

Design and Analysis of Ashok Leyland Chassis Frame Under 25 Ton Loading Condition

N.Lenin Rakesh*, K.Gowtham Kumar, Dr. J. Hameed Hussain

Department of Mechanical Engineering, Bharath Institute of Science & Technology, Chennai, India

ABSTRACT: The present scenario in automotive industry is an sum in demand of trucks not only on the cost and heaviness aspects but too on improved total vehicle features and overall work performance. The chassis plays an important role in the design of any truck. Truck chassis forms the structural backbone of a commercial vehicle. The main function of the truck chassis is to support the components and payload placed upon it. When the truck travels along the road, the chassis is subjected to vibration induced by road roughness and excitation by vibrating components mounted on it. The responses of the truck chassis which include the stress distribution and displacement under various loading condition are also observed. The mode shape results determine the suitable mounting locations of components like engine and suspension system. Some modifications are also suggested to reduce the vibration and to improve the strength of the truck chassis. The chassis design in general is a complex methodology and to reach at a solution which yields a good performance is a tedious task. Since the chassis has a complex geometry and loading patterns, there is no well defined analytical procedure to analyze the chassis. So the numerical route of analysis is adopted, in which Finite Element Technique is most widely used route.

I.INTRODUCTION

There are many industrial sectors using this vehicle for their transportations such as the logistics, agricultures, factories and other industries. If any of the excitation frequencies coincides with the natural frequencies of the vehicle chassis, then resonance phenomenon occurs. The chassis will undergo dangerously large oscillations, which may lead to excessive deflection and failure. The vibration of the chassis will also cause high stress concentrations at certain locations, fatigue of the structure, loosening of mechanical joints, creation of noise and vehicle discomfort. To solve these problems, study on the vehicle chassis for dynamic characteristics is quite essential. The torsion stiffness and modal parameters were determined experimentally and then used to validate the finite element model and finally the chassis was optimized to increase the structural stiffness. It was noted that the torsion mode dominated the natural frequency.

A **chassis** consists of an internal framework that supports a man-made object in its construction and use. It is analogous to an animal's skeleton. An example of a chassis is the underpart of a motor vehicle, consisting of the frame (on which the body is mounted). If the running gear such as wheels and transmission, and sometimes even the driver's seat, are included then the assembly is described as a rolling chassis. The material of the truck chassis is AISI 4130 alloy with quenched and tempered treatment.

Chassis usually denotes the basic frame that decides the overall shape of the vehicle. The chassis is the framework that is everything attached to it in a vehicle. chassis of ASHOK LEYLAND ex is of ladder frame type which has two side members and five transverse members called cross members of box cross section. The chassis has been modeled in catia

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software using actual dimensions. FEA analysis was done using ANSYS Software efficient and reliable transports require an efficient and reliable chassis. Like in the new Quoin. With high-quality components and built-in flexibility for easy adaption to your business. And since we know every kilo counts, we have optimized every single part of the chassis to reduce the overall weight. The result improved payload for improved productivity and fuel-efficiency.

Objective :To investigate the structural analysis of the ASHOK LEYLAND chassis.

To implement permissible optimizations to the basic structure under variable loading conditions.

Finding a best design that can be tested with different materials.

Nodal analysis has to be applied by means of ANSYS software by virtue of which vibration is analyzed.

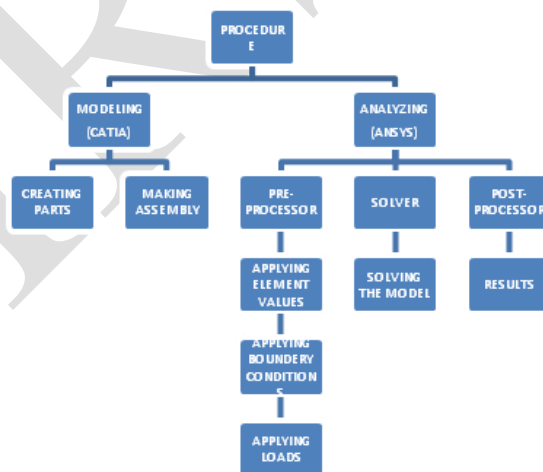
II.NEED OF THE PROJECT

The main focus of this project is to alter the existing model of chassis with a newer one such that it would enhance the overall load carrying capacity which is already 25 ton and performance comparatively higher than compared to the existing one so that maintenance costs would decrease providing the chassis a good life compared to the later.

Materials preferred: GLASS FIBRE REINFORCED PLASTIC. Steel Bedford’s fiberglass reinforced plastic is highly corrosion resistant. So unlike steel, it won’t rust when it’s exposed to harsh weather and chemicals. It’s also nonconductive and impact resistant. Pound for pound, our FRP structural members are stronger than many steels in the lengthwise direction, and weigh up to 75% less. Compared to steel, Bedford FRP offers these advantages:

The strength of steel at 1/4 the weight Simple fabrication with standard tools — no welders or cutting torches, Molded-in color and resin options, including fire retardant

Traditional building materials have their place. But for harsh, corrosive environments, GFRP is a smart choice. Here’s how GFRP compares to several traditional options.



WORK FLOW: The main process involves with the both design and analysis of the model. At first all the possible design calculations are performed as per its physical specs, which later is used to convert the same into a 3D model so that it is

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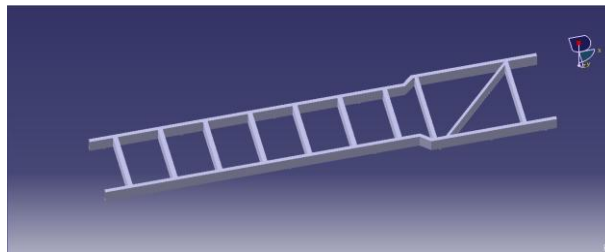
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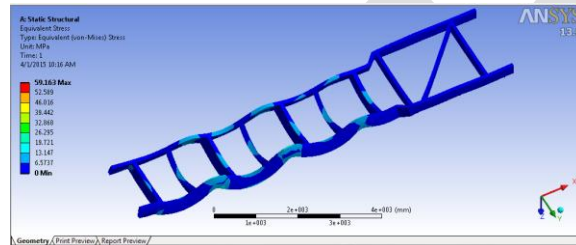
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easily perceptible. Once when done with the design process, structural analysis in which parameters like stress, strain and total deformation are applied ,calculations are performed and all the properties are compared and represented graphically.

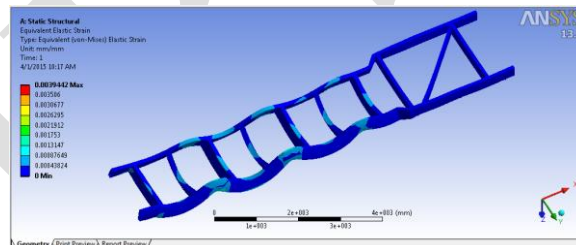
DESIGN :



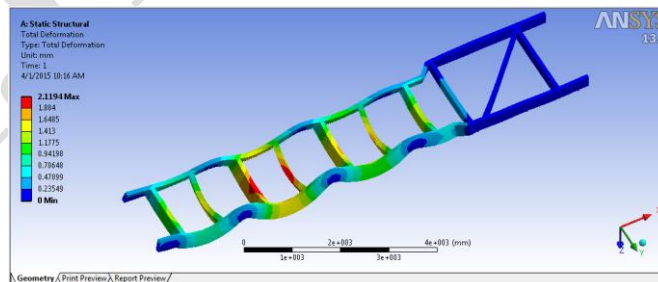
STRESS:



STRAIN:



TOTAL DEFORMATION:



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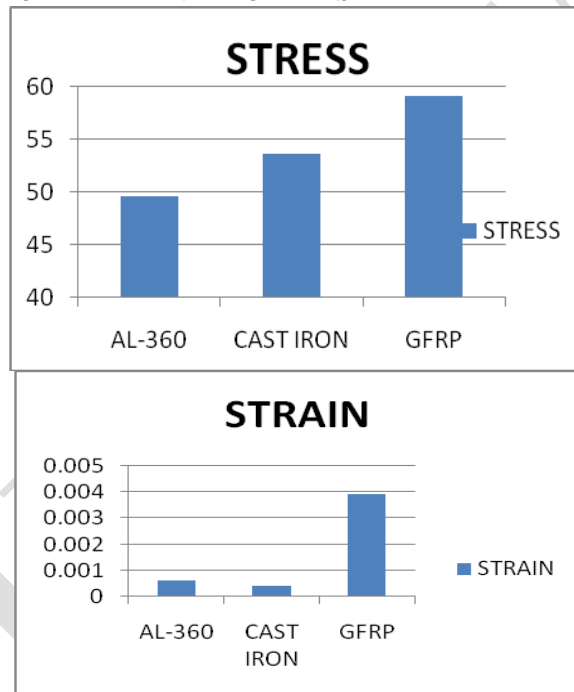
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APPLICATIONS:

- Highly corrosion resistant.
- Improved load capacity.
- Quite economic to manufacture.

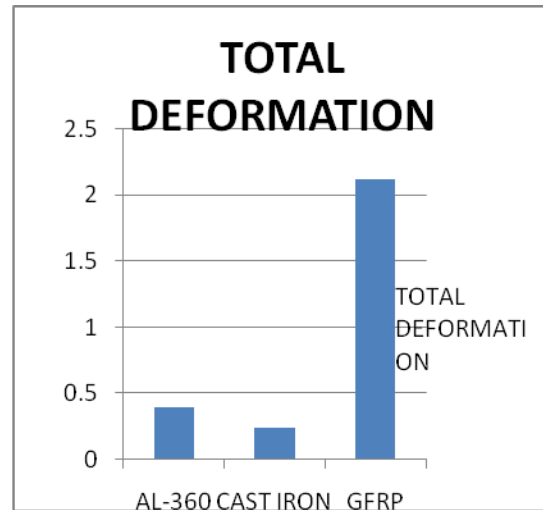
COMPARISON OF MATERIAL FOR DIFFERENT PROPERTIES-



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III.CONCLUSION

In this work, modeled a chassis used in a tataace using Catia. Structural and modal analysis are done on the tata ace chassis using ANSYS. The analysis is done using three materials Cast Iron, Aluminium and E-GLASS EPOXY. And done structural analysis using different materials like. By observing structural analysis results, the stress values for Glass Epoxy and E –Glass Epoxy are less than their respective allowable stress values. So using composites for chassis is safe. By using composites instead of steel, the weight of the chassis reduces 4 times than by using steel because density of steel is more than the composites. By using layers for same thickness of the chassis, the displacement and stress values are reduced than using as single layer. So it is better to take layers than as single layer.

From the obtained ANSYS results it was found that the suitable proposed material for automotive chassis is Glass Fiber Reinforced Plastic Materials. GFRP material having high strength and lesser weight also it is non corroded material, so that chemically it is suitable for chassis application. The GFRP material having large deformation, so that the propagation period is higher when compared to other material like cast iron, steel, aluminum etc..., also this results showing that CFRP was better for chassis application. But, when compared with GFRP the cost of CFRP will be higher therefore here considered that, the GFRP material is suitable for automotive chassis. Also when compared different section it is found that the I-section will be suitable for this application.

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