

Thermal Structural Analysis Of Drum Brake Using Finite Element Method: Review

Shipra Garg¹, Neeraj Sen², Ashish Manoria³

¹M.Tech Scholar (CIM), Department of Mechanical Engineering, S.A.T.I. Vidisha (M.P.)

² Professor, Department of Mechanical Engineering, S.A.T.I. Vidisha (M.P.)

³Professor, Department of Mechanical Engineering, S.A.T.I. Vidisha (M.P.)

Abstract- The drum brake is a mechanical device and they are use in rear part of the car. Which inhibits the rotational motion of the wheel by the action of friction generated between shoe and drum brake. A drum brake system consists of hydraulic wheel cylinder, brake shoes and brake drum. During the brake applied the brake drum components experience high temperature and thermal stress. The most commonly material is use in cast iron and aluminum. So the drum brake material possesses a high conductivity, thermal capacity and high strength of material. It is observed that this composition has enhanced mechanical and physical properties and FEA (finite element analysis) are showing the improvement project which enables it to be used in particle application such as drum brake. They are design to the safety purpose for care and trucks are brake. This model is created with the of help of design modeler for ANSYS 16.0 software. And thermal and structure stresses analysis are using ANSYS 16.0 workbench software.

Keywords- Drum brake, ANSYS workbench, material, thermal stress, structure, FEA.

I. INTRODUCTION

Drum brake was the first types of brake used in mechanical on automobiles parts. Nowadays, over 100years after the first usage. Drum brake are still used on the rear wheels of most vehicles. Drum brake are still used on the rear wheels of the most vehicles. The drum brake is used extensively as the rear brake in automobile, light motor vehicles in particular. The term drum brake usually means a braking which shoes press on the inner surface of the drum. When shoes press on the outside of the drum, it is usually called a clasp brake. The brake drum historical background, the brake drum innovation was in 1902 by “Louiats Renault” though a less sophisticated drum brake has been used by many in year earlier. In the first drum brakes the shoes was mechanically operated with and rods or cables form the mid-1930s the shoes was operated with oil pressure in a small wheel cylinder and piston. the brake drum function are in the to stop the vehicle in shortest possible distance in case of emergency, to control the vehicle when it is travel along the hills, to keep the vehicle I desired position after bringing it in complete rest when there is no driver. The brake drum is generally made by a cast iron. It is positioned very close to the

brake shoes without actually touching it, and rotates with the wheel and axle. As the lining is pushed against the inner surface of the drum, fraction heat can reach as high as 600 degrees F. many vehicles have drum brakes on the rear wheel sand disc brakes on the front. Drum brakes have more parts than disc brake and harder to serve, but they are less expensive to manufacture, and they easily incorporate an emergency brake mechanism. A brake drum unit consists of two brake shoes mounted on a stationary backing plate. When the brake pedal is pressed a hydraulically active wheel cylinder pushes the shoes out to contact a rotating drum which creates friction and slows the vehicle. As the pedal is released, return springs retract the shoes to their original position.

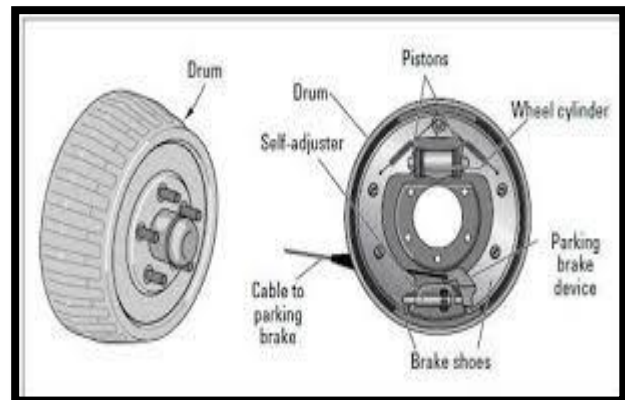


FIG- BRAKE DRUM

II. LITERATURE REVIEW

[1] PUTTI SRINIVAS RAO, D.V.G. PRASAD, D.D.S.P.R. RAJU, B.R. PHANINDRA, B.N.SURYA

In this paper object “development and Analysis of finned brake drum model for effective heat transfer”. In this paper solve by problem, fin are connected to the outer surface of the brake drum. It is increases weight such as converting one fourth of the overall length thickness of the original model into extended surface and then analyzed in this paper. In this paper found to conclusion, the brake drum small stress or displacement show on the modify to design and indicates that the modify design stronger or rigit than original. They are using two material properties in made by brake drum ad provides a range of heat

flow valve. The comparing two material properties with the apply two different application. And this paper conclusion by placing fins on the surface of the brake drum. The amounts of heat flow are increases. When the criteria is maximum heat flow then it are better to go for a brake drum with rectangular cross-section annular fin and is of high conductive material use.

We have decide to work on high conductive material use in brake drum.

[2] UDAY PRATAP SIGNH, A.K. JAIN

In this paper object “finite element analysis of drum brake by using ansys”. In this paper are decided how to solve problem you have to decided the analysis of the brake drum by taking the material gray cast iron, aluminum metal matrix1, aluminum metal matrix2 and the titanium alloy and find out the total deformation, maximum stress, heat flux and maximum temperature. This paper found the conclusion, the brake drum conclude that beside general materials such as cast iron, aluminum metal materix1, aluminum metal materix2. But cast iron and aluminum metal matrix2 shown fewer valves of deformation as well as maximum von-mises stress under static structural analysis. Thermal analysis show adequate values of heat flux which validates the heat dissipation ability of material. In additional to that it has very less weight compared to cast iron and hence cast iron can be replace by aluminum metal matrix2.

We have decide to work light weight of the material.

[3] K.GWOTHAMI, K.BALAJI

In this paper object “designing and analysis of drum brakes”. In this paper found the conclusion, the brake drum uses the concept of friction for avulsion. During the brake operation, heat goes out, this many causes are damage to break assembly. In this case drum brake material should possess high thermal conductivity, thermal efficiency and high power. Thermal analysis of various materials like aluminum alloy, cast iron and stainless steel 304 will be carried out. The steady state condition is studies. A transient state analysis, for regular 30s, 90,120,210, temperature distribution and thermal flux is analyzed. A comparison of all the three results is done and aluminum alloy material is proved better than other materials. We have decided to work heat flux.

[4] SIMON GEORGE, ARUN LR, GURU PRASAD BS

In this paper object “analysis of composite drum brake using FEA approach”. In this paper are using hybrid materials such as

the composite material. And mechanical and physical properties are improving the brake drum application. These researchers are using design modeling catia software. The way from engineering to explore the possibility of substitute material this can perform efficiently and effectively than conventional material. Most of material are using the automobile engineering cast iron and aluminum alloy but these are replace by the material are using lightweight aluminum hybrid composite material. This paper conclusion the radial deformation induced in brake drum is found to be less for sic-fiyash composite material by 0.1695mm. Hence it exhibits sic fly ash composites have better wear resistance compare to base metal.

We have decided to work composite material using FEA (finite element analysis) approach.

[5] MEENAKSHI KUSHAL, SUMAN SHARAM

In this paper “optimization of design of brake drum of two wheeler through approach of reverse engineering by using ansys software” they found problem by the replacing by the material. And aim of the paper is to optimize the Hero Honda passion brake drum and it also increases the braking performance. These models are designed by the CAD (computer aided design) software. And the analysis of the model is done on ansys workbench14.5. This paper concluded that the controlled expansion alloy for brake drum have less weight, less deformation, minimum temperature at the brake drum surface. Hence the controlled expansion alloys can be a better condition material for the brake drum application of the light commercial vehicles.

We have to decide to work replacing by the material and aim of light commercial vehicles.

[6] P VENKATARAMANA

This paper “design of a brake drum using finite element method”, explains the work on TATA INDICA car under the load certain condition. The size is required of the brake drum to use in newly introduced TATA NANO car, the help of finite element analysis. The tested under the different load of the brake drum. The result shown that the size of the brake drum required for NANO car is smaller than the size that being used in INDICA car with lesser brake than the later one. This paper conclusion results are the obtained stresses I the brake drum are lower the allowable stresses of the brake drum material. Our design will be acceptable.

We have decide to work ansys workbench FEA (FINITE ELEMENT ANALYSIS).

[7] Bako Sunday, Usman Aminu, Paul O. Yahaya, Mohammed B. Ndaliman

In this thesis “development and analysis of finned brake drum model using solid works simulation”. In this paper research brake drum development and analysis. These research works on the two models. Brake drum without fin and brake drum with fin, and compare to the both model of the ansys. These are indicated by the added to the fin have brake drum so more circumferential strength. And the circumferential increased the resistance of the brake drum to motion of the shoes force. And this help of reduce the hoop stress or circumferential stress motion at the inner wall thickness of brake drum. And the result of this indicate by the fin has improved by the rate of heat dissipation and conductivity for the inner face to the outer face of the modified brake drum. And the research paper conclusions are show on the brake drum are prone to structural and thermal failure due to hard braking force, if the details design and material properties are not correctly specified. This paper analysis to automotive engineering to model designs a more effective and reliable brake drum.

We have decide to work, these research works on the models. Brake drum without fin and with fin brake drum and we have to decide without fin brake drum.

[8] A.Belhocine, M. Bouchetara

In this paper “temperature and thermal stresses of vehicle grey cast brake”. The main purpose of the study is to analyze the thermomechanical behavior of the dry contact between the brake disc and pads during the braking phase. The simulation strategy is based on computer code ANSYS11. We demonstrated that the ventilation system plays an important role in cooling the disc and provides a good high temperature resistance. The analysis results showing that, temperature and stress field in the processes of braking phase were fully coupled. The temperature Von mises stress, and the total deformations of the disc and contact pressure of the pads increased because the thermal stresses are additional to mechanical stress which caused the crack propagation and fracture of the bowl and wears off the disc and pads.

We have decided to work thermal stresses of brake drum using FEA.

III. CONCLUSION

All above literature survey, all researchers have done analysis on brake drum material properties like cast iron and aluminum alloy. This model is used to find various properties

of material like total deformation, maximum and minimum temperature and heat flux. Some researchers had used the composite material and compared the brake drum model with fin and without fin.

We have decided to work on thermal structure analysis of brake drum using finite element analysis method. We will do the analysis of the brake drum by taking two materials such as gray cast iron and aluminum alloy. We will then find the total deformation, maximum and minimum stress, heat flux, and maximum temperature.

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