

# Study of Regenerative Power System

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**Abstract** – Proper utilization of waste energy can mitigate energy crisis and keep the cost under control. This project aimed to regenerate the energy from braking load in the vehicle. In this study, a prototype electric regenerative system is designed and tested experimentally to predict its performance. The prototype system is operated by a 12V motor that can recharge a 2.4V battery. It is observed that the amount of energy stored in the battery is increased with the increasing braking load. This energy can be used for operating auxiliary components such as fans, lights etc. and in cases, added to the main power source. In a nutshell, this project has brought the totally unused energy during braking in the limelight and paved the way to utilize this energy in a fruitful manner.

**Keywords** – Electric System, Idle load, Regenerative power.

## I. INTRODUCTION

Every time you step on your car's brakes, you're wasting energy. Physics tells us that energy cannot be destroyed. So when your car slows down, the kinetic energy that was propelling it forward has to go somewhere. Most of it simply dissipates as heat and becomes useless. That energy, which could have been used to do work, is essentially wasted. Is there anything that you, the driver, can do to stop wasting this energy? Not really. In most cars it's the inevitable by product of braking and there's now day you can drive a car without occasionally hitting the brakes. But automotive engineers have given this problems a lot of thought and have come up with a kind of braking system that can recapture much of the car's kinetic energy and convert it into electricity, so that it can be used to recharge the car's batteries. This system is called regenerative braking.

A flywheel is a rotating mechanical device that is used to store rotational energy. Flywheels have a significant moment of inertia and thus resist changes in rotational speed. The amount of energy stored in a flywheel is proportional to the square of its rotational speed. Energy is transferred to a flywheel by applying torque to it, there by increasing its rotational speed, and hence its stored energy.

In a traditional braking system, brake pads produce friction with the brake rotors to slow or stop the vehicle. Additional friction is produced between the slowed wheels and the surface of the road. This friction is what turns the car's kinetic energy into heat. With regenerative brakes, on the other hand, the system that drives the vehicle does the majority of the braking. When the driver steps on the brake pedal of an electric or hybrid vehicle, these types of brakes put the vehicle's electric motor in to reverse mode, causing it to run backwards, thus slowing

the car's wheels. While running backwards, the motor so acts as an electric generator, producing electricity that's then fed into the vehicle's batteries. These types of brakes work better at certain speeds than at others. In fact, they're most effective in stop-and-go driving situations. This is designed by using a FlyWheel which is connected to the shaft of the DC geared motor such that its out put is given to the reverse polarity preventer cum polarity corrector. Depending up on the movement of the FlyWheel corrected automatically which is given as an input supply to 12V ,1.3Amp-Hour DC rechargeable batteries. The output of this lead acid battery is given as input to the inverter which drives the AC loads.

The battery is connected to the inverter. This inverter is used to convert the 12volt DC to the 230 Volt AC. This 230 volt AC voltage is used to activate the loads. Here we are also using conventional battery charger unit to recharge the battery. In this project we are using Flywheel, geared dc motor Reverse polarity preventer cum polarity corrector, A Cripples neutralizer, unidirectional current controller and a battery which has high charges to ring capability and long durability.

## II. LITERATURE REVIEW

The Regenerative braking systems vastly improve the fuel economy and further enhance the attractiveness of the vehicle. There are so many methods of regeneration of energy from braking such as (a) Electric Regenerative braking system (RBS), (b) Hydrostatic Regenerative Braking (HRB), (c) Regenerative Braking Using Compressed air and (d) Regenerative Braking Using Nitinol Spring. The electric motor is the main driving components or regenerative braking system where electric motor acts as a motor as well as a generator. b. Another system called Hydrostatic Regenerative Braking (HRB) is brought in to improve the vehicle fuel economy by using electrical/electronic components and hydraulics . The

power produced from the Regenerative braking system could be applied to fill the air tank during the time of braking. By absorbing the kinetic energy (necessary for braking), using the same for compressing the air and reuse these compressed air while powering the car. In the regenerative braking system using nitinol spring, the kinetic energy is stored in form of potential energy in spring. When the system actually demands the acceleration this potential energy stored is given back to the wheels to power them.

### III. EXPERIMENTAL PROCEDURE

#### 1. Fabrication of Project

It consists of a motor with transformer, relay, and capacitor to store the charge into the battery. The measurement device used in this experimental test is a tachometer for RPM, a stopwatch for a time, ammeter and voltmeter for measuring voltage and current and VU meter for checking the signal condition. The tachometer accuracy is 0.05%. When power is supplied, shaft starts rotating with the rotation of the motor. When the brake is applied, due to inertia the shaft continued to rotate for few seconds. As the gear and pinion mesh with the rotation of the shaft will operate the motor and motor works as a generator producing electricity, which is stored in the battery. Represents the schematic view of power transmission in which a gear is fitted to the shaft on which the load is mounted. A pinion mounted on the motor shaft in meshed with the gear. So, when power is supplied to the motor, the shaft started rotating, so the loads e.g. wheels.

### IV. APPLICATIONS

1. Regenerative Braking System
2. Usage of rechargeable battery
3. Geared DC motor
4. Highly sensitive.
5. This system helps in energy generation.

### V. CONCLUSION

In this study, a prototype experimental electrical vehicle is successfully designed and tested to study the energy regeneration for breaking load. Analyzing the results, This study presented the proper potency of the regenerative braking system in case of utilizing the waste energy. A brushless dc motor is recommended as an efficient choice for the further future work.

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