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Materials Today: Proceedings

Available online 6 March 2023

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Lightweight material for weight reductions in an automotive suspension part lower link

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https://doi.org/10.1016/j.matpr.2023.02.304

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Abstract

In the world of automobiles, the purpose of the suspension system is to provide stability under a variety of conditions, including accelerating, cornering, braking, uneven road, and so on, as well as absorb vibrations that are caused by rough terrains or road disturbances. Because it attaches the steering knuckle to the frame of the vehicle, a control arm is an essential component of the suspension system. When the wheels go over a bump, the arm of the suspension is responsible for the movement that causes them to go up and down. Additionally, it is designed to increase the friction between the tyre contacts and patch the road surface in order to provide vehicle stability regardless of the environment. It can be found in a number of different suspensions, such as wishbone and double wishbone suspensions, amongst others. In some circles, it is also referred to as an A-type control arm. In this work, looking for a weight reduction study based on the Steel material (various yield), aluminum and thickness iteration based on Steel material.

Introduction

The term suspension system refers to the assortment of components that are used to connect the sprung and unsprung elements of a motor vehicle. Depending on the particular mechanisms that are used, a variety of models can be found. Dependent and independent suspension systems are the two categories that can be used to classify suspension systems. The selected automobile features an independent double A-arm suspension system. This indicates that the movement of one wheel does not affect the movement of any of the others [1], [2], [3], [4]. A spring-loaded shock absorber is responsible for regulating the movement of the assembly. This type of suspension can be identified by the presence of two control arms, one on the upper and one on the lower half of the vehicle. Typically, the length of both arms is the same; however, there is a suspension arrangement known as a short long arm suspension, in which the upper arm is typically shorter than the lower arm [5], [6], [7], [8]. The connection between the ball joints and the chassis is made by the control arms. These arms are a component of the four-bar linkage that ensures the system moves in the correct manner. They also support the spring-loaded shock absorber. Each component of the suspension ensures that the wheel remains in contact with the surface below it while also allowing relative movement between the wheel and the chassis [9], [10], [11], [12], [13], [14].

As a consequence of this, the vehicle's stability cannot be maintained by a suspension system that is in poor condition, has excessive wear, or was designed incorrectly. In this sense, finite element analysis, more commonly known as FEA, makes it possible to design mechanical parts by estimating the mechanical response to loading conditions. In this body of work, the software known as Ansa is used to calculate the stress distribution along the lower control arm of a small vehicle. First, a description of the methodology that was utilised is given, which includes the formulation of the problem, the procedures for calculation, and the post-processing [15]. The distributions of the loads, von mises stress, and total deformation that have been calculated are then shown. The conclusion is discussed at length at this point.

Section snippets

Methods

In order to carry out a strength analysis, the standard procedure for problem-solving utilising FEM was followed. This procedure can be broken down into three stages: pre-

processing, calculation, and post-processing. The utilisation of composite materials to replace parts and components that were previously made of steel has resulted in some of the most remarkable advancements. Light-duty cars may potentially be lighter thanks to materials like carbon-fiber reinforced plastics (CFRP) and glass

Baseline model

Model meshed and welded as per above mentioned. A thickness of 2.7 mm was assigned for the arm part and side bushing parts, thickness of 4 mm was assigned and weld thickness was assigned as per weld thickness calculation. Material values are mentioned in Table 1. Boundary conditions and load conditions are applied as per 2.2 content. Local coordinates are created based on the mounting direction and loads are applied in that×direction. Applied all the above conditions and observed the

Conclusion

All facets of vehicle manufacture are increasingly using glass and carbon-fiber reinforced polymers. New technologies are creating stronger, more flexible items than ever before, while production times and prices are decreasing. It is anticipated that as volume manufacturing techniques advance and more sophisticated components can be produced in large quantities, the usage of such polymers in suspension systems would rise. There are several avenues for growth, as seen by the innovations in

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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