



DESIGN AND ANALYSIS OF SUSPENSION SYSTEM

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ABSTRACT

The suspension framework is used to watch the vibrations from stun loads in light of anomalies of the street surface. It is playing out its ability without disabling the security, controlling (or) general treatment of the vehicle. Loop springs are utilized as a part of suspension framework in real piece of lighter vehicles. A spring is an adaptable thing used to store mechanical vitality and it can be wind, pulled (or) reached out by some drive and can return to their unique shape when the constrain is released. The present work attempts to look at the sheltered heap of the light vehicle suspension spring with different materials. This work fuses demonstrating and investigation of fundamental suspension spring made of low carbon-basic steel and chromes vanadium steel and proposed the reasonableness for perfect arrangement. Comes about demonstrate that decrease in general anxiety and avoidance of spring for a picked material.

Correlation is made for two materials to confirm best material for spring in Shock safeguard. Different parts in the suspension framework are outlined exclusively partially plan workbench and are collected utilizing item plan workbench. CATIA is the strong demonstrating programming utilized for outlining the safeguard loop spring keeping in mind planning the time spent for drawing furthermore hazard required for outlining and assembling can be effortlessly decreased. Later the Analysis is done in ANSYS by bringing in the planned model shape the CATIA.

The ANSYS writing computer programs is used for examination reason by differing the heap and results are thought about. The motivation stun and dissemination of dynamic vitality is taken care of by safeguard which is a piece of suspension framework. It builds the ride quality and solace by diminishing the abundancy of unsettling influences. So the spring in suspension framework outlining gets to be distinctly essential. Nature of item is mostly affected by modern movement outline.

I. INTRODUCTION

Suspension is the plan of tires, safeguards, tire air, springs, and linkages that interfaces a vehicle to its wheels relative development between the two. Suspension framework serve a twofold need - adding to the vehicle's street holding/dealing with and braking for good element security and driving delight, and keeping vehicle inhabitants tenants and a ride quality sensibly all around disconnected from street clamor, vibrations, knocks, et cetera. These destinations are generally at possibilities, so the tuning of suspensions incorporates finding the correct trade off.



Fig.1 Suspension System

Keeping the street wheel in contact with the street surface is basic for suspension however much as could be ordinary, in light of the way that all the street or ground powers getting up to speed with the vehicle do things being what they are through the contact patches of the tires. The suspension moreover guarantees the vehicle itself and any heap or baggage from damage and wear. The setup of front and back suspension of an auto may be unmistakable. A loop spring is used as a part of the suspension structure which is presented in the bicycle vehicles.

A loop spring, generally called a helical spring, is a mechanical device which is frequently used to store vitality and in like manner release it, to ingest stun, or to keep up a power between reaching surfaces. They are made of an adaptable material shaped into the condition of a helix which returns to its characteristic length when load is not connected.

The material (wire) of a curl spring experiences torsion under pressure or strain. The qualities of the spring basically rely on upon shear modulus however not on youthful's modulus.

A curl spring can be utilized as a torsion spring for this situation the spring in general is subjected to torsion about its helical pivot. The material of the spring is along these lines subjected to a twisting minute, either diminishing or expanding the helical span. In this mode, it is the Young's Modulus of the material that decides the spring attributes. By winding a wire around a formed past metal curl springs are made essentially like round and hollow loop springs are made by using chamber.

Safeguard sorts

There are different methods for changing over an effect/crash into generally smoothed padded contact.

- Metal Spring
- Collapsing wellbeing Shock Absorbers
- Pneumatic Cylinders
- Hydraulic Dashpot
- Rubber Buffer
- Self remunerating Hydraulic

II. APPLICATIONS

Safeguards are a fundamental piece of vehicles and bike suspensions, air create landing rigging, and backings for mechanical machines. Expansive safeguards have furthermore been used as a piece of structure outlining to diminish the powerlessness of structures to seismic tremor mischief and reverberation. A transverse mounted safeguard, called a yaw damper, keeps railcars from impacting nonsensically from side to side and is fundamental in traveler railroads, suburbanite rail and fast transmit frameworks since they keep railcars from harming station stages. The accomplishment of aloof damping advancements in covering vibration amplitudes could be scholarly with the way that it has a business part size of around \$ 4.5 billion

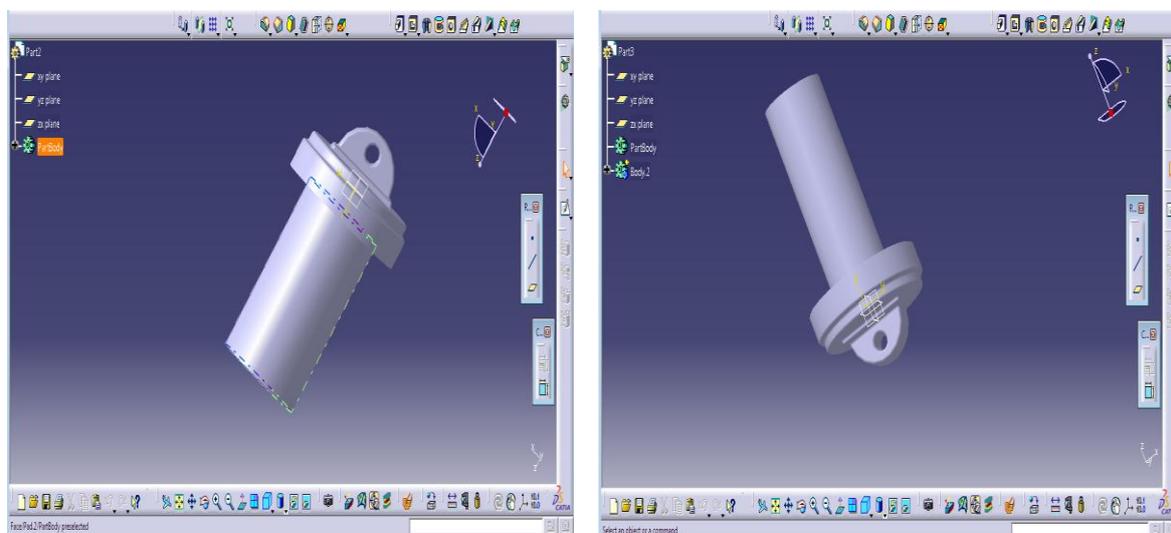
III. PROLOGUE TO CAD

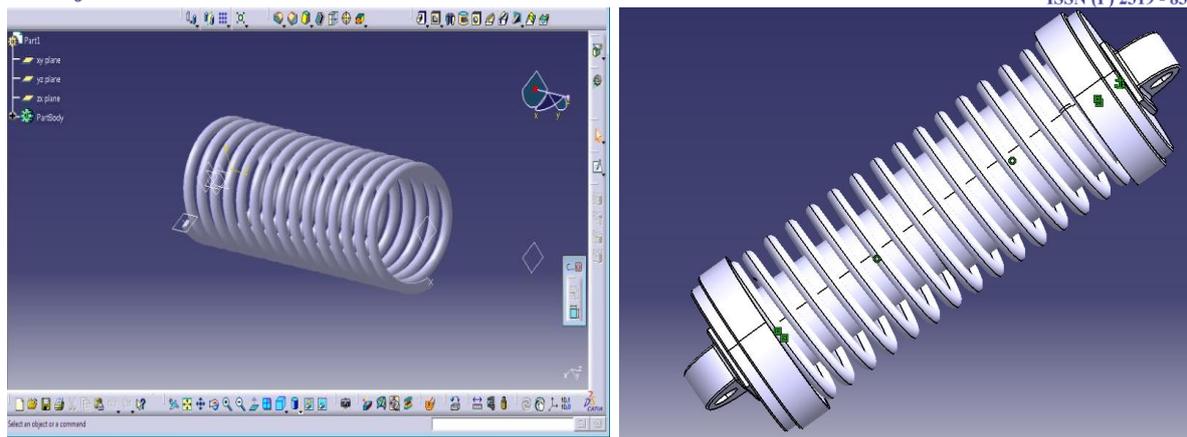
French association Dassault Systems made multi-arrange CAD/CAM/CAE business programming CATIA (Computer Aided Three-dimensional Interactive Application). This is created in the C++ programming dialect; CATIA is the essential aftereffect of the Dassault Systems thing lifecycle organization programming suite. In 1977 a French air create creator Avions Marcel Dassault, started CATIA as an in-house progression around then customer of the CADAM CAD programming to develop Dassault's Mirage contender plane, then was grasped in the shipbuilding, auto, flight and distinctive business wanders.

Modules like 3D representations, sheet metal work seat, manufactured or tooling parts for making of 3D sections like gatherings and formed are accessible in CATIA. The apparatuses in the CATIA empower practical resiliences, Kinematics definition and item definition. CATIA can be associated with a wide assortment of business ventures, from avionics and barrier, auto, and present day apparatus, to bleeding edge, shipbuilding, customer stock, plant diagram, buyer packaged items, life sciences, building outline and improvement, strategy constrain and petroleum, and organizations.

modelling of shock absorber

3.1 Parts of Safeguard





Assembled view of Suspension System

IV. MATERIALS OF SUSPENSION SYSTEM

Steel alloys are the generally utilized spring materials. The most popular alloys incorporate high-carbon, (for example, the music wire utilized for guitar strings), oil-tempered low-carbon, chrome silicon, chrome vanadium, and stainless steel.

Phosphor Bronze, Beryllium copper compound and titanium are different materials which are used to make springs. For cylindrical and non-coil springs Rubber or urethane are used. For coiled springs in very high temperature environments ceramic materials are used. Now for making of spring, one directional glass fibre composite materials have been tested.

4.1 Material Properties

Material Name / Properties	Chromium Vanadium	Low Carbon Steel
Young's Modulus (E)	210Gpa	198Gpa
Poisson's Ratio (μ)	0.27	0.37
Density(ρ)	7.86g/cc3	7.76g/cc3

V. FINITE ELEMENT ANALSYS (FEA)

FEA is the effective usage of the Finite Element Method (FEM), which is used by architects, and scientists to scientifically model and numerically understand extremely complex structural, liquid, and multi phase issues.

The FEA programming is used in wide range of businesses yet is most generally utilized as a part of the aeronautical, biomechanical and locomotive industries. An arrangement of points in finite element (FE) called "hubs" which make the state of the outline. The finite element mesh is formed by joining the hubs by finite elements themselves and contains the material and basic properties of the model, characterizing response of it in specific conditions. The finite element mesh may vary for different materials depend on the foreseen change in stress levels of a specific part.

Areas that experience high changes in stress for the majority part require a higher mesh density than those that

experience little or no stress variation. Purpose of interest might incorporate crack purpose for before tried material, corners, filets, complex purpose of intersect, and high-stress regions.

VI. STRUCTURAL ANALYSIS OF SUSPENSION SYSTEM WITH DIFFERENT MATERIALS

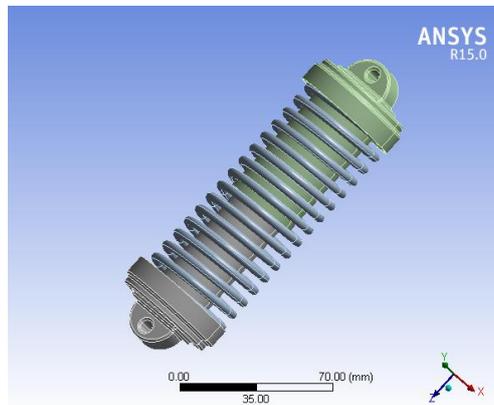


Fig. Suspension System

Meshed Model

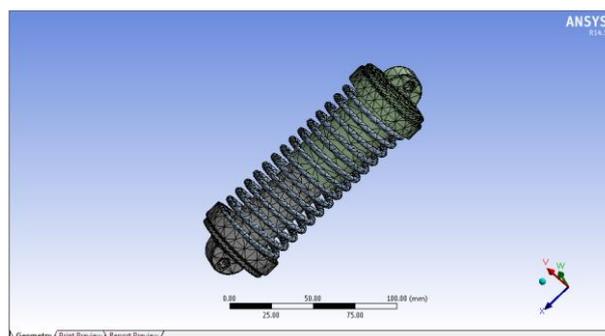


Fig. Meshed model of Suspension system

6.1 Material Type

Chromium Vanadium

Total Deformation

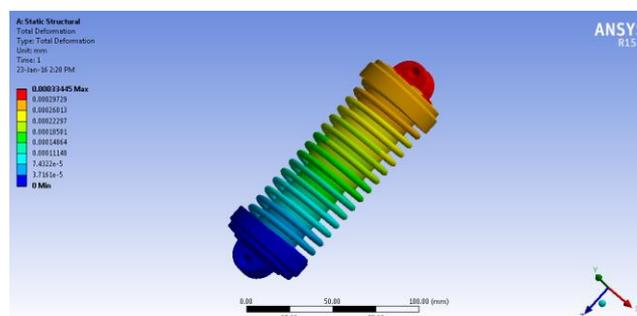


Fig. Total Deformation observed in Suspension system made of Chrome Vanadium

**VII. RESULT AND DISCUSSION****Values observed during structural analysis of Suspension System**

MATERIAL NAME	TOTAL DEFORMATION	EQUIVALENT STRESS	EQUIVALENT STRAIN
CHROME VANADIUM	0.000334	1.6497	9.70e-6
LOW CARBON STEEL	0.0003467	1.4437	8.89e-6

Table.1

VIII. CONCLUSION

As we observed from ansys the stress value for low carbon structural steel is 1.447 and deformation is 0.0003456 The stress value for chromium vanadium material for suspension system is 1.4657 and deformation value is 0.00034557 By comparing the above result the deformation of the structural steel is less then the chromium vanadium so structural steel is better then the chromium vanadium

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