Design and Analysis of a Heavy Vehicle Leaf Spring for the Material Glasses Carbon Composite

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Abstract- **Decreasing weight while expanding or keeping up quality of items is getting the chance to be very imperative research issue in this present day world. Composite materials are one of the material families which are pulling in analysts and being arrangements of such issue. In this paper we depict outline and investigation of composite leaf spring. The goal is to think about the stresses and weight sparing of composite leaf spring with that of steel leaf spring. The plan requirement is firmness. The Vehicle Industry has awesome enthusiasm for supplanting of steel leaf spring with that of composite leaf spring, since the composite materials has high quality to weight proportion, great consumption resistance. The material chose was glass fiber fortified polymer (E-glass/epoxy), carbon epoxy and graphite epoxy is utilized against regular steel. The outline parameters were chosen and dissected with the goal of limiting weight of the composite leaf spring when contrasted with the steel leaf spring. The leaf spring was displayed in catiav5r20 and the investigation was finished utilizing ANSYS 17.02 programming.**

INTRODUCTION

Leaf springs are generally used as a piece of suspension structures to ingest daze stacks in autos like light motor vehicles, overpowering commitment trucks and in rail systems. It passes on flat weights, brake torque, driving torque despite daze engaging. The favoured stance of leaf spring over helical spring is that the terminations of the spring may be guided along an unmistakable path as it side tracks to go about as a helper part despite essentialness holding device As demonstrated by the examinations made a material with most outrageous quality what's all the more, slightest modulus of adaptability the longitudinal way is the most fitting material for a leaf spring. To address the issue of basic resources protection, auto makers are trying to lessen the weight of vehicles in late years. Weight diminishment can be expert essentially by the introduction of better material, design change and better collecting shapes. The suspension leaf spring is one of the potential things for weight decreasing in autos unsprang weight. This achieves the vehicle with more fuel capability and upgraded riding qualities.

The introduction of composite materials was made it possible to diminish the greatness of leaf spring with no lessening on stack passing on point of confinement and solidness. For weight diminish in vehicles as it prompts the reducing of un-sprung weight of auto. The parts whose weight is not transmitted to the suspension spring are known as the un-sprung segments of the auto. This fuses wheel get together, axles, and part of the largeness of suspension spring and defends. The leaf spring speaks to 10-20% 0f the un-sprung weight. The composite materials made it possible to diminish the weight of machine segment with no decreasing of the pile passing on confine. Because of composite material's high adaptable strain essentialness accumulating utmost and high caliber to-weight extent differentiated and those of steel. FRP springs in like manner have extraordinary fatigue resistance and strength. Regardless, the weight diminishment of the leaf spring is refined by material substitution and in addition by diagram change. Weight diminish has been the crucial centralization of vehicle makers in the current circumstance. The supplanting of steel with in a perfect world arranged composite leaf spring can give 92% weight reducing. Additionally the composite leaf spring has bring down burdens appeared differently in relation to steel spring. All

these will realize fuel saving which will influence countries imperativeness to free since fuel saved is fuel conveyed. The objective of the present work is to setup, separate and propose a technique for make of composite mono-leaf spring .

AIM AND SCOPE OF THE WORK

Vehicle suspension system. This is done to achieve the going with

 This diagram helps in the substitution of common steel leaf springs with composite mono-leaf spring with better ride quality.

 To achieve liberal weight reducing in the suspension structure by supplanting steel leaf spring with mono composite leaf spring.

DEMERITS OF CONVENTIONAL LEAF SPRING

- They have less particular modulus and quality.
- Increased weight.
- Conventional leaf springs are normally fabricated and amassed by utilizing number of leafs made of steel and consequently the weight is more.
- Its erosion resistance is less contrasted with composite materials.
- Steel leaf springs have less damping limit.

MERITS OF COMPOSITE LEAF SPRING

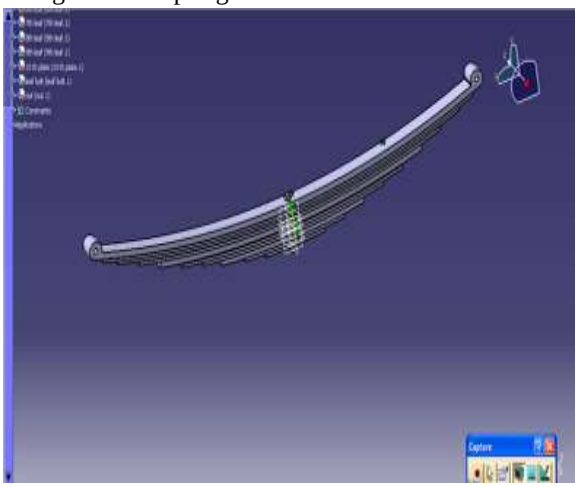
- Due to cover structure and decreased thickness of the mono composite leaf spring, the general weight would be less.
- Due to weight diminishment, fuel utilization would be decreased.
- They have high damping limit; thus create less vibration and commotion.
- They have great consumption resistance.

Introduction to CATIA:

CATIA is an absolutely mechanization programming which relates with the mechanical field. It is graphical UI which is certainly not hard to learn in addition the thing is highlight based and parametric strong showing. We can draw 2D and 3D models of a range and in like way the get-together of the parts should be possible in it.

The shape or geometry of the model or assembling is poor upon the qualities which are suggested as objectives. Modules, for instance, sketcher module used to design 2D illustrations, part layout module is used to diagram the 3D models of geometry, and Assembly work arrangement is used to accumulate the different parts which are pulled in the part plot module. Kinematics is used to give the entertainment or development to the part bodies which are arranged and amassed to some degree and get together layout modules.

Design of leaf spring



INTRODUCTION TO FEA

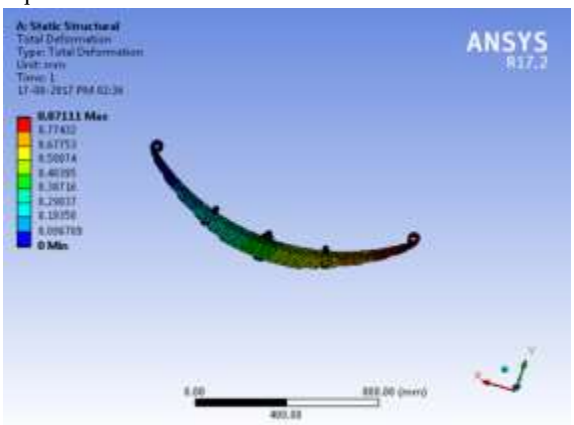
The significant idea in FEA is that the body or structure may be disconnected into more minor fragments of restricted estimations called "Constrained Elements". The main body or the structure is then considered as an assortment of these parts related at a set number of joints called "focus focuses". Clear cutoff points are approximated the clearings over each obliged section. Such recognized points of confinement are called "shape limits". This will suggest the advancement inside the sections like the development at the focuses of the fragments.

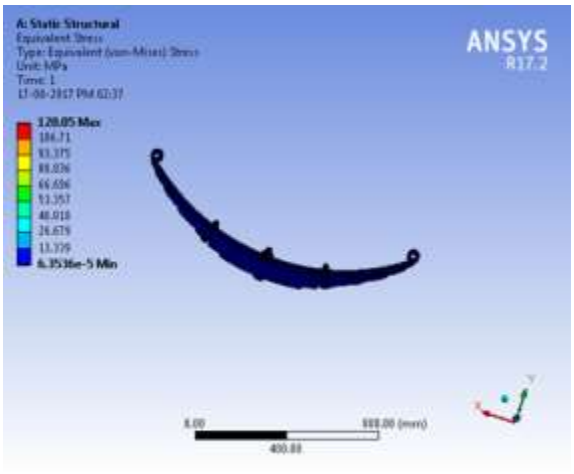
The Finite Element system is a sensible gadget for settling standard and deficient differential relationship in light of the truth it is a numerical gadget, it can manage the capricious issue that can be implied in differential logical announcement from. The usage of FEM is unfathomable as respects the strategy of normal arrangement issues. In light of high cost of taking care of power of years traveled

by, FEM has a foundation set apart by being utilized to manage complex and cost essential inconveniences.

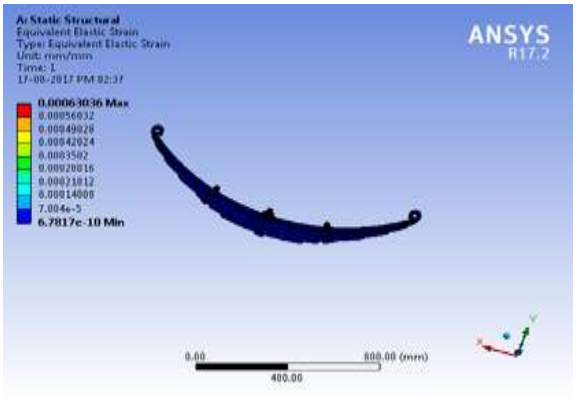
RESULTES AND DISCUSSION

Analysis of leaf spring
Graphite epoxy
Total deformation
Equivalent Stress



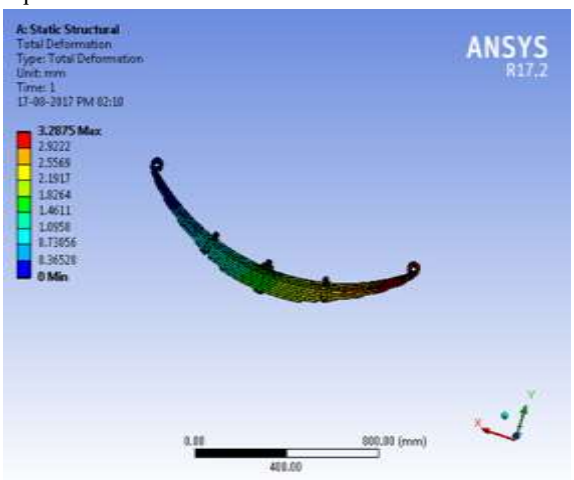


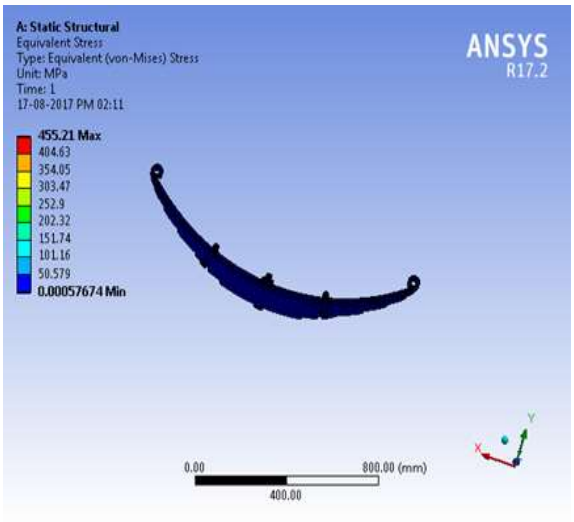
Equivalent Strain



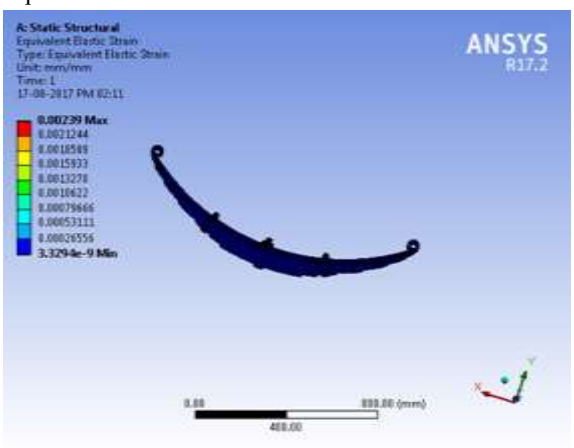
e-glass epoxy

Total deformation
equivalent stress

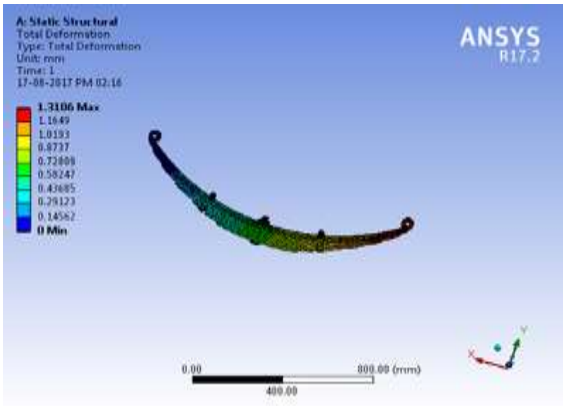


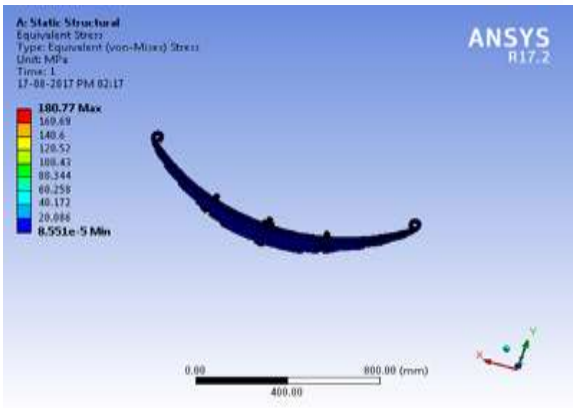


Equivalent Strain

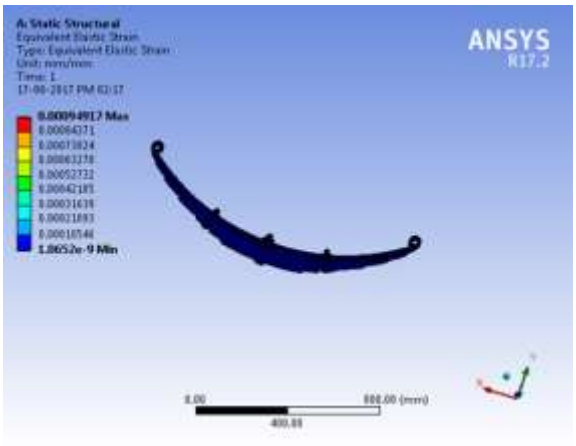


Carbon epoxy
Total deformation
equivalent stress





Strain



	Total deformation(mm)	equivalent stress MPa	Equivalent elastic strain (mm/mm)
Graphite epoxy	0.87111	1.20 e+2	0.00063036
e-glass epoxy	3.2875	4.55e+2	0.00239
Carbon epoxy	1.0136	1.80e+2	0.00094917

CONCLUSION

Our project we have composed leaf spring utilizing cad programming to be specific catia v5 and investigation is finished utilizing ansys 17.02 and the warm and static examination id drawn under required limit conditions. We have watched that graphite epoxy indicates great outcomes when contrasted with other material. In static examination lie graphite epoxy demonstrates bring down misshapening and less influenced to anxiety factors when thought about various materials by this undertaking we need to presume that by utilizing graphite epoxy set up of different materials indicates great physical endurable properties. We even infer that steel is additionally nearly great material.

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