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A REVIEW ARTICLE ON BRAKE PAD WEAR SENSOR

Ganeshkumar S (1), Nitishkumar B V (2), Nishanth Kumar T (3), Mohammed Ashik A (4)
1-Assistant Professor – Mechanical Engineering- SriEshwar College of Engineering, Coimbatore
2,3,4 - UG students – Mechanical Engineering - Sri Eshwar College of Engineering, Coimbatore

Abstract :

To make a vehicle go slower or stop we use brakes, therefore it plays an important role in automobile industry. However, there are many accidents occurring due to brake failure, especially due to worn brake pads and disc. In order to overcome that problem,brake pad wear sensors must be included in all the vehicles. In European countries, it is mandatory to install the wear sensor in all vehicles. In India, we have this important safety feature only in luxury vehicles because of the price of the sensors. The main purpose is to safety up the passengers and drivers.For that brake pad wear sensors must be made mandatory in all the vehicles. Our review paper reveals the most cost effective way to fabricate the brake pad wear sensor with portable and also compatible with all the vehicles**.**

Keywords:*Brake pad, Safety, Wear sensor.*

1.Introduction :

In this paper, a review of previous research project that are related to this project will be discussed. These kinds of surveys were held as one of the tools to have some ideas on how this project works. It is based on other achievement and also to formulate the advantage of proposed solution. This may help in problem solving skills and options required for design and develop ofwear sensors.

2.Brake pad wear using sensor:

Infra Red(IR) based microcontroller sensors were used to detect the brake pad wear. The IR sensor is placed near the brake pad, connected to the microcontroller. The distance between brake pad & brake rotor decreases continuously while wearing out. The distance is the main parameter that is sent to the micro controller. When the distance falls below certain specified limit, the micro controller activates the warning system at the dash board. It constantly monitors the condition of the brake & gives continuous feedback. [1]

Theyconducted an experiment on brake pads where the sensor is integrated with the brake pad by drilling a hole of required depth. The hole is drilled where the hardness is maximum. The place to drill the hole is selected based on result of hardness tests. The depth of hole is based on brake pad's initial thickness & the thickness where the driver should be warned. For the test purpose, micro switch was used. The difference in resistance is measured when the sensor wire wears out due to friction. After carrying out few test runs, the authors successfully did the sensing of brake pad with proper functioning of micro switch & the embedded sensor in the brake pad. [2]

It's an another experiment using sensor, the system that not only warns the driver of brake failure but also applies reverse braking torque through a secondary braking unit. The authors considered brake fluid leakage as the main cause of brake failure. The fluid leak is detected by aliquid level sensor which sends the warning signal once the level decreases below the specified limit. The reverse braking torque is applied through theRatchet -Pawl mechanism. It is also said that the ignition of the engine is turned OFF when it is detected for leakage. A microcontroller governs all the processes. The authors concluded that usage of this secondary braking ensures the safety and also added that this can still be improved. [3]

3.Pad Life Calculation :

Stopping distance & initial brake pad thickness are the two parameters which are measured by the ECU (Electronic Control Unit). The ECU is preloaded with formulae & algorithms based on input data. The Electronic Control unit calculates the data & predicts the brake pad thickness. When the predicted brake pad thickness is nearer or equal to preloaded safe limit of the brake pad, a warning light glows indicating the brake pad's replacement time. Many parameters were taken as constants during the test runs. The authors added that in real life implementations, these parameters may not be constant. [4]

Simulated wear on geometrically designed brake pad & rotor in general purpose FEA software (ANSYS). The positioning & movement of brake rotor & pad is governed by Archard's wear law and the results from tests are integrated into one by explicit Euler's integration. The tests were conducted on ANSYS software under steady state condition. The results obtained from the tests conclude that the wear is maximum (red) at the edges & becomes even (blue) after some time. The thermoplastic properties of brake pad were also considered in this experiment. [5]

4.Study on Different pad materials :

The Authorsstudied about different brake pads materials with or without asbestos in their composition. Binder resin and Reinforced fibers used as friction materials have substantial influence in determining the frictional characteristics. The tribological properties of those materials were studied using tribometer. Alternative materials like mineral fibers, cellulose, aramid, ceramics, & other plastics can be used instead of asbestos. The tribological performance of the brake pad can generally affected by manufacturing and running conditions. [6]

In this paper, authorsdeveloped a brake pad composite from Candlenut and Coconut shell. Poly urethane resin (binder), carbon (fiber reinforcement), and iron sand (abrasives) were added with the shells and made into the shape of brake pad by stir die casting process. The samples were tested for tribological properties and the results were almost same as commercial brake pads. The water absorbed by the brake pad in water absorption test was minimum (0.00584%). The authors concluded that the usage of this shell materials help in waste management and reduces cost and at the same time giving good braking performance as commercial brake pads. [7]

The authors conducted a series of experiments based on a parameter called "FRICTION CATASTROPHE" (FC). In certain conditions, though the brakes are applied, there is no friction between the brake disc and brake pad. This is where FC occurs. The reason for this may be over heating of brake pads, with high load condition and sudden braking. In a series of tests conducted in a test rig, FC occurred in the 7th test. All the tests were test condition of emergency braking. The authors concluded that the brake pad's design & material must be selected on the basis of the parameter "FRICTION CATASTROPHE". [8]

The authorsstudied and analyzed about brake pads made of Banana peels, Palm wastes, Aramid fibers, etc. Binders like phenolic resin, epoxy resin were also studied & their effects on the performance. The manufacturing processes involve mechanical & chemical treatments with addition of filler, friction abrasives etc. A pressure of 15-17 MPa is applied for the green body of the brake pad composite. The test results showed that the coefficient of friction increased as the wt% of binder resin increased. It attributed to closer packing of the microstructures indicating higher hardness & compressive strength. The authors concluded that brake pads can also be made with agricultural wastes as an alternative for asbestos brake pads. [9]

5.Conclusion :

The main function of the brake pad wear sensor is to warn the driver,when the pads get worn out. Thus, Wear sensors are the crucial purchase element for avoiding accidents. Strict standards have been set for this wear sensor. By availing this sensor in all vehicles, we can almost avoid 99% ofaccidents which are caused due to the brake pad failure. This projectalso reduces the cost involved in the concern. Project has been designed to perform the entire requirement task, which has also been provided.

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