

A Review On Structural Analysis Of Alloy Wheels

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ABSTRACT

The wheel of a car plays a pivotal role to endure the weight applied on it. Usually spokes behave as the supports between the hub and the rim. These spokes must have adequate stiffness and strength to dodge the failure of the wheel. In current days these wheels are comprised of, magnesium alloy, steel and aluminum alloy. To decrease the weight of the wheel, numerous wheel designs are executed and applied for automobiles A comparative study is performed by using results of the analysis of the wheel using different materials. The materials used are: Magnesium Alloy, Stainless Steel and Aluminum Alloy and Titanium Alloy in the end best suitable material for the wheel is determined

Keywords : Alloy Wheel, Alloy Rim, Structural analysis, Aluminium alloy, Magnesium alloy, Titanium alloy

1.INTRODUCTION

The evolution of automotive wheel since it was made up of wood till date it is forged to alloy which prove itself an important invention in the history of automotive sector. The wheel rim is an element which is wrapped around by the tyre of the vehicle. The rim hold the tire on the inside edge. It provides support to the suspension system during variable loading on vehicle. Alloy wheel rim is made by mixture of metals and other materials to form a rigid alloy e.g. Al/Mg. Alloy rims are found lighter and stronger than traditional steel wheels, which improve a vehicle's performance, handling, and fuel efficiency.



2. LITERATURE REVIEW

1.S.Arunkumar: this analysis will highlight the best lightweight and high strength material optimization for an automobile wheel rim in 2020. The wheel rim was also subjected to engineering system using the finite element technique. The contour plots obtained for Aluminum alloy 6061, S-Glass epoxy, and E-Glass epoxy materials represent the corresponding stress distribution and total deformation accomplished by an unmodified established automobile wheel rim.

2.chaitanya Sureddi November 2018 : The goal of lowering unsprung mass can be accomplished by reducing weight, which also improves performance and fuel efficiency by reducing inertia loads and overall weight.

3. Aaron Ressa 2013 : Testing was used to create and validate a FEA model, which was then used to analyze and design a laminated carbon fibre composite rim. Several designs were evaluated, and one was chosen for further growth. The final refined design reduced the wheel's weight by nearly 50%

4.Dhiraj Bhargav 2017 Alloy wheels are ones that are formed of an alloy of aluminium or magnesium and are used in the automotive industry. They differ from steel wheels in that they are significantly lighter, which enhances the car's steering and speed.

3. PROBLEM FORMULATION

To design and analyze an optimized alloy wheel rim that minimizes weight while maintaining necessary structural integrity under various loading conditions, aiming to improve vehicle performance and fuel efficiency by exploring different material compositions and design parameters to reduce stress concentrations and potential failure points.

4. PROBLEM STATEMENT

To develop a novel alloy wheel rim design incorporating advanced manufacturing techniques to achieve superior strength-to-weight ratio and improved fatigue life compared to conventional alloy wheels. To investigate the feasibility of using composite materials in conjunction with aluminum alloys to create a lighter and more resilient alloy wheel rim for high-performance vehicles. To analyze the impact of different driving conditions (e.g., aggressive braking, rough roads) on the structural integrity of an alloy wheel rim and propose design modifications to mitigate potential failure points

4. CONCLUSIONS

This survey of various research articles on different types of materials for alloy rim of a car optimized that every material that we studied with different opinions and result outputs of various researchers has its own strength, machinability. But out of all we would like to conclude that material for production of alloy wheel rim is Aluminium Alloy as it is easily available moreover, the cost of manufacturing of Aluminium alloy wheel rim is also cheaper in comparison to magnesium, titanium and CF. Aluminium alloy has more strength, machinability and non-corrosive characteristics compared to any other material like steel, magnesium and titanium alloys. We also found that in comparison with other material under fatigue analysis, Aluminium alloy is long lasting and less susceptible to break under sudden load.

5. REFERENCES

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