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Design and Weight Optimization of 4Wheeler Differential Case Using FEA and UTM Strain Gauge Technique

Prof. S. D. Bhaisare[1], Mr. Akshay T. Pawar[2], Mr. Sumit T. Bopche[3], Mr. Akash J. Pawar[4], Mr. Chetan T. Aher[5]

Assistant Professor, Mechanical Engineering, NBNSSOE, Pune, India[1]

UG Student, Mechanical Engineering, NBNSSOE, Pune, India[2,3,4,5]

Abstract: *In this advanced technological era, lightweight design for fuel efficiency and environmental friendliness is essential for both conventional and hybrid electric vehicles (HEVs), without sacrificing the durability which is an important design factor for vehicle safety. To achieve these objectives, reduction of the structural mass of the full vehicle plays a vital role. The scope of this project is to describe design methodologies for the vehicle differential case applied to achieve light weight and to ensure product life. Optimization of a vehicle differential case done in this study shows that a weight reduction of up to 6% is possible without affecting the safety of the component. The manual optimization methodology used for this process can be implemented for any other cast component. In addition to this, a comparative study is performed of topology optimization using Ansys software on a control arm considering static loading conditions. Three-dimensional CAD model of 4-wheeler differential case is designed using CATIA V5R20. Finite Element Analysis (FEA) software ANSYS Version 19.0 is used to determine the total deformation and equivalent stresses, strain in a 4-wheeler differential case. For weight optimization the 4-wheeler differential case topology optimization module will be used. Experimental investigation will be done by strain gauge technique and UTM. Comparative analysis of FEA and Experimental will be done for validation of work. Conclusion and future scope will be suggested.*

Keywords: Weight Optimization, Reverse Engineering, 3D Scanning, Casting Allowance, etc.

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