

## Transmission Braking System By Using Electromagnetic Clutch

Prof.R.P.Kattimani<sup>1</sup>, Raviraj.A.Shewate<sup>2</sup>,Rohit.M.Supe<sup>3</sup>,Mukund.C.  
Sonawane<sup>4</sup>,Prithviraj.S. Yewale<sup>5</sup>

<sup>1,2,3,4,5</sup>(Mechanical, JSPM Narhe Technical Campus/ University of Pune, India)

---

**Abstract :** The Electromagnetic brakes are new technology of automobile industry, used in automobile vehicle or at industry level. In electromagnetic braking system energy is converted into electrical energy, which can be used further so the brake must be strong enough to stop the rotation of the component within minimum time possible. The electromagnetic braking system is advanced system which can fulfill the need of small as well as heavy systems. In this project the advantage of using the electromagnetic braking system in industrial use is studied.

**Keywords:** Electromagnetic brake, Electromagnetic clutch, braking and clutch system.

---

### I.

### II. INTRODUCTION

- Transmission braking system by using electromagnetic clutch is a system in which brake operates electrically, but the transmission of torque is done manually. In this type of electromagnetic braking the basic operation remains the same while minor changes in its design. The main principle of electromagnetic brake is to convert kinetic energy into heat energy. In Clutches one shaft is typically driven by motor or pulley, and other shaft drives another device. The clutch connects the two shafts so that they can either be locked together and spin at the same speed (engaged), or be decoupled and spin at different speeds (disengaged). In electromagnetic clutch, the flywheel consists of the winding, from the battery or dynamo. When current passes through it, and produces an electromagnetic field. This field attracts the pressure plate, thus this engages the clutch, as when supply is cut-off clutch is disengaged. Thus the transmission braking is done by use of electromagnetic brake and clutch system. /

### III. PROBLEM IDENTIFIED

There are problems developed during carrying out operations on the work piece. There was a need to turn ON and OFF of the Motor shaft used to rotate even after motor is switched off due to Acceleration. Time consuming

### IV. METHODOLOGY

In an electromagnetic brake AC motor is driven by an alternate current. It has two basic parts, an outside stationary stator having coils supplied with the AC current to produce magnetic field which is rotary. Then due to the magnetic field brake is applied by retardation and energy absorbed in form of heating the disc. The time taken for a coil to generate magnetic field should be strong enough to pull in an armature and other time is taken by to come over the air gap in between the armature and the coil shell. In an electromagnetic clutch it has four main parts; field, rotor, armature and hub. After applying the voltage the stationary magnetic field it generates the lines of flux that pass into the rotor. The flux then pulls the armature in contact with the rotor, as the armature and the output start to accelerate.

### V. LITERATURE REVIEW

Bharathram M , Kirubahar Praveen P , Chandrakala D , AkshayJalan , Gowtham Ram N, Brake Pad Actuation Using Electromagnetic Coils, Methods Enriching Power & Energy Developments (Meped'13) April 12 , 2013  
It aims to minimize the brake failure to avoid the road accidents. 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.

An electromagnetic brake is a new and revolutionary concept. Electromagnetic braking system is a modern technology braking system used in light motor & heavy motor vehicles like car, jeep, truck, busses etc. This system is a combination of electro-mechanical concepts. The frequency of accidents is now-a-days increasing due to inefficient braking system.

- ❖ IJRST –International Journal for Innovative Research in Science & Technology |Volume 1 | Issue 12 | May 2015 ISSN (online): 2349-6010

Most of the braking systems utilize friction forces to transform the kinetic energy of a moving body into heat that is dissipated by the braking pads. The overuse of friction-type braking systems causes the temperature of the braking pads to rise, reducing the effectiveness of the system. An Electromagnetic Braking system uses Magnetic force to engage the brake, but the power required for braking is transmitted manually. The disc is connected to a shaft and the electromagnet is mounted on the frame.

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.

- ❖ 1Krunal Prajapati, 2Rahul Vibhandik, 3Devendrasinh Baria, 4Yash Patel Student, Automobile department, Laxmi institute of Technology, Sarigam-Valsad. Gujarat International Journal of Scientific Research in Engineering (IJSRE) Vol. 1 (3), March, 2017

An electromagnetic braking system is a new concept. This project is a new technology of braking system. Electromagnetic braking system is new braking system it is used in LMV and HMV like jeep, buses, car, truck, train and motor bikes. The electromagnetic braking system are also called electro-mechanically brake. Future to highly produced accident to use this braking system to avoid the accidents.

An electromagnetic braking system used magnetic force while applied the force on brake. The rake disc is connected to the shaft and electromagnetic kit are attach in a frame. The power source is used in electricity. The electric power applied to the magnetic coil to the developed the magnetic field in armature coil and attracts the electromagnet disc. To applied the brake and stop rotating gear.

(Assistant professor, Department of Mechanical Engineering, National Conference on Innovations in Mechanical Engineering, 6-8 April 2015 Organized by Department of Mechanical Engineering, MIT Academy of Engineering, Alandi, Pune 412105, India)

In this paper we had develop the electromagnetic braking system. Braking System should ensure the safety and comfort of the passenger, driver and other road user. Electromagnetic braking system is high-tech braking system find its use in small & heavy vehicle like car, jeep, truck, busses etc. This paper represent about minimizing the brake failure in order to avoid the accident.

- ❖ Flemming, Frank; Shapiro, Jessica (July 7, 2009). “Basics of Electromagnetic Brakes” .machine design : pp. 57–58

It also reduces the maintenance of braking system. The effectiveness of brake should remain constant. The proper cooling of brake gives anti fade character and efficient operation of brake.

This system provides better response time for emergency situations and in general keeps the friction brake working longer and safer.

Associate Professor, P1, NirmalKannan Dept. of Mechanical Engine, Magna College of Engineering, Chennai, Tamilnadu, India (Innovative Electro Magnetic Braking System) Volume 3, Special Issue 2, April 2014.

An Electromagnetic Braking system uses Magnetic force to engage the brake, but the power required for braking is transmitted motor.

The disc is connected to a shaft and the electromagnet is mounted on the frame .When electricity is applied to the coil a magnetic field is developed across the armature because of the current flowing across the coil and causes armature to get attracted towards the coil.

As a result it develops a torque and eventually the gear box comes to rest. In this project the advantage of using the electromagnetic braking system in industry is studied.

## **VI. CONSTRUCTION OF TRANSMISSION BRAKING SYSTEM BY USING ELECTROMAGNETIC CLUTCH**

Electromagnetic Clutches Operate Electrically, But Transmit Torque Mechanically. This Is Why They Used To Be Referred To As Electro-Mechanical Clutches. Over The Years, EM Became Known As Electromagnetic Versus Electro Mechanical, Referring More About Their Actuation Method Versus Physical Operation. Since The Clutches Started Becoming Popular Over 60 Years Ago, The Variety Of Applications And Clutch Designs Has Increased Dramatically, But The Basic Operation Remains The Same. Single-Face Clutches

Make Up Approximately 90% Of All Electromagnetic Clutch Sales. This Article Mainly Deals With These Types Of Clutches. Alternative Clutch Designs Are Mentioned At The End Of This Article.

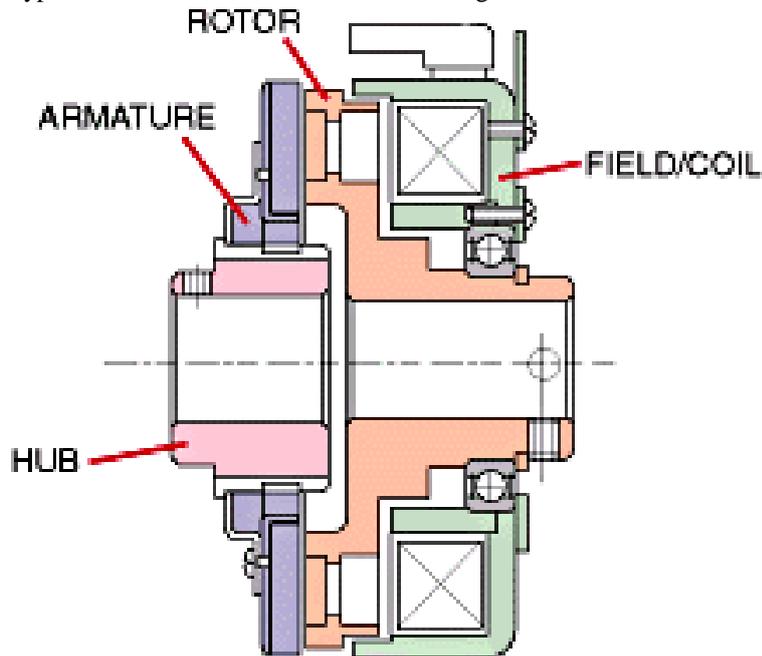


Fig 2: Electromagnetic clutch

### **Electromagnetic brakes:**

Electromagnetic brakes operate electrically, but transmit torque mechanically[6]. This is why they used to be referred to as electro-mechanical brakes[7]. Over the years, EM brakes became known as electromagnetic, referring to their actuation method. Since the brakes started becoming popular over sixty years ago, the variety of applications and brake designs has increased dramatically, but the basic operation remains the same. Single face electromagnetic brakes make up approximately 80% of all of the power applied brake applications. Electromagnetic brakes have been used as supplementary retardation equipment in addition to the regular friction brakes on heavy vehicles. Various Other types of Electromagnetic Braking System are: Electromagnetic Braking System With Brake Pads, Eddy-Current Braking System[8].

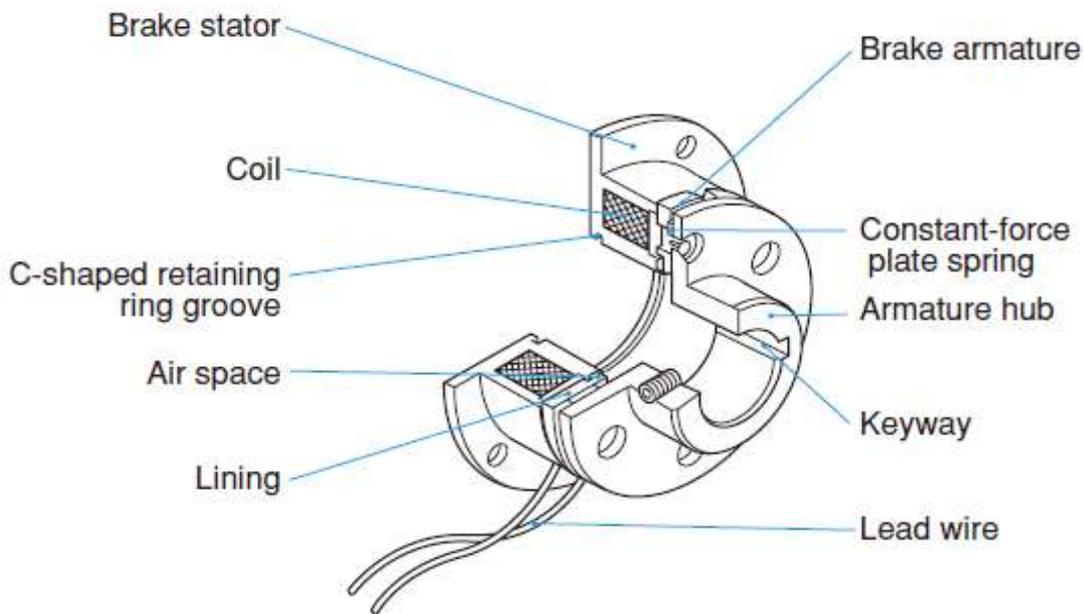


Fig 3: Electromagnetic brakes

Electromagnetism:

Electromagnetism is one of the four fundamental interactions in nature. The other three are the strong interaction, the weak interaction and gravitation. Electromagnetism is the force that causes the interaction between electrically charged particles; the areas in which this happens are called electromagnetic fields.

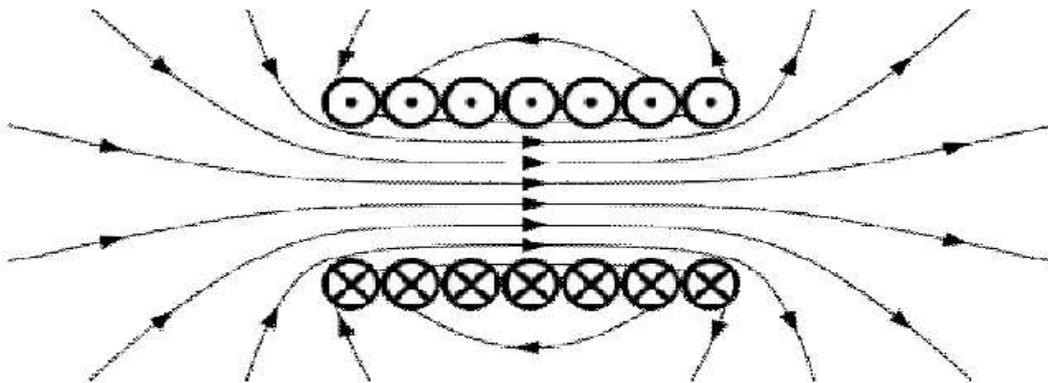
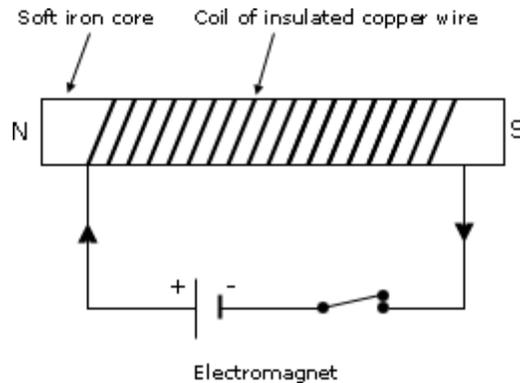


Fig 4: Magnetic Field Lines

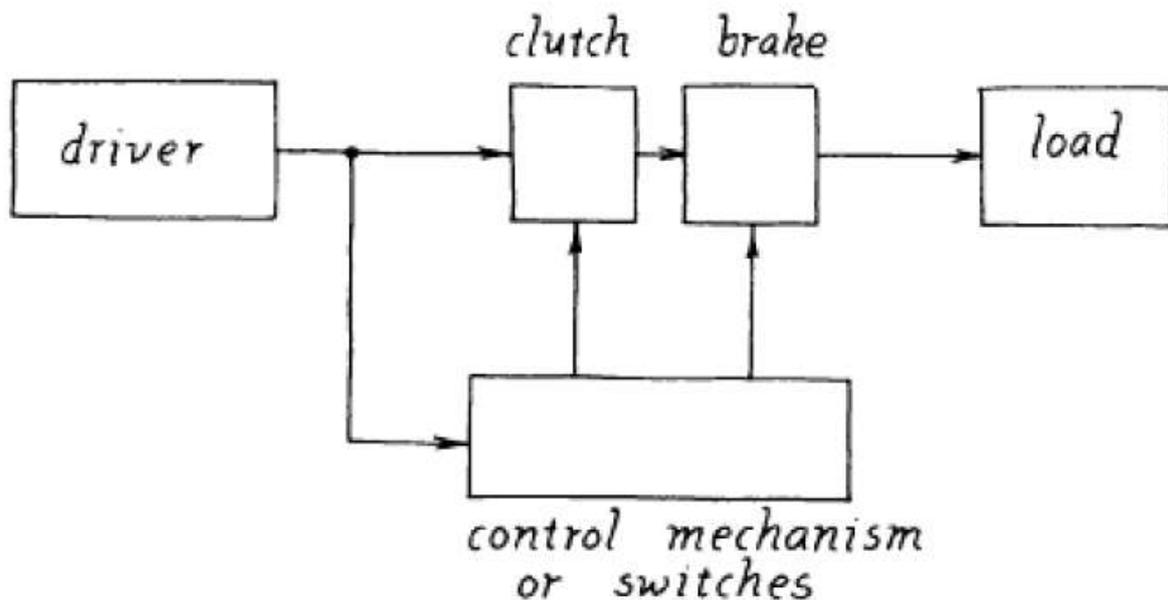
The term "Magnetic effect of current" means that "a current flowing in a wire produces a magnetic field around it". The magnetic effect of current was discovered by Oersted in 1820. Oersted found that a wire carrying a current was able to deflect a magnetic needle.



Electromagnet  
**Fig. 5: Magnetic Field Lines**

**Electromagnet:**

An electric current can be used for making temporary magnets known as electromagnets. An electromagnet works on the magnetic effect of current. It has been found that if a soft iron rod called core is placed inside a solenoid, then the strength of the magnetic field becomes very large because the iron ore is magnetized by induction



**FIG.1 Construction of transmission system**

**VII. WORKING**

Basically machine consist of Electromagnetic clutch which is attached to motor and gearbox at the other side.Gearbox is attached to the workpiece on which operation is to be carried out.In Electromagnetic clutch and brake system there is one rotating metal disc in between the two magnets , to apply the brake, induced electric current is developed in the circuit to attract the magnet to the rotating metal disc and stopped the rotation in several time while applied brake.This type of clutches operate electrically, but transmit Torque mechanically.

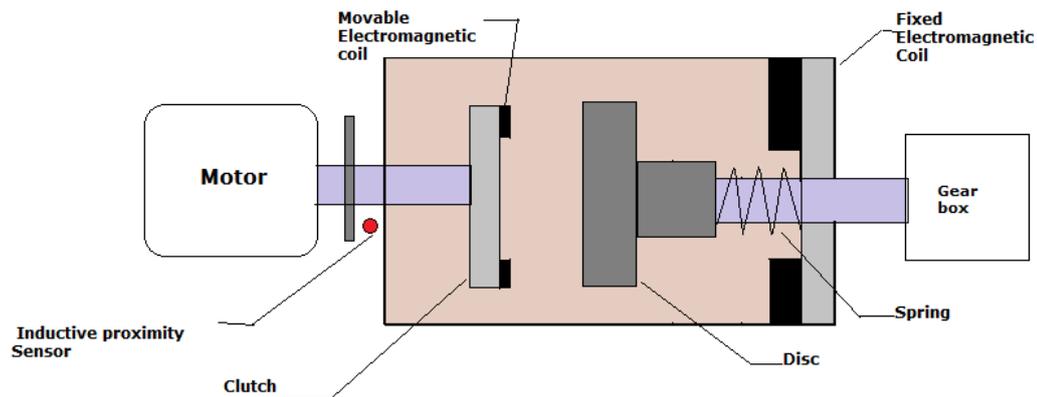


FIG.2 Transmission system

### I. Advantages

1. It requires simple maintenance cares
2. The safety system for industry.
3. Checking and cleaning are easy, because of the main parts are screwed.
4. Easy to Handle.
5. Repairing is easy.
6. Replacement of parts is easy.
7. Electromagnetic brake systems will reduce maintenance cost.
8. The electromagnetic brakes have excellent heat dissipation efficiency owing to the high temperature of the surface of the disc which is being cooled.

### II. Disadvantages

1. A special spring mechanism needs to be provided for the quick return of the brake shoe.
2. Dependence on battery power to energize the brake system drains down the battery much faster.
3. Due to residual magnetism present in electromagnets, the brake shoe takes time to come back to its original position.

### Conclusion

We using electromagnetic clutch in our project as brake shoes and this electromagnetic brake shoe control by smaller based digital circuit. This ir sensor based electronic digital circuit work in auto braking mode at the minimum distance, if driver forget to press brake circuit applied brake in auto mode. Circuit transmit ir waves continuously if some obstruction comes circuit applied automatic braking and this automatic braking system transmit power to dynamo for current generation and braking.

### VIII. REFERENCES

1. RenHe, Xuejun Liu "Brake Performance Analysis of ABS for Eddy Current Zhenjiang 212013, China Received 24 September 2013; Revised 29 October 2013; Accepted 30 October 2013 IJIRST –International Journal for Innovative Research in Science & Technology| Volume 1 | Issue 12 | May 2015 ISSN (online): 2349-6010
2. Associate Professor, Jeyakkannan I, Shankar vignesh s, Prakash A, Subashnandha K, Purushothaman P (ELECTRO MAGNETIC CLUTCH) International Conference on Explorations and Innovations in Engineering & Technology (ICEIET - 2016)
3. 1Krunal Prajapati, 2Rahul Vibhandik, 3Devendrasinh Baria, 4Yash Patel International Journal of Scientific Research in Engineering (IJSRE) Vol. 1 (3), March, 2017
4. Prof.N.B.Totala[1]PriyaBhosle[2], SeemaJarhad[3], SoniyaJadhav[4], KamleshKuchekar[5] (Electromagnetic Braking System) National Conference on Innovations in Mechanical Engineering, 6-8 April 2015 Organized by Academy of Engineering,
5. Flemming, Frank; Shapiro, Jessica (July 7, 2009). "Basics of Electromagnetic Brakes". machine design : pp. 57–58
6. Bharathram M , Kirubhahar Praveen P , Chandrakala D , AkshayJalan , Gowtham Ram N, Brake Pad Actuation Using Electromagnetic Coils, Methods Enriching Power & Energy Developments (Meped'13)April 12 , 2013
7. Ahfock, A., Toowoomba, QLD Wells, C.G., A practical demonstration of electromagnetic braking, Power Engineering Conference, AUPEC 2007 Australasian Universities, 9-12 Dec.2007.
8. Associate Professor, Dept. of MechEngg, Magna College of Engineering, Chennai, Tamilnadu, India NirmalKannan V, Mars Mukesh S (Innovative Electro Magnetic Braking System) Volume 3, Special Issue 2, April 2014