

A REVIEW ON REGENERATIVE BRAKING SYSTEM

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Abstract: As today's world energy transformation is less and loses of energy in high manner. Normally in daily life the energy has been wasting in automobile field. In vehicle whenever brake applying the kinetic energy of the vehicle get wasted due to friction in the form of kinetic energy. The electric vehicle which desgined recently with regenerative braking technology. This paper discussed about energy transformation process and regenerative braking process which recovery energy from kinetic energy into electrical energy. Regenerative braking technology include the electric motors, generators, battery for the energy conversion and storing purpose. It increase the efficiency of the electric vehicle by saving the energy.

Keywords: Regenerative braking system(RBS), Battery Electric Vehicle(BEV),

I. Introduction:

Energy can neither be created nor destroyed But energy transformation may possible. Loss of power and efficiency in electrical and mechanical systems has been a recurring problem in automotive design. As we know for future petroleum resources is limited so, the important method to solve the problem is to develop the electric vehicle with good efficiency. Since LPG and CNG are mostly popular because of their cheap prices per unit and inexpensive budget of installation. However, the concerns about emission problem like carbon dioxide quantity or greenhouse effect still continuously happening. One of the way to reducing this type of emission can we use Battery electric vehicle (BEV).

Regenerative braking system in BEV is significant part, which is responsible for recovering mechanical energy during braking and stored back as electrical energy. An important fuel saving element in Battery Electric Vehicle is the regenerative braking. Use of regenerative braking in a vehicle not only the results of recovering the energy it also increases the efficiency of vehicles and saves energy.

Kinetic Energy

The object has energy because of its motion is known as kinetic energy. If object needs an acceleration , then we need to apply a force. Applying force requires to do some work. After the work done energy will transferred to the object. The transformation of energy is kinetic energy. The kinetic energy obtained by the mass and speed achieved.

II. Regenerative Braking System:

The brake pads were is used as a traditional method which produce friction with the brake rotors for stop or slow the vehicle. In traditional method friction is highly happen because kinetic's energy into heat. Regenerative braking systems (RBSs)is the type of kinetic energy recovery system that transfers the kinetic enrgy of an object in motion into potential or stored energy to slow down the vehicles and increase the fuel efficiency.The advance braking system in the vehicle is regenerative braking. Friction happening in regenerative braking the function of this braking system is kind of back-up system. Energy is wasted every time when the brakes are applied in a vehicle. By applying break vehicles comes into rest position. Kinetic energy is converted into heat as friction between the brakes pads and wheels while applying a conventional brake. This heat is carries away in the airstream and the total energy wasted. Total energy wasted depends on how often, how hard and for how long the brakes are applied.

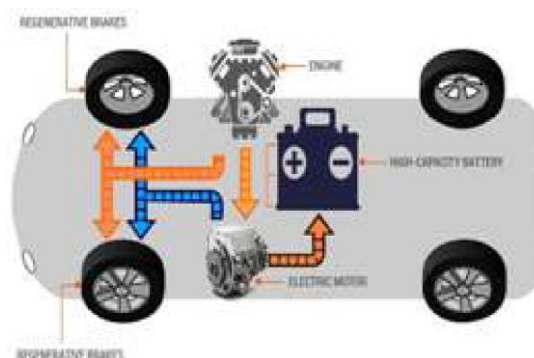


Figure 1: Example for Regenerative braking system

III. Working Principle of Regenerative Braking System:

The electric vehicle spending up, the motor controls the current output by the battery through the sensor signal, and then its speed is adjust for providing power. Then its transmits electric power by the motor becomes generator when electric vehicle braking applying, then electric power converted by the motor to the battery for recharging the battery. Whenever a motor is run in one direction the electric energy

gets converted into mechanical energy. The same process done in opposite direction it function as generator, then it converts mechanical energy to electrical energy. Rotational force of the driving axle to turn electric motors, thus slow down the speed of the car and simultaneously charging the battery of car by regenerative resistance of the electric motors. The resistance from the electric motor is using for recharging the battery.

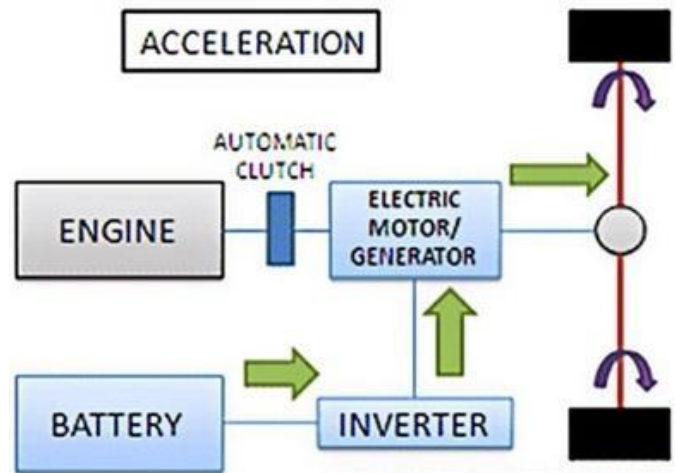


Figure 2: Block diagram of Acceleration

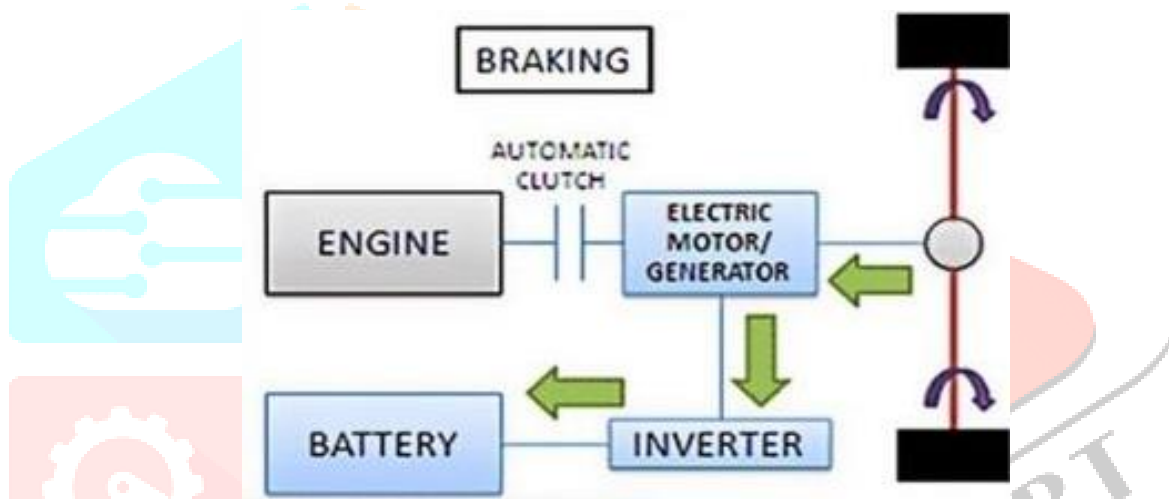


Figure 3: Block diagram for Braking

IV. The Efficiency Of Regenerative Braking System

According to the factors such as, weight of the vehicle, aerodynamics of the vehicle, gearing and engine of the vehicle energy efficiency of a vehicle is occurring. Normally we consider a car which consuming 100% energy in that only about 20% energy is restored, then the balance 80% of energy were wasted as heat energy.

V. Applications

- Major part of regenerative braking is kinetic energy recovery mechanism during braking process
- Could be used in the thermal power plant or any transformation goods within a industry by belt conveyor this system can be using
- Shopping mall, corporate offices, airport, elevators and lift were using regenerative braking
- Mostly used in hybrid vehicles, electric train, bicycles, etc.

VI. Advantages

- Reducing Pollution related to supply generation
- Fuel consumption of the vehicles is decreased depends upon vehicle design, control plan and by the component's efficiency this comes to fuel economy is possible
- Reduced in engine emissions by engine decoupling reduces the total number of revolutions due to this reduced in emissions
- Minimizing the fuel tank level this cause reducing the weight of the vehicle.
- Better efficiency and performance is possible
- maintenance of braking is less.

VII. Future scope

Regenerative braking thus required further research in the braking system to develop an improvement in braking maintenance. which is capable to restore the energy in greater manner and need to decelerates the energy as much possible. components of motors and generators upgradation need in design for better efficiency and reducing costs. reduce the transmission loses by using of carbon fiber. make improvements in engine for better improve in torque.

VIII. Conclusion

Regenerative braking system is normally used in hybrid vehicles. This system process to capture the energy and storing energy then it will be reuseable. The major thing is saving energy which lost during braking process. Comparing to conventional braking this braking operating in high temperature with high efficiency. By upcoming years regenerative braking have broad scope with further advancements and the energy conservations due to this enhances growth of economy will occur.

References

- [1] 'Dr.Kripal singh' "Automobile Engineering", vol.1.
- [2] 'Dr.Deo Raj Tiwari, vinod kumar, Performance and Design Analysis of Regenerative Braking System vol.No.5, AUG 2016.
- [3] 'Prathibha patel', 'Upwan Kumar Sahu', 'veena', 'Rashmi Khutel', 'Juli Singh Sadhak', Electricity Generation Through Wheel Regenerative Braking System, vol 6 No. 4.
- [4] 'Khushboo Rahim', 'Mohd . Tanveer', 'sandeep soni', 'Jagandeep kaur', 'Shruti Karkra', Regenerative Braking, vol 5 No.5.

