ANALYSIS AND OPTIMIZATION OF A HYBRID MONO LEAF SPRING

Marcella Cristina Neves Alvarenga[1,2], Elvis Carneiro Monteiro[2], Antonio Ávila Ferreira[2]

1 – Fiat Chrysler Automóveis do Brasil

2 - Universidade Federal de Minas Gerais

Abstract: Light-weighting in the automotive business has been continuously pursued by the justification of reduction on fuel consumption and less greenhouse gases emissions during its use phase. Mass reduction can be achieved through high-performance materials, design optimization and improved manufacturing. Among the options, composite materials have been largely used not only on automotive industry but also on aircrafts due its better elastic strain energy storage capacity and high strength-to-weight ratio when compared to steel . Among all the potential options, the suspension can account for ten to twenty percent of the unsprung weight [1]. The materials selection for the composite, epoxy and glass fiber on a proportion of 40/60 in mass respectively, was based on performance and cost and the optimized combination with steel (SAE 5160) in terms of mass was determined for the hybrid mono leaf. It was used a pre-modeled geometry and the analysis was done on Ansys 19.0 by the Finite Element Analysis method using the static structural system. Besides the total mass of the component, deformation, strength, stress, stiffness and natural frequencies were evaluated and the results were compared to the ones from the conventional mono leaf spring made of steel.

[1] Kumar, D. A. Kalam, A. SD. Design, Analysis and Comparison between the Conventional Materials with Composite Material of the Leaf Springs. Fluid Mechanics: Open Access 3:127 (2016).

[2] Sainathan, P. Ajay, K. Modeling and Analysis of a Hybrid Mono-Leaf Spring Using FEA. International Journal of Scientific and Research Publications, Volume 5, Issue 12, December 385-390 (2015).

Keywords: leaf spring, weight reduction, hybrid, finite element analysis