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OVERVIEWS OF BRAKE PAD WEAR INDICATING SYSTEM: A STEP TOWARD "DEVELOPMENT OF NEW BRAKE PAD WEAR INDICATING SYSTEM"

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Abstract: - As per the State Crime Records Bureau, Ministry of Road Transportation & Highway, Law commission of India, Two serious road accidents in the nation occurs every minute and 24 dies on Indian roads every hour in India. For die in every minute to brake failure. Brake pads are the most important component of an automobile decelerating system. It helps in smooth delay of a vehicle and finally bringing it to halt. Brake pads convert the vehicle's kinetic energy into thermal energy by friction. The efficiency of the brakes depends completely on frictional material used, which in turn affect the performance of the brake pads. In order to stop the vehicle or to decrease the speed of vehicle, brakes played an important role. The main component of brake which helps to stop the vehicle is brake pad, but currently most of the vehicles uses disk brake as it has high heat conductivity. Due to continuous friction of brake pad it gets injured or get wear, it may cause accidents or failure of brakes. Mostly brake failure occurs because of worn out of brake pad. To save the valued human life from those accidents happened due to failure of brake, there is a need for monitoring of braking system in automobile vehicles. Many investigates are carried out to improve the effectiveness of brake pad at the same time to display the brake pads by using several methods. In the present research paper the overview is carried out to understand the present examination on checking the brake pad and effort is made to developed new system to display the condition of brake pad.

Keywords: *Brake pad, Sensor Microcontroller, Light, Battery etc.*

I INTRODUCTION

Presently, lots of accidents may occur due to different reasons, one of the reason is brake failure and is caused due to poor preservation as well as product defect. As per the National Crime Records Bureau, Ministry of Road Transportation & Highway, Law commission of India, 2 serious road accidents in the country occurs every minute and 24 dies on Indian highways every hour in India. For die in every minute to brake failure. In order to safe protector the valuable human for accident the accident monitoring of brake is very important thing in automobile. Safety of vehicle is the prevention of vehicle accidents or the minimization of harmful effects of accidents, particularly as concern to human life and health. Many researches are carried out to improve the efficiency of brake pad at the same time to monitor the brake pads by using various methods. In the present research paper the overview is carried out to understand the present research on monitoring the brake pad and attempt is made to developed new system to monitor the condition of brake pad. The system which is presented in this research paper continuously monitors the brake pads with the help of position sensor.

A brake is nothing but a mechanical device that prevents the motion of vehicle by slowing down it. Brakes oppose the motion of a body, which creates friction between two working surfaces and convert the kinetic energy of the moving body into heat. Sometimes when the brake lining is cut-off, brake failure may occur. Brakepads are an important component of disk brakes used in vehicles. Brake pads are steel backing plates with friction material bound to the surface that faces the disk plate rotor. Due to the continuous friction between the brake pad and disc plate, heat generated and results in to the wear of brake pad and failure of brake. To avoid these problem, the solution has founded in the form of Brake Pad Wear Indicting System. This system provides the information about the condition of brake pad to the rider or user.

The system which is presented in this research paper continuously monitors the brake pads with the help of position sensor. Sensor is connected along with the disc caliper and disc plate. The signal from the sensor is given to a microcontroller. When the brake pad is worn out, the sensor sends signal to the microcontroller and it blows the light according to the condition of brake pad given on the dashboard of vehicle, which informs the user about the condition of the breke. This system definitely helpful to save the valuable human life from accidents due to failure of brake.

II LITERATURE REVIEW:-

The literature review is carried out to understand the important of brake pad and the present development in the brake pad monitoring system. Lots of researches work is carried out in order to understand the various characteristics of brake pads materials as well as the types of brake pads. Many authors try to focus their research on effect of various speed limits and normal contact pressure on brake pads. Some research also

carried out to development of economical brake lining wear indicating system.

(1) Project is fully furnished and designed for safety of the automobile vehicles. Automatic brake failure meter and braking system is the most effective solution to this problem. It is the most active and the simplest methodology used to reduce the rate of accident due to brake failure. In this system the workings used are two-way relay, buzzer, battery, motor, wiring system. And finally, the braking system installed in the two-wheeler by using these components the most operative system is to be generate. In this system, if brake failure is occurred then the signal gives the indication to the driver in the form of sound and concurrently alternative braking system start their working and apply the secondary brakes by using motor fitted to the chassis as the result of these the speed of the vehicle gets reduced and vehicle is stop in some sec. The advantage of the system is that it is compact in size, and the installation cost is very less. If the system is installed in vehicle then accident due to brake failure gets compact as the result of these the rate of accident due to brake failure get reduces.

(2).The braking system of a car is certainly one of its more important features. The aim of this effort is to create a better braking system with indicator. Brake disappointment occurs only because of worn out of brake shoe and cut in liner. It consist two sensors. One sensor is connected with the brake shoe. The second sensor is the brake liner. The sign from the two sensors is given to a microcontroller. When the brake shoe is damaged out, the sensor senses signal to the microcontroller. Also, if the brake liner is cut, the sensor directs signal to the microcontroller. The microcontroller analyses the signal and operates the conforming indicator. It nothing mistaken, the vehicle will move and if any one critical, the vehicle will stop and the screen shows the indication of brake failure. Since this specifies the status of the brake, the user can identify the condition of the brake and thus limiting the chances of malfunction

(3)Sarvendra Kumar Mehra, et al (2013), this work is meant to study the tribological properties difference of potentially new designed non-commercial brake pad materials with and without asbestos under various speed and nominal contact pressure. Binder resin and reinforcing fibers used in friction materials have substantial influence in causal the friction characteristics. Frictional heat generated during the brake application can easily raise the temperature at the interface beyond the glass change temperature of the binder resin resulting in an abrupt change in the friction force during braking . Brake pads change the kinetic energy of the car to thermal energy by friction. Two brake pads are controlled in the brake caliper with their rubbing surfaces facing the rotor. When the brakes are hydraulically applied, the caliper clamps or crushes the two pads composed into the spinning rotor to slow/stop the vehicle.

(4)Sivarao , et al (2009) in this paper brakes and tires are the major providers for catastrophic failure of ground vehicles. Braking system is the highest important besides tire to confirm the safety of users and vehicle. Ensuring good condition of brake lining is very crucial to approve the efficiency of the braking system, where, the worn off brake lining not only risks life but also damages the entire brake linked parts such as hub, disk, shaft, etc. In this paper, Malaysian made luxury car Proton Perdana V6 brake pads were considered to be surrounded with a lining wear limit alert system. The current spring steel alert system has some disadvantages where, the alerting sound is only started while the car moves and secondly, when the car is on move , rarely the alerting sound extents the driver. Therefore, a critical investigation of the present pads manufactured in Malaysia and their classifications are conducted to identify the most suitable sensor spot on the brake pad. Later, a micro sensor is surrounded into the pad and fully tested on a specially designed test rig. The assessment of thickness, hardness, layer properties and critical wear region has enabled the spotting of exact sensor location. The embedment of the micro switch was successfully done and verified to be very efficient in alerting the driver upon reaching the maximum lining wear limit.

5)The recent examination by N. Chand, S.A.R. Hashimi, S Lomash and A Naik was towards development of asbestos free brake pad. This experiment applications on physical of new material asbestos-free with wear properties. From their research, it is said that the asbestos-free friction lining material can be used for brake as well as other friction lining applications

6)Mikael Eriksson, Filip Bergman, Staffan Jacobson have explored the surface classification of brake pads after running under silent and screeching conditions. This research focuses on the previously almost unknown area of the connection between brake pad surface structure and the occurrence of squeals. From the new result, they indicated that pads with many small contact tables have a larger tendency to create squeal than pads with a few large plateaus. Moreover in the silent pressure interval, the size of the contact plateaus increases speedily with brake pressure

7). Friction layers and friction films on PMC brake pads were examined by W. Osterle, I. Urban, using Focused Ion Beam (FIB) technique, where, it was used to define superficial layers at micro-contact areas of a profitable brake pad. The friction material was a polymer matrix compound (PMC) with nearly 50% metal content (semi metallic) and the counter part was a cast iron rotor. Experiment depending on the component of the pad, one, two or three layers were identified. The experiment

was mostly to show that the FIB technique provides additional information which in combination with the more conventional techniques LM, SEM and TEM increases the knowledge on the role of third body formation and artificial layers on brake pads

8)Zmago Stadler, Kristoffer Krnel and Tomaz Kosmac have researched friction behavior of sintered metallic brake pads on a C/CSiC composite brake disc. This experiment was expected studying on the frictional and wear properties of sintered metallic (MMC) brake linings in combination with a C/C– SiC brake disc. From the result they arrange that the friction performance of MMC-type brake pads on a C/C–SiC brake disc is dependent on the base metallic matrix composition and formation of a friction layer on the brake pad surface

9)The effect of metal fibers on the friction presentation of automotive brake friction materials were explored by H. Jang, K. Ko, S.J. Kim, R.H. Basch and J.W. Fash This experiment explores the effect of different metallic fibers upon friction and wear presentation of various brake friction couples. The results show that when gray cast iron was used as a security disk at low temperatures, the friction materials containing copper or steel fibers showed high speed sensitivity.

10)M. Boniardi, F. D'Errico, C. Tagliabue , G. Gotti and G. Perricone have explored failure analysis of a motorcycle brake disc. The failure has studied on small crack on the disc brake. These cracks were mostly located nearby the holes placed on flange to ventilate and refresh pads. From the result, it is stated that the lifespan of a motorcycle brake disc depends severely on the geometry (position of holes, shape of spokes, etc.), the material properties at high temperatures and working conditions. Werner Osterle and Ingrid Urban

III PROBLEM STATEMENT:-

Brake pads change the vehicle's kinetic energy into thermal energy by friction. A brake is nothing but a mechanical device that constrains the motion of vehicle by slowing down it. Brakes oppose the motion of a body, which creates friction between two working surfaces and change the kinetic energy of the moving body into heat. Sometimes when the brake lining is cut-off, brake failure may occur. Brake pads are an important component of disk brakes used in vehicles. Brake pads are steel support plates with friction material bound to the surface that faces the disk plate rotor. Due to the continuous friction between the brake pad and disc plate, heat created and results in to the wear of brake pad and failure of brake. This problem is taken into reflection and attempt is made to Develop New Brake Pad Wear Indicting System. Which system provides the information about the condition of brake pad to the rider or use.

IV DEVELOPMENT OF NEW BRAKE PAD WEAR INDICATING SYSTEM:-

These invention relates generally to brake pad wear suggestion system to declare the condition of brake pads. This type of indication system is become very much important these days, because the useful monitoring of the brakes plays an important role within the context of the mounting security devices of vehicles. There are some other brake pad wear indicator, which are used in the checking and repair of the vehicle in the auto repair facility. The method used here, connect the wear suggestion device to an already existing CWI connector on the vehicle. These known brake pad monitoring systems only support identification and process of the total wear of the internal and external pads of a brake, with no option to conduct a differential analysis or a localization of the pad Wear. The braking system of vehicle is one of the most important features. The meaning of this work is to create a better brake pad wear representing system which shows accurate condition of pad. Failure of brake arises because of worn out of brake pad and cut in brake liner. When the brake pad is worn out, the sensor senses signal to the microcontroller. Thus it shows the light allowing to the condition of pad on the dashboard [12,13]

Components in Brake Pad Wear Indicating System:

The components used in brake pad wear indicating system are as given below:

1. Microcontroller
2. Sensor
3. Battery
4. Light
5. Brake Pad Assemble

4.1. Microcontroller:

A microcontroller is an combined circuit (IC) device used for regulatory other portions of an electronic system, usually via a microprocessor unit (MPU), memory, and some peripherals. Micrometers are the device, enhanced for embedded applications that requires both processing functionality and agile, responsive interaction with digital, analog or electromechanical component.

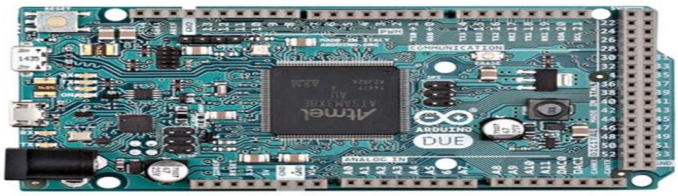

Fig.1 Microcontroller

4.2. Sensor:-

A sensor is a device whose determination is to detect the changes in its environment and send the information to other electronics, frequently a computer processor or microcontroller. A sensor is always used with other electronics. A sensor is a device which changes a physical phenomenon into measurable digital signal further converted into a human-readable display for reading and further processing.

Fig. 2 Sensor

4.3 Battery

Battery contains of one or more than one cells and due to their chemical reactions, it create a flow of electrons in a circuit. Battery is made up of three basic components: an anode (the '-' side), a cathode (the '+' side), and certain kind of electrolyte. Batteries which thrown away after use i.e. use and throw, which are not rechargeable, known as primary batteries. Batteries that can be recharged are called subordinate batteries.

Fig. 3 Battery

4.4. LED Light:-

An electric constituent that emits light when the electric current flows through it, is known as Light Emitting Diode (LED). It is a light cause based on semiconductors. The electrons recombine with holes producing light in the process as soon as current passes through Light Emitting Diode. In these system, it required two LED one is of Green Light and another one is of Red Light.

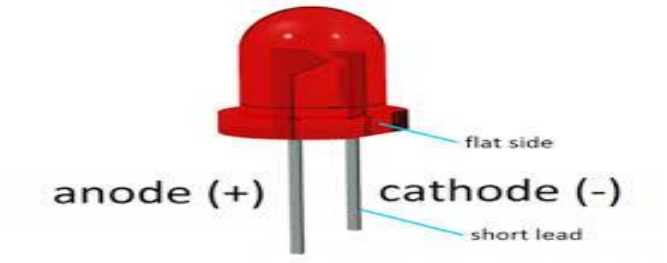

Fig. 4 LED Light

4.5. Brake Pad Assembly:-

Brake pads are an important component of disc brakes used in vehicles. Brake pads has a plates with friction material bound to the surface that faces the disc brake rotor. Brake pads plays an important role to stop vehicle by changing kinetic energy into the heat energy by means of friction. Disc brake get-together consists of two brake pads, contained in the brake with their frictional surfaces facing the rotor.

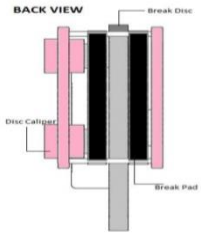

Fig. 5 brake pad assembly

V WORKING OF BRAKE PAD WEAR INDICATING SYSTEM:-

Under block diagram characterizes the Brake pad wear indicating system. The system contains of microcontroller, sensor, rechargeable battery, LED light of two colors (Green and Red) which are all connected to each other. The sensor are coupled along in between disc plate and disc caliper. Sensor senses the condition or change in condition of disc pad and send the data to the micrometer. Micrometer changes those data in to electrical signal which indicates on the dash board in terms of green and red light. Micrometer is the brain of this system. Sensor, microcontroller and light all are mechanical by rechargeable battery.

When the vehicle is in motion without brake failure at this condition the system will show green color LED representative that everything is fine. This happens by moving the signal voltage through the brake wire from one end to other. At the other end of the wheel the signal preparing unit identifies the signal voltage and blink the respective LED. Brake fails can happen due to several reasons such as worn out of brake pads, etc., after a long use of brake pad it might get worn out and get brake at one point of time. So this system is unceasingly monitoring the disorder of the brake pad and alerting the rider

before it gets worn out, this is achieved by placing a LED light on the dashboard of vehicle. If the disorder of brake pad is good, it will show green light. If the disorder of brake pad is bad, it will show red light.

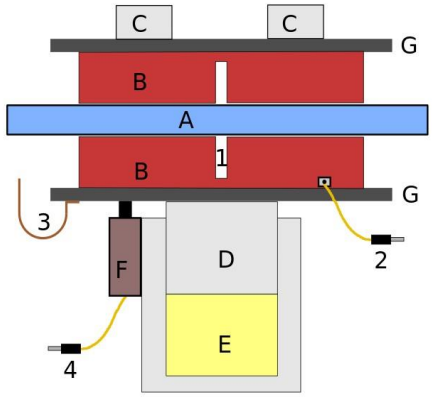

Fig. 6 Schematic block diagram

Indications:

- B - Brake Pad
- G - Disc Carrier
- A - Disc rotor
- C - Module

VI. CONCLUSION:-

The main function of this brake pad wear representing system is to notify the rider or user about the disorder of brake pad whether it may be good or bad. So that the any failure of brake pad and accident produced due to the wearing of brake pad can be prevented with the help of this system. It will indicate an exact condition of brake pad to user. From all exploration and information authors of this paper concluded that, this innovation or project is very much effective and suitable of any type of vehicle either two wheeler or four wheeler. It shows correct result about brake pad as well as it is very cost effective and efficient also.

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