Material Optimization of Shock Absorber Spring

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Abstract - *Shock absorber is a mechanical device designed to smooth out or damp shock impulse, and dissipate kinetic energy. In a vehicle, it reduces the effect of travelling over rough ground, leading to improved ride quality, and increase in comfort due to substantially reduced amplitude of disturbances.*

***Key Words*: Shock Absorber, Analysis, Design, Creo, Material, Spring.**

1. INTRODUCTION

A shock absorber or damper is a mechanical device designed to smooth out or damp shock impulse, and dissipate kinetic energy. Pneumatic and hydraulic shock absorbers commonly take the form of a cylinder with a sliding piston inside. The cylinder is filled with a fluid (such as hydraulic fluid) or air. This fluid-filled piston/cylinder combination is a dashpot. The shock absorbers duty is to absorb or dissipate energy. These are an important part of automobile suspensions, aircraft landing gear, and the supports for many industrial machines. A transverse mounted shock absorber, called a yaw damper, helps keep railcars from swaying excessively from side to side and are important in commuter railroads and rapid transit systems because they prevent railcars from damage station platforms. In a vehicle, it reduces the effect of traveling over rough ground, leading to improved ride quality, and increase comfort due to substantially reduced amplitude of disturbances. Without shock absorbers, the vehicle would have a bouncing ride, as energy is stored in the spring and then released to the vehicle, possibly exceeding the allowed range of suspension movement.

2. Problem Definition

To check the strength of the model, the structural analysis on the helical spring was done by varying different spring materials. Modal analysis is done to determine best material for spring.

3 Methodology

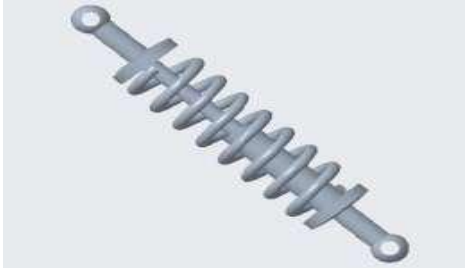
3.1 Design in Creo

Design of Upper Mount
Draw a circle with 60mm diameter and 30mm diameter, circle of 40mm diameter and length 50 mm.

Design of Bottom Mount
Draw a circle with 160mm diameter and 150mm diameter, circle of 40mm diameter and length 50 mm.

Design of Spring
Draw a circle of 70 mm diameter, length of 210 mm, the helix of pitch 50 mm, and a circle of 30 mm diameter, depth 200mm.

3.2 Assemble in Creo



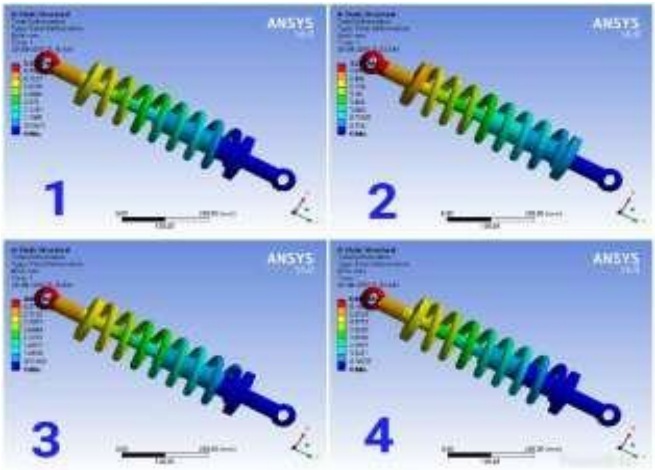
3.3 Analysis in Workbench

Procedure to follow

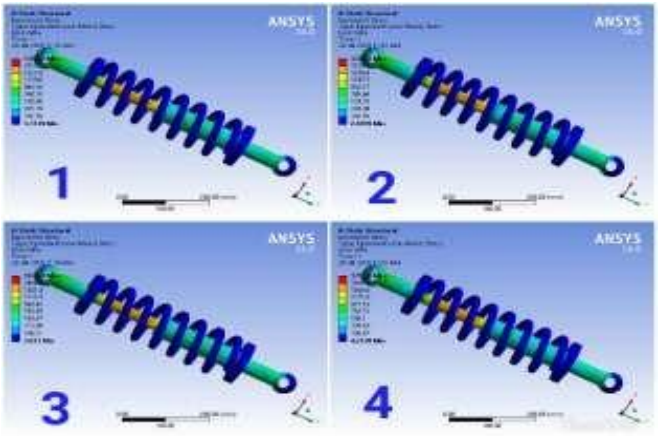
1. Open static structure analysis in workbench.
2. Select material from engineering data.
3. Import geometry.
4. In model do meshing.
5. In setup put in boundary conditions
6. And then solve.
7. Change material and again solve.

4. Result

Displacement



Stress



SL . NO	Parameter	1. Titanium Alloy	2. Stainless Steel	3. Cu Alloy	4. Al Alloy
1	Maximum Displacement (mm)	5.32	3.204	4.8050	6.863
2	Maximum stress intensity (N/mm2)	1706.2	1720.2	1672.3	1755.8

Table of Result

5. Future Scope

1. To optimize the upper and lower mount material.
2. Analysis by considering hydraulic shock absorber.
3. Optimization by considering the angular displacement at end supports.

6. Conclusions

To validate the strength of our design, we have done structural

1. The stress intensity and displacement vectors are less for Stainless Steel than other materials. So, the best material for spring is Stainless Steel.
2. From the analysis results it is clear that the optimal stress intensities & maximum displacement values are obtained for the Stainless Steel material.

Therefore, when the availability of Stainless Steel is more and cost of Stainless Steel material is affordable then the scope of materials for springs with Stainless Steel is preferable.

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