DESIGN AND ANALYSIS OF COIL SPRING IN VEHICLES

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Abstract

Suspension system plays a very important role in new vehicles . its duty is to damp , smooth out the shock impulse furthermore to absorb or dissipate energy so that the suspension system provides the comfort and safety for the passengers and vehicles . it with finite element . one material are selected to simulate the spring steel. The deformation , stress and strain are obtained numerically under various values of load (1800,2200,3000)N.

Keywords: Coil spring, Modulus of Rigidity, Suspension system, Stress, Steel

INTRODUCTION

The suspension system on of the most important component tin the automobile, it is responsible for dissipating the kinetic energy and controlling the shock in automobile s, shock absorber decreases the influence of traveling over the harsh road which is leading to improve the vehicle control and quality of the ride . the suspension system consists of many parts like axles, shock absorber ,springs , ball joints and arm rods. New passengers automobiles have light coil springs .commercial automobiles have coil spring in the front and leaf spring in the rear .the ability of spring to withstand the load depends on its shape , the total diameter of spring and the diameter of

METHODOLOGY

In this study, the simulation and analysis of coil spring were done with different materials. The materials were selected steel structure, the coil spring was simulated with solid works 2018 with specific dimensions are listed in Table 1.

Table 1: The Specifications of Coil Spring

No.	Specification	Value
1.	Outside diameter	88mm
2.	Inside diameter	64mm
3.	Wire diameter	12mm
4.	Free length	315mm
5.	No. of active coil	12
6.	Pitch	25mm

STRESS

Stress parallel to a plane is usually denoted as " shear stress" and can be expressed as

$$\tau = (F_p) / (A)$$

τ = shear stress (pa(N/m^2), psi (Ibf/in^2))

F_p = shear force in the plane of the area (N, Ib_F)

STRAIN

Strain is defined as "deformation of a solid due to stress". Normal strain - elongation or contraction of a line segment .

Normal strain can be expressed as

$$\varepsilon = dl/l_0$$

where

dl = change of legth (m, in)

L_0 = initial length (m, in)

ε = strain – unit less

MODULUS OF REGIDITY (G)

G = stress/strain

= $(F_p/A) / (s/d)$

G = shear modulus of elasticity

F_p = force parallel to the faces which they act

A = area (m^2, in^2)

S = displacement of the faces (m, in)

D = distance between the faces displaced (m, in)

The stress ,strain and modulus of rigidity were obtained numerically for the steel material with different-different load .

1] RESULTS FOR LOAD (1800N)

Stress = (F_p / A)

= (1800) / (3.14*0.32*0.32)

= (1800) / (0.32156)

= 5598.12mm

=5.598 G pa

Strain = (dl/l_0)

= (5598-315) / (315)

= (5283) / (315)

=16.77mm

Modulus rigidity = (stress)/(strain)

= (5598) / (16.77)

= 333.81mm

(TABLE 2) for material,load,modulus of regidity,stress and strain of (1800N).

Material	Load(N)	Modulus of rigidity(mm)	Stress(G pa)	Strain(mm)
Steel structure	1800	333.81	5.598	16.77

2] RESULT FOR LOAD (2200N)

Stress = (F_P) / (A)

= (2200) / (3.14*0.32*0.32)

= 6842.15mm

= 6.842 G pa

Strain = (dl) / (l_0)

= (6842-315) / (315)

= (20.72) mm

= (6842) / (20.72)

= (330.21) mm

(TABLE 3) for material,load,modulus of regidity,stress and strain of (2200N)

Material	Load(N)	Modulus of rigidity(mm)	Stress(G pa)	Strain(mm)
Steel structure	2200	330.21	6.842	20.72

3] RESULTS FOR LOAD (3000N)

Stress = (F_p) / (A)

= (3000) / (3.14*0.32*0.32)

= (3000) / (0.32156)

= 9330.21mm

Strain = (dl) / (l_0)

= 28.61mm

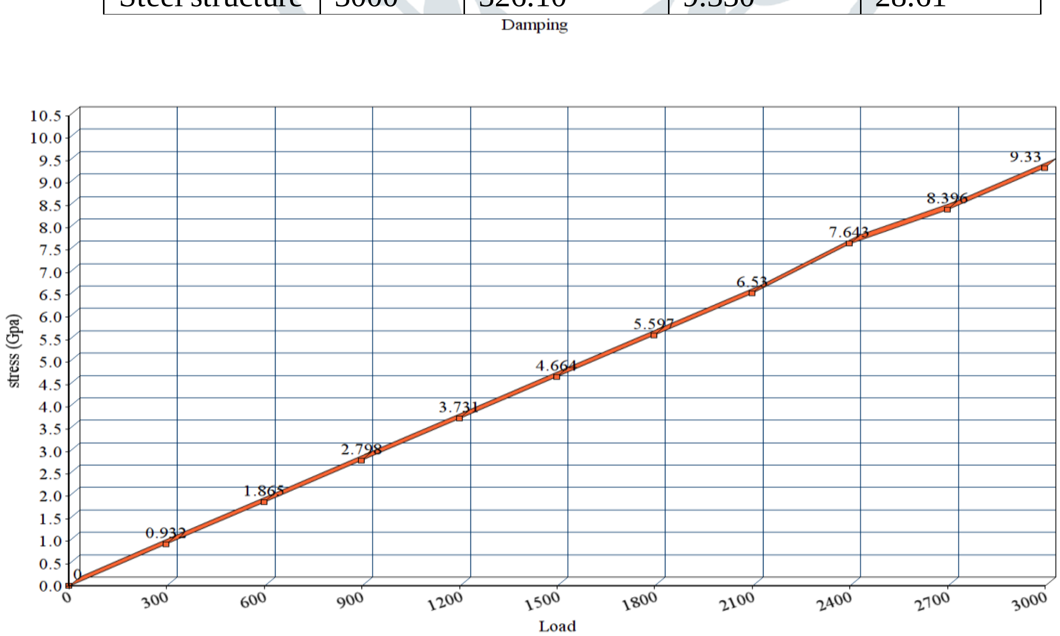
Modulus of rigidity = (stress) / (strain)

= (9330) / (28.61)

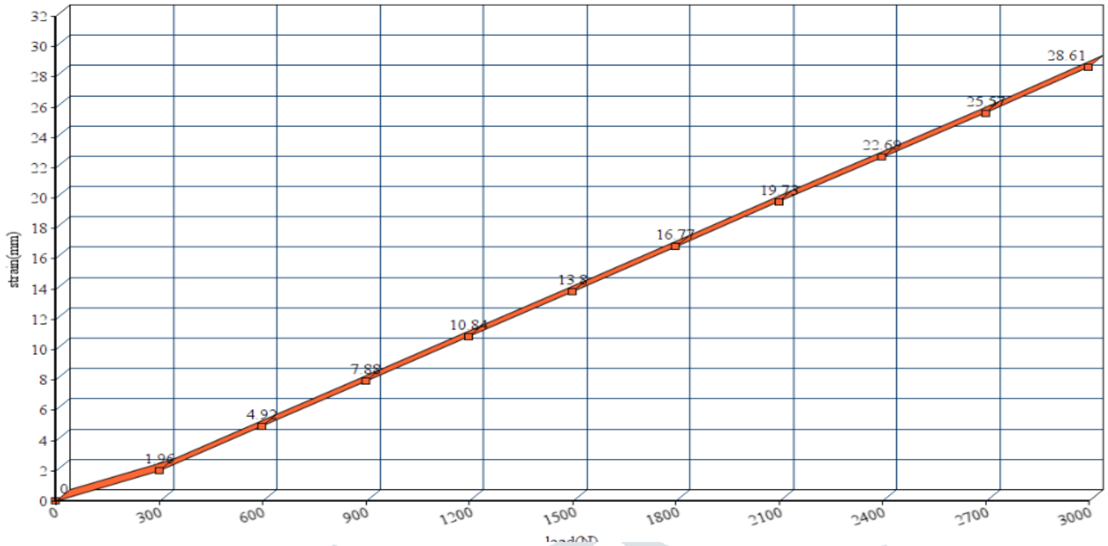
= 326.10mm

(TABLE 4) for material,load,modulus of regidity,stress and strain of (3000N)

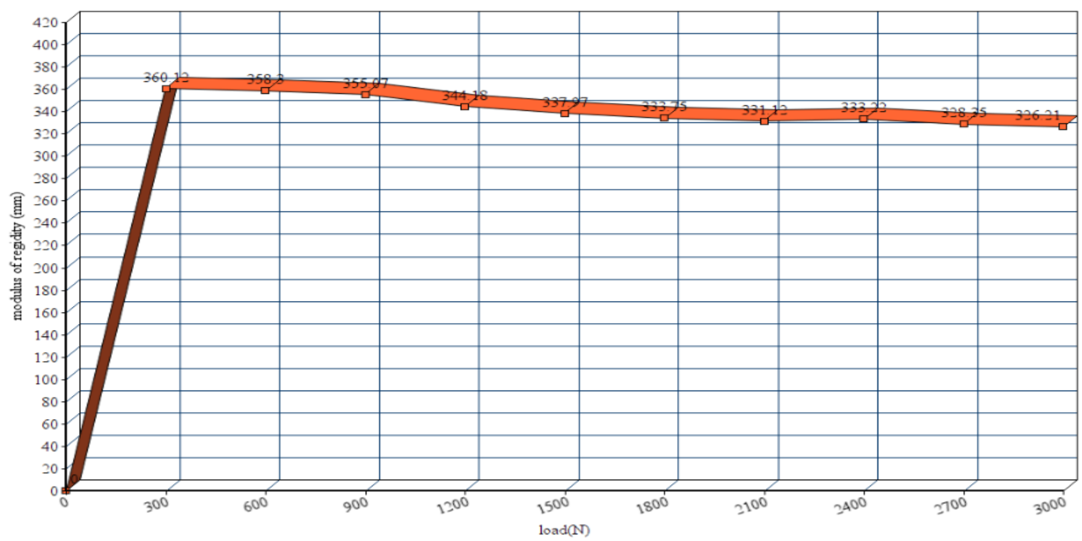
Material	Load(N)	Modulus of rigidity(mm)	Stress(G pa)	Strain(mm)
Steel structure	3000	326.10	9.330	28.61



The comparison of stress at various values for load in above figure 1.



The comparison of strain at various values for load in above figure 2.



The comparison of modulus of rigidity at various values of load shown in figure 3.

CONCLUSIONS

In this study, the simulation and analysis of coil or helical spring with is the main part in the suspension system in modern vehicles were carried out by using solid works. the steel material were chosen to manufacture the spring under various values of load .the strain and strain increased by increasing the load but modulus of rigidity decreased by increasing the load . The value of stress for loaded (1800, 2200) is approximately same and the value of strain , modulus of regidity for loaded (1800,2200,3000) difference is approximately not equal. The value of modulus of regidity for loaded(1800,2200,3000) difference is approximately equal.

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