

## **Electromagnetic Speed Breakers**

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### **Abstract:-**

*Magnetic Bars are a way of using magnetic fields to control objects. This magnetic system and repulsive systems, are referred to as electromagnetic suspension and electrodynamic suspensions. Thus, several nations spend billions of dollars to use this magnetic arrangement. Magnetic Bars use magnetic fields to attract a metallic object. Manipulating fields and controlling their forces can attract an object. Using either Ferromagnetism or Diamagnetism objects can be used. A superconductor is perfectly diamagnetic and electromagnets can exhibit helpful levels of ferromagnetism. Here in this report, a detailed study of magnetic bearing and magnetic bars. And, we have included their advantages as well as their disadvantage.*

**Keywords:-** *Magnetic Bars; Ferromagnetism; electromagnetic suspension.*

### **1. Introduction**

Electromagnetic speed breakers are an innovative solution aimed at improving road safety and reducing vehicle speeds. By utilizing the principles of electromagnetic induction, these speed breakers generate an electromagnetic field that interacts with any passing vehicle's metal components. This interaction creates a resistance force, effectively slowing down the vehicle without the need for traditional physical speed breakers. This technology not only helps in controlling the speed of vehicles but also provides a smoother and more comfortable ride for drivers and passengers. Additionally, electromagnetic speed breakers have the potential to be more durable and low maintenance compared to traditional speed breakers, as they do not suffer from wear and tear or damage caused by vehicle impact. Furthermore, electromagnetic speed breakers have the capability to harness the kinetic energy of vehicles as they slow down, converting it into electrical energy. This electrical energy can then be

stored and used for various purposes, such as powering streetlights or charging electric vehicles. This innovative solution has the potential to revolutionize the way we approach road safety and energy conservation. In today's rapidly changing world, the significance of accurate weather forecasts cannot be overstated. By implementing electromagnetic speed breakers, we can create a safer and more sustainable transportation infrastructure for the future.

## 2. Objective

Electromagnetic Speed Breakers are an innovative solution aimed at improving road safety and reducing vehicle speeds. These speed breakers utilize electromagnetic technology to generate resistance and slow down vehicles as they pass over them. By implementing electromagnetic speed breakers, the objective is to effectively control and regulate vehicle speeds, especially in areas with high accident rates or where speeding is a common problem. By slowing down vehicles, electromagnetic speed breakers can help prevent accidents and reduce the severity of collisions. Additionally, the objective is to harvest the kinetic energy from vehicles during braking and convert it into electrical energy which can be stored and used for other purposes. Such as powering street lighting or charging electric vehicles. The objective of electromagnetic speed breakers is to improve road safety, regulate vehicle speeds, harvest kinetic energy from braking vehicles, and convert it into electrical energy. Some of the objective mention here.

1. To naturally control the speed of the vehicle: By fixing magnets out and about and changing them at explicit distances, we attempted to control the vehicle naturally regardless of whether the driver couldn't handle the vehicle. This will assist with halting the vehicle at signals<sup>1</sup>.
2. To control the mishaps: By fixing magnets at defining moments, signs, and incidental zones, we have some control over the speed of vehicles and mishaps in this way. Assuming breaks of the vehicle flop unintentionally, it will likewise assist at that time with staying away from serious mishaps.
3. To boost the traffic rule keep up: Through this task, individuals will be naturally more mindful of traffic rules, and the propensity for keeping traffic guidelines will be produced among individuals consequently<sup>2</sup>.
4. To safeguard the vehicles from dooming while at the same time going through speed breakers and expanding the proficiency of suspension of the vehicles.
5. Low Support: Magneticbars offer a low-support arrangement contrasted with customary speed breakers, which might debase over the long run or require successive repainting.

## 3. Working:

I) Magnetic brakes operate on the principles of electromagnetic induction and the generation of eddy currents.

II) In simple terms, when a metallic object moves through a magnetic field, it experiences a change in the magnetic field.

III) This change induces a current, known as an eddy current, within the metal. The eddy current, in turn, creates its magnetic field that opposes the initial magnetic field<sup>3</sup>.

IV) The interaction between these opposing fields creates a braking force that slows or stops the movement of the metallic object without any physical contact.

V) The Eddy current will also produce drag which will help in the stopping the car.

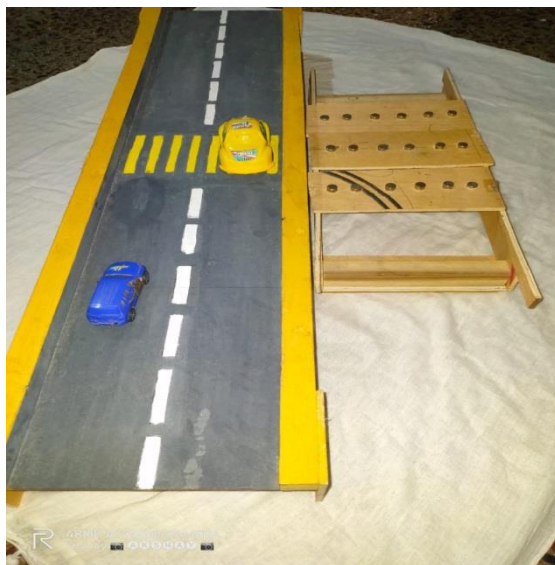


Figure 1:- Electromagnetic Speed Breaker

## 4. Magnetic Bearings

- Magnetic bearings are another application of magnetic technology formed by electromagnetic suspension and electromagnets.
- Magnetic bearings support loads short of any kind of physical interaction.
- The benefits of this include reduced friction, reduced wear on machinery, and the highest speeds of any kind of bearing.
- Disadvantages of magnetic bearings include attraction difficulties when increasing or decreasing bearing distances from objects<sup>4</sup>.

## 5. Advantages

1. Customizable Speed Control: Magnetic speed breakers allow authorities to adjust the strength of the magnetic field, enabling customizable speed control based on specific road conditions or requirements.
2. Reduced Noise Pollution: Compared to traditional speed breakers, which can produce noise from vehicles passing over them, magnetic speed breakers operate silently, contributing to reduced noise pollution in urban areas.
3. Durability: Magnetic speed breakers are typically more durable than traditional speed breakers since they don't involve physical components that degrade over time due to weather or vehicle impact.
4. Minimal Maintenance: With fewer physical components to maintain, magnetic speed breakers require minimal upkeep, reducing maintenance costs and traffic disruptions.
5. Improved Accessibility: Magnetic speed breakers offer smoother transitions for all types of vehicles, including bicycles, motorcycles, and emergency vehicles, ensuring better accessibility for road users.
6. No Visual Obstructions: Unlike traditional speed breakers, which can obstruct the visual field of drivers, magnetic speed breakers are often flush with the road surface, maintaining clear visibility and reducing the risk of accidents<sup>5</sup>.
7. Compatibility with Smart Systems: Magnetic speed breakers can be integrated with smart traffic management systems, allowing for real-time adjustments to traffic flow and speed control based on changing conditions.
8. Enhanced Aesthetics: Magnetic speed breakers can contribute to the aesthetics of urban environments by blending seamlessly with the road surface, avoiding the visual clutter associated with traditional speed breakers.

9. Adaptability to Various Road Surfaces: Magnetic speed breakers can be installed on various road surfaces, including asphalt, concrete, and cobblestone, making them suitable for different types of roads and locations.

## 6. Disadvantages

1. Cost: Magnetic speed breakers can be expensive to install compared to traditional speed bumps.
2. Maintenance: They may require more frequent maintenance to ensure proper functionality.
3. Interference: Magnetic fields could potentially interfere with electronic devices in vehicles.
4. Environmental Impact: Concerns may arise about the environmental impact of the materials used in the magnets.
5. Limited Effectiveness: They may not effectively slow down all vehicles, particularly those with non-magnetic components.
6. Regulatory Challenges: Regulatory approval and compliance with standards may be more complicated for magnetic speed breakers compared to traditional speed control measures.

## 7. Conclusion

- This project was completed and helped us to develop a better understanding of this project as an embedded project so it helped us to clear many concepts about the controller.
- The development of this project has been a learning experience for all team members and would prove as a milestone in their academic career. The achievements of this project are innovative solutions that have the potential to significantly enhance road safety, reduce traffic congestion, and improve the overall driving experience.
- With further research and development, magnetic bar speed breakers could become a standard feature in modern transportation infrastructure, benefitting both drivers and pedestrians alike.
- Based on a cutting-edge technology called embedded development which is rich in the market today its future is much bright.
- So, we conclude that the Electromagnetic Speed Breaker is still far away from perfect, but we believe we have laid the groundwork to enable it to improve out of sight.

## 8. Future Scope

The future of Electromagnetic speed breakers looks promising. As technology continues to evolve and the demand for safer, more efficient braking systems grows, the use of magnetic brakes will likely become more widespread.



- Research is continuing to overcome the present limitations and make them more effective at lesser speeds.
- The development of new resources and technologies, such as superconductors, could potentially enhance the performance and competence of magnetic speed breakers.
- This will help us a lot in domestic as well as industrial levels.
- We can also use these speed breakers to generate Electricity with the help of the weight of vehicles.
- Such speed breakers can be designed for heavyweight vehicles, thus increasing input torque and ultimately output of the generator. It is more suitable and compact<sup>6</sup>.
- Mechanisms to improve efficiency survey on energy consumption in India had published a pathetic report that 85,000 villages in India do not still have electricity.
- The supply of power in most of the country is poor. Hence more research and development of technologies are needed in this field.
- This energy can be used for the lights on either side of the roads and thus power that is consumed by these lights can be utilized to send power to these villages. It may also be used for light vehicle also.

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