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DESIGN AND ANALYSIS OF LPO 1618 BS-IV TATA VEHICLE BRAKE DRUM

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Abstract-

A brake is a mechanical device which restrains motion. A drum brake is a brake that uses friction caused by a set of shoes or pads that press against a turning drum-shaped part called a brake drum. The brake drum is a critical component that encounters high temperatures and develop thermal stresses during application of brakes. In expansion, the application of shoe pressure gives rise to mechanical loads. The energy retained by brakes is dissipated in the form of heat. This heat is scattered in the surrounding atmosphere to stop the vehicle. So the examination takes into account both the thermal stresses and mechanical stresses together. During the brake applied the brake drum components experience high temperature and thermal stress. Due to this the drum brake material should possess a high thermal conductivity, thermal capacity and high strength. Generally, safety parts of LPO1618 TATA vehicle and trucks are brakes, the common material are used for drum brake is cast iron. A model is created with the help of software CATIA .

Keywords: - Drum brake, Static analysis, Catia.

I. INTRODUCTION

Brakes work to slow and stop the rotation of the wheel.braking pads are constrained mechanically against the rotor or disc on both surfaces. They are compulsory for the safe operation of all vehicles. In short, brakes transform the kinetic energy of the trucks into heat energy, thus slowing its speed. Brake fade is the reduction in stopping power or ceasing control that can happen after repeated or supported application of brakes, particularly in high load or high speed conditions. Brake fade can be a factor in any vehicle that utilizes a friction braking system framework including automobiles, trucks, motorcycles, airplanes, and even bicycles. Brake fade is caused by a build-up of heat in the braking surfaces and the subsequent changes and reactions in the brake system framework components and can be experienced with both drum brakes and disk brakes. Loss of stopping power, or fade, can be caused by friction fade, mechanical fade, or fluid fade. Brake fade can be significantly diminished by appropriate equipment and materials design and Selection, as well as good cooling. It is more predominant in drum brakes due to their configuration. Disc brakes are much more resistant or safe to break fade because the heat can be vented away from the rotor and pads more easily, and became a standard feature in front brakes for most vehicles.

Drum brakes were the primary types of brakes used on motor vehicles. Nowadays, over 100 years after the first or primary usage, drum brakes are still utilized on the rear wheels of most vehicles. The drum brake is used broadly as the rear brake particularly for small car and motorcycle. The leading-trailing shoe design is used broadly as rear brake on passenger cars and light weight pickup

trucks. Most of the front-wheel-drive vehicles use rear leading-trailing shoe brakes. A drum brake could be a brake that uses friction caused by a set of shoes or pads that press against a rotating drum shaped part called a brake drum. The brake drum is generally made of cast iron that rotates or pivoted with the wheel. When a driver applies the brakes, the lining pushes radially against the inward surface of the drum, and the ensuing friction slows or stops rotation of the wheel and axle, and thus the vehicle.

Brake Drum

II. LITERATURE REVIEW

Allan Michael Lang

In his research concluded that no simple relationship exists between the natural frequencies of the brake components and the squeal frequency and during squeal both the drum and shoes hold complex modes, which can be best visualized as the superposition of pairs of similar normal modes phase shifted both spatially and in time relative to each other.

Ramesha.D.K

In his thesis concluded that the most extreme temperature obtained for aluminum alloy brake drum is less as compared to the cast iron brake drum for a truck. Also, concluded that thermal or warm deformation is less for aluminum alloy brake drum than the cast iron brake drum. As his study states that the weight of Aluminum is lesser than the Cast iron, it is better to use the Aluminum material in the construction of brake drum.

Simon George

This paper describe the modern development in the field of material technology gave rose to hybrid materials such as composites that paved the way for engineers to explore the possibility of substitute material or fabric which can perform efficiently and effectively than conventional materials. The present work is concentrated on the development of a particulate reinforced composite material for an automobile brake drum in place of conventional material such as cast iron and aluminium alloys are heavier and can be replace by lightweight aluminium hybrid composites. It is observed that this composition has enhanced mechanical and physical properties and FEA analysis shows the projected improvement which enables it to be used in practical application such as drum brakes.

Muhammad najib bin abdulhamid

conducted the experimental analysis on drum brake and FEA examination and concluded that improved material performs better.

Kang and Cho

He investigated thermal deformation and stress analysis of brakes by finite element method for ventilated disk and solid disk. By comparing the result of maximum temperature in the braking process, the ventilated disk appeared a lower temperature than the solid disk. The effect of temperature increase and decrease, depending on the vent region generated in the flange part of the disk. Analysis of design parameter impact on vibration modes of a motorcycle drum brake and brake shoe using the finite element method were also carried out.

Zaidi Mohd Ripin

This paper describe the drum brake squeal is modelled as friction energized vibration based on the binary flutter mechanism which requires the convergence of two modes experimentally identified using Modal Assurance Criterion. Transient analysis is carried out to decide the brake drum response under braking condition and the model produces squeal mode at 2026 Hz comparable to the measured squeal frequency of 1950 Hz. There are limited combinations of the location of center of pressure of the shoes that cause squeal. The amplitude of the limit cycle of the drum brake squeal can be reduced by expanding damping, mode frequency separation and reducing the contact stiffness.

M.A. Maleque

The aim of this paper is to develop the material selection method and select the optimum material for the application of brake drum system emphasizing on the substitution of this cast iron by any other lightweight material. Two methods or strategies are introduced for the selection of materials, such as cost per unit property and digital logic methods. Material performance requirements were analyzed and alternative or elective solutions were evaluated among cast iron, aluminium alloy, titanium alloy, ceramics and composites. Mechanical properties counting compressive strength, friction coefficient, wear resistance, thermal conductivity and specific gravity as well as cost, were used as the key parameters in the material selection stages. The analysis led to aluminium metal matrix composite as the most appropriate material for brake drum system.

LiuHongpu

This paper describe the design and study on the type parameter of the brakes. On the basis of the principles of discretization, discretize the structural pattern of the brake drum. Select the typical or commonplace characteristic of the brake assemblies and the individual parts of the 3d parameterization modeling work, to construct a model for parameterization library calls.

J. M. LEE

This paper describe that the stability of drum brake squeal may be due to change of cross section of the shoes. The squeal is considered as a noise induced by the self-excited vibration of the drum brake which makes the brake unstable. The drum and the shoes are assumed as a uniform ring and non-uniform arches, respectively, for modeling the brake. For a reasonable strategy of modeling, the vibration characteristics of the brake and their relations to the squeal or screech are discussed based on the results of modal tests. The influences of brake design parameters upon the squeal are investigated, and a minor change of the cross-section is proposed to reduce the squeal. The impact of the minor change is verified through noise dynamometer tests. In addition, the effect of asymmetry of the drum, which can be built by mass addition, is presented.

III. CONCLUSION

From the above literature review we find that there are many researchers done analysis on drum brake and material taken by them are such as cast iron, aluminium alloy, aluminium metal matrix and composite materials. The various factors such as: - Material is economically less strength by weight ratio, less weight, less deformation, minimum temperature at the surface, high coefficient of friction and High wear resistance on the brake liner is attributed to the higher temperature generated due to seizure between the brake drum and the panel. From above literature survey M.A. Maleque we find that the analysis on drum brake the aluminium metal matrix composite 1, 2 materials are higher performance index than other materials.Then, I have decided that I will do the analysis of drum brake

by taking the materials such as grey cast iron, aluminium metal matrix composite 1, 2 and titanium alloy.

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