IJARETY

International Journal of Advanced Research in Education and TechnologY (IJARETY)

Volume 12, Issue 3, May-June 2025

Impact Factor: 8.152

www.ijarety.in editor.ijarety@gmail.com

International Journal of Advanced Research in Education and TechnologY(IJARETY)

| ISSN: 2394-2975 | www.ijarety.in| | Impact Factor: 8.152| A Bi-Monthly, Double-Blind Peer Reviewed & Refereed Journal |

|| Volume 12, Issue 3, May - June 2025 ||

DOI:10.15680/IJARETY.2025.1203108

Modelling and 3D Printing of Drum Brake Pads

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ABSTRACT: A Brake is a mechanical device which inhibits motion. A drum brake is 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 a critical component that experiences high temperatures and develop thermal stresses during application of brakes. In addition, the application of shoe pressure gives rise to mechanical loads. So the analysis takes into account both the thermal stresses and mechanical stresses together.Brakes in cars and trucks are safety parts. Requirements not only in performance but also in comfort, serviceability and working lifetime are high and rising. i.e. the brake pad with the friction material, the counter body and caliper, can be modeld

KEYWORDS: Drum Brake Pads, 3D Printing, Rapid Prototyping, Design

I. INTRODUCTION

A brake is a device which is used to bring to rest or slow down a moving body. Safe operation of vehicle demands dependable brakes is required to absorb the kinetic energy of the moving parts or the potential energy of the object being lowered by host when the rate of descent is controlled. The energy absorbed by brakes is dissipated in the form of heat. Drum brakes are a type of braking system commonly used in automobiles, motorcycles, and some industrial applications. They have been in use since the early 20th century and were widely utilized before the advent of disc brakes. Drum brakes consist of a rotating drum attached to the wheel and a set of brake shoes inside the drum.
When the brake pedal is pressed, hydraulic pressure forces the brake shoes outward against the inner surface of the drum, creating friction that slows down or stops the vehicle. Once the pressure is released, return springs pull the shoes back to their original position.

II. LITERATURE SURVEY

C. H. Neeraja a C. R. Sireesha and D. Jawaharlal
[1] have modelled a suspension frame used in twowheeler. Modelling is done in Pro/Engineer. They have done structural and modal analysis on suspension frame using four materials Steel, Aluminium Alloy A360, Magnesium and carbon fiber reinforced polymer to validate our design.

By observing the results, for all the materials the stress values are less than their respective permissible yield stress values. So the design was safe, by conclusion. By comparing the results for four materials, stress obtained is same and displacement is less for carbon fiber reinforced polymer than other three materials. So for design considered, CFRP is better material for suspension frame. Cicek Karaoglu and N. Sefa Kuralay

[2] did the finite element analysis of a truck chassis. The analysis showed that INTERNATIONAL JOURNAL FOR RESEARCH IN EMERGING SCIENCE AND TECHNOLOGY, VOLUME-2, ISSUE-1, JANUARY-2015 E-ISSN: 2349-7610 VOLUME-2, ISSUE-1, JANUARY-2015 COPYRIGHT © 2015 IJREST, ALL RIGHT RESERVED 43 increasing the side member thickness can reduce stresses on the joint areas, but it is important to realize that the overall weight of the chassis frame increases. Using local plates only in the joint area can also increase side member thickness. Therefore, excessive weight of the chassis frame is prevented.

In November 2008 Mohamad Tarmizi Bin Arbain uses 3D model for finite element analysis issues regarding the experimental analysis of car chassis is addressed. The modeling approach is investigated extensively using both of computational and compared it to experimental modal analysis. A comparison of the modal parameters from both

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experiment and simulation shows the validity of the proposed approach. Then perform the computational stress analysis with linear material type analysis to find the stress concentration point in the car chassis.

Karaoglu and Kuralay[3] investigated stress analysis of a truck chassis with riveted joints using FEM. Numerical results showed that stresses on the side member can be reduced by increasing the side member thickness locally. Fermer et al investigated the fatigue life of Volvo S80 Bi-Fuel using MSC/Fatigue Conle and Chu

[4] did research about fatigue analysis and the local stress –strain approach in complex vehicular structures. Structural optimization of automotive components applied to durability problems has been investigated by Ferreira et al Filho Et. al.

[5] have investigated and optimized a chassis design for an off road vehicle with the appropriate dynamic and structural behavior.

III. METHODOLOGY

This methodology explains the step by step process which are carried out to accomplish the completion of entire modelling and 3D-printing of Bevel gear. Using Solid works, the computer model of Bevel gear will be designed. The 3D-model design is then printed by using the 3D printer. The 3D model of Bevel gear is printed by using Fused deposition Modelling technique. Acrylonitrile butadiene styrene(ABS) and Polylactic acid(PLA) are basically used material for preparing a model in 3D printing. The use of 3D printing technology allowed for the customization of the gear design and the creation of complex geometries that would be difficult or impossible to produce using traditional manufacturing methods.

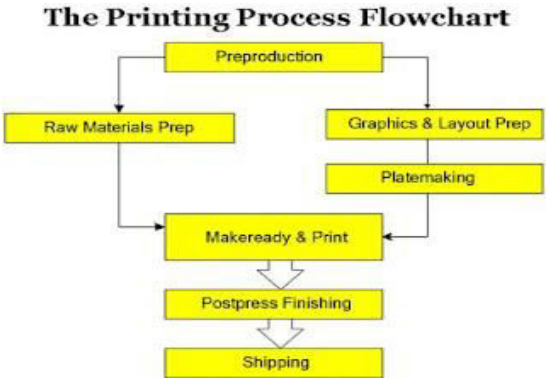

Fig- printing process flow chart

MODELLING OF Drum Brake Pads

Fig- 3d model of Drum Brake Pads

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IV. CONCLUSION

Modeling and 3D printing of drum brake pads involve designing and manufacturing brake components with precise specifications and complex geometries. While specific results for drum brake pads are limited, insights can be drawn from related research on brake discs. The brake drum is a critical component that experiences high temperatures and develop thermal stresses during application of brakes. In addition, the application of shoe pressure gives rise to mechanical loads. So the analysis takes into account both the thermal stresses and mechanical stresses together. Brakes in cars and trucks are safety parts. Requirements not only in performance but also in comfort, serviceability and working lifetime are high and rising. i.e. the brake pad with the friction material, the counter body and caliper, can be modeled.

V. ACKNOWLEDGEMENT

We owe our immense thanks to Mr. J. Kishore our project guide, Assistant Professor mechanical in Engineering, Institutions Department of Guru Nanak Technical Campus for the sustained interest, constructive criticism, and constant encouragement at every stage of this Endeavour. We would like to say sincere thanks to Mr. V. SHYAMU, Assistant Professor, Department of Mechanical Engineering for coordinating Projects. We extend our deep sense of graduate to Dr. A. RAJKUMAR, Professor & Head of the Mechanical Department for his masterly supervision and valuable suggestions for the successful completion of our project. We would like to say sincere thanks to Dr. RISHI SAYAL, Associate director, coordinator of AICTE IDEA LAB and Dr. S. V. RANGANAYAKULU, Dean R & D Co-ordinator of AICTE IDEA LAB for providing excellent lab facility, for smooth completion of project and we are thankful for your support. We wish to express our candid gratitude to Dr. KODUGANTI VENKATA RAO, Principal and the management of the Guru Nanak Institutions Technical Campus for providing us the best amenities which enabled us to complete our project in the stipulated time. Finally, yet importantly, we are very thankful to our parents, friends, and other faculty of Mechanical Engineering Department for their constant support in completion of this project.

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