

SELF CHARGING THROUGH REGENERATIVE BRAKING SYSTEM.

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Abstract

As in this 21st century, the one of the main problems is energy crisis. The resources are exhausting in faster and faster. Because of all the people of the world depends upon these resources. To protect these sources from depletion, there should be one special technology that will help the recovering the energy so that less amount of energy utilization is occurred. There is a technology called Regenerative Braking System (RBS). It will recover the energy that generally gets wastage in different forms to the environment. So, we can implement this system in automobiles. To recover the energy source. Use that energy source to do some useful work. Regenerative braking systems (RBS) is the method to recovering the energy released and at the same time reducing the brake emissions of vehicles. The Regenerative Braking System is a method is based on the principle of the mechanical energy of the motor created and that energy converted into electrical energy. The converted electrical energy is stored in the battery for later usage. This Regenerative Braking System must meet the maximum energy recovery criteria by performing its function safely within the shortest braking distance. This study was conducted to provide important & perfect information about the system of regenerative energy. These systems providing the economic benefits through saving the fuels like petrol, diesel and prevention of losing material. It leads to a clean environment and renewable energy sources, which are among the most significant issues on the global agenda. It is clear that more comprehensive studies should be carried out in this area.

Keywords: Regenerative Braking, Generator, Energy Recovery, Wheel, Battery Charging, Accelerator

1. INTRODUCTION

In the 21st century main research in the field of automobile is going on the alternate the energy sources, the vehicle efficiency and reducing the emissions. Most of the public vehicles and commercial vehicles like buses, trucks, delivery vans loss large amount of Kinetic Energy during continuous braking and constant driving at low speed in urban areas and rural areas due to road condition and traffic with leads to high fuel consumption. The main problem of vehicle is slow movement at traffic areas it leads to the result is emission of greenhouse gases due to incomplete combustion. when the vehicles are allowed to move in high amount of speed, there would be better combustion and resulting the lower emission of greenhouse gases. However, the speed cannot be constant throughout the road. So that there should be

alternate method to overcome this type problem. Regenerative Braking System can be used as a solution of above that problem. This Regenerative Braking System is generally used in electrical vehicles. Regenerative Braking System allows the vehicle to recaptured amount of kinetic energy which would be loss during the braking and slowing vehicle. The recovered process can be used for future as they can be stored in the battery. This type of system can be implemented in electric vehicles. Which would be operated in urban areas and traffic route areas so that they can recover the energy sources. This system is generally placed in a driven axle near the brakes so that the energy can be recovered. This system allows the vehicles to be in good state as the fuel consumption rate will be reduced. Due to this system, there would be a loss in emission of greenhouse gases and other harmful gases. This system generally recovers more energy source in high speed. The more amount of energy is recovered during braking, so the less amount of fuel consumed in the automobile.

2. Working principle

Regenerative braking is a system that converts the kinetic energy of a moving vehicle into electrical energy, which can be stored in a battery or used to power the vehicle's electric motors. This system is commonly used in electric and hybrid vehicles to improve their efficiency and range. The regenerative braking system works by using the electric motor as a generator, which produces electricity when the vehicle is decelerating or braking. When the driver presses the brake pedal, the system reduces the power supplied to the motor, causing it to act as a generator and convert the kinetic energy of the moving vehicle into electrical energy. This electrical energy is then sent back to the battery, where it is stored for later use. The regenerative braking system is particularly effective in urban driving conditions, where vehicles frequently start and stop. By using regenerative braking, the vehicle can recover much of the energy that would otherwise be lost during braking, and use it to power the vehicle during acceleration. This reduces the need to rely on the battery or engine, and can improve the overall efficiency of the vehicle. In summary, the regenerative braking system works by converting the kinetic energy of a moving vehicle into electrical energy, which can be stored or used to power the vehicle's electric motors. This system improves the efficiency and range of electric and hybrid vehicles, particularly in urban driving conditions where vehicles frequently start and stop...

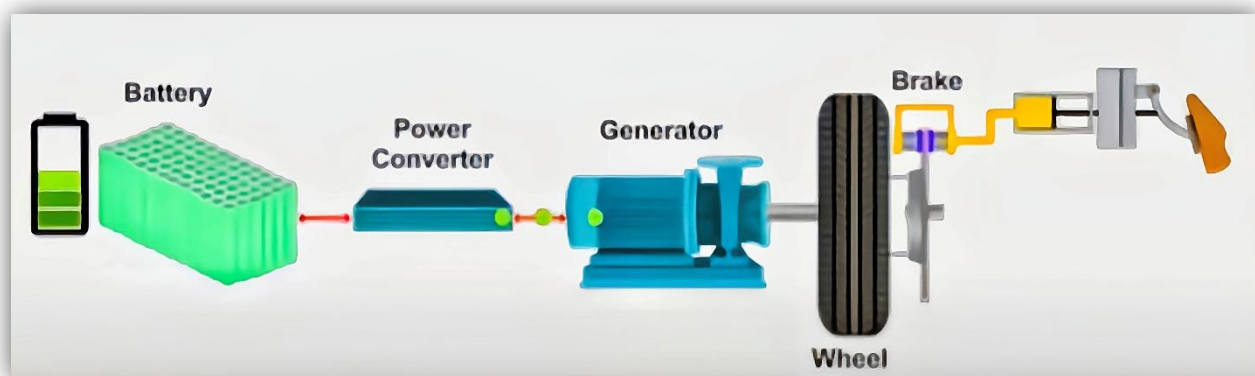


Figure 1. Working principle of Regenerative Braking System.

3. Materials and Methodology

Regenerative Braking System cannot be only used as a braking system in any vehicle. This Regenerative Braking System has slow reaction time as electric motor has to be operate in opposite direction for slowing and braking process. Many of the researchers, engineers and drivers suggested to use the frictional braking system such as anti-Lock braking system (ABS) for efficient and smooth operation. The both frictional braking system and electrical braking system can be termed as hybrid braking. The hybrid braking is commonly used in many automobiles manufacturing companies in the current situation. The following materials were used for fabrication are first understood and then bought from the market. The tabular form below shows the materials required with the quantities.

Table 1. List of Materials

S.no	Name of Parts	Specification	Quantity
1	Square table	60cm*60cm	1
2	Battery	12V, 1Amph	1
3	Generator	12V	1
4	DC convertor	-	1
5	Motor	9500RPM	1
6	Accelerator	Semiautomatic	1
7	Wheel	30cm diameter	1
8	Multimeter	Calculating power	1
9	Electric wires	Copper wires	2meters
10	Brake wheel	10	1

Table 1. Materials used in regenerative braking system

2.1 Procedure

First cut the square bar into some pieces and then welded together in order to square frame shape. The square bar is welded at each corner to form a structure like table. The square shape of wooden surface is fixed and drilled in the square bar to hold the multiple materials like Wheel, Generator, Accelerator, Motor etc. Arranged the design as shown in figure 2 to hold the Wheel. And then all the other materials are accelerator, generator, battery, brake wheel, motor etc.... fixed on the square wooden surface. The power of motor is transmitted to the Wheel by the connecting the rubber belt drive. The brake wheel is fixed at the tip of the geared D.C motor is connected to battery for the purpose of store the energy. That stored energy is used as secondary battery for the vehicle use or used for vehicle accessories like Lighting systems, ignition systems etc... to increase the efficiency of primary battery. In our model generated energy is transferred into battery and the battery energy is used to L.E.D lights through copper wire. For the purpose of unidirectional flow of energy, we use the diode

fixed at the one terminal of the battery. The entire assembly is coloured with black paint to protect from the rust.

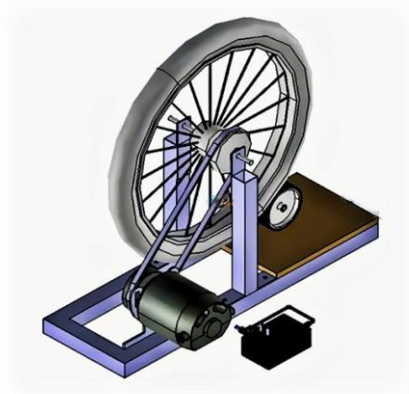


Figure 2. Fixing the wheel positioning

2.2 Design



Fig2.2.1 Body



Fig2.2.2 Brake wheel



Fig 2.2.3 Wheel

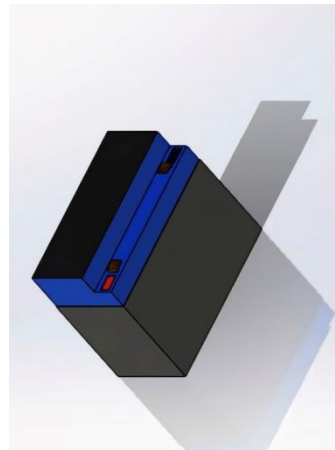


Fig 2.2.4 Battery

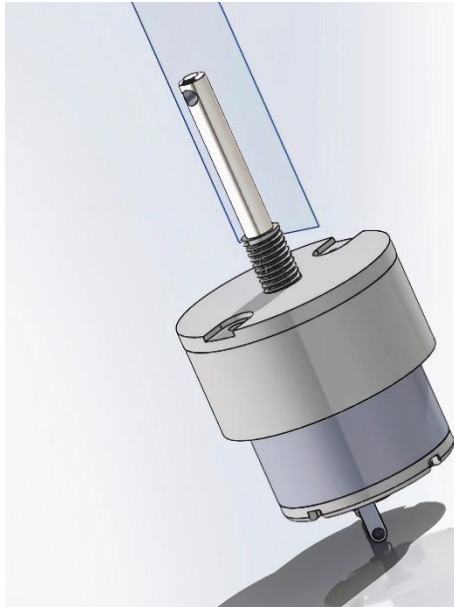
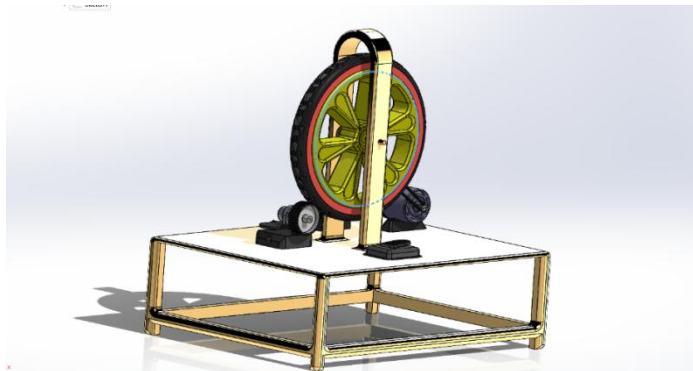


Fig 2.2.5 Motor



Fig 2.2.6 Belt



Design of Regenerative Braking System

2.3 Fabrication



Figure3.RegenerativeBraking System

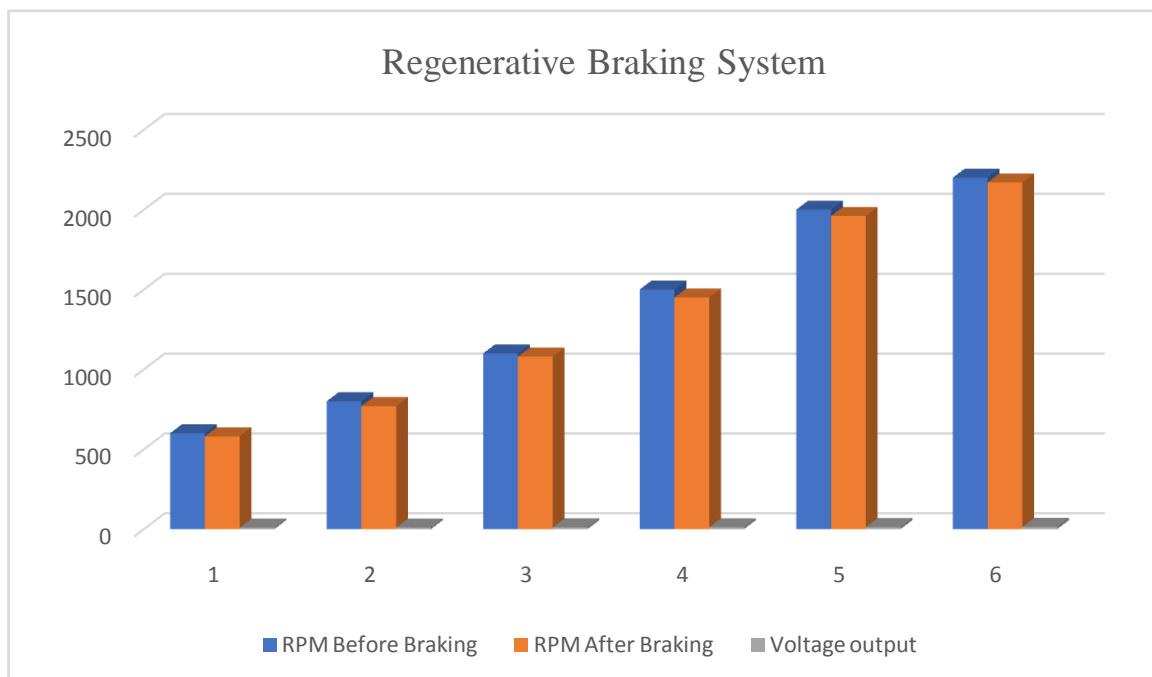
2.3 Experimenting

The final design after the fabrication is experimented to know that the design is made as per the requirement and the model should fulfil some Mechanical properties.

4. Result

After the testing, the model is operated and the results obtained in various loading conditions are noted and tabulated below.

S.No	R.P.M. Before Braking	R.P.M. After Braking	Voltage output
1	600	580	8.98
2	800	770	9.56
3	1100	1080	10.81
4	1500	1450	11.91
5	2000	1960	12.49
6	2200	2170	13.58



By the results of Regenerative Braking System voltage values are increasing with the speed of the wheel. That means when the wheel has the getting power to rotatory motion then the result is output as voltage. We calculating the wheel RPM by the tachometer before and after brake applying. While brake applying some voltage is generated. That energy is stored in battery as shown in fig.3 and also, we showed the how much energy is generated and stored by the multimeter. We can use that energy to L.E.D. lights.

5. Conclusions

Regenerative Braking System is used in the vehicle to recover the energy loss due to friction as heat to the environment during braking. On high temperature and speed this system is more efficient as compared to traditional braking system. As this system cannot be used alone without any other braking mechanism, there should be another research to develop a better system that can alone recovers the energy and complete the applications of braking. The further research should also have to be done to decrease the weight of the system. If we could use more efficient system like this, the huge savings are obtained in any country economy.

6. Future Scope:

As this project is completely based on the experimental test rig and if this system is applied in the current working vehicles there are may be some problems which may cause uncomfortable for drivers. As RBS don't provide braking at high speed so this system should be implemented with other forms of Braking system like Anti-Lock Braking System (ABS). Implementing this system in the current working vehicle will increase the mass if the vehicle and occupies additional space. So, this factor should be considered before vehicle design so that this factor could be overcome. When RBS is implemented to any vehicles, there would be certain change in structure of vehicle, weight and some configuration of the vehicle. Sometimes the driving style also changes which will be difficult for driver to learn the configuration at a short time. But many of the driver and users has shown their positive responds towards this braking system. RBS usage is directly linked with sustainable and eco-system conversation. If the Eco-driving Process are used by the drivers and all the automobile users this system could have considerable effect of energy on the traffic flow.

7. References

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