

Design of Water Removal Mechanism from Moped Braking System

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Abstract-The propose for doing the project that it is frequently observe in two wheeler moped that the braking capacity reduces due to entrainment of water in "Internal Expanding Brake". Also there is locking and jerking motion of brake and the vehicle respectively, when the brakes are applied, there is loud noise coming out from the brake drum when we initially apply the brake in the monsoon season.

Index Terms-Internal Expanding Brake, Water Entrainment.

However, Yang and Gibson [9] saw significant promise for computer-aided design and engineering in developing quiet but effective brakes. While completing the present review, we found a new review on disc brake squeal by Papinniemi [10]. This short review can be considered as a complement to Yang and Gibson [9]. This review can be considered as a sequel and discusses thermal effects and noise in several types of automotive braking systems. Unique to all afore mentioned reviews, also discusses the role of random vibrations in the generation of brake noise.

I. Introduction

Brakes are one of the most important safety and performance components in automobiles. Ever since the advent of the automobile, development of brakes has focused on increasing braking power and reliability. Brake noise is irritating to consumers who may believe that it is symptomatic of a defective brake and file a warranty claim, even though the brake is functioning exactly as designed in all other aspects. Thus, noise generation and suppression have become prominent considerations in brake and manufacture. Many makers of materials for brake pads spend up to 50% of their engineering budgets on noise, vibration and harshness issues.

The subject of brake squeal has generated a considerable volume of literature, including several review articles. Many of these reviews also discuss other types of brake noise, such as drum brake squeal and brake groan. In his 1976 review, North [3] compared early lumped parameter squeal models that fell into two classes-pin-disc (or pin-on-disc) systems incorporating kinematic constraints and eight-degree of freedom systems. These models featured frictional forces which have some of the features of a follower force.

II. Problem Definition

It is frequently observed in two wheeler moped that the braking capacity reduces due to entrainment of water in "Internal Expanding Brake". Also it is observed that because of water there is locking and jerking motion of brake and the vehicle respectively, when the brakes are applied. Also there is a loud noise coming out from the braking system when we initially apply the brakes.



Figure 01

When the brakes are applied on a moving vehicle, the kinetic energy is transformed into heat energy generated between the braking surfaces. Asbestos, a fibrous mineral with good frictional and heat-resisting properties, is the basis of most brake but due to water entrainment in brake system there is no friction between liner and drum and this reduces the capacity of braking system.

III. Modification on Brake Panel



Figure 02 Figure 03

Figure 02 shows hole of 8 mm drilled on brake panel for blower nozzle.

Figure 03 shows rubber sealing on brake panel which restricts water flow inside the brake system.



Figure 04 Figure 05

Figure 04 shows blower which operates on 12 volts D.C. and gives 16 CFM flow rates and rotates at 3000 rpm and having 33 mm outer diameter. Purpose of using blower is to cool the brake system and the air inside the brake which is produced by air blower comes out from clearances between panel and drum which interns pushes the water out from clearances.

Figure 05 shows sealing rubber made up of Ethylene Propylene Diene Monomer (EPDM) which has good property of gas permeability and can be operates in between 60° to 300°F. EPDM is mixture of rubber, zinc oxide, carbon, steric acid, sulphur, ZDBC, CBS, TMT. Dimensions of sealing rubber used for sealing purpose are 48 mm outer diameter and 42 mm inner diameter.

IV. EXPERIMENTATION

a. Experiment on Caliper

We have done an experiment on the caliper to see what will be the effect on caliper when it comes in contact with water. So we took a bucket of cold water and kept the caliper in it for a period of one hour and

before putting it into water we measured the dimensions of caliper to see whether its size gets contracted or expanded when it comes in contact with water.

After taking out from water we measured the dimension of caliper by using vernier caliper and the result that we found out that there is no change in thickness but surface of caliper becomes smooth that when we apply brake there could be no friction between the caliper and drum. The amount of roughness to the surface of caliper that is given on grinding machine is totally gone when it comes in contact with water.

Another experiment that we have done on caliper that we kept caliper in hot water for the same period of time and we got the result that caliper gets contracted with 0.5mm when it comes in contact with hot water when we keep it for duration of one hour and also the surface of the caliper becomes smooth.

Next experiment we have conducted is that we kept the caliper in impure water in which water is full of dirt, dust, mud etc. and duration was one hour. The result that we got is impurities try to stick on the caliper and make the surface smooth and there will be no friction between caliper and the drum. If the brake is applied the impurities that stick on the surface of caliper may damage the surface of drum.

The conclusion that we got during the experimentation is that when the surface of caliper comes in contact with water the surface becomes smooth and there is no friction between caliper and drum.

Medium Used	Duration (hrs)	Observation	Results
Hot water	01	A linear contract by 0.5 mm friction & surface becomes smooth.	Friction reduced.
Cold water	01	No dimension change & surface becomes smooth.	Friction reduced.

Water consisting dirt, dust, mud.	01	Impurities stick on friction surface & no dimension change	Friction reduced, wear & noise occurs.
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Table 01

b. Experiment on Brake System

Drilling of hole of 8 mm on brake panel for blower nozzle for more quantity of air flow into the brake assembly. Speed of the brake drum = 1050 rpm. Quantity of water for each trail =1 liter.

- Comparison of Results

Results without Seal and Blower	Results with Seal and Blower
Putting water on rotating brake for half an hour, we found that water enters in the system	Putting water on rotating brake for half an hour we found that water does not enter in the system.
This makes the surface of caliper wet, and there is reduction in the capacity of braking as there is no friction between the caliper and drum	This keeps the surface of caliper dry, and retains the capacity of braking and for cooling we have use the 12V DC Blower.
It also makes noise when we apply brake when water is being poured on system	It doesn't make any noise when we apply brake when water is being poured on system.



Table 02

V. RESULTS

Using seals which is made up of EPDM and air blower which is operated at 12 volt DC current, the entrainment of water is restricted. The air inside the brake which is produced by air blower comes out from clearances between panel and drum which interns pushes the water out from clearances. This keeps the surface of caliper dry, and retains the capacity of braking. It doesn't make the noise when we apply brake when water is being poured on system.

VI. CONCLUSION

We have discussed about the problems of the Internal Expanding Brake occurring frequently i.e. noise, water entrainment, locking and jerking motion, loss of friction between the caliper and drum, the phenomenon of smoothening of the friction surface which overall results in reduction of braking capacity of the vehicle.

Hence after experimentation on the brake caliper in various conditions of water we came with the results that when caliper is in contact with water for long duration, the friction surface becomes smooth which reduces the braking capacity of the caliper due to entrainment of water. As the surface of the caliper becomes smooth there exists a locking and jerking motion of the vehicle.

Using seals which is made up EPDM and air blower which is operated at 12 volt DC current, the entrainment of water is restricted. The air passed in the brake which is produced by air blower comes out from clearances between panel and drum which intern pushes the water out from clearances if any. This keeps the surface of caliper dry, and retains the capacity of braking.

EPDM, Aflas, Fluoroelastomers, Nitrile, Polyurethane, Chloroprene rubbers are materials

which have good physical properties compared to the other rubber material and can be used for sealing purpose. These materials can sustain fluctuating temperature operations.

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VII. FUTURE SCOPE

In future, this project is most useful for retaining the capacity of brake as just we have to produce hole on brake panel for entry of air and a rubber seal which is interchangeable. We have designed such a solution which will be easily adaptable and adjustable with the existing design of the brake system. This project also decreases the chances of accident in monsoon season because the entrainment of water is restricted and also reduces the noise while applying brake.

Another way of providing air in brake drum is by using exhaust gases coming out from engine. By using the principle of turbo-charging, i.e. rotating a turbine with the exhaust gases and in turn rotates the blower at high speed which gives the desired air flow for the drum. This method will not use any electrical supply from the battery which will result in fuel efficiency of vehicle.

VIII. REFERENCES

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