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Stress Analysis Two Wheeler Helical Coil Spring for Different Material

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Abstract: *In this paper work is carried out on modelling and analysis of spring used in two wheeler and some modification is also done. In this paper a comparative study of different material is carried out by statics analysis and try to suggest a optimized material. The modelling of spring is done in CATIA and Analysis is carried out in ansys15.This works helps to designer developed better suspension. Spring is always a interest area for researcher. The Mechanical energy is stored in spring, by applying force it can be pulled, stretched, compressed. It return to its orignal shape when force is released, follows elasticity*
Keywords: *Helical Spring, CATIA, Ansys,*

I. Introduction

Suspension system play a vital role in automobile industry. Irregularities on road make a vehicle difficult in comfort for human. A better suspension paly vital role in human comfort irrespective of cost, again it may lead to accident. A conical compression spring has advantage that it generates negative solid height, constant spring rate ,smooth oscillation and good physical stability, hence we can say that conical spring can operate in harsh condition compared to regular spring. In this paper we have compare four spring material for better results.

1.1Types of Springs:

Different types of spring used in industry. 1. Helical springs. 2. Conical and volute springs. 3. Torsion springs. 4. Laminated or leaf springs. 5. Disc or Belleville springs

II. Stresses In Helical Springs Of Circular Wire

To determine the stress generated in the spring;
consider a helical spring subjected to an axial load F.
Let
D= Mean Diameter of the spring coil,
d = Diameter of the spring wire,
n = No. of active coils,
G = Modulus of rigidity for the spring material,
F = Axial load on the spring,
τ = Max. shear stress induced in the wire,
C = spring index = D/d
P= Pitch of the coils, and
δ = Deflection of the spring, as a result of an axial

Caluculation for the helical spring:
Spring index, $C=D/d$
Wahl"s stress factor, $k = 4C-1/4C-4+0.615/C$
Maximum shear stress, $\tau=k\times 8WD/\pi d3$
Deflection of spring, $\delta=8WC3n/Gd$ [6]
Some of the common spring materials are given below.
• Hard-drawn wire: This is cold drawn, cheapest
spring steel. Normally used for low stress and static load. The material is not suitable at subzero temperatures or at temperatures above 1200C.
• Oil-tempered wire: It is a cold drawn, quenched, tempered, and general purpose spring
steel. It is not suitable for fatigue or sudden
loads, at subzero temperatures and at temperatures above 1800C.

• Chrome Vanadium: This alloy spring steel is used for high stress conditions and at high temperature up to 2200C. It is good for fatigue resistance and long endurance for shock and impact loads.
• Chrome Silicon: This material can be used for highly stressed springs. It offers excellent service for long life, shock loading and for temperature up to 2500C.
• **Music wire:** This spring material is most and has highest tensile strength and can withstand repeated loading at high stresses. It cannot be used at subzero temperatures or at temperatures above 1200C.
• Stainless steel: Widely used alloy spring materials.
• Phosphor Bronze / Spring Brass: It has good corrosion resistance and electrical conductivity widely used for small springs. It is the toughest corrosion resistance and electrical conductivity.

Meshing:

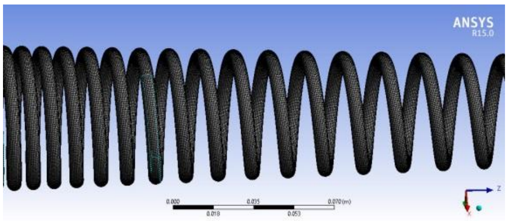

Fig. 1 Meshing of spring

III. Analysis Of The Springs

Analysis is carried out in Ansys 15 for four different material and results shown

Material Used Structural Steel:

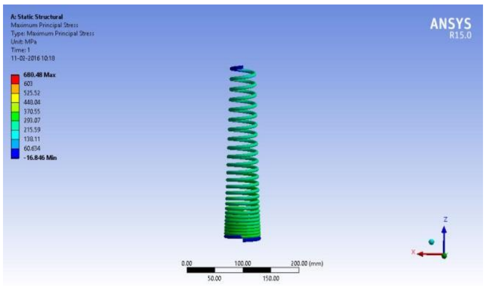

Fig. 2 Max Principal Stress

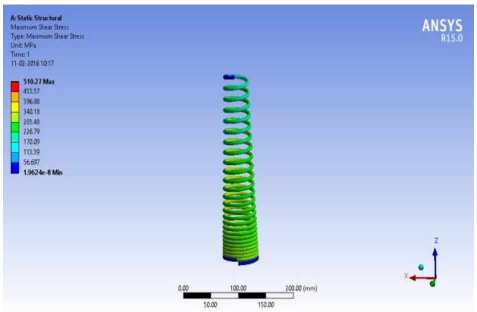

Fig. 3 Maximum shear Stress

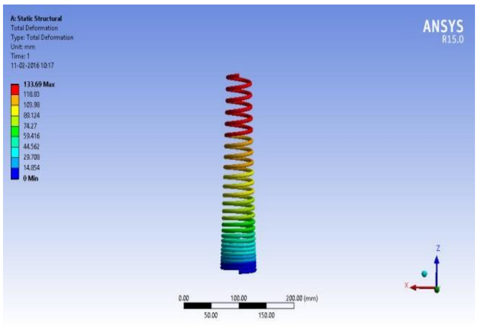

Fig. 4 Total deformation

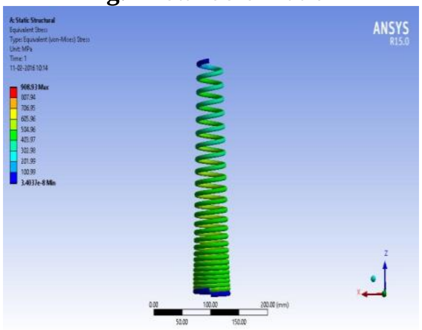

Fig. 5 Eqvivalent stress

Material Used Aluminum Alloy:

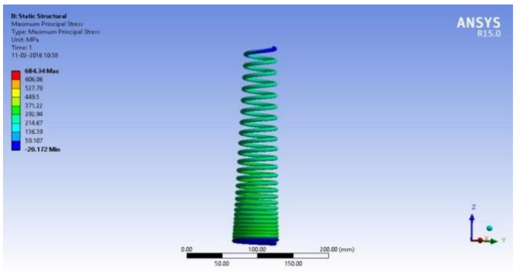

Fig. 6 Max Principal Stress

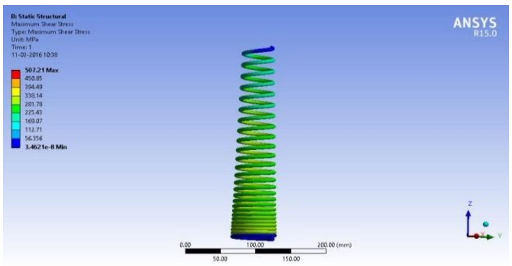

Fig. 7 Maximum shear Stress

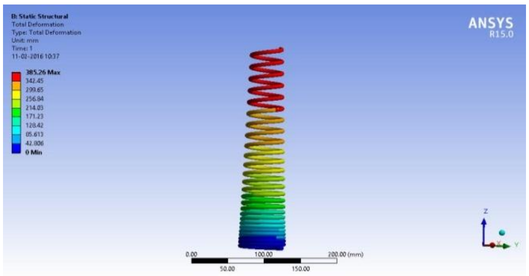

Fig. 8 Total deformation

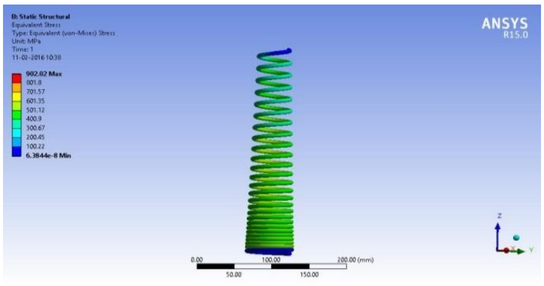

Fig. 9 Eqvivalent stress

Material Used Titanum Alloy:

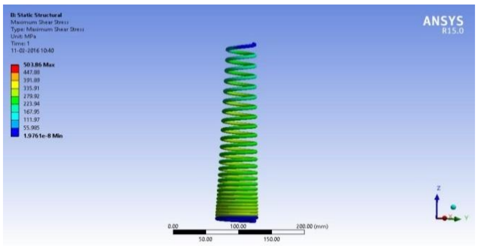

Fig.10 Max Principal Stress

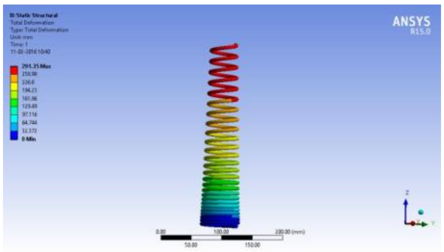

Fig.11 Maximum shear Stress

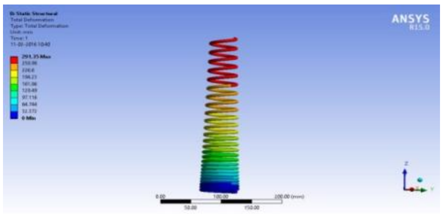

Fig.12 Total deformation

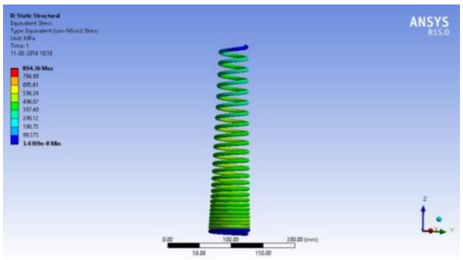

Fig.13 Eqvivalent stress

Material Used Chrome Vanadium:

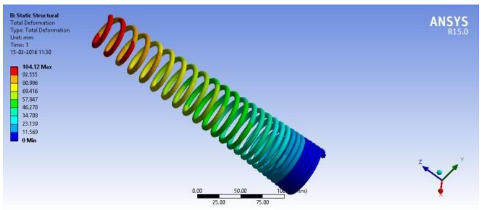

Fig.14 Max shear stress

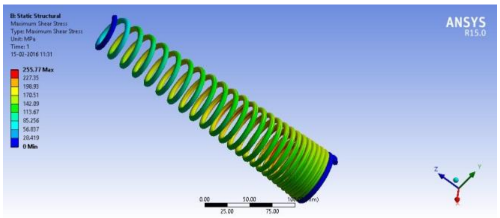

Fig.15 Total deformation

IV. Results

SN	Material	Max Shear stress	deflection
1	Structural steel	510	133.69
2	Aluminum alloy	507.21	385.26
3	Titanium Alloy	503.85	291.73
4	Chrome vanadium	255.77	104.72

V. Conclusions

We have used four material, Structural steel, aluminum alloy, titanium alloy and chrome vanadium Out of four material used the chrome vanadium is better for good deformation and stress. The above results will help designer to carry out research.

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