Electromagnetic Braking System

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Abstract - Electromagnetic brakes may be new and flexible. The electromagnetic braking system can be a modern braking system used in heavy vehicles. This program is a combination of electro-mechanical ideas. The frequency of accidents is now increasing due to an inefficient braking system. Clearly, the electromagnetic brake brake is an important factor in the safe braking of heavy vehicles. It aims to reduce breakage to avoid road accidents. It also reduces the maintenance of the braking system. The advantage of this procedure is that it is commonly used in any vehicle with minor transmission modifications and electrical systems. The Electromagnetic Braking System uses a magnet to connect the brakes, but the position required for the brake is transmitted automatically. The disc is attached to the shaft and electromagnets are attached to the frame. When electricity is applied to the coil the magnetic field is enhanced everywhere due to the current flow throughout the coil and causes the armature to be attracted to the coil. As a result, it improves torque and ultimately the car involves relaxation. These brakes are usually applied to heavy vehicles such as auxiliary brakes. Electromagnetic brakes are commonly used in commercial vehicles with the current control provided to provide magnetic flux. A practical rule of thumb for this process is that when the magnetic flux passes through and the perpendicular to the rotating wheel eddy Current flows opposite the rotating wheel / rotor. This eddy current tries to block the rotating wheel or rotor. This causes the rotating wheel or rotor to rest / neutral these are too small to collide. As a result, they are long-lived and have long life spangles and maintenance. These brakes are a very effective replacement for convectional brakes because of their many benefits. The reason for applying this brake on cars is to reduce the wear and tear of the brakes as they move slowly. Therefore, there will also be no heat loss. Electric brakes work much better than a standard brake The timeit takes to install brakes is also short.

Key Words: Automobiles, Brakes, Electromagnetic System,Magnetic Flux, Economic

1. INTRODUCTION

Brakes are a widely used tool to slow down the flow of traffic to reduce speed and prevent accidents. On the brakes K.E. converted to heat with the help of a collision between an obstacle and a disk. During this time of extreme heat it is produced and the environment is lost. Which also reduces the life expectancy of exercise. How to fix the ban auto is not cheap. To avoid such loss of power and to make the standard braking system process more economical replace the electromagnetic braking system early. It works on the principal of electromagnets. During this project we developed a braking system. Able to work with two wheels at high speeds and low repair costs. Here we will use an electric coil and a plunger.

There is an electromagnetic effect that moves the plunger inside the brake area. When electricity is used in this field, it creates an internal magnetic flux. That flexibility is transmitted to the hysteresis disk through the field. The hysteresis disk is connected to the brake shaft. Gravity drag on a hysteresis disk allows for continuous pull, or finally suspension of the outlet shaft. There are many benefits to using electronic control systems. The structure and behavior of the brakes will be easier to adjust by changing software and output parameters than by repairing machine parts. This also allows for easy integration of existing and new control features such as anti-lock braking system (ABS), car stability control (VSC), electronic hand brake (EPB), etc., and vehicle chassis control (VCC)) and variable control (ACC). Diagnostic features therefore eliminating liquid brakes are additional advantages, and such as a small number of components, simplified cables and a generally designed structure.

2. LITERATURE REVIEW

Several literatures are identified within the field of Electromagnetic Braking system. Various authors are doing research add this particular area which are discuss below.

Umang S. Modi, Swapnil C. Bhavasar(June-2015) had done research adding current styles to the Electro-magnetic Braking System. During this research work they showed that the braking system power is usually increased using electric brakes, and the slide mode controller is often used for the satisfactory results of controlling electric brakes. In this paper the authors have tried to apply the

electromagnetic braking brakes and it is proposed to use an electro-magnetic braking system near the traking braking to avoid overheating and degradation. These electric brakes are commonly used in wet conditions to eliminate skiing equipment, and the price of such brakes is cheaper than in the opposite models. The third page represents the FEM model of magnetic brake. The model analyzes and calculates magnetic fluctuations in the initial stage of the braking system design. This project demonstrated that the air gap features a significant effect on the magnetic flux from FEM model.[1]

Sagar Wagh, Aditya Mahakode, Abhishek Mehta and Vaneela Pyla (June2017) did research work on the Electromagnetic Braking System in Automobile. In this research work they have shown that the Electromagnetic braking system is found to be more reliable compared to other braking systems. In an oil braking system or in an air braking system even minor leaks may cause complete brake failure. While the electromagnetic braking coil and shooting circuits are individually attached to each wheel, any coil that fails to brake is a complete failure of the remaining three coils. And this process requires little or no care. During this paper, it was found that electric brakes make up about 80 percent of all used brake areas. Electromagnetic brakes are used as additional backlinks for conventional collisions with heavy vehicles. Friction brakes are often used sparingly and thus do not reach high temperatures. Brake linings will last longer before they need to be repaired so a potential problem of brake fade may be avoided. This advanced braking system not only helps with the operation of the brakes but also helps to avoid accidents and reduces the frequency of accidents to a minimum. In addition, electric brakes prevent the risk of long-term use of the brake in excess of its heat dissipation capabilities. [2]

Potapov L.A., Fedyaeva G.A., Smorudova T.V. (2016) did research work on Modeling Electromagnetic Processes in Electromagnetic Brakes and Slip Clutches with Hollow Ferromagnetic Rotors. In this research project they revealed that a mathematical and computer model is being obtained; moment electric brakes with empty ferromagnetic rotation are estimated to support these models. The mechanical features taken from this figure are similar to those of the test after the introduction of the bite effect feature. The statistics enable the study of the impact of various speed parameters on the electric brakes and slip clutch and improve the design of those devices. Analysis of the obtained models revealed features of electromagnetic processes inside an empty electromagnetic rotor with an indirect magnetic element. Feature curves provide an effect that reflects the effect of rotation on the uneven distribution of current densities and the induction of magnetism over the rotor phase..[3]

G.L. Anantha Krishna1* K.M. Sathish Kumar (2018) did research work on Exploratory Investigation The influence of various parameters on the fixed magnet Eddy Current Braking System. During the study they revealed that the investigation into the static magnet eddy current braking system was controlled by a magnetic field of Neodymium Iron Boron (NdFeB) with a diameter of 12.5 mm and a diameter of 50 mm.

The probe was made of Copper, Aluminum, Brass discs 4 mm, 6 mm and 8 mm thick at 2000 rpm, 3000 rpm and 4000 rpm which included 27 tests. It was noted that Copper 6 mm thickness is 84.8 percent, 86.3, 81.8 percent slowing down. The average speed limit is 16 seconds, 15 seconds and 22.5 seconds respectively. An 8 mm thick aluminum disc has been found to reduce speeds of 70.6, 86 and 85.1. The time taken to reduce the speed is 3.3 noting that the percentage reduction speed is large and the time taken is a small amount of 8mm thick Aluminum disk. This is usually thanks to high penetration, good tilt and better depth of aluminum disk penetration. However, in Copper disc 6 mm thickness it is noted that the percentage reduction speed is large but the time taken is large compared to the Aluminum disc. This is often due to the negative inclination, the small depth of penetration of the created magnetism and the low penetration of Copper..[4]

Yusuf Yasaa, Eyyup Sincarb, BarisTugrul, Ertugrulb, Erkan Mese (July 2016) researched the A multidisciplinary design approach for electric brakes. during this study, a complete design of EM brakes is achieved. Important steps in construction and preparation are highlighted. Simple and effective analysis models are available to understand the performance of the EM brake power station. Flux connections and magnetism created as an ampere-turn function and air gap are analyzed and determined using FEA software. The hot EM brake model is built on analytics and the hot EM brake behavior is investigated with 3D FEA software. The algorithm is designed to improve the performance of EM brakes by performing the required trade between requirements and parameters. A proto- brake type is generated and test tests are performed to confirm the configuration. Good alignment between test results and analysis models is satisfactory. Toleration of production and the difference between spring fluctuations results in fluctuations within the current waveform leading to armature imbalances that contribute to brake reaction time and reduced brake performance. It is noted that, signals about the similarity of the brakes are derived from the current wave state in the production phase which allows for early detection of problems. It has been found that magnetic fluctuations and the force of the lining collision are reduced by high coil temperatures leading to a decrease in EM brake torque capacity. Coil houses can be filled with epoxy resins with high thermal conductivity to improve the thermal performance of the EM brake. [5]

3. CONSTRUCTION

The system consists of a rectangular frame, made of soft metal. roller bearings fitted with welding. The shaft is held between the bearings. The wheel and aluminum disc are attached to theshaft at a certain distance. There are two AC-type magnets. There are two magnets of AC types Next to the aluminum disk and mounted on a frame. Torque is supplied to the shaft through a chain drive, driven by an engine, mounted on a frame. The system is also equipped with an ultrasonic sensor unit, used by the ECU unit, which detects the presence of disturbances and slows movement.

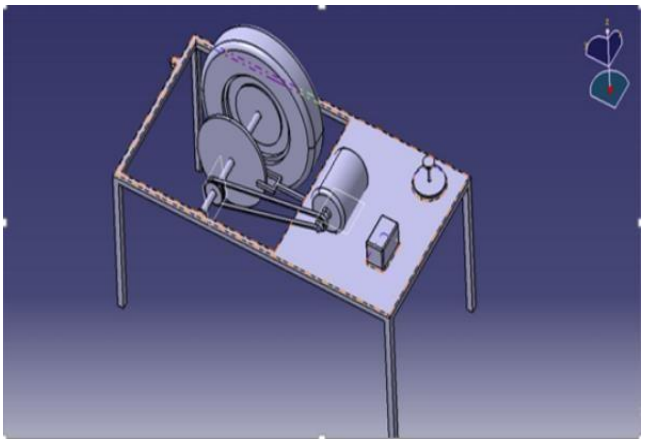

Fig -1: 3D CAD Model of Electro-magnetic Braking System

4. WORKING

Electromagnetic brakes work electrically, but transmit torque mechanically. this is often why they are used to call electro-mechanical brakes. Over the years, Electromagnetic brakes are called electromagnetic, in relation to their starting point. The flexibility of the applications and the brake designs have greatly increased, but the critical performance Assumptions,

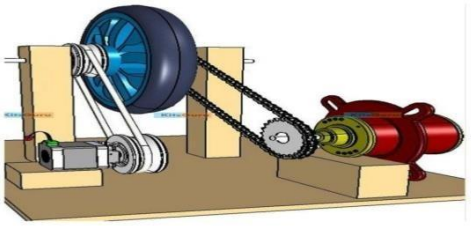

Fig -2: Working Model of Electro-magnetic BrakingSystem

5. DESIGN AND ANALYSIS

- **Design of shaft:**

Firstly, we have select the material for shaft is Mild Steel Material selection for shaft is steel i.e., 1090

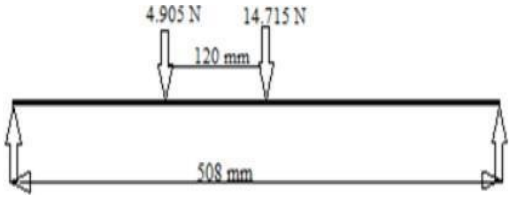

Fig -3: FBD of shaft.

of the brakes remains the same. One-sided electric brakes make up about 80 percent of all brake areas. Electromagneticis powered by AC supply where magnetic flux is used to supply the brake machine.

If the electromagnetic magnet is not powered, disk rotation isfree and equally fast under the weight action to which the shaft is connected. When electromagnetic is enabled, magnetic flux is produced in such a way that the brakes are applied to the disc in rotation and thus absorb the force as a disc. Therefore, when the armature is of interest in the field the stop torque is transferred to the housing sector and the frame of the machine to reduce the load. The AC motor causes the disc to rotate on the shaft using pulleys connected to the shaft. Ultrasonic sensor is located before the braking system frame. This ultrasonic sensor emits ultrasonic waves of a specific frequency, usually detecting an adjacent object. When an object reaches a distance of 5 to 10 feet on the frame, the ultrasonic sensors detect the next object and use a braking system.to hold the brakes quickly.

Brinell hardness number (BHN)=255 Weight of pulley (Wp) =4.905 N Weight of Tyre (Wt) = 14.715 N

(Forces along Y direction) = reaction at bearing A - weight of tyre weight of pulley + reaction at bearing B. ΣF y=Ra - Wt - Wp + Rb

=Ra+Rb=19.62N Moment about pt. A ,

ΣM a=(134*4.905) + (254*14.715) - (Rb*508)

Reaction at B (Rb) = 8.651NReaction at A (Ra) = 10.96N

Resultant reaction (R) = (Ra^2 + Rb^2) = 195.31NMaximum moment,

M=Ra*134

=10.96*134

=1468.64 N. mm

Maximum Torque,T= F*Dp/2

=195.13*432/2

=42148.08 N.mm

6. FUTURE SCOPE

Many new technologies are coming to the world. They createtons of effect. Many industries have found their new face as a result of this advent of technology. industry moreover one of them. There is prosperity in the global industry. So, a lot of research goes here too. As an integral part of the car, there are also new features on the brakes. The electromagnetic brake is one of them. This improved braking system not only improves efficiency braking but also helps to avoid accidents and reduce the frequency of accidents to a minimum. In addition, electric brakes prevent the risk of long-term use of the brake in addition to its heat dissipation capabilities.

7. CONCLUSION

The electromagnetic braking system is found to be reliable andefficient compared to other braking systems. In an oil-based braking system or an air-conditioning braking system, minor leaks may lead to complete failure of the brakes. Although the electromagnetic braking coil and shooting circuits are connected separately on each wheel, any damaged or failing coil brakes do not fail completely as the remaining three coils work properly. And this program needs very little adjustment.In addition, it is found that electric brakes form approximately 80 percent of the total energy used by the brakes. Electric brakes are used as additional reversal brakes in addition to normal collisions with heavy vehicles. Friction brakes can be used sparingly and therefore do not reach very high temperatures. Brakes will last longer before they need extra care and the potential problem of brake fade can be avoided and thus more economical.

8. Advantages

- There is no misfortune.
- A little warmth is unfortunate.
- Minimum wear of segments.
- It is fully controlled electronically.
- Great braking power to restore the energy lost in braking
- Opportunities to regain lost vitality in braking.
- The potential danger of flat tire and cramping dueto grinding is negligible
- No need to change brake oils consistently.
- There is no need to change the oil on the brakesregularly.
- No oil spills
- The problem of brake liquid vaporization and tightening is removed Less support cost.
- Longevity compared to standard brakes.
- It can be used as part of an industry to stop or reduce flexible components.
- No need of abs.

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