

Contactless Electricity Generation by Using Wheel

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ABSTRACT: The intention of this project is to build a straight forward powered generator from a used bicycle wheel and to use it to power light bulbs, cell phones, laptops, and other small appliances. This project will help to develop engineering skills while learning about a clean way of generating electricity and satisfying our basic requirement. We are going to use the hard drive magnet and inductive coil to generate electricity due to which our mobile phone will be charge and followed by ac to dc converter. This is totally clean way of generating energy. As fuel is not a renewable energy source and the prices are increasing day by day. It will not be affordable by a common man after some period. Here no fuel is required to generate electricity, so everybody can afford this method for power generation also it eliminates the emission of CO₂ which will reduces the pollution. Conventional methods for generating electricity make use of dynamo and wind turbine, but they have disadvantage that they produce friction and reduces speed which require more efforts. For the project to work we need strong electromagnets so we have used Neodymium magnets and also used coil. The basic idea of this project comes from the functioning of motor, that is how it rotates in the magnetic field and cut's the magnetic line and how flux is introduced into the coil. The motivation behind the project is to generate electricity without having any friction and without using natural resources.

KEYWORDS: Uninterrupted power supply, Flywheel Energy Storage System, kinetic energy, spinning mass, environmentally safe.

I. INTRODUCTION

This is a mechanical device which uses the wheel to store energy in the form of inertia. In this system we applied an additional energy source to start the main motor like electricity. In this system main motor is used to drive a series of pulley and belt arrangement which forms a gear train arrangement which produce a twice/ thrice speed at the shaft of generator. The significant thing about the system is that the electricity generated at the output of the shaft is more than that of input. The inertia of wheel can be increased by increasing the radius of wheel and weight of wheel. It also increase if the wheel weight is concentrated as far out toward the rim of the wheel as is possible. Firstly, the requirement for an effective system needs to be a suitable wheel with a large diameter and vast majority of the weight needs to be close to rim. The construction needs to be robust and secure as ideally. The rate of rotation will be as high as possible as the weight on the wheel is concentrated outward of the rim which needs to be exactly at right angles to the axle on which it rotates and exactly centered on the axle. The main motor is at low speed, low voltage input motor, the generator is high speed, and high voltage output generator. Therefore, when we apply an extra energy to the main motor it starts running, which causes to rotate the wheel. When the motor is reaches the highest speed (constant speed) we switch the power by applying the electrical energy generated by the generator. We add the extra thing in the system like transformers, rectifier, inverter etc. to run the system and take the efficiency output. Electric trains, cars, and other electric vehicles are powered by electric motors connected to batteries. When we're driving along, energy flows from the batteries to the motors, turning the wheels and providing us with the kinetic energy we need to move. When we stop and hit the brakes, the whole process goes into reverse: electronic circuits cut the power to the motors. Now, our kinetic energy and momentum makes the wheels turn the motors, so the motors work like generators and start producing electricity instead of consuming it. Power flows back from these motor-generators to the batteries, charging them up. So a good proportion of the energy we lose by braking is returned to the batteries and can be reused when we start off again. In practice, regenerative brakes take time to slow things down, so here our system zero friction no physical contact of vehicle connected, the wheel plate just connected parallel with the type shaft to get the good output continuously even when there is braking.

II. RELATED WORK

Design Specifications-

1. Motor - 1440 RPM, 2. Small pulley diameter- 75mm, 3. Neodymium magnet- 25 mm Dia * 3 mm Thick, 4. Copper Coils- 36 gauge, 5. Tire diameter- 270mm, 6. Shaft diameter- 20mm, 7. Lead acid battery- 12V1.3AH/20HR, 8. Shaft diameter- 20mm, 9. Bearing type- Pedestal bearing (P204)

Selection of Neodymium Magnets -

1. Dimensions: 25mm Dia. x 3mm thick, 2. Magnetic Face: 25mm diameter, 3. Magnets Type: Neodymium, 4. Material: NdFeB, 5. Grade: N52, 6. Plating /Coating: Ni-Cu-Ni (Nickel), 7. Magnetization Direction: Axial/radial(Poles on Flat Ends), 8. Max Operating Temp: 176°F (80°C), 9. Quantity: 08 pcs

III. METHODOLOGY

- 1) We have used the wheel of cycle which is linked to the pulley installed on the same shaft and its diameter is less than the wheel diameter due to which its velocity of rotation will be increased. The wheel of cycle rotated by electric motor by using belt and pulley arrangement.
- 2) There is a circular wooden plate on its periphery neodymium magnets are mounted which is inter connected to the wheel. As the wheel rotate the neodymium magnet plate also rotate due to their physical contact.
- 3) There is another wooden plate with copper coils on its periphery which is stationary plate and placed slightly apart from neodymium magnets plate.
- 4) As neodymium magnet plate rotate with wheel due to this rotating magnetic field produced which induced emf in a stationary copper coils, according to Faradays law of electromagnetic induction.
- 5) This generated AC voltage converted into Dc voltage by AC to DC converter used in battery charging unit which is further stored in a battery

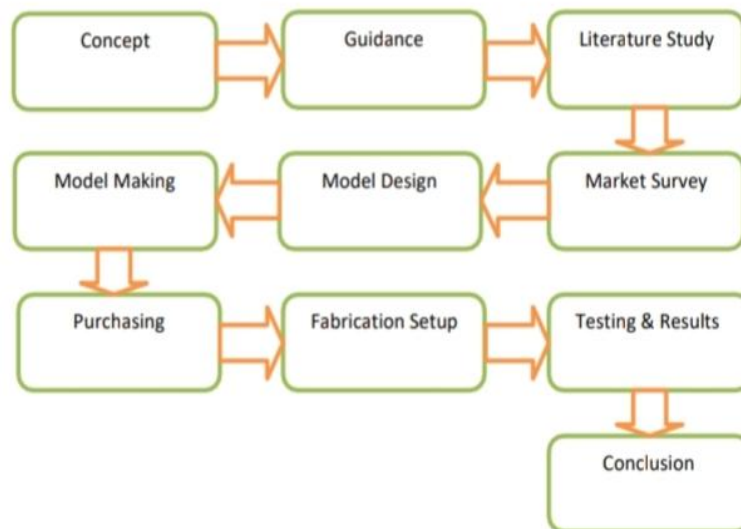


Fig. 1 Methodology

IV. DESIGN AND FABRICATION OF CONTACTLESS ENERGY GENERATION SYSTEM WITH WHEEL-

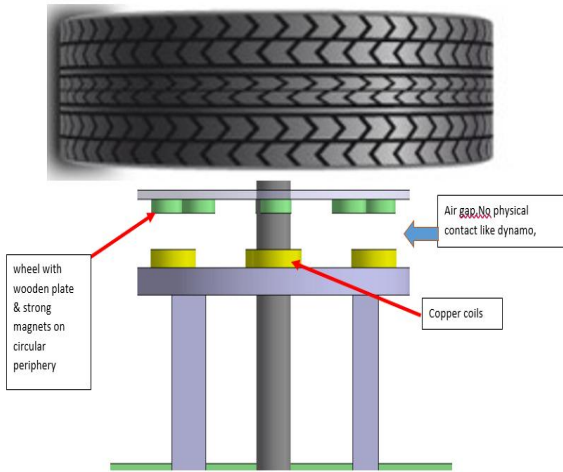


Fig. 2: Cad Drowning Setup.

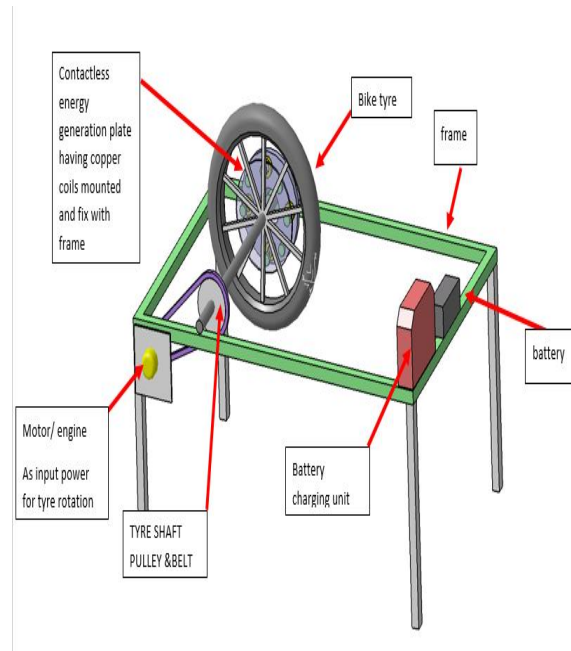


Fig. 3: Expanded View

Basic Principle of Operation:

Faraday's Law of Electromagnetic Induction:

Faraday's Law of Electromagnetic Induction Faraday's law of electromagnetic induction explains the relationship between electric circuit and magnetic field. This law is the basic working of the most of the electrical motors, generators, transformers, inductors etc.

Faraday's Second Law:

Faraday's second law of electromagnetic induction states that, the magnitude of induced emf is equal to the rate of change of flux linkages with the coil. The flux linkage is the product of number of turns and the flux associated with the coil.

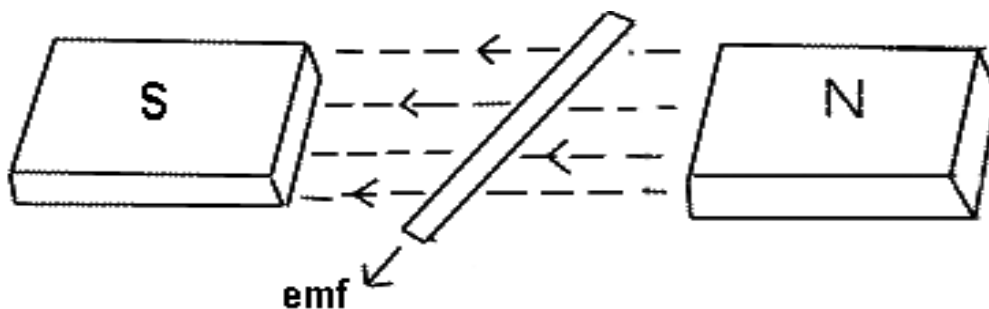


Fig. 4: Faraday's law electromagnetic induction



Working:

To avoid Dynamo mechanism we have designed this system, in this we are replacing the conversion of energy to mechanical energy and then electrical energy we directly converting kinetic energy to electrical energy hence there is no chance of energy loss and we get 100% energy output without any friction and no effect to other parts by using this energy we can charge battery also we can make bicycle which can run on battery so this friction less energy generator will help to charge that battery or mobile or any other stuff To do this mechanism we are using some coils and strong magnets which are different from normal magnets called as neodymium magnets, there is no physical contact like dynamo with tyre just small coin size magnets are placed on Tyre when Tyre rotates e m f induced in a coil and it generates electricity this energy is upto 230 volt. can easily charge the battery with this.

V. EXPERIMENTAL RESULTS

1. Belt Drives Transmission:

Motor RPM = 1440 (standard motor)

Motor pulley Diameter (Input) = 75mm

Pulley Diameter (output) = 85mm

Centre Distance = 250mm

Rpm = to find

Formula:

$$1440/\text{RPM of shaft 1} = 85/75$$

$$\text{RPM of shaft 1} = 1270.58$$

$$\text{RPM of shaft 1} = N_2 = 1270.58$$

2. Chain Drives Transmission:

Rpm output of belt drive is input rpm of chain drive therefore,

Large sprocket RPM = 1270

Sprocket diameter = 120mm

Small Sprocket diameter = 80mm

Large sprocket teeth (input) = 22 Small sprocket teeth (output) = 14 Centre Distance = 400mm

Chain length = 1000mm

Formula:

$$\frac{\text{RPM of Motor}}{\text{RPM of shaft 1}} = \frac{\text{Diameter of shaft pulley}}{\text{Diameter of Motor pulley}}$$



1270/RPM output = 22/14

RPM output = 808 Hence the input speed of 1440 RPM is converted to 808

3. Stator-

The Stator is stationary part of system. At the centre of the stator the permanent magnet is placed and around this permanent magnet several coils are placed. The 12 gauge wire is used for coil.

The magnetic field is induced according to faraday’s law of induction.

The voltage induced is given by

$$V=N \cdot dB/dt \cdot A \dots\dots(1)$$

Where

$d\phi/dt$ is change in magnetic field

N=Number of turns of copper wire

Consider coil which we r using , in square shape and its winding dimensions are as follow ,

A=Coil area

Area=width*length

$$\frac{\text{RPM of Shaft 1}}{\text{RPM of shaft 2}} = \frac{\text{No of teeth on larger pulley}}{\text{No of teeth on smaller pulley}}$$

$$=2.4*1.5$$

$$=3.6\text{cm}^2$$

$$A =0.036\text{m}^2$$

The numbers of turns of coils are 3300.

we get the , magnetic field of neo-magnet = 0.1726 T (tesla)

The change in magnetic field of neo-magnet is 0.17tesla.

Therefore,

$$dB/dt=0.17$$

Now substitute the value in equation (1),

We get ,

$$V=20.19 \text{ V.}$$

So, the each coil produces average voltage of 20.19V.



4. Calculation Of Resistance Of Coil:

so here our ,

area of coil is $A = 3.6\text{cm}^2$,

length of coil = 2cm,

Both conductance and resistance depend on the geometrical dimensions of a wire. Our wire resistance calculator uses the following resistance formula:

$$R = \rho * L / A$$

where

R is the resistance in Ω ,

ρ is the resistivity of material in $\Omega * \text{m}$,

L is the length of wire,

A is the cross-sectional area of the wire

$$\text{Resistance } R = 0.05544 \text{ m ohm}$$

$$I = V/R$$

$$I = 20/0.05544$$

$$I = 0.360750361 \text{ m amp}$$

VI. CONCLUSION

We can conclude that, the system arrangement generates electricity without any friction and can be utilized in the maximum amount. We have successfully designed the project and implemented on frame, the generated power is utilized to charge the battery of electrical vehicle; we also understand the concept of electromagnetism and how to generate power by just placing the magnet and coil of equal quantity on different disks without making any contact. The voltage output taken from the assembly is totally dependent on the rpm of the wheels so voltage is fluctuating so a battery is used to provide a constant power supply. A battery connected to the generator assembly is continuously charged when shaft moves at 80- 90 rpm which is normal speed of vehicle. By this assembly battery is continuously charging.

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