

# Regenerative Braking System

Vinay Pratap<sup>1</sup>, Vikas Yadav<sup>2</sup>, Vinay Yadav<sup>3</sup>, Vivek Verma<sup>4</sup>

<sup>1,2,3,4</sup>B.Tech. Student, Dept. of Mechanical Engg., United College of Engg. and Management, Prayagraj, India

**Abstract:** Regenerative Braking System is the way of slowing vehicle by using the motors as brakes. Instead of the surplus energy of the vehicle being wasted as unwanted heat, the motors act as generators and return some of it to the overhead wires as electricity. The regenerative braking taking place on the vehicle is a way to obtain more efficiency; instead of converting kinetic energy to thermal energy through frictional braking, the vehicle can convert a good fraction of its kinetic energy back into charge in the battery, using the same principle as an alternator.

**Keywords:** Hybrid Vehicles, Regen and Fuel cell, Batteries, Bearings, Motors.

## 1. Introduction

Regenerative braking is an energy recovery mechanism which slows a vehicle or object by converting its kinetic energy into a form which can be either used immediately or stored until needed. In this mechanism, the electric motor uses the vehicle's momentum to recover energy that would be otherwise lost to the brake discs as heat. This contrasts with conventional braking systems, where the excess kinetic energy is converted to unwanted and wasted heat by friction in the brakes, or with dynamic brakes, where energy is recovered by using electric motors as generators but is immediately dissipated as heat in resistors. In addition to improving the overall efficiency of the vehicle, regeneration can greatly extend the life of the braking system as its parts do not wear as quickly.

## 2. Design

The basic steps for the designing of regenerative braking system are as follows.

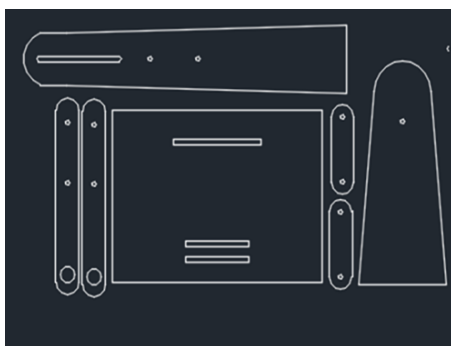


Fig. 1. Base plate and supporting plate

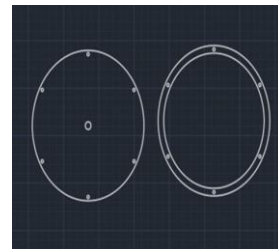


Fig. 2. Drum or Flywheel



Fig. 3. Drum with motor



Fig. 4. Regenerative Braking System

## 3. Dimension

### A. Base Plate



Fig. 5. Base plate

Base plate dimension = 200mm X 150mm  
 Slot in base plate =  
 slot 1 = 84mm X 4.94mm  
 slot 2 = 60mm X 4.94mm

**B. Supporting Plate I**

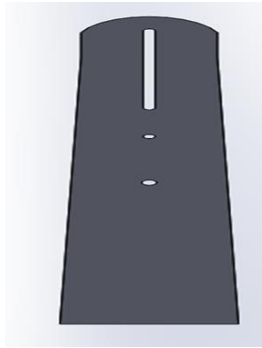


Fig. 6. Supporting Plate I

Dimension of supporting plate1 = 308 mm X 60mm  
 Slot in supporting plate1 = 79mm X 4 mm  
 Circle 1 = diameter 10mm  
 Circle 2 = diameter 4 mm

**C. Supporting Plate II**

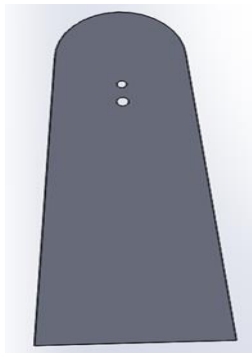


Fig. 7. Supporting Plate 2

Dimension of supporting plate 2 = 195mm X 84mm  
 Circle = diameter 10mm

**D. Connector I**

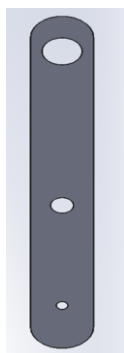


Fig. 8. Connector I

Dimension of connector1 = 173mm X 22mm  
 Circle1 = diameter 14mm  
 Circle2 = diameter 4mm

**E. Connector II**

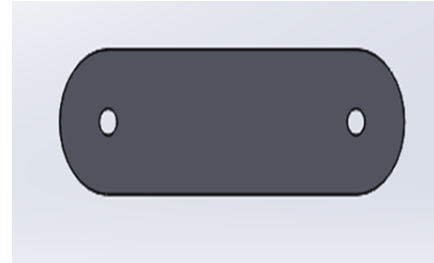


Fig. 9. Connector 2

Dimension of connector 2 = 79mm X 22 mm  
 Circle = diameter 4mm

**F. Drum or Flywheel**

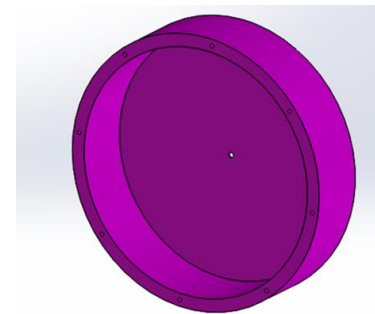


Fig. 10. Drum or Flywheel

Dimension of Drum or Flywheel = outside diameter  
 = 198mm

Inside diameter= 178mm  
 Circle1 = diameter 10mm  
 Circle2 = diameter 4 mm

**4. Material used**

Wood is used for Base Plate. ACRYLIC used for Supporting Plate is in 5mm thickness. ACRYLIC is also used for Drum or Flywheel is in 10mm thickness.

**5. Future scope**

Regenerative braking systems require further research to develop a better system that captures more energy and stops faster. As the time passes, designers and engineers will perfect regenerative braking systems, so these systems will become more and more common. All vehicles in motion can benefit from these systems by recapturing energy that would have been lost during braking process. Future technologies in regenerative brakes will include new types of motors which will be more efficient as generators, new drive train designs which will be

built with regenerative braking in mind, and electric systems which will be less prone to energy losses.

### **6. Conclusion**

Theoretical investigations of a regenerative braking system show about 25% saving in fuel consumption. The lower operating and environment costs of a vehicle with regenerative braking system should make it more attractive than a conventional one. The traditional cost of the system could be recovered in the few years only. The exhaust emission of

vehicle using the regenerative braking concept would be much less than equivalent conventional vehicles as less fuel are used for consumption. These systems are particularly suitable in developing countries such as India where buses are the preferred means of transportation within the cities.

### **References**

- [1] [www.wikipedia.com/RegenerativeBrakingSystem](http://www.wikipedia.com/RegenerativeBrakingSystem).
- [2] R. S. Khurmi, "Theory of Machine."
- [3] [www.electricvehiclenews.com/2012/02/aircraft-of-future-could-capture-and-re.html](http://www.electricvehiclenews.com/2012/02/aircraft-of-future-could-capture-and-re.html)