DESIGN AND DEVELOPMENT OF ELECTROMAGNETIC BRAKING SYSTEM

This report is presented as part of Degree of
Bachelor of Science in Aviation Engineering Technology

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Copyright Statement

Acknowledgement

This project is a bachelor's thesis "*Design and Development of* Electromagnetic Braking System" at Superior University Lahore. The content of the thesis is based on our personal interest in Automotive Technology and its impact in commercial market in following years. It aims to improve braking capabilities in vehicle, especially in heavy vehicles. We would like to thank the HOD, Sir Ilyas Mahmood, for granting us opportunities for pursuing exciting projects and for supporting us during the process of developing our project thesis.

Foremost, we would like to express our sincere gratitude to our advisor, Sir Mohsin Khalil Ahmad and Co-advisor, Sir Owais hasan, Department of Aviation Technology and Aviation Technology, Superior University Lahore. We could not have completed this project without their constant encouragements, valuable insight, motivations and guideline; we would like to thank our parents and friends for support and encouraging us.

Dedicated to my exceptional parents and adored siblings whose tremendous support and cooperation led me to this wonderful accomplishment

Abstract

Braking system in a moving vehicle is one of the most important control. A Brake will be sufficient powerful to stop a vehicle from moving in emergency with a lowest distance. Road and rail vehicles and also aircraft depend mainly on friction brakes. It ensures the safety and comfort of the driver, passenger, and for other road user. In friction brakes energy from the moving part can be absorbed and slows down the vehicle with the help of friction. Conventional braking system (such a mechanical frictional brake) are more bulky and have low power and weight ratio. Electromagnetic brakes is more innovative braking system that will utilize in small and in some heavy vehicle also like as car, train, buses, truck etc. It reduces wear, a least sensitive to temperature rather than these frictional brakes, it has fast and straight forward actuating, and features a reduced sensitivity to wheel-lock and also lower maintenance of braking system but the effectiveness of brake should remain constant. Electromagnetic braking system provides us with better response time such as in emergency conditions. Electromagnetic force use in braking system to engage the brakes. Electromagnet is mounted on the frame where disc is connected to a shaft. When we applied electricity to the coil a magnetic field is developed across the armature because of the flowing current across the coil and causes armature to get attracted towards the coil. As a result, a torque is developed and eventually the vehicle comes to rest. The behavior of two different materials aluminum & copper was studied to be used as brake disc. It's aimed to see the effects of increasing current induction into electromagnet which produce drag force that will slow down the motion. A few graph been presented to show the best material to be used as the brake disc for electromagnetic braking system using eddy current project. The variation in braking torque and braking time with reference to variation in current and air gap was studied to show the results.

Key Words: conventional brakes, aluminum Electromagnetic brakes, friction, wear, actuation

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CHAPTER 1: INTRODUCTION

The study of work in this thesis has been presented in two different parts. First part is related to the detailed background for brakes, history and different design brakes and another is the introduction and problem statement. And second part is detailed study on reasons and solutions of the problems.

1.1 Objectives of the Research

The main objective of this project is to create an eddy current brake that could be constructed easily, be controllable by using current hardware and software, and be able to deploy in the automotive industry. This task was accomplished by instinctive thinking, many hours of research, and consulting with Professor Owais hassan. We work hundreds of hours of machining in addition with complex calculations that gave rise to a simple design concept and execution. Simplicity is a main feature of this project, if that project was to be complicated it wouldn't be able to complete within time allotted and it would lessen the purpose of creating a better system. The simpler mechanism, the less parts in system that can fail, and thus there is a decrease in a replacement time of components (excellent for commercial applications such as in heavy vehicles).

1.1.1 Primary Objective

1. Design and development of mechanical structure

2. Design and development of actuation and control mechanism

1.1.2 Secondary Objective

Besides the core objective, following are the secondary objectives:

1. To understand planning and execution of project

2. To understand the fabrication methods in a mechanical workshop

3. To understand the usage of several mechanical machine tools and furthermore measuring tools

4. To create day to day human life easier by appropriate use of the technology

1.1 Introduction

We outline the general principles of regular conventional brakes and several supplementary retardation techniques in addition to the regular friction brakes on heavy vehicles in this section. This system is designed as a “friction less” system and although it is not completely friction less it fulfills the standard hydraulic brake pads and rotors which wear and fail due to friction and loss between material.

The main principle of braking in road vehicles includes the transformation of kinetic energy into the form of heat. This high energy transformation required a large rate of heat dissipate so that stable performance can be maintained. In this project we work to make a braking system which can be applicable on small and heavy vehicle. Electromagnetic brakes operate with the help of electricity, but can transfer torque mechanically. The Electromagnetic braking system is used as supplementary retardation for high speed vehicle and having low maintenance cost. we are using an electromagnetic coil and a rotating aluminum disk. There is an electromagnetic effect on moving disk. When electric current is applied to the field, it generates an internal change in magnetic flux. That flux is then transferred into a disk passing through the field. The disk is attached to the brake shaft. A magnetic strain on the hysteresis disk permits for a constant drag, and resulting slowdown of the output shaft.[8]
As the result, the brakes are capable enough to generate a high torque and absorb energy at extremely high rates for short periods of time.

1.2 Principle of electromagnetic braking system

The main rule of which braking system work is when we will operate braking system the kinetic energy of automotive object is then converted into heat energy. A Brake when create must be capable to reduce the speed of a moving object in a very short time period and regardless how much it fast the velocity is.

1.3.1 Categories of Braking System:

Brakes are classified into the following categories:

1. by method of power: Mechanical brakes, Hydraulic brakes, Vacuum brakes, Air brakes by method of application: Service or foot brakes, Parking or hand brakes

2. by method of braking contact: Internal Expanding Brakes,

3. External Contracting Brakes. ``````````````````````````

4. by method of operation: Manual, Servo, Power operation

by Method of Applying Brake force: Single Acting Brakes,

5. Double Acting Brakes.

1.4 Mechanical or Friction Brakes

Frictional brakes are often devices that can use unmoving pad with a rotary rotating wear surface. Collective conformations consist of shoes that can contract with the rubbing at the external surfaces of a rotating drum, like as we have a band brake. A rotatory drum and the brake shoes that gain a rubbing within drum, ordinarily it will be called a “drum brake”, however with some other battery tack together are achievable; and platelets at which we pinch a rotating disc, normally mention to as “disc brake”. Another brake configurations can also be used, but are use very less frequently.

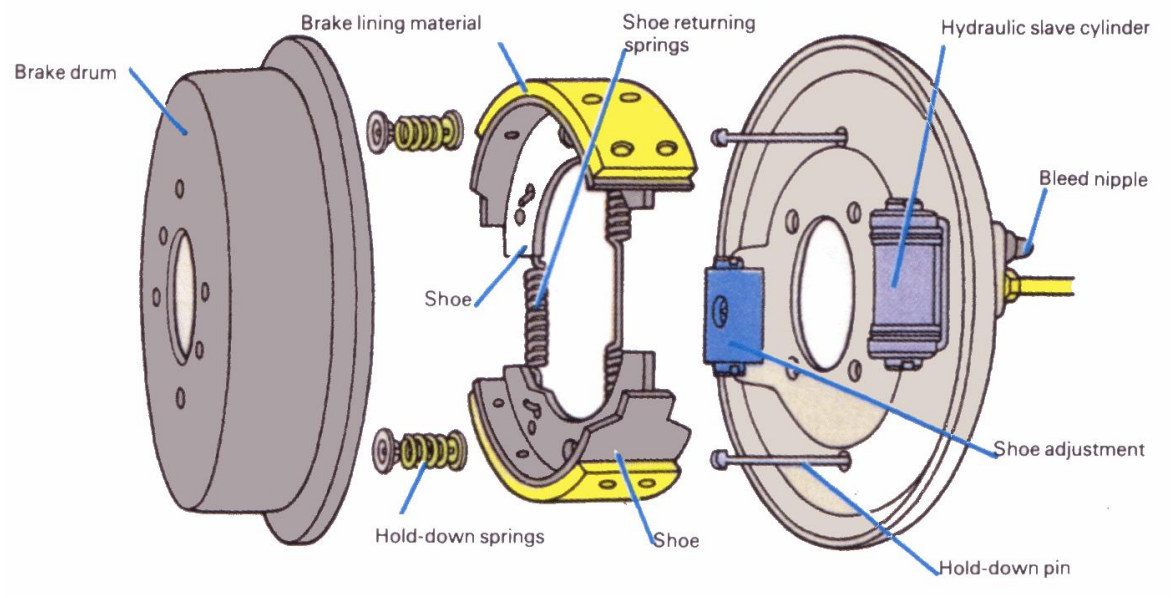

Figure 1.1: Hydraulic drum brakes

1.4.1 Characteristics

Brakes in a moving vehicle can be defined according to their various physical benefits including.

1.4.1.1 Peak force:

Peak force is the extreme slow down force which will be achieved. The maximal force which frequently have more power limitation in that tires and in this situation that brake will create a wheel skid/slip.

1.4.1.2 Continuous power dissipation:

The brakes will usually be very warm when it comes to use, and they will be more likely to fail if the temperature is too high. A high amount of power (power within a unit of time) that can be reduced by brakes without fail in this continuous decrease in power. Continuous power reduction may depend, e.g. Rotate disk temperature and speed in ambient cool air.

1.4.1.3 Power to weight ratio:

The amount of power required for a vehicle to stop relative to its weight is called power to weight ratio. In heavy vehicle the main problems are that we need a large power to stop it instantly which is not possible. In railway train it takes approximately 20sec to stop where a bicycle need 1-2sec, the delay in time is because of high weight with respect to power. Electromagnetic braking system deal same as for 10kg and 150kg mass.

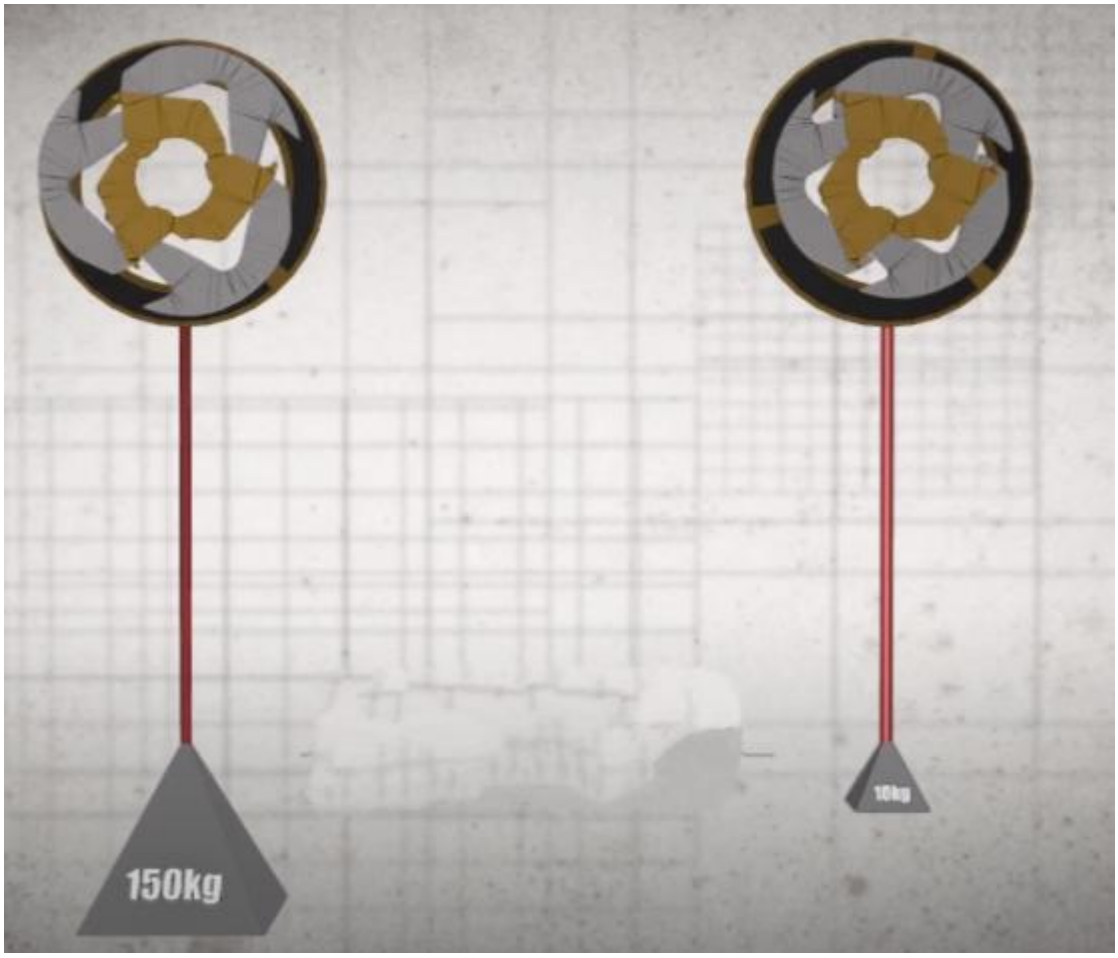

Figure 2.1: Weight comparison on electromagnetic braking system

1.5 Problems regardless with the friction brakes

1.5.1 Fading Effect

As the brakes continue to heat, it might goes toward less effectiveness, known as brake fade. Most of the designs will inherently prone with the fade, while the others designs are comparatively more resistant. Additional use thinking, like cooling, might be having a very large effect on fading.

Figure 3.1: Brake fading

1.5.2 Brake Fluid Leakage

When a vehicle has worn with a brake shoes or with the brake pads, the fluid quantity will be as low as in the brake fluid storage tank. Suppose if we have a comparatively some updated brake pads and its latterly top-offed ours brake storage tank or reservoir and you can only observe some of days after that the fluid quantity has dropped conspicuously. In that's proceeding, it's a great stake that might be leak anywhere in the braking system that helps you likely larger brake problems than something as simple as with the time these brake pads can gone worn.

1.5.3 Pneumatic/pressure in brakes/ malfunctioning of fluid:

In motor brakes especially in cars, buses, trucks, aircraft and trains we need high pressure air or fluid to exert force on wheel and stop it from moving. Air is compressed using compressors and hydraulic pressure is created by hydraulic pumps which make structure complex, less cost effective and more change of failure such as air/fluid leakage.

1.5.4 Loss of stability at high speeds:

When velocity of a vehicles increase continuously, the demand for active safety is subsequently becomes higher and higher. When brakes are applied at high speed it causes to lock the Tyre at one position, due to high momentum of vehicle it continuously moving and cause loss of stability.

1.5.5 Other Problems

Other leading difficulty that comprises liquid in that brake freezing and vaporization of fluid and can only be occurs only is in some rare example. Freezing also a quite very frequent at coldest places like Russia and in other countries in Scandinavian etc. At that the temperature would reaches very down between -50°C to the −65°C, in such cases there we required for few agents of anti-freezing that will increase complication in the system.

1.6 Development of electromagnetic braking system

We have two main components in the electromagnetic braking system, the electromagnetic and the aluminum disk. Electromagnets or neodymium (endless magnets) are set on the rotor. Electrical Current will supply electric magnets from battery sources. Internal caliper and rotating electromagnets can be set by blasting, welding and riveting or by high-quality metal plates. On the rotor, a constant magnet is placed at its boundary at a certain point. The electromagnets in the caliper are the opposite of the electromagnets in the rotor. There is also one very strong electromagnetic used to create magnetic fluctuations or eddy current in aluminum rotor as it will be shown in the figure[7]

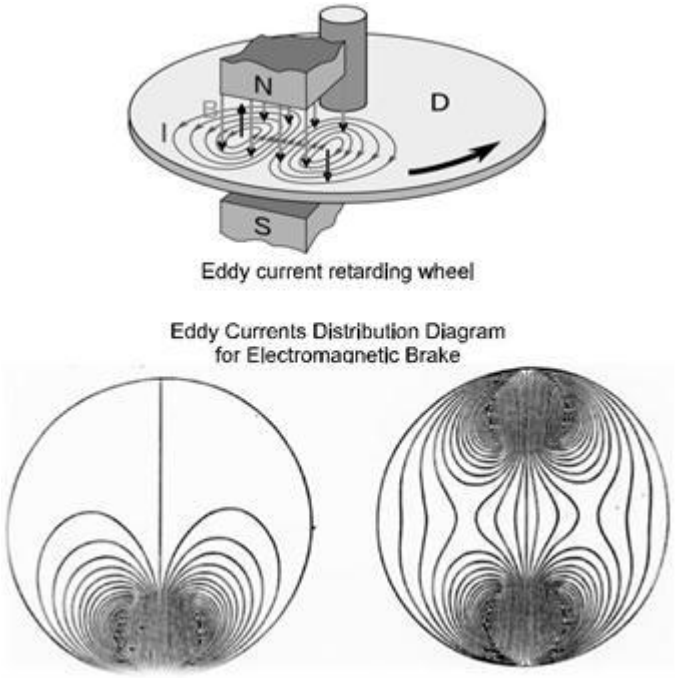

Figure 4.1: Sketch of Electromagnetic flux on plate

1.6.1 Material Selection

Rotate disk material should be upgraded to minimalist the amount of time τ and also reduce the disc moment of inertia I. There are two strong elements in our collection, namely aluminum and copper. This selection is based on the equation effect of Equation. In order to reduce the constant time, we must choose the lowest possible density to the conductivity of all accessible objects. We have calculated that estimate of the number of potential sales items. We will then find that copper and aluminum materials are at the top of the list.

The copper rating is 1.5 * 10-4 kgm2 / S and the aluminum rating is 0.76 * 10-4 kg 2 / S.

Therefore, we decided that we should use aluminum as the material of our rotating disk in the prototype in order to achieve better performance of the brakes.

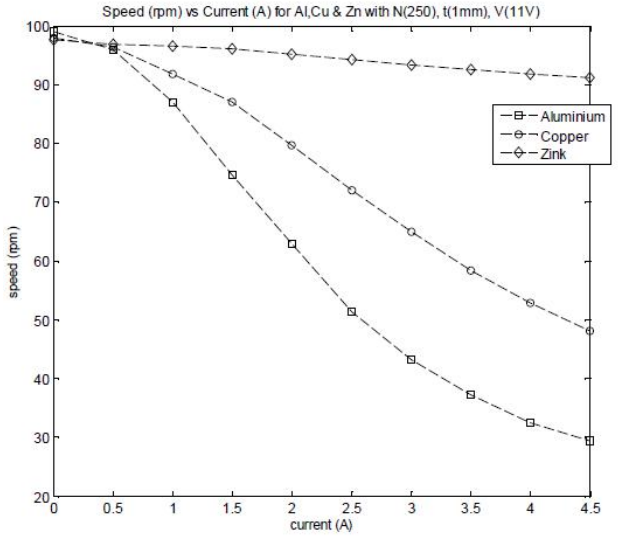

Figure 5.1: Test comparing of Copper, Aluminum and Zink

1.6.2 Selection of Disc Thickness

The size of the rotating disk should be improved to minimize duration and should reduce the moment of disc inertia. The inertia of the disc is always proportional to the size of the disc, so when we can automatically reduce the radius, it reduces the inertia of the disc. The consistency of the time does not depend on the size of the disk. While maintaining sufficient structural strength, Thus the problem of upgrade reduces by reducing the thickness of the disk.

1.6.3 Disc Radius

The radius of the disc should also be improved to reduce the constant time and reduce the moment of disc inertia. The rotating disk inertia is equal to the fourth power radius, so the disk inertia will be reduced when reducing the disk radius. The constant operation on the disk radius is not clear. The fixed time equals a square radius, however, the generated magnetic flux is also a function of disk space because the larger the radius, the more pulls can properly mount a strong magnetic field produced. The primary function of the magnetic field on a disk radius is unknown, and can only be calculated by testing. Therefore, in improving the rotor disc radius has a design challenge due to imperfections leading towards the mathematical relationships.[3]

CHAPTER 2: LITERATURE REVIEW

The electromagnetic braking system (electromagnetic braking system or electric brakes) can slow down or stop the movement of a moving object using electromagnetic force with the help of friction. The original name was "Electromagnetic braking system" but over time its name has been changed to "electromagnetic braking system", referring to their method of operation.After some time, during which it would become more and more popular throughout the 20th century, especially in many cars and trains, the variety of applications and brake designs increased over time, but the basic functionality of the system remained the same. Both current eddy brakes and electromagnetic braking use resistance forces are called electromagnetic force, but electric brakes eventually rely on collisions and current eddy brakes use direct magnetic force.

With the advancement of technology, there are many new programs and designs coming to the world. The mechanical drum brake was firstly developed in year 1902 by a French industrialist, one of the creators of Renault and inventor of the automobile industry name Louis Renault. Since from 1949 and 1953 Chrysler Imperial were first used brakes with hydraulic functions in it. In the 1980s, most motor cars were fitted with four-wheel disc drive brakes. In 2006 to now disk brake, pressurized hydraulic/pneumatic drum brakes were used. Modern car’s today use convectional brake system in which brake pedal to be

pressed that exert force on brake's hydraulic cylinder to create a hydraulic pressure which forces brake shoe or brake caliper to apply force on the wheel to stop it from moving.[1]

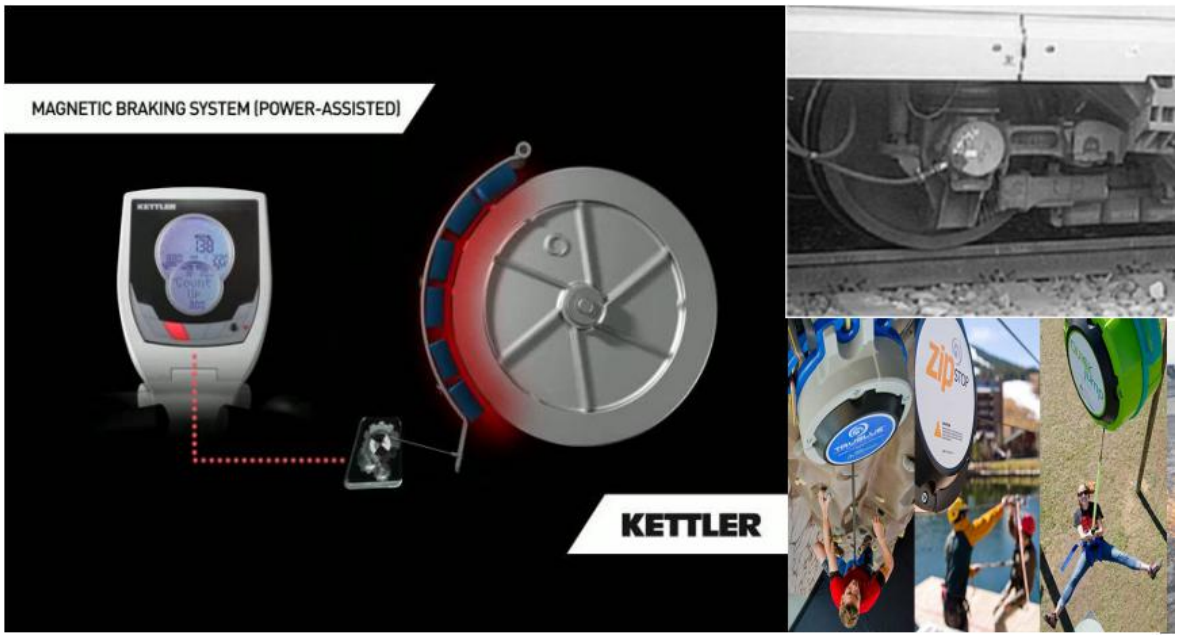

Figure 6.1: Brake used in gym, train and in other equipments

2.1 Electromagnetic brake used in a variety of applications such in

2.1.1 Gym machines:

In gym machinery electromagnetic braking has a major use, it slows or increase friction in the rotating metal to help producing more load without adding mass with the help of these magnets

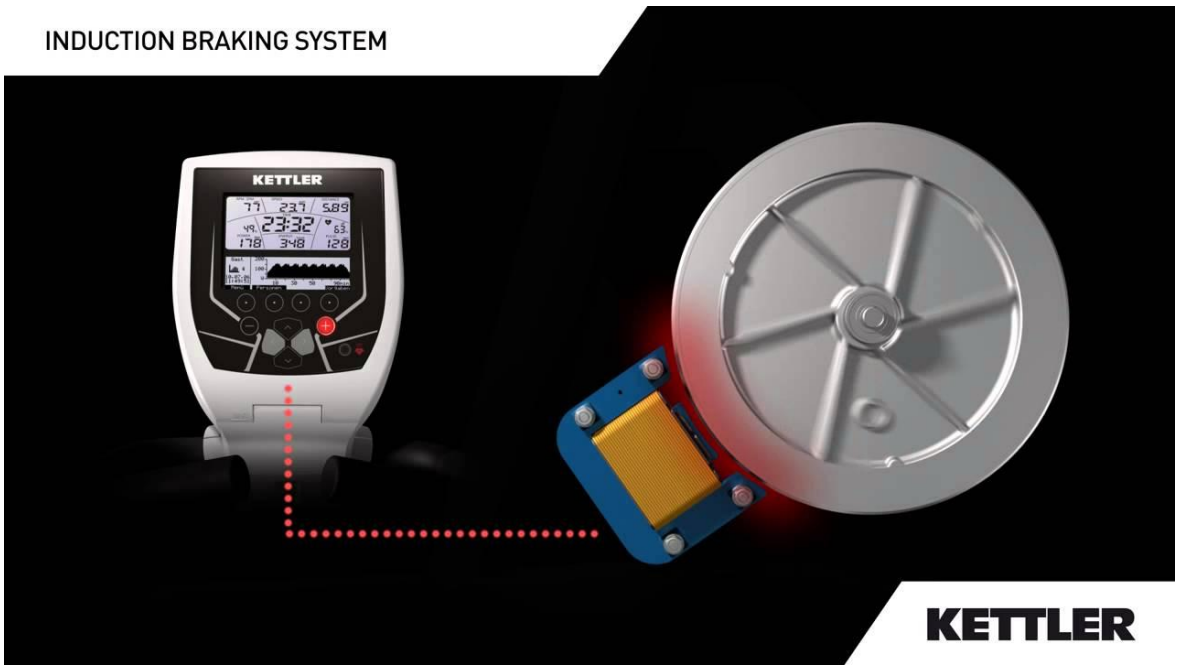

Figure 7.1: Electromagnetic brakes in gym

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2.1.2 Industrial equipment:

In many industries such as where product manufacturing plants have, they use con-ware belt to move these products so during movement we want slow and stop movement here so electromagnetic brake is the best solution which works without any friction hence a low investment should require to maintain.

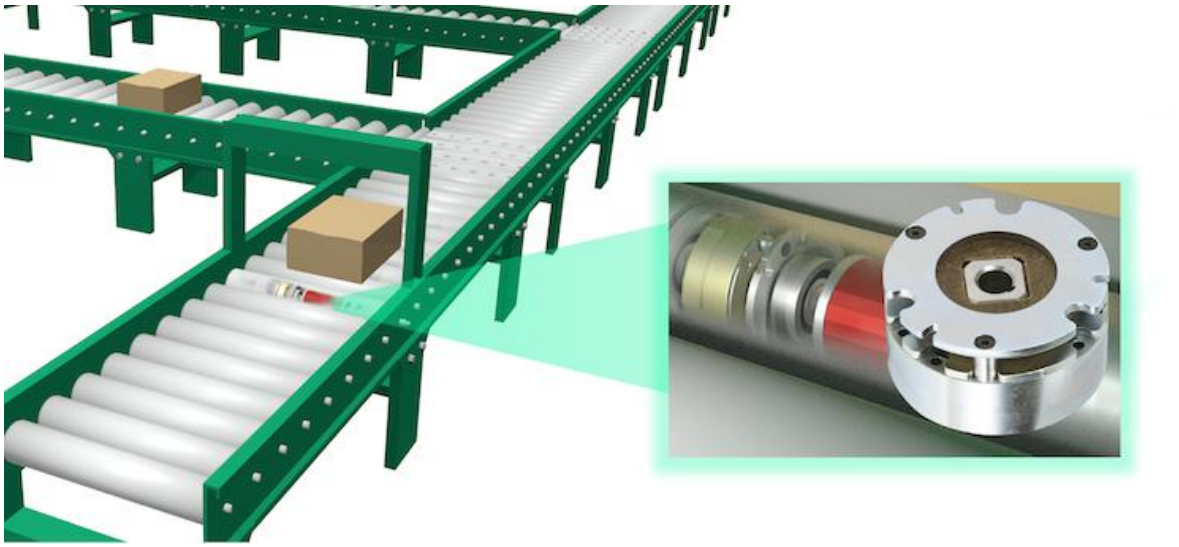

Figure 8.1: Electromagnetic brakes in industrial equipment

2.1.3 Recreational equipment

Recreational equipment like mountain climbing rope also a useful example of electromagnetic braking mechanism which work on same eddy current brake to slow glider downward movement with this recreational tool.

Figure 9.1: Electromagnetic brakes in recreational equipment

2.1.4 Roller coaster

Roller Coaster is one of the earliest examples of the electric braking system, where saddlery real power is produced by its magnetic rivals, the roller coaster train will lower the level as it rotates over the stains on the old hot current technology. This system is usually used at the end of roller coasters or after the train has slowed down or increased speed. Electric trains and some heavy vehicles.

Alternating current (AC) is applied to the magnet to form a electromagnetic field. The metal fin attached to the underside of the train exceeds the electromagnetic field while the magnetic field will causes a wave to propel the fin and then propels the train down the track.

Figure 10.1: Electromagnetic brakes in roller coaster

2.1.5 Train and heavy vehicles.

Electromagnetic brakes are used in many train like bullet train and other magnetic trains they are fully function with the help of magnetic force. The main benefits of train is that it have high speed and a very high brake efficiency, low maintenance, have no pollution and much more gain of this braking system.

In a few years ago a mechanical stroke engine train can experimentally use a magnetic brake mechanism to stop it fast, so for this propose a big temporary magnet uses to it that when energize can drop magnetic field lines on the track. The attraction between these two components can cause the brake to apply

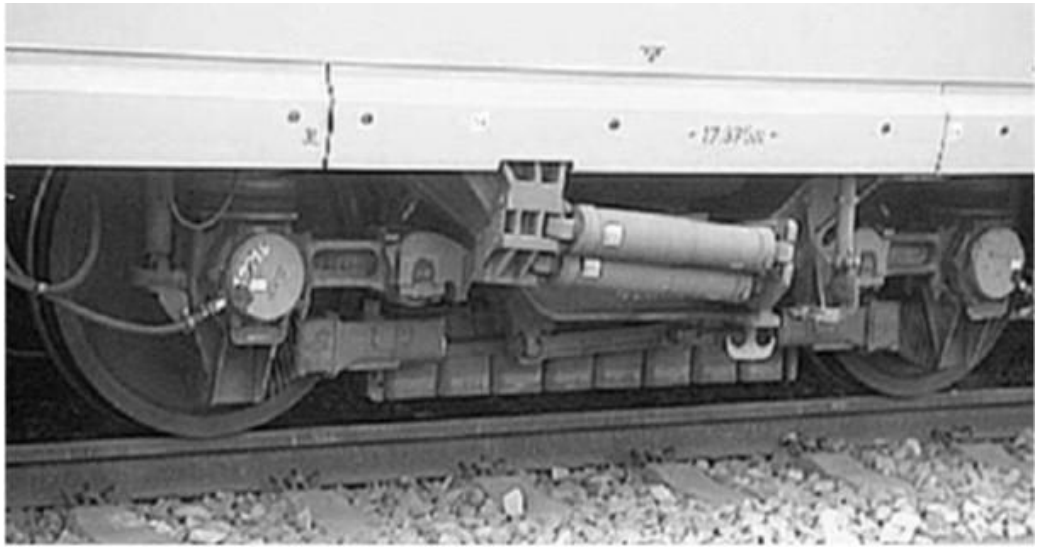

Figure 11.1: Electromagnetic brakes in trains

In heavy vehicles such as truck buses and other car also use electromagnetic braking system for their efficient brake functioning, a most famous and widely used system that named electromagnetic brake retarder have a great benefits in braking world.

Electromagnetic braking retarder is one of the most widely used braking devices that will help heavy-duty moving brakes slide down steep slopes. As it will work, electromagnetic braking retarders will heat up and cause and its performance will decrease. The reversible or resistant force of the electromagnetic braking retarder will produce them and will drop by more than 50% of them as they continue to heat up, and this will lead to a "run" in the car where it will be a booth. Because at that time the temperature-dependent controls on the braking retarders serve two purposes; the first is to keep the cars moving faster and the other is to prevent the retarder from overheating. The paper tells us complete control over braking retarders or through a flexible system.

Figure 12.1: Electromagnetic brake retarder

CHAPTER 3: METHODOLOGY

Braking in an electromagnetic braking system works on the similar mechanism as we have seen in eddy current brake. Current put into the coils produce a magnetic field that is perpendicular and penetrates the brake surface. The surface of brake generates an eddy loop current because of changing magnetic flux within the coil as the motor continue to rotate. The eddy current loop after then produces electromagnetic field which will moves this magnetic field that originally produced the eddy current per Lenz's Law. The cross multiplication of the eddy current and the magnetic field that will induce a drag force would have known as a Lorentz force, on the brake surface which will reduce the angular velocity of that wheel. Kinetic energy of these vehicle will then dissipated into heat, which consists of the Joule heating of the brake surface and the innate friction of the propulsion system and the road surface.

3.1 CAD design

The CAD design of the project is shown in the figure

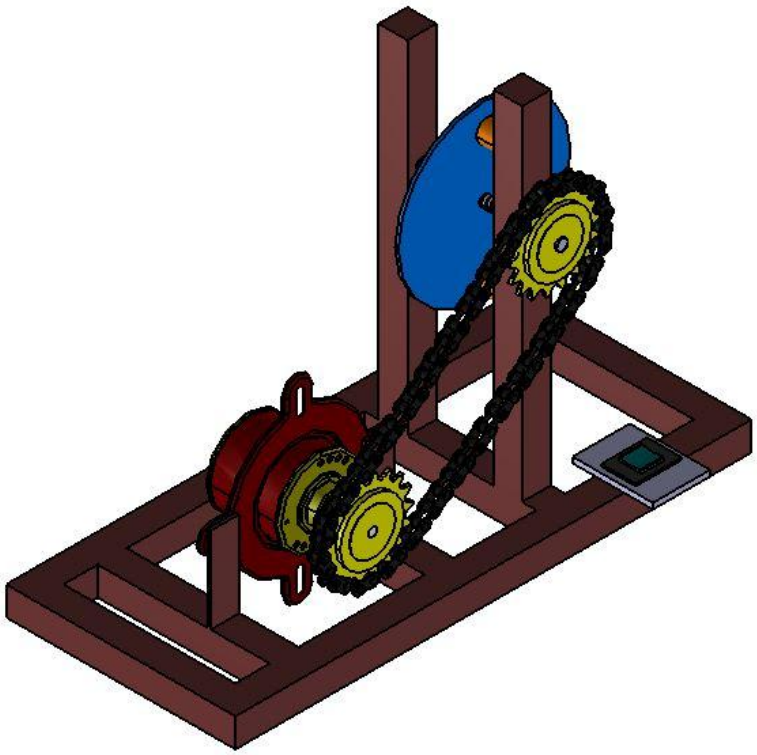

Figure 13.1: 2D model of electromagnetic braking system

3.2 Component used:

We are using these different components:

1: Aluminum disc

2. Electro Magnet

3. DC Motor

4. Switch

5. Pedestal Bearing

7. Power supply

3.2.1 Rotating Disc

In electromagnetic braking system the rotating aluminum disk is a part of disc brake at which the brake pads must be applied. The material is that we use is a nonferrous by nature and because of its non-ferrous material it is a excellent conductor of the magnetic field and with this so much quantity of eddy current will be produced in those Non-ferrous nature of

material and hence efficiency in the brakes will be automatically increased. The Non-ferrous metals like Aluminum and also like Copper. Consequently, aluminum is a material that we select as a Rotating disc.

Specifications of Aluminum Disc are listed below:

Diameter of disk: 304mm

Thickness of disk: 4mm

Figure 14.1: Rotating disk

3.2.2 Electromagnet

Such Categories of magnets whose magnetic field can be created by a movement of electric current it will known as electromagnet. When a current remove from the circuit the magnetic field will vanishes. Electric current flow in a wire can generate a very strong magnetic field in that wire. To point out magnetic field the electromagnet a 23-gauge wire will covered with a coil of metal, with so much turns of the wire existing side by side. When in a electromagnetic field of when all these turns can passes from that wire at a central part of that coil and it will know produce a very hard magnetic field there. A magnetic coil that's when form the shape of a very straight tube (like a helix) it will known in the form of solenoid.

Suppose we can place a very soft form of iron within the coil a very much harder, a magnetic fields will created when a “core” in a ferromagnetic material, Ferromagnetic core in electromagnetic braking system multiples that magnetic field into more than thousands in times and its capability in the field of coil separately, because of the high magnetic a permeability in a ferromagnetic properties in it. This is ferromagnetic core inside and also a iron core that with a electromagnet. The main benefits of electromagnet at a permanent magnet is that in electromagnetic field it will be more rapidly manipulate over a broad in a varieties of controlling the actual quantity in electric current. All the same, a continue supplying of a electrical energy that necessary to be maintained in that field.[4]

Diameter of a coil which we are using is 8mm and a 23 gauge of Copper wire

Figure 15.1: Electromagnet

3.2.3 Switch

It is used to turn on and off the power. We use two switches to turn on and off the power supply. The motor is controlled with the help of one switch and the magnet is controlled with the help of the other switch.

3.2.4 Power supply

Power supply in the system is an electrical equipment that supplied by electrical load to an electrical power . In this project we use 12 volt having 8AH and 20HR

Figure 16.1: Power supply

3.2.4 DC Motor

A electrical DC motor that we use used in project is an electrical device that can generate mechanical energy from electrical energy. The actual work of the DC motor in project can be based on a principle which is when a electrical energy(current) that can carry and can also a that conductor is situated within the electromagnetic field, it will also then experience a strong mechanical or so be called a resistive force.

Figure 17.1: DC motor

3.2.5 Chain and Pulley

Chain and pulley mechanism have been made to transfer motor torque to disk, it has following characteristic Diameter: 125mm | 50mm

Central Diameter: 2.1ft

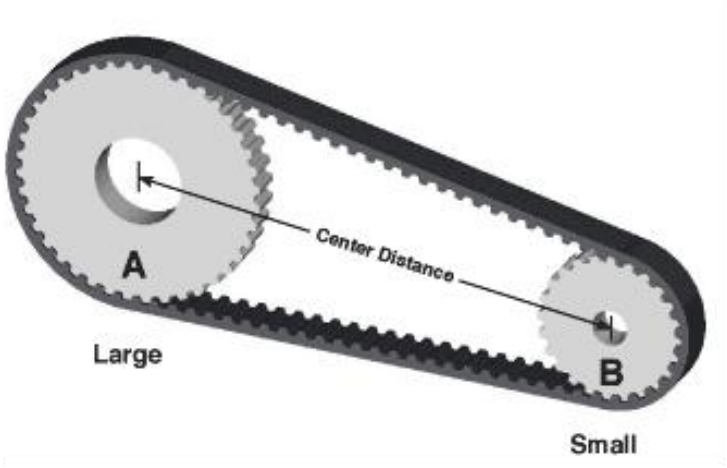

Figure 18.1: chain and pulley

Engagement time

In reality there are two types of time engagement that we study in that electromagnetic in braking mechanism. The initial one of that time that take us for a coil which will be developed in a electromagnetic field, it will be hard enough to pulling a armature. And another one is that of the air difference within both disk and the electromagnet, which is the space within armature in it and also coil shell. The AutoCAD group will mechanically compute the inertia of all these components in it, Rather then a key to be sizing with a braking will calculate and how much inertia will it reflect being moves back toward the brakes. For doing that, engineers will use that statement: $T = (WK2 \times \Delta N) / (308 \times t)$ Where in statement:

T = required torque in lb-ft

WK2 = total inertia in lb-ft2

ΔN = changing rotational speed(rpm)

t = time within acceleration or deceleration will must takes place.

Flow Chart

Flow chart of electro-magnetic braking system will shown as follows

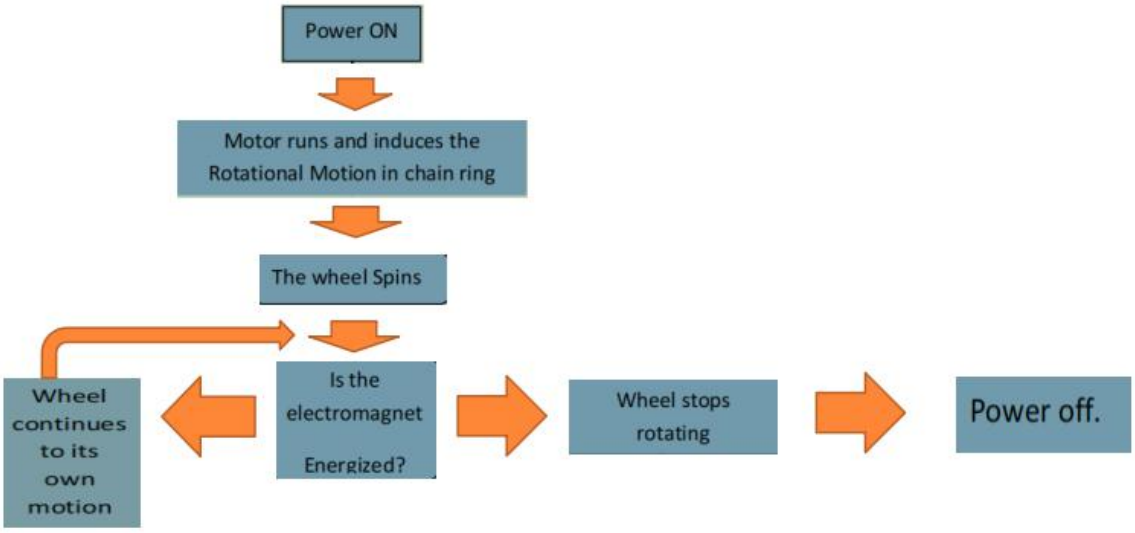

Figure 19.1: Flow chart

Assumed data

1) – M - Rotating mass 2kg

2) - t -Braking time 3to 3 sec

3) – d - Wheel diameter. 10 inch 0.254meter

4) – N- Wheel rotational speed 500 to 1000 rpm

5) - R- Ratio of wheel / disc diameter 2.5

6) -Disc radius 12 inch

7) μ= 0.25- the Coefficient of the friction

8) - Effective area in the radius of disk = 15 inch

9) E = 29.0 of joules - The total energy of the rotatory mass of disk

10) I = 8 Amp-hr - Current that moves in coil

11) L= 0.048 metre - The solenoid length is 2.5 inch

12) P- 59.6 x 106 S/m – The conductivity of electrical aluminum disc

13) R = 0.015m - The length of the magnet is 2 inch

14) V = 12 - The voltage of battery is 12 volt

15) I = 10 Amp-hr - The Current in the battery

16) C = 465 Joules/Kg 0C Specific heat capacity of the aluminum disc

17) K = 54 w/m 0C The thermal conductivity in aluminum disc

18) Volume = 0.00003601 in meter cube volume disk

19) P = 7850 kilogram / metre cube - Aluminum disc density

20) μo = 4π x 10-7 air Permeability

21) μs= 2000 steel permeability

Find Designs Parameter of that will we assume at some specific Parameters:

The Brake force:

The total braking force all that it need is that only it will measured by help of Newton Second Law of motion

Velocity = d x Π x N/60 = (0.276 x Π x 150)/60 = 2.1666 metre/second.

A = (v-u)/time = (12-0)/2.5 = 6 metre/sec 2

F= m*A = 12 x 6 = 72N

T = (Fx 0.5d)/R = (72 x 0.5 x 0.276)/2.5 = 3.97Nm

Clamp force

Clamp force = Time/ (Re x μ) = 0.832/(0.06 x 0.25) = 55.46 N

Brake power

Let assume we finish this is from this speed test behind at zero then kinetic energy of it is given-ed by: -

KE = 1/2 x m x v2 = 0.5x2x2.16662 = 2.166 Joules

Rotational Energy:

Rotational speed is that energy that which we need to slow down the moving component. It will vary with different type of vehicles and what type of gear that we choose even so take at least 3percent of kinetic energy in a reasonable consumption. This will power you then it's granted by:

Power = Energy/time = 29 / 2.5 = 11.61 w

That's average power. Peak in the power at time of brake is double on this.

CHAPTER 4: RESULTS AND DISCUSSIONS

Using electromagnetic braking system with a secondary retardation equipment, so that the frictional braking system will used as less in frequently, and hence it will practically would never ever reached to the maximum temperature(heat). Brakes line that it would be lasted substantially more than longer then before demand maintenance of it, and it will be possibly "brake fading" trouble should be avoided. Researched that will be conducted with a truck manufacturer, it will be proved that the magnetic braking system will be arrogated up-to eighty percentage of power duty that which will would be other than has been demand for the every day services of brakes. Moreover, the magnetic braking system will help in preventing that causal agency which will be arises from the protracted uses of the brake system which will beyond at the potentiality to dissipation of the heat. That's the more possible to be happen at while when a moving vehicle will descender with a very long gradient at very much high speed. Installation of the magnetic braking system is not a very much difficult task. It will not to be need a accessory cooling a system. It will also have not effect in performance and efficiency of the engine. Magnetic braking system will also have a better in control. The thermal performance of that elector-mechanical braking will be achieved in the mean of a natural process and by the radiation of that thermal energy at a very very high in temperatures. Electromagnetic braking system will have an superior in dissipation of heat and it's efficiency. The Electromagnetic braking system will

have a very good in the dynamic thermal performance rather than a regular of frictional braking.[6]

4.1 Result Analysis

The results are taken in accordance with the rotating speed at which it moves of aluminum disk with the motors and stops that time at when a electromagnet in the system will in the action and then the motor energy supply will be cut off from the system.

These results will be provided as in the table.

Table 1.1: Tables to show results comparing RPM with time to stop.

SR NO	ROTATING SPEED(RPM)	STOPING TIME (SEC)
1	500	1.10
2	1000	1.40
3	1500	2.10
4	1700	2.50

CHAPTER 5: CONCLUSION AND FUTURE RECOMMENDATIONS

The electromagnetic braking system has a general tendency over the way to reduce friction. In an oil braking system or air braking system, even minor leaks can lead to complete failure of the brakes. While on the electromagnetic braking coil and the shooting circuits are individually attached to each wheel, any coil that fails the brakes does not fail completely with three coils operating properly. The main advantage of the system requires very low maintenance. As it grows, it is found that the electric brakes created close to 80% of the total power when we apply the brakes. Magnetic braking system can be used as an additional back-up devices with addition to the standard of the braking system on the heavy vehicles. So this frictional brakes can also to be used for a fewer use than that of the fictional brake system alone, so they will never be reached at maximum temperatures where that temperature will be the same. Brake linings will last longer before they need to be repaired and the potential problem of brake failure may be avoided. This advanced braking system not only helps to hold the brakes effectively, 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 excess of its heat dissipation capabilities. The combination of current swirl and attractive power makes this brake effective. This brake can be used as a stopper in the car. The use of abs can be eliminated by using a small

controlled magnetic field. It can be used as part of train trainers to reduce planned travel quickly. The combination of these brakes extends the life of the brakes and acts as fully applied brakes. This type of brake is used as a wet condition, against a slippery steel we do not use it. It is completely electrically controlled, which brings a few errors. The braking force brought to this brake is not as much as the breaking of the plate. Next, it can be used as an aid or relief for vehicles.

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