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“ANALYSIS OF LEAF SPRING USING COMPOSITE MATERIAL IN SANDWICH PARTTEN: A REVIEW ”

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ABSTRACT

A leaf spring is a simple form of spring, normally used for the suspension in wheeled cars. Leaf springs are long and narrow plates attached to the body of a trailer that rest above or under the trailer's axle. For safe and cozy using, to prevent the street shocks from being transmitted to the car components and to guard the occupants from road shocks it's miles important to determine the maximum safe strain and deflection. The objective is to find the stresses and deformation in the leaf spring via making use of static load on it. One-of-a kind materials with special mechanical properties are taken into consideration for the structural static evaluation. Consequently within the gift paintings, leaf spring is designed by means of considering static load on automobile. The leaf spring is modelled using CATIA V5 for the three materials, steel (SUP9), Glass epoxy and Carbon epoxy which are of great interest to the transportation industry.

Keyword: Leaf spring, Materials, Finite Element Analysis (FEA), Epoxy, ANSYS, CATIA

I. INTRODUCTION

The chassis of an automobile includes the tires and the wheels that let the automobile move on the surface by maintaining the right amount of friction to keep it on that surface. The frame also holds together the vehicle structure white supporting the engine and body loads. This chassis is mounted over a suspension system, which also works as a load support for the automobile. The most common type of suspension system available for commercial vehicles is the leaf spring suspension. Leaf springs are beams of high deflection that can be used individually as a single leaf, or in stacked assemblies of up to twenty leaves, as multi-leaf depending on the type of the vehicle to be used on.

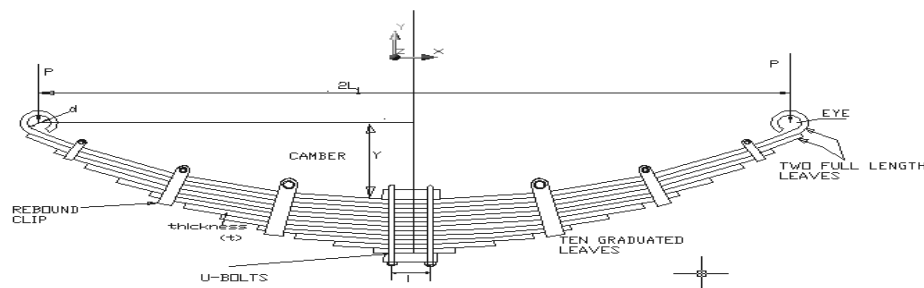


Fig.1.1: Semi elliptic leaf springs

Leaf springs function by absorbing the normal forces and vibration impacts due to road irregularities by means of the leaf deflection, stored in the form of strain energy for a short period, and then dissipated.

Terms Involved:

1. **Span:** Horizontal Distance between the Eyes of spring.
2. **Main Leaf:** The Long leaf fastened to the supports is called main leaf or master leaf.
3. **Eye:** Main leaf ends are bent to form the Eyes.
4. **Camber:** Distance b/w horizontal axis joining 2 eyes and main leaf.
5. **Auxiliary Leaves:** Other leaves below main spring are called Graduated leaves.

II. LITERATURE RIEW

The chapter here shows the review of previous journals based on study and analysis of leaf spring. The study in this chapter is subdivided into number of categories on the basic of work done in past.

V.K. Aher et. al.[1] The purpose of this paper is to predict the fatigue life of steel leaf spring along with analytical stress and deflection calculations. This present work describes static and fatigue analysis of a steel leaf spring of a light commercial vehicle (LCV).The non-linear static analysis of 2D model of the leaf spring is performed using NASTRAN solver and compared with analytical results. The pre-processing of the model is done by using HYPERMESH software. The stiffness of the leaf spring is studied by plotting load versus deflection curve for various load applications. The simulation results are compared with analytical results. The fatigue life of the leaf spring is predicted using MSC Fatigue software.

Shishay Amare Gebremeskel et.a l[2] material plays very important role in every manufacturing process. The paper also describes and solves the major issues of vehicles weight through use of composite material E-Glass/Epoxy composite shown in Fig. 1. Their work focuses on constant cross section design, weight reduction, and design. The result shows that shear stress in much less than the shear strength ($\tau = 3\text{mpa}$) and the design is safe even for flexural failure. They focus on their work for design of leaf spring used in three wheelers.

Anand Kumar et.al [3] the very first issue in every automobiles is weight reduction with maintenance of strength. The paper here comprises of use of 55SI2MN90 for steel leaf and Glass-fiber 7781 for composite leaf spring as a material. The work comprises of hand layup method and mathematical calculation the paper also discusses about the fabrication of leaf spring and for this a wooden made pattern is used. The pattern is created according to design dimensions. The mono composite made up of hand layup method.

Anil kumar et.al [4] the paper comprises of work done on the conventional steel leaf spring with variable composite materials like Graphite, Carbon, and E-Glass/Epoxy etc .The different effects occurs on the working condition of leaf spring is analyze here with the help of mathematics and Ansys software. The experiment is performed with the help of 10 leaf springs, 2 full length and 8 in graduated. Stress based analysis and modal analysis is performed with the help of ANSYS software shown in the figure given below. The results concluded that the static analysis of steel leaf spring displacement is 92.59mm which is below the chamber length of leaf spring and stiffness noted as 35.60mm.

III. OBJECTIVES

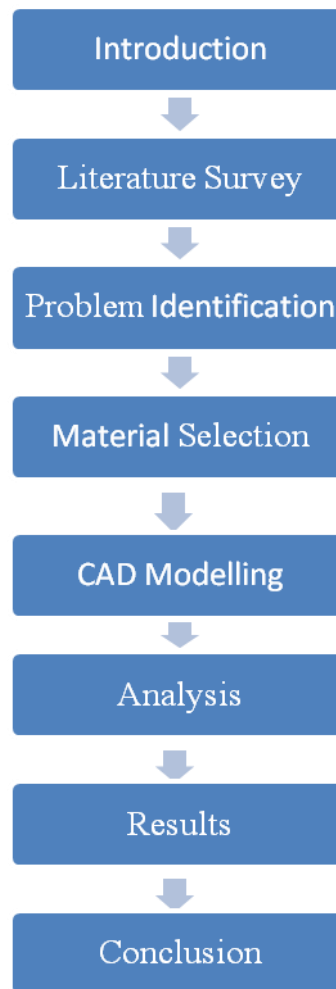
The objectives of the work are:

- a) To design and analyse leaf spring with composite material.
- b) To model a composite leaf spring with specific dimensions using Catia.
- c) To provide optional material for leaf spring as the usage of composite materials has resulted in considerable amount of weight saving in the range.
- d) To design and analyse a composite leaf spring with different material for an automobile like conventional steel and new carbon Epoxy,Glass epoxy.
- e) To compare the results of conventional steel spring and new carbon epoxy,Glass epoxy.

IV. PROBLEM STATEMENT

Due to its large volume production, it is only logical that optimization of the leaf spring for its weight or volume will result in large-scale savings. It can also achieve the objective of reducing the weight of the vehicle component, thus reducing inertia loads, reducing vehicle weight and improving vehicle performance and fuel economy. So considering automobile development and importance of relative aspect such as fuel consumption, weight, riding quality, and handling, hence development of new material is necessary in the automobile industry.

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V. RESEARCH METHODOLOGY**VI. CONCLUSION**

As a lot of work has been done in designing of leaf springs which is discussed briefly in this text, on the basis of this study, problems in overall weight reduction by using composite materials are identified. Many of the authors suggested various methods of designing, manufacturing and analyses of composite leaf springs. After studying all the available literature it is found that weight reduction can be easily achieved by using composite materials instead of conventional steel, but there occurs a problem during the operation while using the composite leaf spring i.e. chip formation when the vehicle goes off road. Therefore there is an immense scope for the future work regarding use of composite materials in leaf springs to reduce the overall weight of the vehicle as well as the cost of the vehicle. The hybrid leaf spring (Steel leaf and composite material leaf in sandwich pattern) considerably low cost as compared to composite materials.

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