ANALYSIS AND EXPERIMENTAL VALIDATION FOR BEHAVIOR (COMPRESSION, TENSILE, FATIGUE ETC.)OF COMPOSITE MATERIAL HELICAL COMPRESSIVE SPRING USED FOR FOUR WHEELER SUSPENSION SYSTEM.

Mr Ajay Tukaram Kumbhar
P.G. Student in Mechanical Engineering, A.M.G.O.I.Vathar

Prof. E.N. Aitavade
Department of Mechanical Engineering, A.M.G.O.I.Vathar

Mr. Satyajit Ankush Patil
Student In Mechanical Engineering, Ssdit Red Shirala,Sangali

Mr Vijay Vishnu Kumbhar
Student In Mechanical Engineering, Ssdit Red Shirala,Sangali

ABSTRACT

The Helical spring is used for suspension in automobile. The Helical spring absorbed the shocks and bump. The present study explores about experimental and computational analysis of helical spring used in automobile. This study concentrated on the use of composite material for manufacturing of helical spring. Overall this study compares the results obtained by experimental analysis of existing mild steel material helical spring by using Universal Testing machine and composite material helical spring. The validation of experimental results is given by ANSYS computational results. Finally the Comparison is done for concluded the results.

KEYWORDS: helical spring, composite material, ANSYS.

INTRODUCTION

The automobile chassis is mounted on axles, not direct but through some form of spring this done to isolate the vehicle body from the road shocks which may be in the form of bounce, pitch, roll or sway. These tendencies give rise to an uncomfortable ride and also cause additional stress in automobile frame and body. All the parts which perform the function of isolating the automobile from the road shocks are collectively called the suspension system. The energy of road shocks causes the spring to oscillate. These oscillations are restricted to a reasonable level by the damper, which is more commonly called a shock absorber. Suspension system prevents the road shocks from being transmitted to the vehicle components and to safeguard the occupants. It also prevents the stability of vehicle in pitching or rolling, while in motion. Springs are used in mechanical equipment with moving parts, to absorb loads, which may be continuously, or abrupt varying. The absorption of the loads takes place in the form of elastic energy. Coil springs are manufactured from rods which are coiled in the form of a helix. The design parameters of a coil spring are the rod diameter, spring diameter and the number of coil turns per unit length. Normally, springs fail due to high cycle fatigue in which the applied stress remains below the yield strength level and the loading cycle is more than 105 cycles/sec. In springs made from steels, the chemical composition of the steel and the heat treatment given to it are such that the inherent damping capacity of the steel is high. It is rare that a spring fails in service due to faulty design. The causes of failures are mainly related to deficient microstructure and/or presence of stress concentration raisers.and industrial applications.

LITERATURE REVIEW

Manish Dakhore et.al. [1]
He has studied value of stress found to be more at the critical section of the spring as indicated by red colour. Hence possibility of failure is more at that section compared to other section of spring. This paper is discusses about locomotive suspension coil springs, their fundamental stress distribution and materials characteristic. The analysis of locomotive spring is carried out by considering cases, when the locomotive at the straight path, curved path and on uphill. This paper also discusses the Experimental analysis of a helical suspension spring by using strain gauge. The stress analysis for the forces obtained and for modal and harmonic response has been carried out by FEA using ANSYS.
Md. Mustak et.al. [2]
Studied the used of E-poxy glass materials for the design of helical suspension spring. The metal coils of helical spring are replaced by e-poxy carbon. In this work finite element analysis of helical spring is analyzed by using ANSYS, and in out the values of all parameters.
Aamir A. Waghade et.al. [3]
Have carried out the works on harmonic analysis of helical suspension spring. In this paper they have introduced the method for rectangular cross section helical spring. This paper discusses the experimental analysis of ahelical suspension spring by using strain gauge. The stress analysis for the forces obtained and for modal and harmonic response has been carried out by FEA analysis.
Achyut P. Banginwar et.al. [4]
He carried out work on the design and analysis of shock absorber using finite element analysis in this paper; he discussed about shock absorbing system by using 3D Pro-Engineering Software and validates the design, he has done structural analysis, modal analysis on the shock absorber system.
Mehdi Bakhsheshet.al. [5]
Hehavestudied result found by comparing steel spring with composite helical spring it has been found to have lesser stress and has the most value when fiber position has been considered to be in direction of loading. Also weight of spring has been reduced shown that changing percentage of fiber, especially at Carbon/Epoxy composite, does not affect spring weight.
P.S.Valsange [6]
He have been presented the review of fundamental stress distribution, characteristic of helical coil springs. An in depth discussion on the parameters influencing the quality of coil springs is also presented. Factors affecting strength of coil spring, F.E.A. approaches by the researchers for coil spring analysis are also studied. Reduction in weight is a need of automobile industry. Thus the springs are to be designed for higher stresses with small dimensions. This requires critical design of coil springs. This leads to critical material and manufacturing processes. Decarburization that was not a major issue in the past now becomes essential, to have better spring design.

Vladimir Kobelev [7]
He presented research work on Shape Optimization for Helical Compression Springs. This work is concentrated for reducing impact events in railroad cars, primarily, and some heavy trucks, helical, or coil, springs are used. In some vehicles, torsion bars are used instead of the coil springs. The reduction of weight of the suspension springs causes the decrease of unsprung mass of the axle, and has a positive influence on the comfort, traction and steering properties of the car. The development of modern passenger cars has highlighted a trend toward reduced package space for suspension components in order to maximize package space for occupants and loads. Such requirements lead to reduction in spring dimensions and wire cross-section. The efficient design procedures for spring elements are based on the modern simulation and optimization methods.

TERMS USED IN COMPRESSION SPRINGS

a. SPECIFIC STRAIN ENERGY

The main factor to be considered in the design of a spring is the strain energy of a material used. Specific strain energy in the material can generally be expressed as……..,

$$U = \frac{1}{2} x W x \sigma$$

b. SOLID LENGTH

When the compression spring is compressed until the coils come in contact with each other, then the spring is said to be *solid*. The solid length of a spring is the product of total number of coils and the diameter of the wire. Mathematically, Solid length of the spring,

$$LS = n'.d$$

Where,
n' = Total number of coils, and
d = Diameter of the wire.

c. FREE LENGTH

The free length of a compression spring, as shown in Fig.1.2 is the length ofthe spring in the free or unloaded condition. It is equal to the solid length plus the maximum deflectionor compression of the spring and the clearance between the adjacent coils (when fully compressed).Mathematically,

Free length of the spring,
LF = Solid length + Maximum compression + Clearance betweenadjacent coils (or clash allowance).

$$LF= n'.d + \delta max + 0.15\ \delta max$$

The following relation may also be used to find the free length of the spring, i.e.

$$LF = n'.d + \delta max + (n' - 1) \times 1 \text{ mm}$$

In this expression, the clearance between the two adjacent coils is taken as 1 mm.

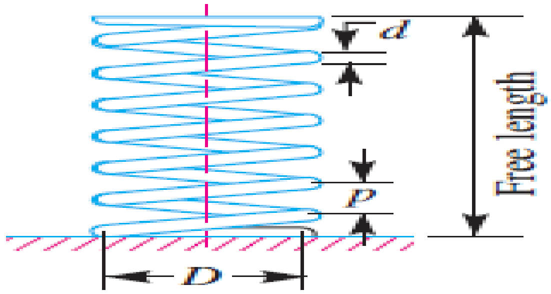

Fig.1.2.Free Length of Spring

d. SPRING INDEX

The spring index is defined as the ratio of the mean diameter of the coil to the diameter of the wire. Mathematically,
Spring index,

$$C = D / d$$

Where,
D = Mean diameter of the coil,
d = Diameter of the wire.

e. SPRING RATE

The spring rate (or stiffness or spring constant) is defined as the load required per unit deflection of the spring. Mathematically,
Spring rate,

$$k = W / \delta$$

Where ,
W = Load,
δ = Deflection of the spring.
K = Stiffness or spring rate.

f. PITCH

p = Free length/n'-1

The pitch of the coil may also be obtained by using the following relation, i.e.
Pitch of the coil,

$$P = \frac{\text{Free Length of Coil}}{n' - 1}$$

Where,
LF = Free length of the spring,
LS = Solid length of the spring,
n' = Total number of coils,
d = Diameter of the wire.

THESIS OBJECTIVES

- Study about the helical spring and understanding issues associated with this field.
- Study the area of different techniques or approaches to understand their principles a supplied to the subject of study.

- Selection of suitable vehicle spring.
- Collected its performance related parameter.
- Study, analysis and testing of computational modal of helical spring.
- Manufacturing of composite material helical spring.
- Study analysis and testing of experimental modal of helical spring.
- Finally comparison for computational and experimental modal of helical spring.

DESIGN & FABRICATION OF COMPOSITE COIL SPRINGS.

The design of a new spring involves the following considerations:

- Space into which the spring must fit and operate.
- Values of working forces and deflections.
- Accuracy and reliability needed.
- Tolerances and permissible variations in specifications.
- Environmental conditions such as temperature, presence of a corrosive atmosphere. Cost and qualities needed.

The designers use these factors to select a material and specify suitable values for the wire size, the number of turns, the coil diameter and the free length, type of ends and the spring rate needed to satisfy working force deflection requirements. The primary design constraints are that the wire size should be commercially available and that the stress at the solid length be no longer greater than the torsional yield strength. Further functioning of the spring should be stable.

DESIGN CALCULATION FOR EXISTING & COMPOSITE SPRING,

Mean Diameter of spring=100 mm
Wire Diameter=15 mm
Nos.of Active Coils=07
Modulus of Rigidity for Steel=80 KN/mm^2=80 x 10^3 N/mm^2
Axial Loading =20,000 N

- Spring Index=$C=\frac{D}{d}=\frac{50}{15}=3.33\cong 4$

- Shear Stress Factor=$K_s=1+\frac{1}{2C}=1+\frac{1}{2\text{ x}4}=1.125$

- Maximum Shear Stress= $\tau=\text{Ks}\frac{8\text{ WD}}{\Pi\text{D}^3}$

$$\tau=1.125\text{ x}\frac{8\text{ x}20000\text{x}50}{\Pi(15)^3}=849.25\text{ MPa.}$$

- Maximum Deflection of Spring

$$\sigma=\frac{8\text{WD}^3\text{n}}{\text{Gd}^4}=\frac{8\text{ x }20000\text{ x }50^3\text{x}7}{80\text{ x }10^3\text{ x }15^4}=34.56\text{ mm.}$$

- Stiffness of Spring

$$\text{Stiffness}=\frac{\text{W}}{\sigma}=578.70\text{ N/mm}$$

- Strain Energy Stored in Spring

$$\text{U}=\frac{1}{2}\text{x W x }\sigma.$$

$$U = 345.6\ N - m.$$

➢ Free Length of Spring (Lf)

$$Lf = nd + (n - 1)x1$$

$$Lf = 7x15\ (7 - 1)x1 = 111\ mm.$$

➢ Pitch of Coil = $P = \frac{\text{Free Length of Coil}}{n' - 1}$

$$n' = (n + 1) = (7 + 1) = 8$$

$$\text{Pitch of Coil} = \frac{111}{8-1} = 15.85\ mm.$$

Where,
D is mean diameter of spring
W is static load
d is bar diameter of spring
C is spring index = D/d
To reduce shear stress in the springs, the bar diameter, the mean diameter & spring Index, C=D/d have to be designed in proper way.

Table: 3.1.Summeries of Design Data.

Parameters	Values
Mean Diameter	100mm
Wire Diameter	15 mm
Pitch of Coil	15.85 mm
Free Length	111mm
Nos.of Turns	07
Spring Index	4

FABRICATION OF COMPOSITE COIL SPRINGS

Composite springs were manufactured by the filament winding method. springs were manufactured by the same method. A mandrel having the profile of the spring is prepared first.. This mandrel is fixed in the lathe chuck. A mould release agent like silicone gel is applied on the mandrel. Glass fiber roving/carbon fiber roving is dipped in the measured quantity of resin and wound on the mandrel by rotating it on a lathe. After the complete winding of the roving in the profile of the mandrel a shrink tape is wound on the mandrel. This shrink tape applies the required pressure on the material. The mandrel along with the material and the shrink tape is cured in atmospheric temperature for 24 hours. After curing shrink tape is removed. The excess resin on the surface of the spring is removed by filing. The cured spring is removed from the mandrel by rotating in the reverse direction. Fig 3.1 shows the fibers wound on the mandrel. Fig 4 shows the cross sectional view of spring with mandrel. Fig 3.2 shows the fabricated composite coil springs.
The fabricated spring is having the dimensions L=200mm, D=59mm,The spring constant of a helical spring can be determined at two measured points, corresponding to deflection at both 30%and 70 % of the full loading, on the load deflection curve from the compression test of a helical composite springThe failure load and the maximum compression of a helical composite spring are also evaluated to ensure its safe use.In this study, a spring testing

machine which automatically records the deflection and load applied on the spring is used.The load deflection curve can be drawn from these data. The spring rate, maximum compression and failure load can be evaluated from the load deflection curve. A special fixture is used to hold the spring in the machine.

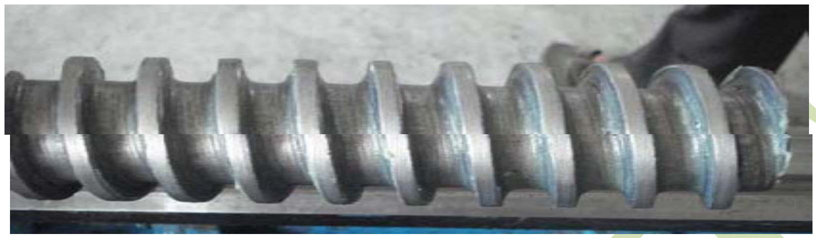

Fig.3.1.Mandrel having the profile of the spring.

Fig.3.2 Fibers Wound on the Mandrel.

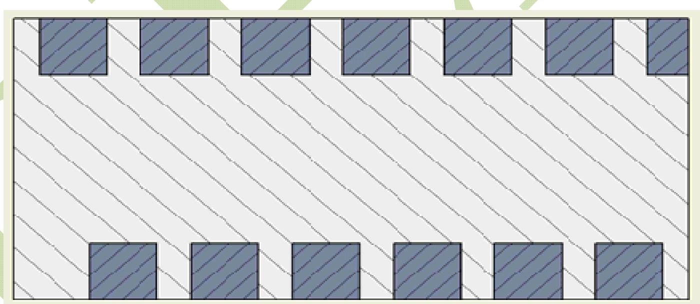

Fig.3.3 Sectional View of the Composite Spring with the Mandrel.

EXPERIMENTATION RESULTS & DISCUSSIONS

In this chapter we have discussed about the results obtained from the experimental and computational; analysis by using ANSYS software on the composite and conventional springs respectively. The result obtained from the experimentation is described. The spring is design and analysis as per calculated data. Experiments were carried out on the both types of spring on Universal Testing Machine. The experimental data is used for carried out the computational results. The experimentation on the both spring is carried out with loading of 20000N.Fig.4.1 shows the experimental setup for carried out the compression loading on the UTM machine. The helical spring under test as shown in figure. A gradually increasing axial loading is given to spring and it is simultaneously recorded by the monitor of UTM (shown in fig.). The results are noted for peak points for existing spring and plotted the graph between Load Vs Displacement for conventional materials spring and composite materials spring respective.

The objective of this research is to find the feasibility of replacing metal coil springs with the composite coil springs. Glass fibers composite springs is manufactured to study the use of composite materials. In order to improve relative reliability of the experimental results three sets of springs were fabricated in each type and tests were conducted on these springs. The average values of these test results were taken for analysis. The average values of the load and deflection rates of the deflection curves of the three types of springs are shown in Fig.4.2. The spring rates are calculated from the load deflection curves and are shown in Fig 4.3. As observed from the results the spring rates of the glass fibre springs is 27% more than the conventional spring. This is due to the more strength of the glass fiber compared to conventional spring. The failure loads and maximum compression of the two types of springs is carried out on the UTM. Again the failure load of the glass fiber spring is more than the conventional spring. The maximum compression of the glass fiber spring is more than the conventional material types of springs due to its high strength. The weight of the glass fiber spring is 18% less than glass conventional material types of springs. It is evident from the above results the spring rate, failure load, maximum compression of the spring depends upon the material characteristics. Since the properties of glass fibers are high specific tensile strength, high modulus, low density, low coefficient of thermal expansion, heat resistant, chemical stability, and self lubricity the springs made from these fibers exhibit better properties.

Fig.4.1.a.Experimental Setup for Testing on the spring

Table: 4.1Summaries of Experimental Data on the Conventional & Composite Spring

Sr.No.	Deflection (mm)	Loads in Newton	
		CS	GF
1	3	10.20	12.70
2	6	15.20	28.90
3	9	35.20	45.20
4	12	55.20	62.33
5	15	60.20	78.50
6	18	75.20	94.20
7	21	85.20	110.87
8	24	92.32	125.30
9	27	112.20	142.36
10	30	132.20	158.3
11	33	145.23	175.20
12	36	160.25	192.36
13	39	172.10	208.20
14	42	180.30	223.32
15	45	201.23	240.12

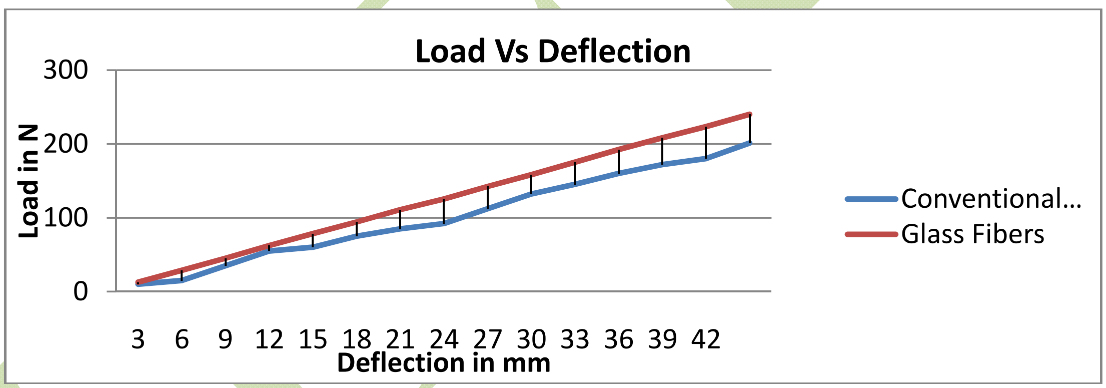

Fig.4.1b Variation of Load versus Deflection.

4.2. MAXIMUM FAILURE LOAD OF SPRING

The failure of spring is tested with gradually increasing loading on it. The failure load for both springs is tested on the UTM machine as shown in figure above. The following results were obtained with conventional type and composite type of spring.

Table: 4.2.Summeries of Maximum Failure Load

Conventional Materials Spring	Glass Fiber Spring
640.283 N	850.50 N

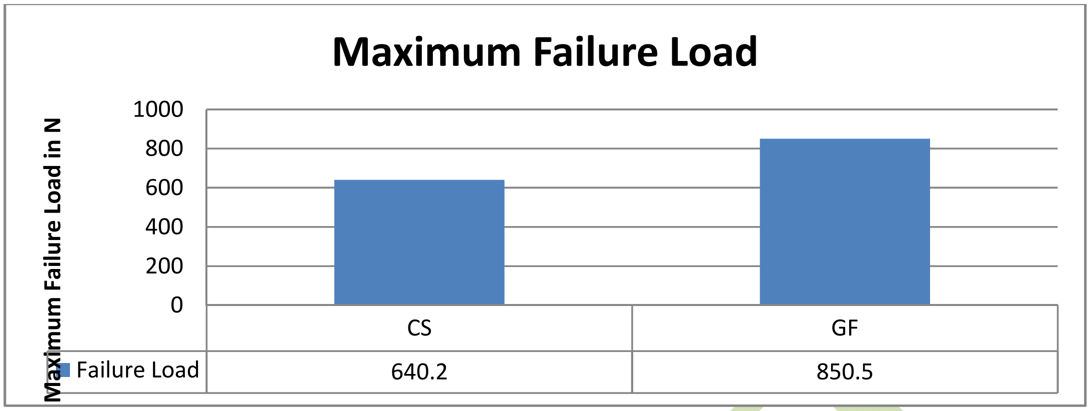

Fig.4.2 Maximum Failure Load

4.3. MODELLING AND ANALYSIS OF COMPUTATIONAL RESULTS

- CATIA R-16 (V-5)

The modeling for exists and optimize design is carried out in CATIA R-17 Software. The CATIA (Computer Aided Three-dimensional Interactive Application) is cornerstone for product lifecycle management. Commonly referred to as 3D Product Lifecycle Management software suite, CATIA supports multiple stages of product development, from conceptualization, design (CAD), manufacturing (CAM), and engineering (CAE). CATIA facilitates collaborative engineering across disciplines, including surfacing & shape design, mechanical engineering, equipment and systems engineering.
CATIA enables the creation of 3D parts, from 3D sketches, sheet metal, composites, and molded, forged or tooling parts up to the definition of mechanical assemblies. It provides tools to complete product definition, including functional tolerances, as well as kinematics definition.CATIA facilitates the design of electronic, electrical as well as distributed systems such as fluid and HVAC systems, all the way to the production of documentation for manufacturing.

4.4. APPROACHES FOR MODELLING

- Modeling of Blade

The helical spring is model with the mean diameter of 100 mm and wire diameter of 15mm.The numbers of turns for spring is 07 with free length of 111mm.The spring is modeled using the CATIA software.

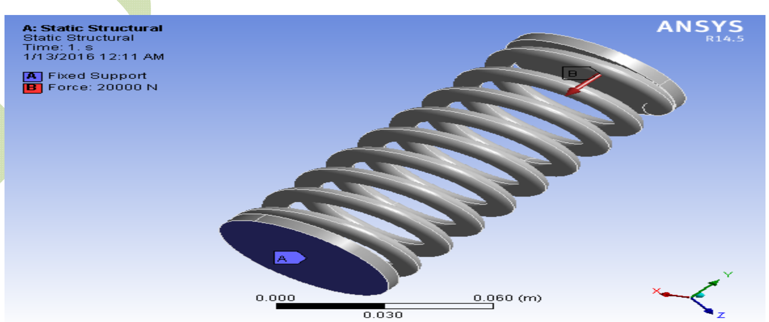

Fig.4.3 Axial Loading on Helical Spring

FINITE ELEMENT ANALYSIS OF SPRING DESIGN

Finite element analysis (FEA) has become commonplace in recent years, and is now the basis of a multibillion dollar per year industry. Numerical solutions to even very complicated stress problems can now be obtained routinely using FEA, and the method is so important that even introductory treatments of Mechanics of Materials such as these modules should outline its principal features. In spite of the great power of FEA, the disadvantages of computer solutions must be kept in mind when using this and similar methods.

➢ Defining Material Properties

Material properties are constitutive properties of material such as modulus of elasticity or density, are independent of geometry. These material properties are obtained from experimental testing. Depending upon application, properties may be linear, non-linear, isotropic, anisotropic, etc. For this analysis the material properties are isotropic. The values of Young’s modulus, density, Poisson’s ratio are given as follows.

Table 4.3: Summaries of Spring Material Properties of E-Glass Fiber.

Parameter	Value
Density	1.85e9kg/m3
Young’s modulus	3.33 e5GPa
Poisson’s ratio	0.09
Tensile strength	217 – 520 Mpa
Compressive strength	276– 460 MPa

➢ Generating the Mesh

The process for generating a mesh of nodes and elements consists of three general steps:

- **a.** Set the element attributes.
- **b.** Set meshes controls (optional). ANSYS offers a large number of mesh controls from which can choose as needs dictate.
- **c.** Meshing the model.

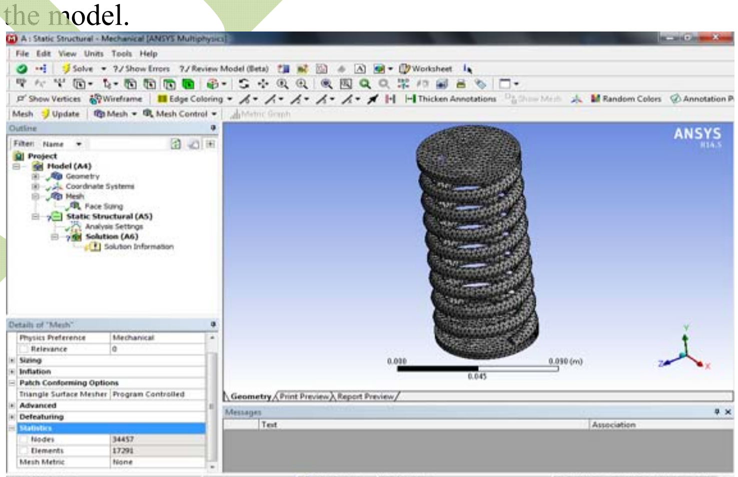

Fig.4.4 Meshing Model of Helical Spring

NOVATEUR PUBLICATIONS
INTERNATIONAL JOURNAL OF INNOVATIONS IN ENGINEERING RESEARCH AND TECHNOLOGY [IJIERT]
ISSN: 2394-3696
VOLUME 3, ISSUE5, MAY-2016

Mesh the model by Mesh Control "AutoGEMControl1" which selects the tetrahedrons element of Maximum Element Size type. The analysis model contains 1560 tetrahedrons elements and 780 nodes.

4.7.2.Load Steps.

- **a.** Loading and Boundary conditions (Loads / Constraints)
- **b.** Fixed Support
- **c.** To apply the boundary conditions we will fix the one end of the blade. i.e. Fix Supports are applied on the one side of blade, and applying uniform loading on it.

4.8. Analysis (Solutions)

In this step we have calculated the solution. In this step the parameter like max, min principle Stress/ Strain, Shear stress, Deformation will be checked.

a. Static Structural Analysis of Existing Spring

Structural analysis is probably the most common application of the finite element method. The term structural (or structure) implies not only civil engineering structures such as bridges and buildings, but also naval, aeronautical, and mechanical structures such as ship hulls, aircraft bodies, and machine housings, as well as mechanical components such as pistons, machine parts, and tools. Static Analysis used to determine displacements, stresses, etc. under static loading conditions. Both Linear and nonlinear static analyses. Nonlinearities can include plasticity, stress stiffening, large deflection, large strain, hyper elasticity, contact surfaces and creep.

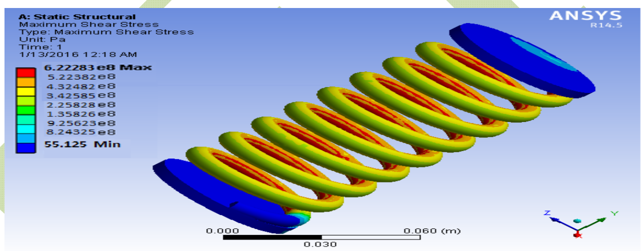

Fig.4.5a.Static Structural Analysis of Spring

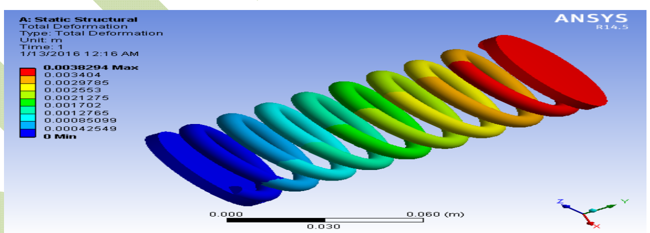

Fig.4.5b.Total Deformation of helical Spring

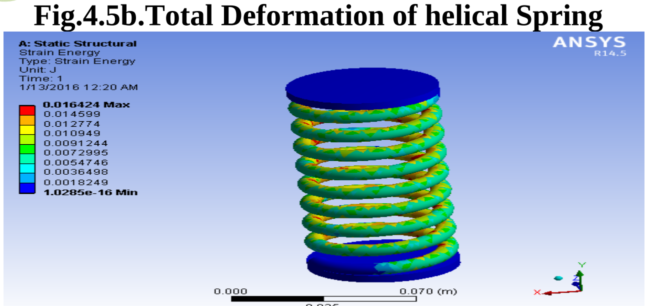

Fig.4.6 Strain Energy for Conventional Material Spring

Table.4.1: Results of Existing Spring

Parameters	Value
Maximum Shear Stress	6.22e8 Mpa
Maximum Displacement	0.0038294 m
Stress Intensity	0.016424 m/m

b. Static Structural Analysis of Composite Material Spring

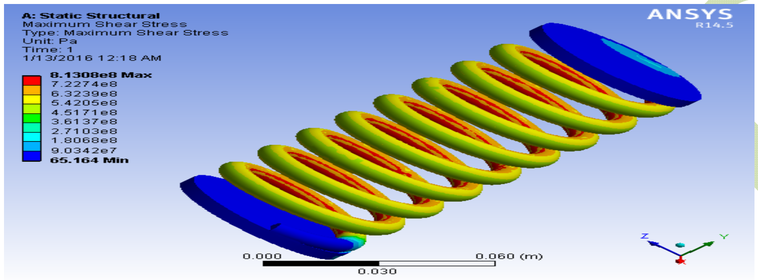

Fig.4.7 Static Structural Analysis of Composite Spring.

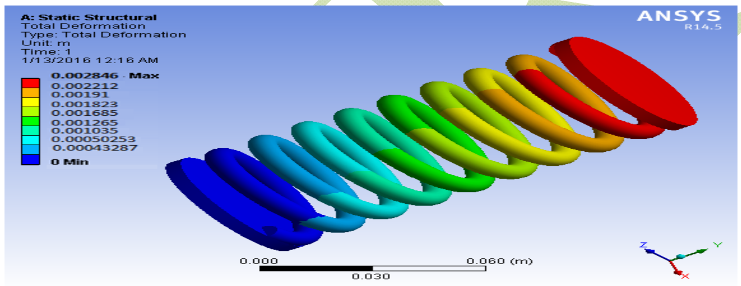

Fig.4.8 Maximum Deformation Analysis of Composite Spring.

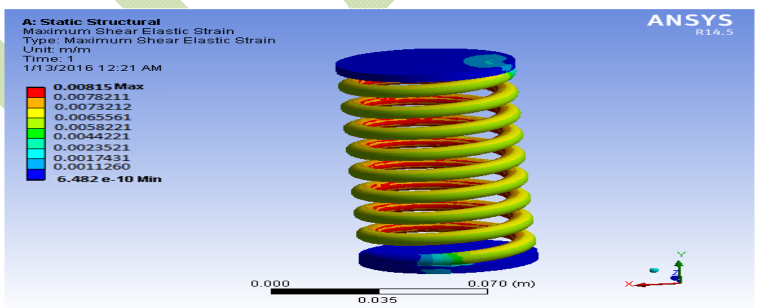

Fig.4.9 Maximum Shear Elastic Strain of Composite Spring.

RESULTS

Table.4.2: Results of Composite Spring

Parameters	Value
Maximum Shear Stress	8.1306 e 8Mpa
Maximum Displacement	0.002846 m
Stress Intensity	0.00815 m/m

c. Comparative Results Analysis of Computational and Experimental Results

Parameter	Conventional Materials Spring	Composite Fiber Spring	Conventional Materials Spring	Composite Fiber Spring
	Experimental Results		Computational Results	
Maximum Failure Load	640.283N	850.50N	622.28 N	813.06 N
Maximum Displacement	0.004425 m	0.003256m	0.0038294 m	0.002846 m

The experimental results and the computational results shows nearly equal values for maximum failure and maximum diasplacemet.In experimental analysis the gradually increasing load is applied to the helical spring, also the deflection is noted after the interval of 3mm.The maximum values for deflection of the composite and conventional material spring is found to be 0.003256 mm and 0.004425 m respectively. The experimental and computational results show the good matching and useful for validating results.

CONCLUSION

A helical Compression steel spring has been replaced by composite helical springs. Numerical results have been compared with theoretical results and found to be in good agreement. Compared to steel spring, the composite helical spring has been found to have lesser stress and has the most value when fiber position has been considered to be in direction of loading. Weight of spring has been reduced and has been shown that changing percentage of fiber, especially at Carbon/Epoxy composite, does not affect spring weight. Longitudinal displacement in composite helical spring is more than that of steel helical spring and has the least value when fiber position has been considered to be in direction of loading. The springs developed from the glass fiber are 25% more in strength more than the steel springs and the cost of the glass fiber springs is 200%more than the steel springs. The selection of the glass fiber springs depends upon the cost and application of the spring which can be compensated by saving the fuel from weight reduction. As compared to steel springs of the same dimensions, the stiffness of composite coil springs is less. In order to increase the stiffness of the spring the dimensions of the composite spring is to be increased which in turn increases the weight of the spring. Hence the application of the composite coil springs can be limited to light vehicles, which requires less spring stiffness, e.g. electric vehicles and hybrid vehicles.

REFERENCES

[1]Design of machine &element (DME)Book. Dakhore M. &BhushanBissa et.al. "*Failure analysis of helical suspension spring Using F.E.A.", International journal Mgnt& research, ISSN – 2320-0073, June 2013.*

[2] Md. Mustak& m. Madhavi et.al. "*Development of high strength helical coiled spring Using carbon pre-peg epoxy based composite", Indian journal science 2005, ISSN- 2250-0138, 2013.*

[3] Aamir A. Waghade, Gaurav V. Bansodet. al. "*Experimental & harmonic Analysis of helical suspension spring", Discovery May 2014.*

[4] Mehdi Bakhsheshet. al. "*Optimization of Steel Helical Spring by Composite Spring", International journal of multidisciplinary Science and Engineering, ISSN- 2045-7057, June 2012.*

[5] Achyut P. Banginwaret. al. "*Design and analysis of shock absorber using FEA tool", International Journal of Engineering Research and Development,ISSN-2278-067X, February 2014.*

[6] P.S.Valsange,*Design of Helical Coil Compression Spring" A Review, International Journal of Engineering Research and Applications, ISSN: 2248-9622.*

[7] Vladimir Kobelev, *Shape Optimization for Helical Compression Springs, Technology Center, Mubea,Spring Journal-15, ISSN: 2150-9652.*

[8] Tausif M. Mulla, *finite element analysis of helical coil compression spring for three wheeler. automotive front suspension, International Journal of Mechanical and Industrial Engineering (IJMIE) ISSN No. 2231 –6477, Vol-2, Iss-3, 2012.*

AUTHORS:

Mr Ajay TukaramKumbhar
(P.G.Student in Mechanical Engineering, A.M.G.O.I.Vathar,Mob-9975883174
Email Id:ajaykumbhar01@gmail.com)

Prof. E.N. Aitavade
(Department of Mechanical Engineering,A.M.G.O.I.Vathar,Mob-9922848887)

MrSatyajitAnkushPatil
(Student In Mechanical Engineering, Ssdit Red Shirala,Sangali,Mob-9049637372)

MrVijay VishnuKumbhar
(Student In Mechanical Engineering, Ssdit Red Shirala,Sangali,Mob-7709362483)