between contacted parts. To overcome such a problem, necessary modifications have been made in such a project. Here instead of rotating the main shaft through a fixed wheel, a special type of fan is used to rotate the main shaft.
Such fan rotates due to vacuum developed when the train passes near such mechanism with greater pace. Due to which the whole operation becomes frictionless and becomes more efficient compare to the previous design.

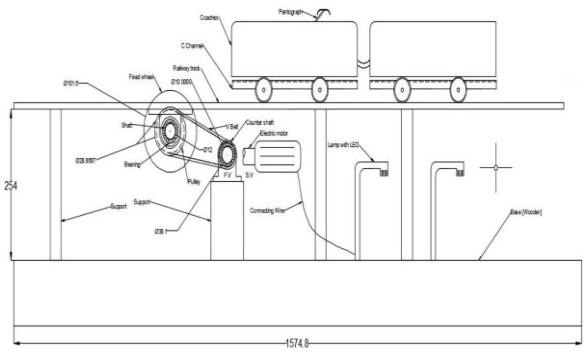

Fig: 1 Assembly Drawing (2D)

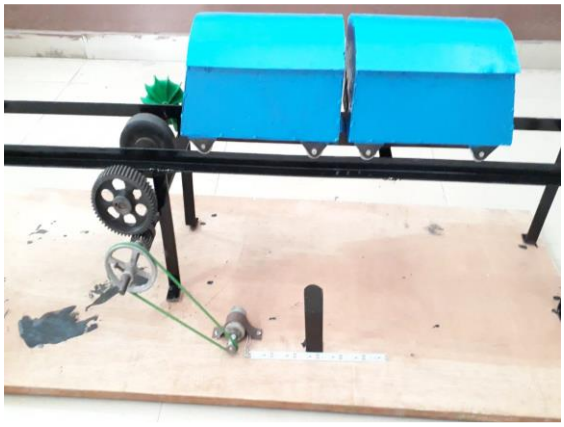

Fig: 2 Assembly Drawing (3D)

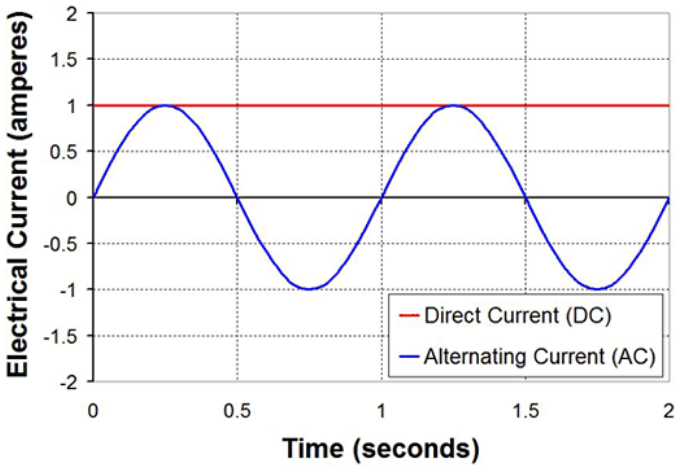

Fig: 3 Current Produce by the dynamometer

WORKING OF THE SYSTEM:

- Whenever the train passes near to the system, the system gets activated due to the vacuum created from the track
- The impeller starts to rotate, and the pulley is rotated with the help of a rotating impeller.
- The pulley is attached to the dynamometer, and the rotating pulley runs the dynamometer.
- Then the electricity is generated from the dynamometer; the motor is also connected to the dynamometer.
- The motor is producing the D.C. current, and the developed electricity is then stored in the battery type storage.
- The battery used for the storage is the lithium-ion type, which stores the excess amount of electricity generated and can be used whenever needed.
- The ammeter and voltmeter are also connected to the battery and are displayed above the ground.
- The meters show the current level and also show whether the electricity is being generated or not.
- The stored electricity has an output above the ground. Whenever there is a need for electricity, the stored power can be directly transferred to any place in a very short period.

IV. SPECIFICATION OF COMPONENTS

SR. NO.	COMPONENT	QTY.	SIZE	MATERIAL
1	Gear	1	101.6 mm	Cast Iron
2	Pinion	1	38.1 mm	Cast Iron
3	Big pulley	1	85 mm	Cast Iron
4	Small pulley	1	18 mm	Cast Iron
5	Dynamometer	1	12V	Steel
6	Fan	1	101.6 mm	Hard fiber

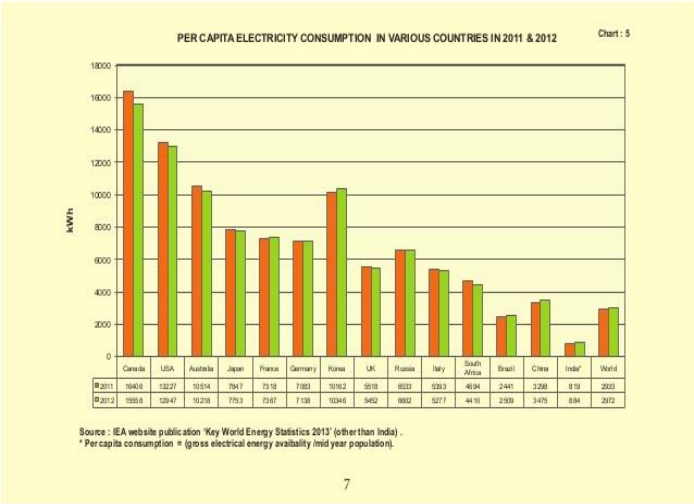

Fig: 4 Electricity consume in different countries

MAINTAINANCE OF SYSTEM COMPONENTS:

- After some time (1 or 2 years), Lubrication of gear and other moving is to be carried out.
- Periodically Maintenance is to be carried out for its smooth operation.
- The mechanism should be checked once in 6 months
- Must see whether the belt used is loose or not.
- Check whether there is a misalignment of the shaft.
- Check whether the fan is being damaged or not due to the striking of stones.
- Carry out the Maintenance of Dynamo in regular premises.

V. COSTING OF SYSTEM

SR.NO	COMPONENTS	MATERIAL	QUAN	TOTAL PRICE (Rs)
1	**Wooden ply**	**Wood**	**1**	**200**
2	**L Section**	M.S	**1**	**500**
3	**Gear**	**C.I**	**2**	**400**
4	**Shaft**	**M.S**	**3**	**240**
5	**Electric motor**	**Steel**	**1**	**250**
6	**Sheet metal**	**G.S**	**1**	**120**
7	**Fixed wheel**	**Rubber**	**1**	**250**
8	**LED lights**	**-**	**4**	**60**
9	**Belt**	**Rubber**	**1**	**200**
10	**Pulley**	**C.I**	**2**	**200**
				TOTAL of 2420

- **TROUBLESHOOTING:**

PROBLEM	POSSIBLE CAUSE	ACTION
Gear Not Work	Arrangement Of Gear Is Wrong	Set Gear Properly On Shaft
Loosening Of Belt	Power Loss Due To Slip	Set Proper Tension And Tighten The Belt
Misalignment Of Shaft	Failure Of The Shaft	Proper Alignment
Improper Construction	Improper Operation	Proper And Planned Construction

VI. CONCLUSION

From our above research, we conclude that the system developed will run with a vacuum created near the track while the train passes over the track. The system is very compact and can be installed very near to the railway tracks. This system runs with the dynamometer's help installed inside the system, which generates the electricity from the vacuum created by the train. This system also stores the electricity in the battery type storage installed just under the ground. The system's cost is very cheap, and the amount of electricity generated by the system is huge.

The stored energy can be used whenever necessary and wherever needed. This system comes with negligible Maintenance, which is just once in two years, and that too just the Lubrication of components is required. I conclude by strongly recommending this system to be one of the greatest solutions to the problems faced by the Indian villages.

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