

# Supermagnet Braking System

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## Abstract

In this project Super magnet brake is the innovative concept based on the magnetic attraction of the conducting metals. A super magnet brake, like a conventional friction brake, is responsible for slowing an object, such as a train or a roller coaster. Unlike friction brakes, which apply pressure on two separate objects, eddy current brakes slow an object by creating eddy currents through electromagnetic induction which create resistance, and in turn either heat or electricity.

**Keywords:**Magnet1, Electromagnetic 2, frictionless 3, contactless 4

## 1. Introduction

- Brake (device), device used to slow and stop a rotating wheel and thus a moving vehicle. Brakes such as those on automobiles, trucks, trains, and bicycles use friction between a wheel and another object to slow the motion of the vehicle.
- The friction created by the rubbing together of two objects generates a large amount of heat. A brake system must be capable of dissipating the heat as rotating wheels slow, because excess heat can cause the brakes to lose their grip and fail.
- Accidents are one major occurrence that happens worldwide on road transport abruptly due to these lives can be lost or could even have some serious injury. Most of the time the major cause of the accident is braking where overloaded cant able to achieve the required braking performance and lead to accident. Accident happens also in a standing vehicle where the handbrakes was not able to hold the vehicle for time.Brake failure due to overheat because of too much friction and pressure.
- The existing braking systems suffer from a lot of drawbacks like inferior time-delay response and noise due to mechanical parts, wear and tear due to friction and contact, low performance and bulky size. The super magnet brake consists of a round disc plate in which small, small magnets are encrypted on it. It is the made to rotate by means of a motor coupled to it.
- The motor centre shaft is connected to the shaft from round disc plate. Two iron plates separated by some distance which distance to be larger than that of the thickness of the disc plate provided the metal iron plates will slide up to the circular disc. When, the motor starts running, the disc plate will also rotate tin the same direction to the direction of the motor.
- While it reached the certain speed, the iron plates is made to slide on the rail such that the round disc will be right in between the two iron plates. The moment when the iron plates moved towards the disc, the rotating disc will slower down and finally it stops.

## 2. Objective

- The main objective of this project is to design, construct and develop a Supermagnet brakes as it is used as supplementary retardation equipment in addition to regular function of braking.
- Leads to the frequency of accidents to be minimized.

## 3. Proposed Solution

- The super magnet brake consists of a round disc plate in which small, small magnets are encrypted on it. It is the made to rotate by means of a motor coupled to it.
- Electric brake or electric retarder, is a device used to slow or stop a moving object by generating eddy currents and thus dissipating its kinetic energy as heat. Unlike friction brakes, where the drag force that stops the moving object is provided by friction between two surfaces pressed together, the drag force in an eddy current brake is an electromagnetic force between a magnet and a nearby conductive object in relative motion, due to eddy currents induced in the conductor through electromagnetic induction.
- The magnetic field may be created by a permanent magnet or an electromagnet. With an electromagnet system, the braking force can be turned on and off (or varied) by varying the electric current in the electromagnet windings. Another advantage is that since the brake does not work by friction, there are no brake shoe surfaces to wear, eliminating replacement as with friction brakes

## 4. Working Principle

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## 5. Advantages

- Reduced wear. The amount of friction required to slow or stop loads in mechanical braking systems can create significant wear and tear on the components of the brake over time.
- By using electromagnetic force and the properly selected friction material to provide the slowing/stopping action, electromagnetic brakes help reduce wear.
- Enhanced performance. An electromagnetic brake can be customized to provide fast action, precise engagement, and smooth, backlash-free operation.
- Lower costs. By reducing component wear and improving brake efficiency, electromagnetic braking solutions last longer and require considerably less maintenance.
- Improved heat dissipation. Well-designed electromagnetic braking systems can be highly effective at dissipating heat compared with mechanical systems and other alternatives.

### 5. Design Description

- Table 1 shows the components mainly used in the system.

Table 1: Components used

S.No	Components	Description
1	Ac Motor	40w Induction
2	Bearing	Ball
3	Pedals	Accelerator/brake
4	Ferromagnet	8 in 20 dia

Figure 1: Prototype of Supermagnet Braking System



### 6. Conclusion

- The frequency of accidents will be minimized by using Supermagnet brakes as it is used as supplementary retardation equipment in addition to regular function of braking. The Super magnetic Braking System is more reliable than the conventional braking systems.
- The conventional brakes may create a danger situation when used beyond their capabilities to dissipate heat and this problem can be resolved by using Super magnetic Braking System.
- The cost of these brakes is less than the other available substitutes as well as this system can work in wet conditions as well which helps to avoid the problem of skidding.

### 7. Future Scope

- The Electromagnetic brakes are excellent replacement for conventional automobile brakes. The use of Electromagnetic brakes can be done for lighter vehicles also. With some modification, a regenerative braking system can be equipped with the Electromagnetic brakes.
- These brakes are often utilized as a part of wet condition, so there's no utilization of against slipping instrument .it is completely electrically controlled which brings about fewer mishaps. The braking

power delivered during this brake isn't the maximum amount because the plate brakes. Subsequently, it is often utilized as an auxiliary or crisis slowing mechanism within the autos.

## 8. References

1. H.D. Wiederick, N. Gauthier, D.A. Campbell, & P. Rochan (1987) "Magnetic braking: Simple theory and experiment", American Journal of Physics 55:500–503.
2. M.A. Heald (1988) "Magnetic braking: Improved theory", American Journal of Physics 56: 521–522.
3. Y. Levin, S.L. Da Silveira & F.B. Rizzato (2006) "Electromagnetic braking: A simple quantitative model", American Journal of Physics 74:815–817.
3. Nice and Karim (2000-08-22). "How Power Brakes Work". Howstuffworks.com. Accessed on December 12, 2016.
4. "What is a Strong Magnet?" The Magnetic Matters Blog. Adams Magnetic Products. October 5, 2012. Accessed on December 12, 2016.
5. "An Introduction to Neodymium Magnets". NdFeB-Info website. eMagnets UK. Accessed on December 28, 2016.
6. Sumit Patel, "Development of the Electro-Magnetic Brake", IJRST Volume 1 | Issue 12 | May 2015.
7. Sevel P, Nirmal Kannan V, Mars Mukesh S, "Innovative Electro Magnetic Braking System", IJRSET, April 2014.
8. Oriano Bottauscio, Mario Chiampi, Alessandra Manzin, "Modelling analysis of the electromagnetic braking action on rotating solid cylinders", Science Direct, December 2006.
9. Dr Kirpal Singh. Automobile Engineering and Technology, Vol.
10. R. A. Barapte "Electromagnetic Engineering" Technova Educational Publication.
11. Khurmi & Gupta "Machine Design" S Chand Publication.
12. V. B. Bhandari "Design of Machine Elements" Tata McGraw Hill.
13. K. Balaveera Reddy. "Design data hand-book for mechanical engineering."