Modelling and Analysing of Leaf Spring

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Abstract:
Leaf spring is that the potential element for weight reduction so as to attain high fuel potency and better ride attributess.i need to seek out deformation and stress from the materials like steel, titanium, and copper alloy properties of steel are density, elastic modulus, Poisson magnitude relation lastingness, yield strength. and therefore the properties for metal are high strength, stiffness, toughness, denseness etc. Favourable mechanical properties of composite materials like lightweight weight, high strength and smart corrosion resistance encourage researchers to exchange typical steel leaf spring with composite leaf spring. In gift work typical steel leaf spring materials and totally different various materials planned by several researchers ar listed and their effects on performance, responsibleness are studied. Comparative stress, deflection performed on totally different steel and composite spring models by several researchers victimisation CAE tools are studied and results are compared with experimental results. style software package Creo two.0 is employed for 3D modelling of spring associated analysis software package ANSYS is used for FEM analysis of spring as FEM is an correct, economical and fewer time intense technique of study.

Keywords: Spring, Composite material, FEM, ANSYS, Creo 2.0.1.

1. INTRODUCTION:
In order to conserve natural energy resources weight reduction in a cheap manner while not compromising the strength, comfort level and performance of the vehicle has become one amongst the main targets of all automobile industries. Weight reduction additionally offers extra blessings in terms of hyperbolic pay load and increased fuel potency to the finish client. Weight may be reduced by optimizing style, material and producing method of the elements. spring suspension assembly may be a system that not solely damps the road shocks and assure snug ride however additionally acts as a support and absorbs breaking force, driving force and lateral hundreds. Leaf spring Composite materials area unit high strength fibres combined with appropriate matrix material like epoxy as organic compound. Combination of these 2 materials offers favourable mechanical properties such as high strength to weight quantitative relation, higher stiffness, high natural frequency, smart fatigue strength, higher natural frequency and smart resistance to corrosion. Due to the favourable properties of stuff several authors have projected totally different composite materials such as E-glass/Epoxy, E-carbon/Epoxy, Graphite/Epoxy, Glass fibre strengthened plastic (GFRP), Natural fibre strengthened composite (NFRC), Jute fibre strengthened composite (JFRC), Jute/E-Glass/Epoxy, S-glass/Epoxy, Carbon/Epoxy, Boron/Aluminium, Kevlar/Epoxy etc. for the replacement of standard steel leaf spring materials. the target of gift work is to check {different totally different completely different} analysis works that deals with {the stylethe planning the look} and comparative static FEA analysis of composite leaf spring with that of standard steel leaf spring mistreatment different design and analysis software system such as machine CAD, Pro-E, Solid works, CATIA, ANSYS, Unigraphics and Hypermesh etc. and to check concerning totally different various materials for the replacement of standard steel mono or multi spring material. 3D modelling of spring with chosen specification is completed in Creo a pair of.0 and analysis is completed in ANSYS sixteen.

2. RELATED WORK
N.P. Doshi, et al. [1] has projected style modification in existing spring with dynamic load impact thought by implementing analytical and finite component methodology. Stress and deflection analysis has been meted out by exploitation ANSYS eleven.0. they need over that on reducing variety of leaf spring from seventeen to thirteen weights reduced by vi kilo and price reduced by G. Goudha, et al. [2] has developed finite component models to optimize pure mathematics and material of composite elliptical spring by considering spring rate, shear stress and log life as operating style constraints. impact of bulginess magnitude relation on the performance of composite elliptical leaf spring was investigated each through an experiment & numerically M. M. Patunkar, et al. [3] in their work has done modelling and comparative analysis of mono composite leaf spring created of E-Glass/Epoxy composite material with standard 60Si7 steel mono spring underneath static load conditions. Experimental testing of standard steel leaf spring was done by exploitation Hydraulic Static Load take a look at Rig underneath static load conditions. most load throughout take a look at was 25Kg with associate degree load interval of 5Kg started from no load condition. Dial Indicator was used for measure the load and Strain Gauge was used for deflection mensuration. three-D modeling of mono composite leaf spring was done exploitation Pro-E five.0 and analysis was done exploitation ANSYS ten.0 software. [4] in their work has done style and analysis of standard mono spring normal eye finish and casted eye finish. CAD modelling was worn out CATIA and analysis was worn out ANSYS underneath similar

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loading conditions for parameters like deformation, von-mises stress, traditional stress etc. Kumar Krishan, et al. [5] in their work has done style and finite component analysis of standard SUP9 steel multi spring as well as 2 full length leaves in that one is with skew-eyed ends and seven graduated length leaves. Finite component modelling was meted out in CATIA V5 R17 and was foreign in ANSYS11 for finite component analysis.

3. MODELLING

Extrude:
To create this part body go to Creo software and click on file new and select part design module. In part design module then go to sketcher tool and select sketcher tool and select required plane. After sketching for the leaf of we enter into the part module in part module we have to select the extrude tool for adding the material for what we drawn in sketcher moduler for the required thickness as shown in fig

![Figure 1](image1.png)  
**Figure 1. To applying adding the material**

![Figure 2](image2.png)  
**Figure 2. For giving the length of adding material**

Sweep
To create this part body go to Creo software and click on file new and select part design module. In part design module then go to sketcher tool and select sketcher tool and select required plane. We can select the sweep tool in part module for adding the material for irregular path for the leaf so after that we can select the ok option for adding the material as shown in below.

![Figure 3](image3.png)  
**Figure 3. Creating the shape of sweep**

![Figure 4](image4.png)  
**Figure 4. Creating the path of the leaf**

Body move copy:
So we can apply the same body of the material for the opposite direction for the required length as shown in below.

![Figure 5](image5.png)  
**Figure 5. Applying the mirror**

Fillets
For selecting the edges to get the round shapes of the body for the required radius as shown in below.

Mirror:
Mirror is for applying the both sides of same object for required distance of the leaf spring.
4. ANALYSIS

Structural analysis:
Structural analysis permits us to figure out complicated structural engineering troubles and make greater, faster design judgements. It is used throughout the industry to enable engineers to optimize their product designs and reduced the cost of physical testing.
5. CONCLUSION

CAD tool is used for 3d modelling of leaf spring. Leaf spring assembly model was imported from cad to ansys 16.2 by using IGES file format. Static analysis of leaf spring was performed by using different material combination under similar loading condition has been done. Results were obtained by selecting by using environmental conditions by using different material properties. Deformations and stress were obtained by using different material properties the minimum deformations are seen in the structural steel (3.5441 x 10-6 m) and minimum stress were seen structural steel (2.8973 x 106 Pa). By end of this project we conclued that structural steel is having more load bearing capacity when compared to that of other materials.

6. REFERENCES


