

## **A Review Paper On Contactless Braking System**

Hiral patel<sup>1</sup>, Sanket patel<sup>2</sup>, Aakash bhavsar<sup>3</sup>, Gosai pratikgir<sup>4</sup>, Mehul sorthiya<sup>5</sup>

<sup>1,2,3,4</sup>

UG Student, Mechanical Department, Sigma Institute of Engineering, Vadodara, Gujarat, India.

<sup>5</sup>Assistant professor, Mechanical Department, Sigma Institute of Engineering, Vadodara, Gujarat, India.

---

**Abstract** — *The contact less brake is a new and revolutionary concept. It is a modern technology braking system used in light & heavy motor vehicles like car, truck, jeep, bus etc. It is a combination of electro-mechanical concepts. Now-a-days the frequency of accidents is increasing due to inefficient braking system. In this research work, with a view to enhance to the braking system in automobile, a prototype model is fabricated and analyzed. This project intends to the design and implementation of new system of retardation (braking) for automobiles.*

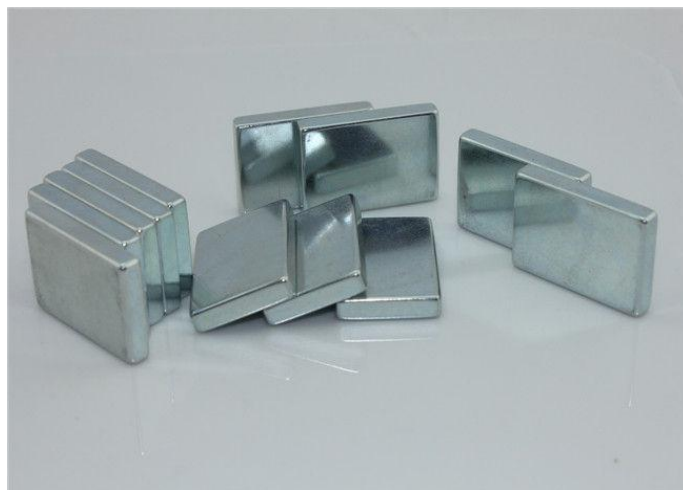
---

**Keywords-** *Braking system, Contactless, Eddy current, magnetic braking system, copper plate.*

---

### **I. INTRODUCTION**

All the conventional system of braking in road vehicles used is development of contact friction for retardation. This system is prone to the wear and tear on usage. Conventional braking system produce continuous power dissipation in form of heat due to this the temperature of the component is rises too high. Friction based braking system are also not efficient under wet conditions. This brake creates small noise on application and also creates loud screeches on hard usage. Contactless braking projects are a design and implementation of new system of retardation (braking) for automobiles. The design of this new brake is based upon the phenomenon of electromagnetic induction and eddy currents. The design basically consists of very strong magnet and rotating metallic plate. The wheel develops eddy currents due to the change in magnetic flux associated to the wheel due to its rotation. Due to this magnetic flux eddy current will be produce in the direction in rotation of wheel also the resisting force will be produce in the opposite direction of rotating wheel due to this resisting force the speed of wheel is reduce. The eddy current development obeys Maxwell's law of electromagnetic induction and Lenz's law of direction of induced current. The current in turn dissipates the rotational energy of the wheel as heat bringing the wheel to a stop.

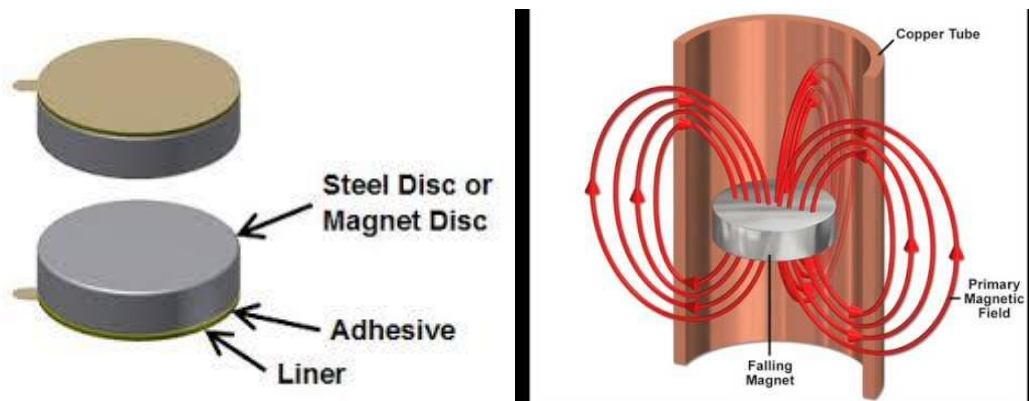


**Figure 1. Neodymium magnet**

### **II. WORKING PRINCIPLE**

When electromagnets are used, control of the braking action is made possible by varying the strength of the magnetic field. A braking force is possible when electric current is passed through the electromagnets. The movement of the metal through the magnetic field of the electromagnets creates eddy currents in the discs. These eddy currents generate an opposing magnetic field, which then resists the rotation of the discs, providing braking force. The net result is to convert the motion of the rotors into heat in the rotors. Called "Eddy" since they are analogous to fluid eddies in formation and behavior Responsible for the opposing magnetic fields that produce drag and heating effects. The drag

effects give rise to induction braking. Absent external potentials will result in the system coming to a halt Heating effects are exploited by devices such as induction cookers If left unchecked, then it could result in serious damage to mechanical/circuit components

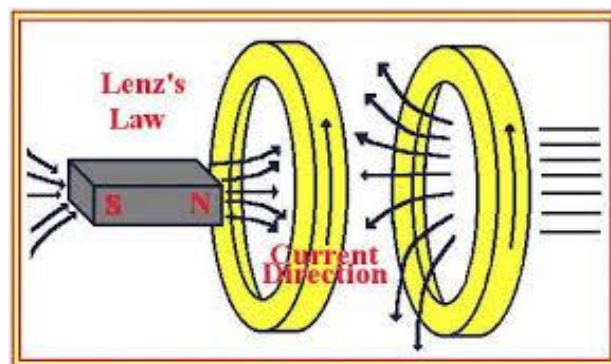


*Figure 2. Copper pipe & Neodymium magnets*



*Figure 3. Neodymium Magnets*

Eddy currents are flow in a circular path. As a name from “eddy” that is formed when a liquid or gas flows in a circular path around obstacles when conditions are right. For generate eddy currents for an inspection a “probe” is used. Inside the probe is a length of electrical conductor which is formed into a coil. Alternating current is allowed to flow in the coil at a frequency chosen by the technician for the type of test involved. A dynamic expanding and collapsing magnetic field forms in and around the coil as the alternating current flows through the coil. When an electrically conductive material is placed in the coil’s dynamic magnetic field electromagnetic, induction will occur and eddy currents will be induced in the material. Carhop, M., (1989) Eddy currents flowing in the material will generate their own “secondary” magnetic field which will oppose the coil’s “primary” magnetic field according to the Lenz’s rule.

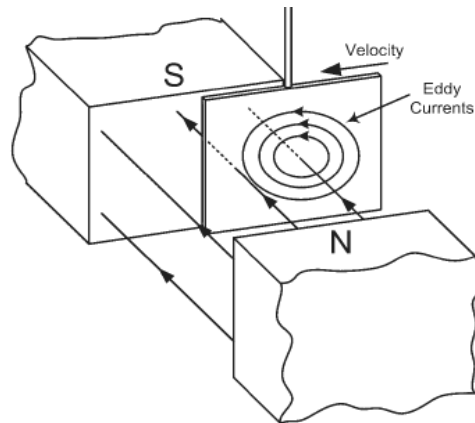


*Figure 4. Lenz's law*

The methodology is a process for implementation and developing the project. The goal and the successfulness of the project is depends on how the plans is conduct to achieve the result. Methodology is to describe the each step to accomplish the sequence of the flow work from the beginning until the result is obtained and success. All the results obtain were evaluated and improved till the best result came out and to be taken. This implementation would be and getting the worst result where try and error is happens here. Where any ideal decision may reconsider and repeating to satisfy the best result.

### III. LITERATURE REVIEW

**Virendrakumar Maurya, Riturajjahan, G . Tripathi, S . Jaganraj [1]** describe working principle of eddy current brake mechanism, which can be analyzed by Maxwell 3D Transient solver. An eddy current brake, like a conventional friction brake, is responsible for reducing the speed of an object, such as a train or a roller coaster etc. Unlike the other brakes, which apply pressure on objects, eddy current brakes reduce the speed of object by creating eddy currents. Through electromagnetic induction which create resistance. In this paper, linear Halfback magnetized mover is applied to eddy current braking system for high speed. For such a breaker, They give analytical formulas considering end effects for its magnetic field, eddy current distribution, forces according to the secondary relative permeability, and conductivity. The results given here through electromagnetic induction which create resistance, and in turn either heat or electricity.



*Figure 5. generation of eddy current[1]*

**Sahil Jitesh [2]** describe that with development in a technology in automobiles the braking system is getting more and more advanced. This brake helps drivers to have better control of a vehicle in some conditions where hard braking may be necessary. In operation of any machinery the most primary safety system is the braking system. Basic designs of the braking system involve the conversion of kinetic energy to heat energy by friction. This is accomplished by friction between two rubbing surfaces. These brakes have some problems i.e. significant wear, fading, complex and slow actuation, lack of fail-safe features, increased fuel consumption due to power assistance, and requirement for anti-lock controls. For solving these problems, a contactless brake has been developed. This concept includes a metals disk which will conduct eddy currents.

**Nirmal Kannan V, Mars Mukeshs [3]** describe that with all the advantages of electromagnetic brakes, they have been widely used on heavy vehicles where the 'brake fading' problem exists. Same concept is being developed for application on lighter vehicles. The concept design is just a prototype and needs to be developed more because of some disadvantages. These electromagnetic brakes can be used as an auxiliary braking system along with the friction braking system to avoid or reduce overheating and brake failure. These find vast applications in heavy vehicles where high heat dissipation is required. In rail coaches it can be used in combination of disc brake to bring the trains moving in high speed. When these brakes are combined it increases the life of brake and act like fully loaded brakes. These brakes can be used in wet conditions which eliminate the anti-skidding equipment, and cost of these brake are cheaper than the other types. The braking force produced in this system is less than the disc brakes if can be used as a secondary or emergency braking system in the automobiles.

**Akshyakumar S. Puttewar, Nagnath U. Kakde, Huzaifa A. Fidvi, Bhushan Nandeshwar [4]** describe that an electromagnetic brake is a new concept. Electromagnetic braking system used in light motor & heavy motor vehicles. This is a combination of electro-mechanical concepts. Now-a-days the frequency of accidents is increasing due to inefficient braking system. It is obvious that the electromagnetic brake is a basic supplement to the safe braking of substantial vehicles. The aim of this system is to minimize the brake failure to avoid the road accidents also reduces the maintenance of braking system. Preferred standpoint of this framework is that it can be utilized on any vehicle with minor alterations to the transmission and electrical frameworks.

**Er. Shivanshu Shrivastava [5]** describe that the eddy Current braking technique is a classical example of how effective braking be obtained from application of magnetic field. This braking system is based on the principle of relative motion between a magnetic source and a electric conductor metal. Eddy current braking system is modeled in simulink and effects of various parameters are observed over the overall braking. This paper also provides a comparative study between the various parameters involved and understand the braking system and also give various factors and parameters affecting the efficient braking are observed.

**Er. N. B. Shinde, Prof. B.R. Borkar [6]** describe the numerical methods and analysis procedures used in the study of automotive disc brake. It covers Finite element Method approaches in the automotive industry and complex Contact analysis. This review can help to analysts and to choose right methods and make decisions on new areas of method

development. It brings up some extraordinary issues in displaying and investigation of circle brake screech and proposes new theoretical outline of the plate slowing mechanism.

**Milinds Deotale, Hrishike Shshivankar, Rohit More [7]** describe that a road accidents are a commonplace in today's scenario. Accident prevention has been one of the leading areas of research. In Indian vehicles are equipped with ABS (Anti-Lock Braking System), traction control, brake assist etc. for driver's safety. This paper focuses on a system known as 'Intelligent braking system' (IBS) which install several sensors to respond when emergency conditions occur. The system includes an wave emitter provided on the front portion of the car. An receiver is also fitted to receive the signal. The reflected wave gives the separation between the hindrance and the vehicle then a microcontroller is utilized to identify the beats and apply brakes to the vehicle. IBS car provides the glimpse into the future of automotive safety. By IBS system we can reduce road accidents and save more lives.

**Smit Patel, Meet Patel, Anand Patel [8]** describe that in directing slowing mechanisms use rubbing strengths to change the active vitality of a moving body into warmth that is dispersed by the braking cushions because of this the temperature of the braking cushions to rise, lessening the viability of the framework. The purpose of implements this phenomenon in developing a braking system. The potential uses of the stopping mechanism can be a decelerating framework to build the security of a lift or any guided rail transportation framework As a result it develops a torque and eventually the vehicle comes to rest. In this paper the advantage of using the electromagnetic braking system in automobile is studied. These brakes can be incorporated in heavy vehicles as an auxiliary brake. The brakes can be used in commercial vehicles to produce the magnetic flux by controlling the current supplied. Making some improvements in the brakes it can be used in automobiles in future. It also reduces the maintenance of braking system. An advantage of this system is that it can be used on any vehicle with minor modifications to the transmission-and-electrical-systems.

**Umang S. Modi Swapnil C. Bhavsar[9]** describe that the current plate contains three reviewed research papers on the electro-magnetic braking. Electro-attractive braking is presently taking a decent pace in the applications on the everyday stuffs like autos, machine plug and as movement retarder also. As opposed to a traditional contact rubbing braking, this framework are more productive, snappy in the reaction and has no wear so it has great strength. In this paper three different papers are reviewed and summarized here to know the principles, applicability and future scope of-electro-magnetic-braking-system.

**Tushar S. More, Sharayu U. Ratnaparkhi[10]** describe that emergency braking system which will stop the descent of the trolley automatically and allow for a manual, controlled descent to be performed by an occupant of the trolley if needed. The stopping mechanism must be solid, have the capacity to work after long stretch of non-utilize and work without decimation of major slowing mechanism segments when utilized. The idea in which a brake caliper applies braking power specifically to an optional link was chosen. An arrangement for manual operation-of-the-caliper-is-added-to-framework.

**S. Sarip[11]** describe that This design of the connection between the friction ring and the hub is important in a lightweight brake disc. Significance of this association has been perceived and comprehended for a long time and auto brake circle creators give careful consideration to the plan of the alleged "top cap" area of the plate. Which crushing face is mounted to the top, and the arrangement of "undercut" both enable coning to be controlled inside sufficient breaking points. However the lightweight brake plate of the sort proposed here has a totally unique temperature profile, both regarding the size of the temperatures came to amid braking, and the conveyance of temperature in the circle. This is additionally known from the utilization of lightweight circles on bikes.

#### IV. CONCLUSION

With every one of the points of interest contactless brake over rubbing brakes, they have been generally utilized on substantial vehicles where the 'brake blurring' issue is not kidding. A similar idea is being produced for application on lighter vehicles. A model will produce for giving demo of rapid whirlpool current slowing mechanism. In light of systematic 2-D field arrangements considering dynamic end impact, the attractive field, vortex current conveyance, and strengths as per the auxiliary relative porousness and conductivity were introduced. We additionally need to watch that the air-crevice flux thickness has a non-uniform appropriation for the fast.

#### REFERENCES

- [1] Virendra Kumar Maurya, Rituraj Jalan, H. P. Agarwal, S. H. Abdi, Dharmendra Pal, G. Tripathi and S. Jagan Raj, Eddy current braking embedded system 2011, International Journal of Applied Engineering and Technology ISSN, Vol. 1.
- [2] Shil Jitesh, "Antilock Braking System", 2014, International Journal of Mechanical Engineering And Robotics Research, Vol 3, No 4, October 2014.
- [3] Sevel P, Nirmal Kannan V, Mars Mukesh S "Innovative Electro Magnetic Braking System", International Journal-of-Innovative-Research-in-Science, Engineering & Technology, 2, April 2014.
- [4] Akshyakumar S. Puttewar, Nagnath U. Kakde, Huzaifa A. Fidvi, Bhushan Nandeshwar, "Enhancement of Braking System in Automobile Using Electromagnetic Braking", IOSR Journal of Mechanical and Civil Engineering.

- [5] Er. Shivanshu Shrivastava A Parametric Analysis of Magnetic Braking –The Eddy Current Brakes – For High Speed and Power Automobiles and Locomotives Using SIMULINK”, International Journal of Advanced Research in Electrical, 8 August 2014.
- [6] Er. N. B. Shinde, Prof. B.R. Borkar” Literature Review on Fem Analysis Of Disc Brake System”, International Journal-Of-Engineering-And-Computer-Science.
- [7] Milind S. Deotale, Hrishikesh Shivankar, Rohit More,” Intelligent Braking System”, International Journal on Recent & Innovation-Trends-in-Computing & Communication
- [8] Smit Patel, Meet Patel, Anand Patel, development of the electro-magnetic brake”, international journal for innovative-research-in-science & technology
- [9] Umang S. Modi, Swapnil C. Bhavsar,” Current trends in Electro-magnetic Braking System: A review paper of the current scenario of the magnetic braking system”, International Journal for Scientific Research & Development.
- [10] Tushar S. More, Sharayu U. Ratnaparkhi,” Review on E-Brake System for Cable Trolley System” International Journal of Research in Aeronautical and Mechanical Engineering issn (online): 2321-3051.
- [11] S. Sarip “Design Development of Lightweight Disc Brake for Regenerative Braking – Finite Element Analysis” International Journal of Applied Physics and Mathematics, Vol. 3, No. 1, January 2013.