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Review Paper on Optimal Robust Control of Contactless Breaking System Using Eddy Current System

Aakash Tandel[1],Sagar Jyani[2],Hardik Patel[3],Parth Patel[4],
Mr. Twinkal M. Bhavsar[5]
[1-4]UG Student, Mechanical Department, Gujarat Technological University/Sigma Institute of engineering, Vadodara, Gujarat, India
[5]Assistant Professor, Mechanical Department, Sigma Institute of engineering, Vadodara, Gujarat, India

ABSTRACT

A non-contact method, using magnetic drag force principle, was proposed to design the braking systems to improve the shortcomings of the conventional braking systems. The extensive literature detailing all aspects of the magnetic braking is briefly reviewed, however little of this refers specifically to upright magnetic braking system, which is useful for industries. One of the major issues to design upright magnetic system is to find out the magnetic flux. The changing magnetic flux induces eddy currents in the conductor. These currents dissipate energy in the conductor and generate drag force to slow down the motion. Therefore, a finite element model is developed to analyze the phenomena of magnetic flux density when air gap and materials of track are varied. The verification shows the predicted magnetic flux is within acceptable range with the measured value. The results will facilitate the design of magnetic braking systems.

Keywords : Friction, Breaking system, Eddy current.

I. INTRODUCTION

Equipment in addition to the regular friction brakes on heavy vehicles. We outline the general principles of regular brakes and several alternative retardation techniques in this section. The working principle and characteristics of electromagnetic brakes are then highlighted. In this project we are trying to make a braking system. Which can be applicable in two wheeler or four wheeler at Electromagnetic brakes have been used as supplementary retardation high speed and low maintenance cost.

Here we are using an electromagnetic coil and a plunger. There is an electromagnetic effect which moves the plunger in the braking direction.

When electricity is applied to the field, it creates an internal magnetic flux. That flux is then transferred into a hysteresis disk passing through the field. The hysteresis disk is attached to the brake shaft. A magnetic drag on the hysteresis disk allows for a constant drag, or eventual stoppage of the output shaft.

Brakes are generally applied to rotating axles or wheels, but may also take other forms such as the surface of a moving fluid (flaps deployed into water or air). Some vehicles use a combination of braking mechanisms, such as drag racing cars with both wheel brakes and a parachute, or airplanes with both wheel brakes and drag flaps raised into the air during landing.

The working principle of the electric retarder is based on the creation of eddy currents within a metal disc rotating between two electromagnets, which sets up a force opposing the rotation of the disc . If the electromagnet is not energized, the rotation of the disc is free and accelerates uniformly under the action of the weight to which its shaft is connected. When the electromagnet is energized, the rotation of the disc is retarded and the energy absorbed appears as heating of the disc. If the current exciting the electromagnet is varied by a rheostat, the braking torque varies in direct proportion to the value of the current.

In an eddy current brake the magnetic field may be created by a permanent magnet, or an electromagnet so the braking force can be turned on and off or varied by varying the electric current in the electromagnet's windings. Another advantage is that since the brake does not work by friction, there are no brake shoe surfaces to wear out, necessitating replacement, as with friction brakes. A disadvantage is that since the braking force is proportional to velocity the brake has no holding force when the moving object is stationary, as is provided by static friction in a friction brake, so in vehicles it must be supplemented by a friction brake.

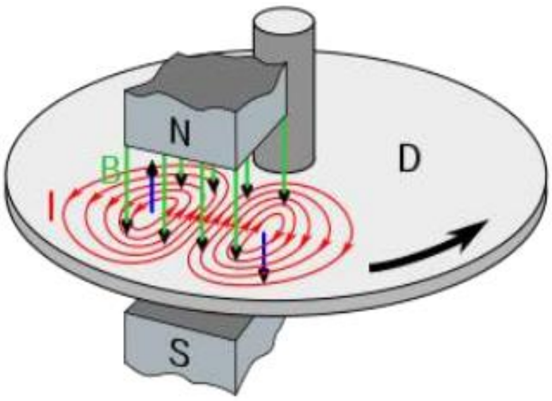

Fig. 1: Braking system using eddy current

II LITERATURE SURVEY

Design an eddy current braking system and optimization for various operational parameters has been done. These parameters have been previously iterated in cited projects and papers and also in the simulation models and are to be cross-checked with the experimental setup[1]. This brake is wear-free, lesssensitive to temperature than friction brakes, has fast and simple actuation, and has a reduced sensitivity to wheel-lock. The present dissertation includes an introduction to friction braking, a theory of eddy-current braking, analytical and numerical models of the eddy-current brake[2]. In this paper, eddy current braking system is modeled in SIMULINK and effects of various parameters are observed over the overall braking. This would provide a comparative study between the various parameters involved and understand the braking system[3]. From theoretical calculations and experimented braking time values, a maximum reduction in braking time 23.97% is found and max air gap limit of 3 mm is obtained beyond with electromagnetic brakes are found to be ineffective[4]. From the experiment that has been conducted, it can be concluded that aluminium is the best material compared to copper and zink to be use as the disc brake for eddy current braking using electromagnetic. Aluminum reacts better and faster compared to the other two materials[5]. It is much easier to keep the magnetic field constant and select the proper conductor materials. The advantages of these last two designs using different materials along the guide rail are tolerable deceleration; and easy manufacturing[6]. A nearly maintenance-free system can be achieved if permanent magnet is utilized to establish the magnetic field.

III. CONCLUSION

From literature survey, Electromagnetic braking means applying brakes using electronic and magnetic power. Here we use the principal of electromagnetism to achieve friction less braking. This tends to increase the life span and reliability of brakes. Since no friction leads to less wearing out brakes. Also it require less maintenance and oiling. The main purpose behind the proposed use of these brakes in vehicles is that is frictionless.

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