

# ZERO FRICTION ELECTRO MAGNETIC BRAKING SYSTEM

**MR.R.DINESH <sup>1</sup>, MR.R.KARTHIKEYAN <sup>2</sup>, SANJAY SARVESH.VP <sup>3</sup>, HARIHARAN.M <sup>4</sup>,  
HARIHARAN.G <sup>5</sup>, JEEVA.S <sup>6</sup>**

Assistant Professor , Department Of Mechanical Engineering, SNS College Of Technology, Coimbatore,  
Tamilnadu, India<sup>1,2</sup>

Ug Student, Department Of Mechanical Engineering, SNS College Of Technology, Coimbatore, Tamilnadu, India<sup>3-6</sup>

**Abstract:** With the breakthroughs in technology, improvisation with existing systems is not only more efficient than its ancestors, but it is also essential to be able to adapt to the next generation. This is now made possible by the interdisciplinary integration of technology. With respect to automotive brakes, conventional braking mechanisms cannot always reach their potential due to friction loss and wear of the brake shoe material, and the smoke is also inherently toxic due to the generation of heat. Therefore, this is the process of creating a more reliable and environmentally friendly braking system that works like ABS (Anti-Lock Braking System) built through a control unit. This document describes the impact on electromagnetic braking systems and other traditional braking systems. The braking system must ensure the safety and comfort of the driver when driving the vehicle on the road. There are many types of traditional braking systems, including drum brakes, disc brakes, hydraulic brakes, and pneumatic brakes. This braking system creates high friction, causing thermal wear of the braking components and ultimately reducing the efficiency of the braking system. Therefore, an electromagnetic brake system is used. This is a method of braking efficiently with a high-power torque ratio and less friction. Most braking systems operate on the principle that kinetic energy is converted to thermal energy. This method has its own drawbacks and must be replaced with a more maintenance-free, more efficient braking system that reacts quickly, does not heat up. In this project, we propose a low friction braking system that utilizes the eddy current phenomenon. This phenomenon is controlled by Faraday's law of electromagnetic induction and Lenz's law. Eddy currents are generated by the relative movement between a metal or alloy conductor and a magnet.

**Keywords:** Electromagnetic Braking, Zero Friction Brake, Magnetic Brake System, Frictionless Braking.

## I. INTRODUCTION

Electromagnetic brakes (furthermore known as electromechanical brakes or EM brakes) slow or forestall motion using electromagnetic strain to use mechanical resistance (friction). The particular call changed into "electro-mechanical brakes" however through the years the choice modified to "electromagnetic brakes", regarding their actuation method. Since turning into famous within the mid-twentieth century especially in trains and trams, the range of programs and brake designs has accelerated dramatically, however the critical operation stays the same. Electromagnetic brakes are the brakes walking on the electrical strength & magnetic strength. They art work at the precept of electromagnetism. Electromagnetic brakes are of today's automobiles. The walking precept of this tool is that when the magnetic flux passes thru and perpendicular to the rotating wheel the eddy modern-day flows contrary to the rotating wheel/rotor direction. This eddy modern-day attempting to stop the rotating wheel or rotor.

This consequences within the rotating wheel or rotor consists of rest/ neutral. It is placed that electromagnetic brakes can increase a terrible strength which represents nearly times the most strength output of a fashionable engine, and as a minimum 3 instances the braking strength of an exhaust brake. (Revering 1994).

These performances of electromagnetic brakes purpose them to a excellent deal greater aggressive candidate for opportunity retardation equipment's as compared with distinct retarders. By using with the aid of using the electromagnetic brakes are supplementary retardation equipment, the friction brakes may be used an entire lot a good deal much less frequently, and consequently nearly in no manner acquire excessive temperatures. The brake linings have to closing extensively longer earlier than requiring protection and the potentially "brake fade" trouble is probably avoided. In studies performed with the aid of using a truck manufacturer, it changed into proved that the electromagnetic brake assumed 80% of the obligation which can in any other case had been demanded of the ordinary

company brake (Reverdin 1974). Furthermore, the electromagnetic brakes save you the threat which can stand up from the extended use of brake beyond their functionality to expend heat. This is maximum probable to arise even as an automobile descending an extended gradient at excessive pace. Ina looks at with an automobile with five axles and weighting forty tones powered via way of means of a powered via way of means of an engine of 310 bhp journeying down a gradient of 6% at a consistent pace among 35 and forty mhp, it may be calculated that the braking strength important to keep this pace decide the order of 450 hp. The brakes, therefore, could need to soak up three hundred hp, which means that every brake withinside the five axels need to soak up 30 hp, that a friction brake can usually absorb with self-destruction.

## II. LITERATURE REVIEW

This test confirmed us the simplicity in utility of the electromagnetic braking gadget. They proved all barriers of the Conventional braking gadget may be conquer with the aid of using the usage of of electromagnetic braking gadget.

Sevvel P, Nirmal Kannan V and Mars Mukesh S have said using electromagnetic braking gadget withinside the heavy cars to limit the “Brake Fading” effect. Conventional motors use Anti-Lock Braking System to keep away from locking of brakes and purpose skidding, however with the Electromagnetic braking gadget there might be no directcontact among the brake pads and disc so the priority of locking of braking is avoided.

They proposed using this generation in regular light-weight motors as well. OrianoBottauscio, Mario Chiampi and Alessandra Manzin performed studies on comparable utility of electromagnetic braking structures and that they said the electromagnetic diffusion and the electromechanical phenomena bobbing up in a strong cylinder rotating inner a magnetic subject are right here analyzed. Also, finite detail voltage components observe is having been defined withinside the stated studies paper. The have an impact on at the dynamic conduct and power dissipation of the materialelectric and magnetic properties, the geometrical parameters and the deliver situations is investigated thinking about a version problem.

## III. HISTROY

It is discovered that electromagnetic brakes can expand a poor electricity which represents almost two times the most electricity output of an average engine, and as a minimum 3 instances the braking electricity of an exhaust brake. (Reverdin 1994). These performances of electromagnetic brakes cause them to lots extra aggressive candidate for opportunity retardation equipment’s as compared with different retarders. By the use of with the aid of using the use of the electromagnetic brakes are supplementary retardation equipment, the friction brakes may be used much less frequently, and consequently almost by no means attain excessive temperatures.

The brake linings might ultimate notably longer earlier than requiring preservation and the potentially “brake fade” hassle may be avoided. In studies carried out with the aid of using a truck manufacturer, it become proved that the electromagnetic brake assumed 80% of the responsibility which might in any other case were demanded of the normal provider brake (Reverdin 1974). Furthermore, the electromagnetic brakes prevent the hazard which can stand up from the extended use of brake past their functionality to use up heat. This is maximum probable to arise at the same time as a car descending an extended gradient at excessive velocity. Ina take a look at with a car with five axles and weighting forty tones powered with the aid of using a powered with the aid of using an engine of 310 bhp traveling down a gradient of 6% at a constant velocity among 35 and forty mhp, it could be calculated that the braking electricity important to keep this velocity of the order of 450 hp.

## IV. OBJECTIVES

### PRIMARY OBJECTIVE

The important goal of our mission is to layout and fabricates an Electromagnetic Braking System model.

### SECONDARY OBJECTIVE

Besides the primary goal, following are our secondary objectives:

- ✓ To apprehend mission making plans and execution
- ✓ To apprehend the fabrication strategies in a mechanical workshop
- ✓ To apprehend the use of numerous mechanical system equipment and additionally measuring equipment.
- ✓ To make each day human lifestyles extra less difficult with the aid of using right use of technology.

## V. SIGNIFICANCES AND SCOPE

The following are the significances:

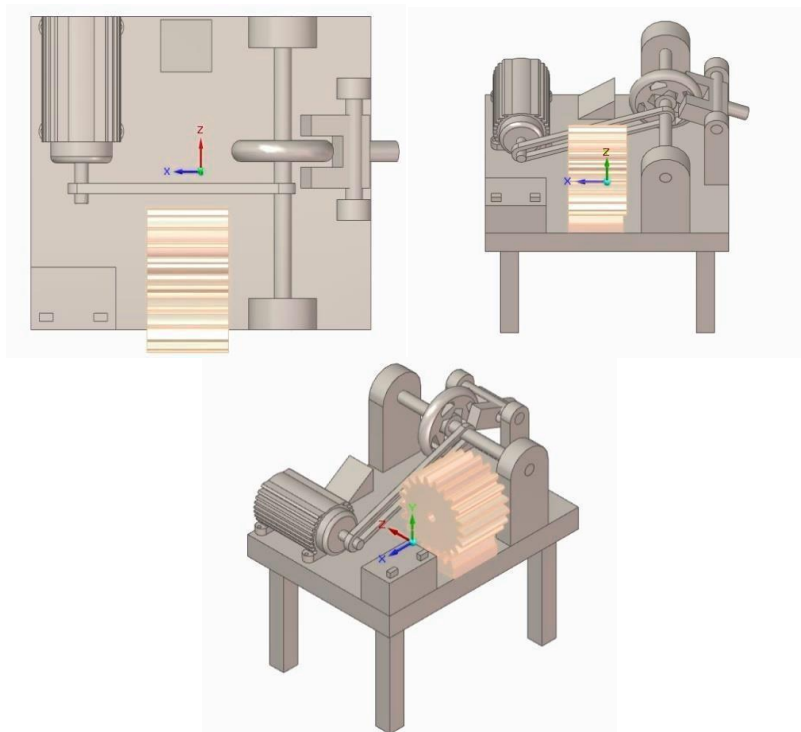
- ✓ Electromagnetic brakes fulfill all of the power necessities of braking without the usage of friction. They have higher warmth dissipation functionality to keep away from issues that friction brakes face times.
- ✓ They also can be used as a supplementary retardation system similarly to the ordinary friction brakes on heavy vehicles.
- ✓ These brakes thing fee is much less so those brakes are cheap.
- ✓ They may be used as an opportunity technique for the destiny disaster of the crude oils.

## VI. LIMITATIONS

The following are the limitations:

- ✓ The setup of an electromagnetic brake could be very hard if there isn't sufficient area among the gearbox and rear axle.
- ✓ It can't use grease or oil.
- ✓ EM brakes are proper at slowing matters down, now no longer absolutely preventing them.

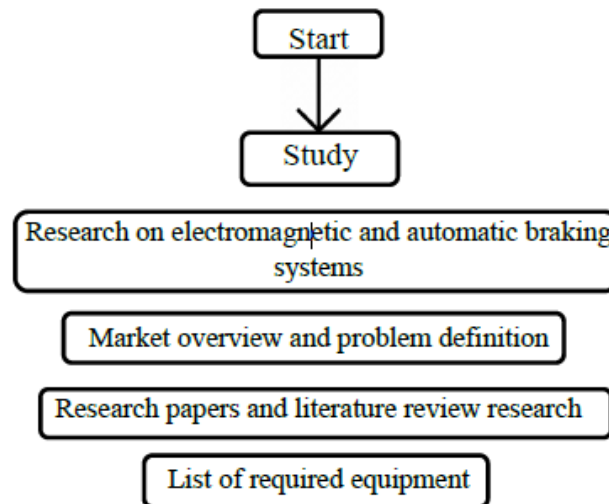
## VII. 3D MODEL OF THE DESIGN



## VIII. METHODOLOGY

Basically, this task consisted of investigating and investigating electromagnetic brake machines as a second degree in hydraulic brake machines. First, make the bottom of the electromagnet and the stand of the wheel. Then create a wheel, connect it to the spook, and use bearings to hang the spook on the stand.

The Electromagnet is made by winding a copper thread around a cylindrical frame and connecting it to its base. In addition, a U-shaped steel rod is welded to the L-shaped steel rod to form a brake shoe, which is relaxed by an electromagnet. The fan is also connected to the motor, which is suspended. The electromagnet, wheels and fan car are connected to an external battery and can be painted or varnished by switching on.



### **IX. OVERALL FABRICATION OF THE SYSTEM**

1. Analysis of problems with a zero-friction electromagnetic brake system.
2. Design of required components.
3. Selection of required materials.
4. Purchase of materials.
5. Creation of electromagnets.
6. Generation and transmission of reports.

### **X. SIGNIFICANCES AND SCOPE**

The subsequent square measure the significances:

- ✓ Magnetic attraction brakes satisfy all the energy needs of braking while not the utilization of friction.
- ✓ They'll even be used as a supplementary retardation instrumentation additionally to the regular friction brakes on serious vehicles.
- ✓ These brakes' part price is a smaller amount therefore these brakes square measure low-cost.
- ✓ They'll be used as an alternate methodology for the longer-term crisis of the crude oils.

### **XI. CAREER OBJECTIVE**

The main objective of our project is to regulate the speed of the vehicle additionally on stop it once and wherever quickly and with efficiency.

- ✓ By exploitation magnetic attraction braking, we are able to scale back the latency of braking
- ✓ By automating the system, we are able to implement it on the vehicles for the security measures on each day.
- ✓ we are able to minimize the time of the braking and convey to three seconds
- ✓ These systems may be used as additional } braking system in aircrafts that provides extra safety measures.
- ✓ By this technique of system, we are able to implement it within the industries wherever to regulate the speed of some larger moving elements within the
- ✓ machines wherever the dimensions is large and powerful of these parts which is able to be exhausting to regulate by the opposite typical methods.

### **XII. WORKING PRINCIPLE**

When the motor is powered, the pulley is driven by a belt. The pulley will now rotate continuously. Since the steel plate is connected to the pulley, it rotates in front of the electromagnet. If you need braking, turn on the controller. Therefore, current or voltage is applied to the electromagnet. The magnetic field is generated by the excitation coil by applying a voltage or current. This coil creates magnetic flux lines between the metal discs and draws the armature to the surface of the metal discs. When the current or voltage is removed from the brake (electromagnet), the metal disc can rotate freely. Here, a spring is used as a medium to keep the armature winding of the electromagnet away from the disc.

Wheel rotation is achieved by switching control of the supply to the spool. Slip occurs only when decelerating and only when the brakes are applied. No slip occurs after the brakes are completely stopped. The hysteresis disk is connected to the brake shaft. electromagnetic types work on an on-off basis, and cannot be easily modulated. Principle of Braking System The principle of braking system is; while operating the braking Also it is quite smaller in size compared to the traditional braking systems. has increased dramatically, but the basic operation remains the same. It consists of an electromagnet, armature disc. The ability of the braking system is to bring the vehicle to the safe controlled stop. Electromagnetic braking system is found to be more reliable as compared to other braking systems.

### **XIII. WORKING OF THE MODEL**

The model works with the principle of magnetism field wherever the wheel is formed to run at a speed with the assistance of a motor or manually, when the wheel is at a definite speed or rate the ability provided to that is free and therefore the wheel is on the free movement it's then the brakes are applied wherever the 2 magnets are mounted shut the disc associate degreed an air gap is maintained between the disc and therefore the electromagnet of 0.5mm. The electromagnets get engaged only there's a provider of DC power to that, however before that the model is been automatic with a regulator, relay and a RF channel controller. wherever the regulator generates a set output voltage from the provision and to control one or more voltages, whereas the relays are the switches that opens and closes the circuit by electrically or electromechanically and that they management the circuit by gap and shutting contacts in another circuit. The RF channel is that the device accustomed shift on and off of the applying by means of a distant controller wherever by transmittal the signal to the relay and therefore the operation is performed consequently. The automatic came upon is connected to the ability provide wherever then the circuit is connected to the electromagnets so the automation will be done simply. once the wheel is rotating at a definite revolutions for an amount of your time the wheel is formed to retard or stop with the assistance of the electromagnets by the assistance of the magnetism field, wherever the setup is operated by dominant the RF channel remote wherever the rotating wheel will be stopped by dominant the RF controller wherever the controller transmits the signal to the relay wherever the relay is then activates the circuit so it directly activates the electromagnets wherever the electromagnets tends to prevent the wheel by applying the force to the disk and thus the wheel is formed to prevent in fraction of seconds and therefore the controller is disengaged wherever then the automatic setup disengages the electromagnets so the wheel and therefore the disk connected to that is left free. therefore, the number of retardations within the wheel is made to prevent or stop in associate degree economical method.

### **MERITS**

- ✓ Electromagnetic brakes are much more effective.
- ✓ The electromagnetic brake works very smoothly.
- ✓ Better cooling of the brakes.
- ✓ Less wear.
- ✓ Little maintenance is required.
- ✓ Automatic braking is more durable.
- ✓ The service life of automatic braking has been extended.
- ✓ Car braking is much more effective.
- ✓ Automatic braking works perfectly smoothly.
- ✓ Very little maintenance is required.

### **APPLICATIONS**

- ✓ Commercial vehicle
- ✓ Building lift
- ✓ Industries machine
- ✓ Copy machines
- ✓ Conveyor drives
- ✓ Packaging machinery
- ✓ Printing machinery
- ✓ Food processing machinery
- ✓ Factory automation
- ✓ Used in some railway system

**CONCLUSION**

This report presents the performance of electromagnetic braking systems, including various components, their cost effectiveness and efficient use of the energy supplied. A more efficient braking system can be achieved by using effective and powerful electromagnets.

Smooth braking provides effective braking with less wear. The maintenance cost of this brake is low. This brake is a non-contact braking system, so there is no friction and less wear. Therefore, the debris formed during braking is small and therefore environmentally friendly. This brake is a cleaner braking method. Since the wheel is not locked, it will not rotate. Ideal for high speeds. It works on electricity and uses very little electricity for a short period of time. It does not take up space and is easy to install. It can be effectively used in place of the normal braking system.

**REFERENCES**

- [1].Sumit Patel, "Development of the Electro-Magnetic Brake", IJRST –International Journal for Innovative Research in Science & Technology| Volume 1 | Issue 12 | May 2015.
- [2].SevvelP,NirmalKannanV,MarsMukeshS,"InnovativeElectroMagneticBrakingSystem", IJRSET, April2014.
- [3]. Oriano Bottauscio, Mario Chiampi, Alessandra Manzin, "Modeling analysis of the electromagnetic braking action non rotating solid cylinders", ScienceDirect, December 2006. AkshayKumar S. Puttewar, Nagnath U. Kakde, Huzaifa A. Fidvi, Bhushan Nandeshwar, "Enhancement of braking system in automobile using Electromagnetic Braking", IOSR-JMCE.
- [4]. McConnell, H.M, "Eddy current phenomena in ferromagnetic material", AIEE Transaction, vol.73, part I, pp 226-234, July1954.
- [5]. Tatsuya YAMASAKI, M. E. (2007). Development of an Electromechanical Brake.NTN Global.
- [6]Warrendale,Braketechnology,ABS/TCS,andcontrolledsuspensionsSocietyofAutomotive Engineers, & SAE World Congress. (2001)., PA: Society of Automotive Engineers. DrKirpal Singh. Automobile Engineering and Technology, Vol 1
- [7]R.A.Barapte "Electromagnetic Engineering" Technova Educational Publication
- [8] Khurmi& Gupta "Machine Design" S Chand Publication.
- [9]V.B. Bhandari "Design of Machine Elements" Tata McGraw hill.
- [10]K. Balaveera Reddy. "Design data hand-book for mechanical engineering.