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Design and Fabrication of Frictionless Electricity Generator using Drive Shaft of Electric Vehicle

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Abstract

The problem of power generation is one of the key worldwide challenges that requires a high degree of scientific reasoning and a thorough understanding of energy sources. A vehicle's driveshaft can produce energy, which can be used to replenish batteries or power a hybrid engine. The driveshaft that generates electricity is composed of coils of copper wire that wrap around the magnetised driveshaft, which acts as the rotor of an electrical generator.The magnetic driveshaft rotates as a result of the power of the hybrid engine, producing an electrical field that is captured by copper wire coils and used to run the hybrid engine or recharge a super capacitor. Its circular motion produces an EMF and magnetic field in the coil in accordance with Faraday's law of electromagnetic induction.

Keywords: Drive shaft, engine, coils, hybrid, electricity, wire, generator, rotor, recharge.

1. Introduction

Electric and hybrid electric vehicles (EV/HEV) are practical choices for the preservation of fossil fuels and the reduction of emissions for a safe environment and sustainable transportation. So, we will increase the electrical vehicle's efficiency by converting the mechanical energy of the drive shaft into electrical energy, which will then be stored in a different battery and made readily available for usage as needed. Vehicles have been powered by a wide range of sources over the years. Before the internal combustion engine was invented, vehicles were powered by animals, the wind, and human labor. Since the invention of the internal combustion engine, fuels used in vehicles have included gasoline, diesel oil, natural gas, ethanol, and mixes of ethanol and gasoline. These fuels are expensive to use, difficult to acquire and transport, becoming more difficult to locate. In response to these problems with so-called "fossil fuels," automobiles are either wholly powered by electric motors or by hybrid engines that combine electric motors with gasoline or diesel engines. Electric engines are powered by batteries. However, the batteries' weight reduces the efficiency of the electric motor. The limited storage capacity of the batteries affects the range of an electric motor-driven vehicle.Also, there aren't many battery-recharging stations, which lessens the usefulness of electric cars. A driveshaft that produces energy has been created to overcome these problems. This typically consists of a copper wire coil that surrounds the magnetized driveshaft and a magnetic driveshaft that acts as the rotor of the electrical generator. Simply put, a generator is a device that converts mechanical energy into electrical energy. This is made possible by the electromagnetic principle. As this electrical energy is produced, the generator will induce an electric current to flow through an external circuit. In order to transform mechanical energy into electrical energy, generators typically include a rotor, a copper winding, and a series of magnets. The mechanical energy supplied to the generator is ultimately converted into electrical energy based on the electromagnetic induction concept. One of the important components of this study is the drive shaft, also

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known as the driving shaft. Power is transferred through rotation, which can lead to a number of stresses, including torsional and shear stresses. To transmit more power, the driving shaft must be able to sustain such strain; as a result, the transmission must be smooth. Design factors are also taken into consideration.

2. Construction

Electrical generators have been around for a while and are used for many different things. Simply put, a generator is a device that converts. mechanical energy into electrical energy. This is made possible by the electromagnetic principle. As this electrical energy is produced, the generator will induce an electric current to flow through an external circuit. In general, generators are made up of a rotor, a copper winding, and a magnet arrangement that converts mechanical energy into electrical energy. The two main components of an electric generator are the rotor and the stator. The stator, which is normally composed of one or more magnets and copper winding, rotates inside the rotor, which is frequently a metal shaft or loop.

2.1 Design Setup

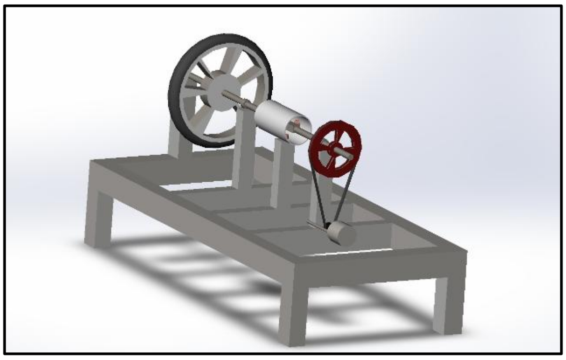

Figure 1. Design setup

2.2 Experimental Setup

Figure 2. Experimental Setup

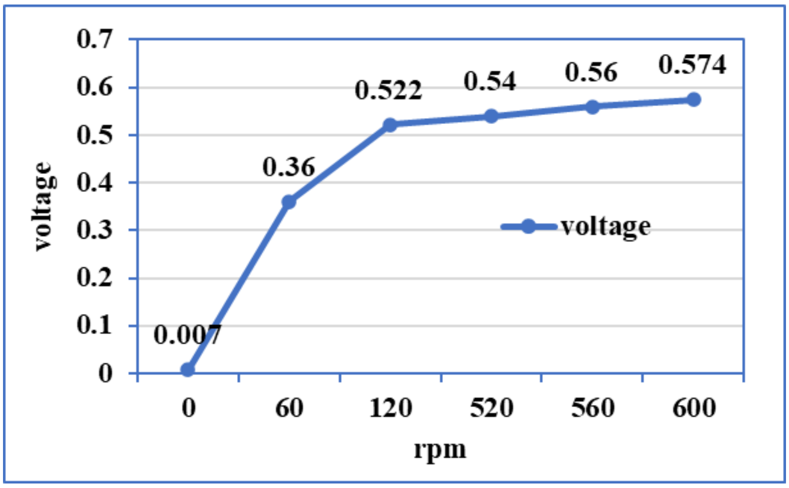

Figure 3. Speed vs. Volatge Graph

Table 1. List of parts and its materials

Parts	Material
Frame	Mild Steel
Shaft	Steel
Coil	Copper Coils
Battery	STD
Bearing	STD
Motor	STD
Disc Magnets	Neodymium

2.3 Design of Motor

Whatever the use, a motor's main job is to transform electrical energy into mechanical energy to create spinning motion. Our project's design requires a variable speed motor; therefore, we investigated the rpm factor in manufacturer catalogues and selected one motor based on price.

2.4 Winding Coil

Increasing the number of windings per coil will increase the voltage generated by each coil, but doing so will also increase the size of each coil, posing a design difficulty. A wire with a larger size spacing can be used to lower the size of each coil. Again, there is a problem: the smaller the wire, the less current will pass through it before it starts to heat up because of the higher resistance of a small wire. A narrower gauge wire would further lower the measured resistance of each of our coils, which is 40.

2.5 NEYODIUM Magnet

Neodymium magnets, also known as NdFeB, NIB, or Neo magnets, are the most popular type of rare-earth magnet. The $Nd_2Fe_{14}B$ tetragonal crystalline structure of the permanent magnet is a combination of neodymium, iron, and boron. The strongest permanent magnet currently available is made of neodymium. General Motors and Sumitomo Special Metals each developed one in 1984.

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Figure 4. ***NEYODIUM Magnet***

NdFeB magnets can be classified as being sintered or bonded, depending on the manufacturing process used. They have replaced other types of magnets in many applications in modern products that need strong permanent magnets, such as electric motors in cordless tools, hard disc drives, and magnetic fasteners.

2.6 Battery

In our project, we're employing secondary-type batteries. This kind can be recharged. A battery is made up of one or more electrochemical cells, which store chemical energy and transform it into electric current. Secondary (rechargeable) and primary (disposable) batteries both work by converting chemical energy into electrical energy. Because their chemical components are consumed in an irreversible reaction, primary batteries only have one use. Secondary batteries can be recharged by running a charging current through them in the opposite direction from the discharge current, since the chemical processes used by secondary batteries are reversible. Secondary batteries, usually referred to as rechargeable batteries, can be charged and discharged several times before wearing out. Certain deteriorated batteries can be recycled.The use of batteries rose as they became more adaptable and portable. Batteries have contributed to a number of environmental problems, such as the contamination of hazardous metals. A battery is a device that converts chemical energy directly into electrical energy and may contain one or more voltaic cells. Each voltaic cell is made up of two half cells connected in series by a conductive electrolyte. On one half of the cell, the positive electrode is located, and on the other, the negative electrode. The electrodes are electrically connected by the electrolyte, which can either be solid or liquid, preventing their physical contact. The ratio of the resistance of the ideal voltage source to the resistance of the battery determines the voltage across the load.Due to the battery's low internal resistance when it is new, the voltage across the load is practically identical to the battery's internal voltage source. As the battery empties, the voltage drops across its internal resistance increases, decreasing the voltage at the battery's terminals and decreasing the battery's ability to deliver current to the load.

3. Working Principle

This experimental set-up operates according to Michael Faraday's "Electromagnetic Induction" theory. According to the rule, an electromotive force can be produced by both a conductor travelling through a magnetic field and a change in the magnetic flux inside a magnetic field. A conductor either moves continuously in a stationary magnetic field or is placed in a moving magnetic field (when using an AC power source). As a result, the voltage in the circuit is measured when a bar magnet passes over the device. This has the benefit that magnetic fields can now be used to generate electrical energy in a circuit instead of merely using batteries. The electromagnetic induction concept underlies the operation of equipment including generators, transformers, and motors.

4. Corrosion Problem

These neodymium magnets experienced severe corrosion after five months outside.In sintered NdFe14B, the grain boundaries of a sintered magnet are particularly prone to corrosion. Serious harm from this type of corrosion can include the spalling of a surface layer or the disintegration of a magnet into a fine powder of magnetic particles.A protective covering is often added to commercial goods to reduce this risk of exposure to the environment. Nickel, nickel-copper-nickel, and zinc plating are the most popular varieties, while other metals, polymers, and protective lacquer coatings can also be utilised

5. Temperature Effects

Neodymium has a negative coefficient, which causes it to lose coercivity and maximum magnetic energy density (BHmax) as temperature increases. Neodymium-iron-boron magnets have a high coercivity when the temperature is at room temperature, but as soon as the temperature exceeds 100°C (212°F), the coercivity begins to rapidly decrease until it approaches the Curie temperature, which is around 320°C or 608°F. The magnet's effectiveness in high-temperature applications like wind turbines, hybrid motors, etc. is constrained by this decline in coercivity. Terbium (Tb) is added to the magnet, raising the cost, to stop the performance from declining due to temperature changes.

6. Hazards

Rare-earth magnets produce stronger forces, which can result in risks that other types of magnets do not. Neodymium magnets larger than a few cubic centimetres are powerful enough to break bones and can harm body parts confined between two magnets or between a magnet and a ferrous metal surface.When magnets are placed too closely together, they can collide with enough force to chip and break the brittle magnets, and the flying chips can cause a number of health problems, including eye damage. In other cases, small children who swallowed many magnets suffered injury or even perished as a result of their digestive tract becoming wedged between two magnets.A significant health risk arises from using machines that have magnets integrated into or linked to them. Stronger magnetic fields can be hazardous to mechanical and electronic devices because they can magnetise clocks and the shadow masks of CRT-type monitors at a greater distance than other types of magnets can. They are also capable of erasing magnetic materials like credit cards and floppy discs. Chipped magnets can occasionally present a fire risk when they come together and send sparks flying like lighter flint because some neodymium magnets contain ferrocerium.

7. Conclusions

The presented work aims to reduce the fuel consumption of the automobile in the particular or any machine, which employs drive shafts, in general it is achieved by using light weight composites. The battery is charged with the help of the vehicle's alternator, but due to the alternating current being in direct contact with the engine with a transmission, the engine will experience a certain degree of resistance.Therefore, to reduce this resistance and improve the efficiency of the engine, we modified the design of the drive shaft so that while transmitting the driving force from the engine to the differential, it also generates electrical energy to charge the battery, so it will not utilize engine power. Therefore, increasing the efficiency of the engine

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