

# Multiphysics CAE of Shock Absorber

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## Abstract

A Shock absorber is a mechanical component engineered to absorb the impact-load and convert kinetic energy to heat energy by avoiding critical damages. In Vehicle it reduces the effects of impact during travelling over rough grounds, leading to improve ride quality, and increase in comfort for the rider. Though shock absorbers are designed to limiting excessive suspension spring movement, their key purpose is to damp spring oscillations. In a shock absorber the design of suspension spring need more focused for better performance. It is the critical part, which undergo high deformation and stress due to heavy impact loading during its life cycle. This helical coil suspension spring come with different material properties for better performance improvements. This paper deals with the structural, dynamic and energy absorbing characteristics of a Shock absorber. A physical and mathematical model was developed for a helical coil suspension system, considering different material properties. In current design process, high strength alloy steel and beryllium copper was considered. A suspension spring of variable pitch has considered improving the comfort level.

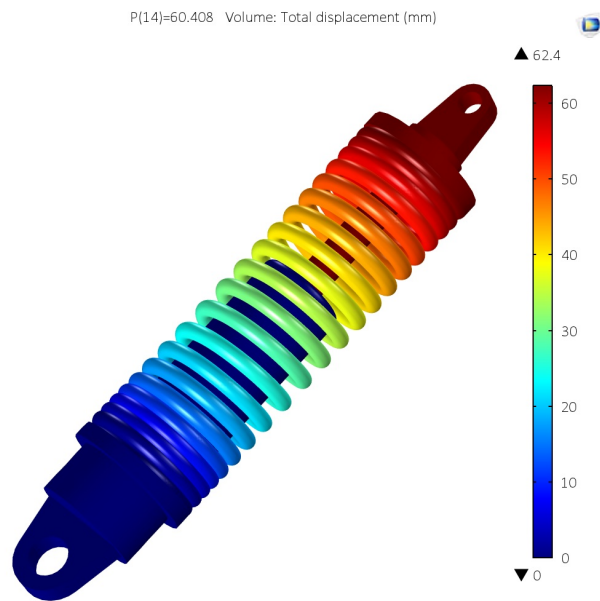
Design and analysis of a shock absorber is a complex part which affect the comfort level during its operating condition. In this experiment, Multibody Dynamics module of COMSOL Multiphysics software was implemented to derive the structural, dynamic and energy absorbing characteristics of overall assembly. CAD Import module has used to import the model into COMSOL for real time simulation. The model was analyzed under different parametric loading conditions from 50 kg to 200 kg to derive the desired results. The derived displacement and stress values are plotted in Figure 1 & 2 respectively.

The numerical analysis has performed for a shock absorber design and derived results are manipulated effectively. The Multiphysics CAE analysis will be performed to explore the energy harvesting potential of shock absorber.

## Reference

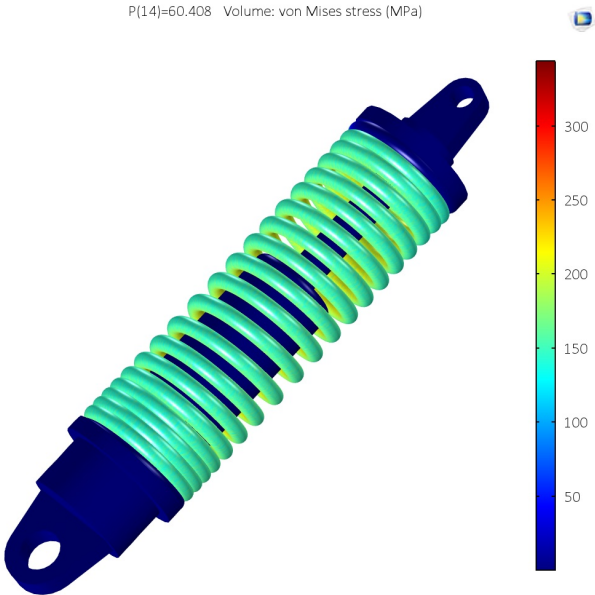
1. Shigley's "Mechanical Engineering Design", McGraw-Hill Series in Mechanical Engineering [Book].
2. "Strength of Material [Mechanics of Solid]" by R.K Rajput. [Book].
3. "The Shock Absorber Handbook" by Dixon [Book].
4. "Practical Finite Element Analysis" by Nitin S. Gokhale [Book].

## Figures used in the abstract



**Figure 1:** Displacement result.

P[14]=60.408 Volume: von Mises stress (MPa)



**Figure 2:** Stress contour plots.