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A Review on Finite Element Analysis of Leaf Spring for Composite Material

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Abstract:- Suspension framework is a standout amongst the most critical frameworks of a car, which convey the aggregate load (weight) of the vehicle. There are different kinds of suspension framework utilized Leaf spring is one of the important parts which is for the most heavy vehicle and SUV because of its high load limit. The principle point of leaf spring is to retain the stun, increment the security solace to the travelers and shield the vehicle from wear and harm.

For candidate perspective it is essential that the heaviness of the leaf spring must be less and the leaf has a high quality limit under the exhaustion stacking and swaying movement. This should be possible by utilizing distinctive material or composite for lessen the weight and increment the quality.

In this work we take the Leaf spring of IVECO DAILY van. The designing of these leaf spring is done on Solid Works 16.0 and analysis work is done on ANSYS 15.0. The parameters like Deformation, Von-Mises stress was gotten from ANSYS programming which indicates decrease in weight and increment in quality.

***Keywords**:- Leaf Spring, SUV (Sports Utility Vehicle), Solid Works, Fatigue Loading, Von–Mises Stress & Ansys 15.0 .*

I. INTRODUCTION

A spring is a flexible body, whose extend in measure when stack connected and recapture its unique shape when evacuated. Leaf spring is the least complex type of spring utilized as a part of the suspension arrangement of a vehicle. It assimilates motor vibrations, stuns and stacks by springing (bobbing) activity and to some reach out by damping capacities. It ingests vitality as potential vitality and it takes after the Hook's law. Higher the springs limit higher the agreeable rate. Most generally utilized leaf spring type is semi-elliptic in substantial and light car vehicles. The multi leaf spring involves different step. While mono leaf spring has just a single step. Number of steps builds the spring engrossing ability. For overwhelming vehicles multi leaf spring are utilized while for light vehicle mono leaf spring can be utilized. The characterization of leaf spring included as Elliptical, Semi Elliptical, Three quarter Elliptical, Quarter Elliptical, and Transverse. The leaf spring for the most part comprises of various parts like Master leaf, Central clamp, Eye, and Rebound clip.

II. HISTORY

There were a variety of leaf springs, usually employing the word "elliptical". "Elliptical" leaf springs referred to two circular arcs linked at their tips. This was joined to the frame at the top center of the upper arc and the bottom center was joined to the "live" suspension components, such as a solid front axle. Additional suspension components, such as trailing arms, would usually be needed for this design, but not for "semi-elliptical" leaf springs as used in the Hotchkiss drive. That employed the lower arc, hence its name. "Quarter-elliptic" springs often had the thickest part of the stack of leaves stuck into the rear end of the side pieces of a short ladder frame, with the free end attached to the differential, as in the Austin Seven of the 1920s. As an example of non-elliptic leaf springs, the Ford Model T had multiple leaf springs over its differential that was curved in the shape of a yoke. As a substitute for dampers (shock absorbers), some manufacturers laid non-metallic sheets in between the metal leaves, such as wood. Leaf springs were very common on automobiles, right up to the 1970s in Europe and Japan and late '70s in America when the move to front-wheel drive, and more sophisticated suspension designs saw automobile manufacturers use coil springs instead. Today leaf springs are still used in heavy commercial vehicles such as vans and trucks, SUVs, and railway carriages. For heavy vehicles, they have the advantage of spreading the load more widely over the vehicle's chassis, whereas coil springs transfer it to a single point. A further advantage of a leaf spring over a helical spring is that the end of the leaf spring may be guided along a definite path.

A more modern implementation is the parabolic leaf spring. This design is characterized by fewer leaves whose thickness varies from center to ends following a parabolic curve. In this design, inter-leaf friction is unwanted, and therefore there is only contact between the springs at the ends and at the center where the axle is connected. Aside from a weight saving, the main advantage of parabolic springs is their greater flexibility, which translates into vehicle ride quality that approaches that of coil springs. It is widely used on buses for better comfort. A further development by the British GKN company and by Chevrolet with the Corvette amongst others is the move to composite plastic leaf springs.

III. ABOUT ANSYS

ANSYS is the art of forecasting pressure stream, Deformation and Safety.

ANSYS is utilized as a part of all phases of the outline procedure:

Theoretical investigations of new plans –

- Detailed product development
- Troubleshooting
- Redesign

ANSYS investigation supplements testing and experimentation by lessening all out exertion and cost required for experimentation.

Following are a portion of the territories, where ANSYS is being utilized:-

- HVAC
- Automobile
- Food Processing
- Marine
- Aerospace
- Electronics

IV. STATIC STRUCTURE

ANSYS is the art of anticipating pressure stream, Deformation and Safety. A static basic examination decides the relocations, stresses, strains, and powers in structures or segments caused by loads that don't instigate huge inactivity and damping impacts. With the limited component investigation (FEA) instruments accessible in the suite, you can tweak and computerize answers for your basic mechanics issues and parameterize them to examine different plan situations.

Static structure is utilized as a part of all phases of the plan procedure:-

A. Preparatory work before investigation
- It contains demonstrating.

B. Preprocessor demonstrating through the preprocessor
- *Defining*: characterize cell writes, constants, material properties and so forth.
- *Modelling:* Create demonstrate in work page or fabricate specifically with outer programming , at that point input
- *Meshing:* To prescribe the little matrix division
- *Checking:* Check that the model is right before sparing

C. Solving by Solution

- Select the sort of investigation, set examination choice.
- Apply extra load and limitations
- Set stack step choice
- Solving

D. Viewing result by means of General Post process or Time Hist Post Process

V. TYPES OF LEAF SPRING FRAMEWORKS

A. Multi-leaf spring **–** This kind of leaf spring has in excess of 1 leaf in its get together. It comprises of a middle jolt that legitimately adjusts the leaves and clasps to oppose its individual leaves from contorting and moving.

B. Mono leaf spring **–** Consists of one principle leaf where the material's width and thickness are consistent. Illustration the leaf will be 2 ½" wide all through its whole length. The spring rate is lighter than others styles of leaf springs and for the most part requires a gadget to control positive and negative torque stacks and requiring curl springs to hold the undercarriage at ride tallness.

C. Parabolic Single leaf **–** Consists of one primary leaf with a decreased thickness. This style is adequate to control pivot torque and hosing, while keep up ride tallness. The benefit of this style is that the spring is lighter than the multi-leaf.

D. Fiberglass Leaf spring **–** the fiberglass leaf spring is made of blend of plastic strands and gum; it is lighter than every other spring. Be that as it may, the cost is three times more prominent. What's more, fiberglass springs are delicate to warm.

VI. CHARACTERISTICS

A. The leaf spring goes about as a linkage for holding the hub in position and accordingly isolate linkage are a bit much. It makes the development of the suspension basic and solid.

B. As the situating of the hub is done by the leaf springs so it makes it disadvantageous to utilize delicate springs i.e. a spring with low spring consistent.

C. Along these lines, this sort of suspension does not give great riding solace. The between leaf rubbing between the leaf springs influences the riding solace.

D. Quickening and braking torque cause twist up and vibration. Additionally twist up causes backside squat and nose-plunging.

E. The between leaf rubbing damps the spring's movement and diminishes bounce back, which until safeguards were broadly embraced was an awesome favorable position over helical springs.

VII. MANUFACTURING PROCESSES

Leaf springs are made as after:

- Shearing of flat bar
- Center hole punching / Drilling
- End Heating process forming (hot & cold process)

- Eye Forming / Wrapper Forming
- Diamond cutting / end trimming / width cutting / end tapering
- End punching / end grooving / end bending / end forging / eye grinding
- Center hole punching / Drilling / nibbling
- Heat Treatment
- Heating
- Camber forming
- Hardening
- Quenching
- Tempering
- Surface preparation
- Shot peening / stress peening
- Primary painting
- Eye bush preparation process
- Eye reaming / eye boring
- Bush insertion
- Bush reaming

VIII. LITERATURE REVIEW

S. Saelem, S. Chantranuwathana, K. Panichanun, P. Preedanood, P. Wichienprakarn, and P. Kruo-ongarjnukool [1] simulated a leaf springs model. An experimental leaf springs model was verified by using a leaf springs test rig that could measure vertical static deflection of leaf springs under static loading condition. The results showed a nonlinear relationship between the applied load and the leaf springs deflection for both directions of loading.

N. Vijaya Rami Reddy, Dr. K.Sudhakar Reddy , A.Chinna Mahammad Basha , B. RajNaveen[2] simulated a composite leaf spring model. This mainly consist the comparison between the leaf spring made by the composite and Mono Composite Carbon Epoxy. . The results showed that stresses in the composite leaf spring are much lower than that of the steel spring, composite spring can design to strengths and stiffness much closer to steel leaf spring, strength to weight ratio is higher for composite leaf spring than conventional steel spring with similar design.

D V Ramanareddy , B. Subbaratnam, E. Manoj Kumar, Perala kalyan Praneeth[3] compare's the theoretical value and the FEM value of the composite and conventional leaf spring the result outcomes that all the composite leaf springs have better displacement, stresses and weight compared to the conventional steel leaf springs.

Vamsi Krishna Dommeti , Raghavendra Rao[4] use composite reinforced consisting natural fiber with conventional leaf spring in respect to weight, riding quality, cost and strength. The result outcomes that reinforced composite material spring is lighter 72% compared to conventional steel spring, and Stress is reduced 4.15% from steel for similar performance.

*Rajendran, S. Vijayarangan [5]*they had applied artificial genetic algorithms for design optimization of composite leaf spring. Hence it was helped to reduce weight of leaf spring along with good strength and stiffness property. They have taken thickness and width as design variables for design optimization. They have suggested that, for optimization of leaf spring mathematical programming can be good instead of using many conventional and global methods. By using this technique reduction in weight of steel leaf spring was achieved up to 23.4%. For this, they have replaced mono leaf spring by seven leaf springs under identical conditions.

Sachin Patil [6] design and test the 2 stage parabolic leaf spring under the static load in which he tested the existing leaf spring and the parabolic leaf spring. For s constant load the common existing leaf spring the stress exceeds the beyond limit at given load and which is validated by experimentally. New parabolic leaf spring to overcome the existing leaf spring stress limit as per SAE spring design manual. Designing parabolic leaf spring; additional factor of safety is assured and in each section.

Pradosh Chaudhari, Kulbhushan Hatote, Sachin Dhengle, Rahul Bothe, Abhijeet Shirude [7] Compare the V- shape leaf spring to the general purpose leaf spring. The boundary conditions for both the leaf springs are same. The results obtained are The deflection in V-spring is more than the leaf spring at same loading condition with same leaf spring dimension , The bending stress for V-spring at different three loading condition is also more than the leaf spring And The V-spring suspension system is better only for part loading or medium loading condition

Basavaraj Kabanur, Prof.P.S.Patil [8] aims to improve the design of the leaf spring by reducing the frictional stresses between the leafs. It is done by changing the size of the leaf spring i.e. leaf spring with variable radius of curvature and Leaf spring with U shape bend at the center. Both 2 steps are used for reducing the area of contact between the plates of the leaf. The result are Due to reduction in the area of contact between leaves so the frictional stress developed will be minimum , The riding comfort of vehicle was improved due to increase in a strain energy and There is substantial reduction in weight, the modified leaf spring having the less number of leaves

Mr. Sunil S. Pawar, Mr. Nilesh V. Patil, Prof. H. V. Shete [9] Aims Stress Analysis of Leaf Spring by Using Photo Elasticity Technique. The photo elasticity techniques will be used to study stresses and stress distribution in three dimensional models subjected to static loading conditions. However, the calculation of maximum bending stress of leaf spring is three dimensional problems. The accurate evaluation of stress state and distribution of stress is complex task. Thus we have to analyze the stress pattern by using 3D Photo elasticity techniques. So it is decided to find the stresses & deformation in leaf spring by using 3D photo elastic technique. Also, the stresses and stress distribution in spring can be determined with the finite element method. The result tells us the stress and deformation onto the leaf spring.

Vinkel Kumar Arora, Gian Bhushan, M. L. Aggarwal[10] concluded that influence of high contact pressure and temperatures resulted in micro weld between the two leaf surfaces. The fatigue strength of the leaf springs was studied as a function of shot peening parameters.

IX. LEAF SPRING MATERIAL

The material used for leaf springs is usually a plain carbon steel having 0.90 to 1.0% carbon. The leaves are heat treated after the forming process. The heat treatment of spring steel products has greater strength and therefore greater load capacity, greater range of deflection and better fatigue properties.

A. Carbon/Graphite Fibers

Their advantages include high specific strength and modulus, low coefficient of thermal expansion and high fatigue strength. Graphite, when used alone has low impact resistance. Its drawbacks include high cost, low impact resistance and high electrical conductivity.

B. Glass Fibers

The main advantage of Glass fiber over others is its low cost. It has high strength, high chemical resistance and good insulating properties. The disadvantages are low elastic modulus poor adhesion to polymers, low fatigue strength and high density, which increase leaf spring weight and size. Also crack detection becomes difficult.

C. Composite Materials

A composite material is made by combining two or more materials – often ones that have very different properties. The two materials work together to give the composite unique properties. However, within the composite you can easily tell the different materials apart as they do not dissolve or blend into each other.

D. Natural Composites

Natural composites exist in both animals and plants. Wood is a composite – it is made from long cellulose fibers (a polymer) held together by a much weaker substance called lignin. Cellulose is also found in cotton, but without the lignin to bind it together it is much weaker. The two weak substances – lignin and cellulose – together form a much stronger one. The bone in your body is also a composite. It is made from a hard but brittle material called hydroxyapatite (which is mainly calcium phosphate) and a soft and flexible material called collagen (which is a protein).

E. Early Composites

People have been making composites for many thousands of years. One early example is mud bricks. Mud can be dried out into a brick shape to give a building material. It is strong if you try to squash it (it has good compressive strength) but it breaks quite easily if you try to bend it (it has poor tensile strength). Straw seems very strong if you try to stretch it, but you can crumple it up easily. By mixing mud and straw together it is possible to make bricks that are resistant to both squeezing and tearing and make excellent building blocks. Another ancient composite is concrete. Concrete is a mix of aggregate (small stones or gravel), cement and sand. It has good compressive strength (it resists squashing). In more recent times it has been found that adding metal rods or wires to the concrete can increase its tensile (bending) strength. Concrete containing such rods or wires is called reinforced concrete.

X. IDEA OF FATIGUE

In limit sense, the term weakness of materials and auxiliary parts implies harm and harm because of cyclic, over and again connected anxieties. In a wide sense, it incorporates countless that harm and crack under burdens and natural conditions. It is arranged between high-cycle (exemplary) and low-cycle weakness. Plastic distortions are little and limited in the region of the break tip while the primary piece of the body is disfigured flexibly, at that point one has high-cycle exhaustion. On the off chance that the cyclic stacking is joined by plastic disfigurement in the majority of the body, at that point one has low-cycle exhaustion. Generally we say low-cycle weariness if the cycle number up to the start of a noticeable break or until the point when last crack is beneath 104 or 5.104 cycles.

In material science, weakness is the dynamic, confined, and lasting auxiliary harm that happens when a material is subjected to cyclic or fluctuating resist ostensible burdens that have greatest esteems not as much as the static yield quality of the material. The subsequent pressure might be underneath a definitive pliable pressure, or even the yield worry of the material, yet still reason cataclysmic disappointment. A reasonable case of low-cycle weakness would be the bowing of a paperclip. A metal paperclip can be twisted past its yield point without breaking, yet rehashed bowing in a similar area of wire will make material fall flat.

XI. FATIGUE STRENGTH

Exhaustion quality is characterized as the most extreme pressure that can be continued for a predetermined number of cycles without disappointment. Low cycle weariness quality methodologies the static quality. At the point when the cycle number surpasses as far as possible, the weariness quality tumbles to portion of the static quality.

XII. TERMS INVOLVED FOR LEAF DESIGN

A. *Span:* Horizontal Distance between the Eyes of spring.
B. *Main Leaf:* The Long leaf attached to the backings is called primary leaf or ace leaf.
C. *Eye:* Main leaf closes are twisted to frame the Eyes.
D. *Camber:* Distance b/w flat hub joining 2 eyes and fundamental leaf.
E. *Auxiliary Leaves:* Other leaves underneath heart are called Graduated takes off.

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XIII. METHODOLOGY

Fundamentally STRUCTURE examination includes three noteworthy assignments called Pre-Processing, Processing (Solving) and Post Processing.

A. *Pre-Processing:* All the errands that happen before the numerical arrangement are called pre-handling. This incorporates characterizing the issue, making its 3D model, fitting, and applying physical working condition called limit conditions.

B. *Processing:* Processing includes fathoming numerical conditions of strong structure until the point when unacceptable union is accomplished. Generally it requires the PC to explain a large number of conditions and may take couple of hours to few days.

C. *Post-Processing:* When the model has been settled, the outcomes can be broke down both numerically and graphically. Post-handling is about perception either in straightforward 2-D to 3-D portrayals.

XIV. MATERIAL PROPERTY

In the analysis we are using the most used material for the leaf spring some of them are as follows.

- 65Si7/SUP9
- 55SiMn90(Steel)
- Carbon Epoxy
- Steel
- 55Si2Mn90
- Structure Steel 2
- Hi Carbon Steel (SAE1074)
- Low Carbon Steel (SAE1020)
- Inconel(600)

Material Property of 65Si7/SUP9

Mechanical	Symbol	Unit	Values
Young's Modulus	E	GPa	210
Poisson's Ratio	µ	-	.266
Density	ρ	Kg/mm^3	0.00000785
Yield Strength	S_y	MPa	1158

Material Property of 55SiMn90 (Steel)

Mechanical	Symbol	Unit	Values
Young's Modulus	E	GPa	210
Poisson's Ratio	µ	-	.3
Density	ρ	Kg/mm^3	7620
Yield Strength	S_y	MPa	1470

Material Property of CARBON EPOXY

Mechanical	Symbol	Unit	Values
Young's Modulus	E	GPa	70
Poisson's Ratio	µ	-	.3
Density	ρ	Kg/mm^3	1600
Yield Strength	S_y	MPa	1680

Material Property of STEEL

Mechanical	Symbol	Unit	Values
Young's Modulus	E	GPa	270
Poisson's Ratio	µ	-	.3
Density	ρ	Kg/m^3	7600
Yield Strength	S_y	MPa	370

Material Property of 55Si2Mn90

Mechanical	Symbol	Unit	Values
Young's Modulus	E	GPa	210
Poisson's Ratio	µ	-	.3
Density	ρ	Kg/m^3	7850
Yield Strength	S_y	MPa	1470

Material Property of STRUCTURE STEEL 2

Mechanical	Symbol	Unit	Values
Young's Modulus	E	GPa	210
Poisson's Ratio	µ	-	.3
Density	ρ	G/Cm^3	7.85
Yield Strength	S_y	MPa	250

Material Property of HIGH CARBON STEEL (SAE1074)

Mechanical	Symbol	Unit	Values
Young's Modulus	E	GPa	210
Poisson's Ratio	µ	-	.29
Density	ρ	Kg/m^3	7840
Yield Strength	S_y	MPa	505

Material Property of LOW CARBON STEEL (SAE1020)

Mechanical	Symbol	Unit	Values
Young's Modulus	E	GPa	200
Poisson's Ratio	µ	-	.3
Density	ρ	Kg/m^3	7700
Yield Strength	S_y	MPa	205

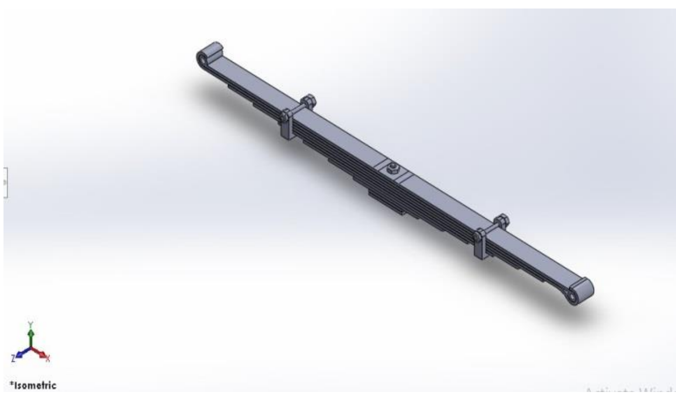
Material Property of INCONEL (600)

Mechanical	Symbol	Unit	Values
Young's Modulus	E	GPa	214
Poisson's Ratio	μ	-	.3
Density	ρ	Kg/m^3	8500
Yield Strength	S_y	MPa	310

XV. ANALYSIS PROCEDURE OF LEAF SPRING

A. Geometry

To start with produce the geometric model of the leaf spring from SOLIDWORKS into ANSYS programming.



B. Characterize Materials

Characterize a library of materials for Analysis. In this Analysis of leaf spring, chose materials are steel, Epoxy glass, Epoxy carbon, Aluminum Alloy, Titanium Alloy. These materials can be chosen from the building information accessible in Ansys programming.

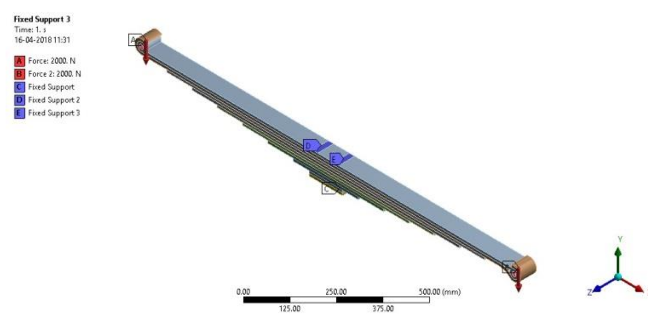
1	Contents of Leaf Spring	Add	Description
2	Material		
3	55si2Mn90		
4	55SiMn90(steel)		
5	65Si7/SUP9		
6	Carbon epoxy		
7	Hi carbon steel(SAE1074)		
8	Inconel(600)		
9	Low carbon steel(SAE1020)		
10	Steel		
11	Structure Steel 2		

C. Generate Mesh

Presently produce the work. This partitions the illustration into limited number of pieces. It will demonstrate the quantity of hubs and components display in the illustration in the wake of cross section is finished.

D. Apply Boundary conditions

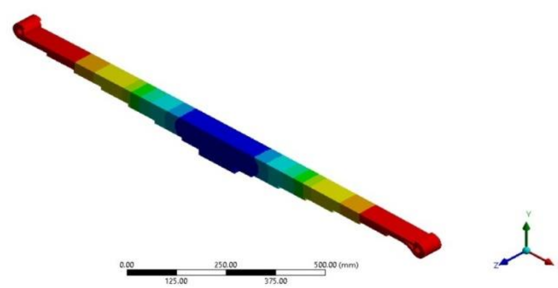
Basically boundary limit conditions are considered for the leaf spring. For this situation both the closures of the leaf spring are given settled help and the heap on the leaf spring is connected at the base leaf in upwards heading.



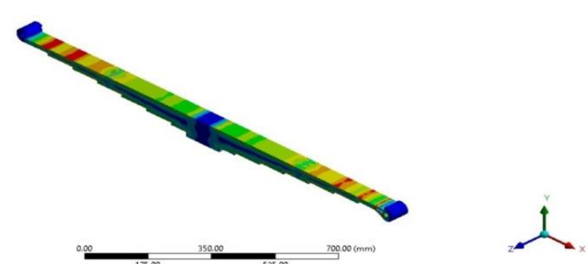
E. Get Solution and Obtain Result-

Result outcomes in the form of deformation and stress.

Deformation:

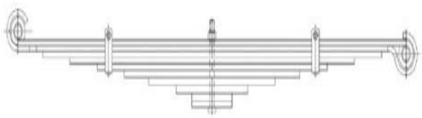


Von-Mises Stress:



XVI. GEOMETRY OF LEAF

Leaf spring of IVECO Daily II [14] :

Application	Replaces OE:							Bush Dia 16mm
IVECO Daily II 45, 49	93812312 98616125 							
Airsprings™ Part No	Pos.	No. of Leaves	Width (mm)	Dimensions (mm) A	Dimensions (mm) B	Total Leaf Tickness (H)	Centre Bolt	U-Bolt To Suit
51255	Rear	9	60	700	715	81	M10	15323A

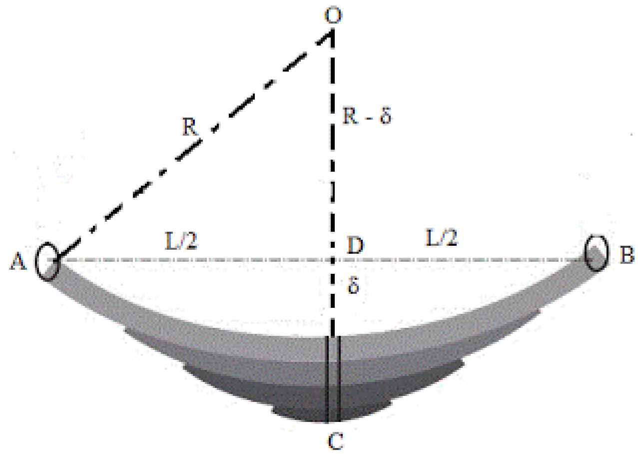
Length of Master leaf (1st leaf) = 1415 mm
Length of 2nd leaf = 1415 mm
Length of 3rd leaf = 1207.8 mm
Length of 4th leaf = 1015.65 mm
Length of 5th leaf = 823.5 mm
Length of 6th leaf = 631.35 mm
Length of 7th leaf = 439.2 mm
Length of 8th leaf = 247.05 mm
Length of 9th leaf = 127.25 mm

Width of the leaf = 9 mm

Mass of Master leaf (1st leaf) = 824.65 gm
Mass of 2nd leaf = 851.66 gm
Mass of 3rd leaf = 651.51 gm
Mass of 4th leaf = 547.74 gm
Mass of 5th leaf = 442.57 gm
Mass of 6th leaf = 340.22 gm
Mass of 7th leaf = 223.46 gm
Mass of 8th leaf = 132.70 gm
Mass of 9thleaf = 68.01 gm

Let us consider-

B = Width of each plate
n = Number of plates
l = Leaf spring span
t = Thickness of each plate of leaf spring
δ = Deflection of the top spring
R = Radius of the plate in which plates are bent initially
F= Force/Load acting on the spring
σ = Maximum bending stress developed in the plate of leaf spring
A and B = Two ends of the leaf spring
C = Center point of the leaf spring

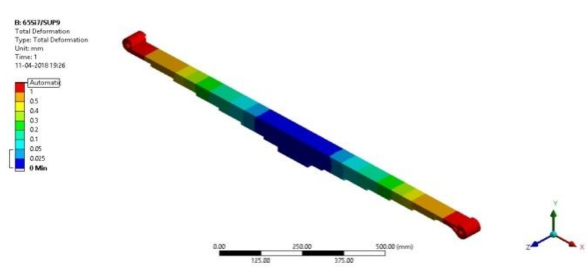


		Maximum Bending Stress	Maximum Deflection
Cantilever Beam	Uniform Cross-section	$\frac{6Fl}{Bt^2}$	$\frac{4Fl^3}{EBt^3}$
	Uniform Strength	$\frac{6Fl}{Bt^2}$	$\frac{6Fl^3}{EBt^3}$
Simply Supported Beam	Uniform Cross-section	$\frac{3Fl}{2Bt^2}$	$\frac{Fl^3}{4EBt^3}$
	Uniform Strength	$\frac{3Fl}{2Bt^2}$	$\frac{3Fl^3}{8EBt^3}$

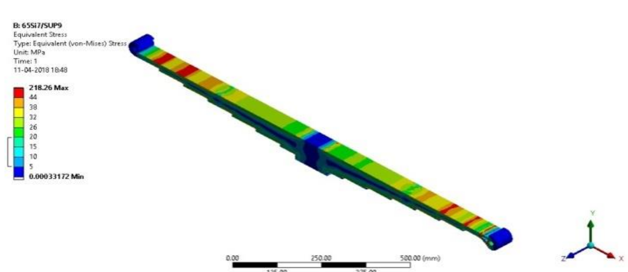
XVII. RESULTS

A. *Results for 65Si7/SUP9*

- *Deformation*

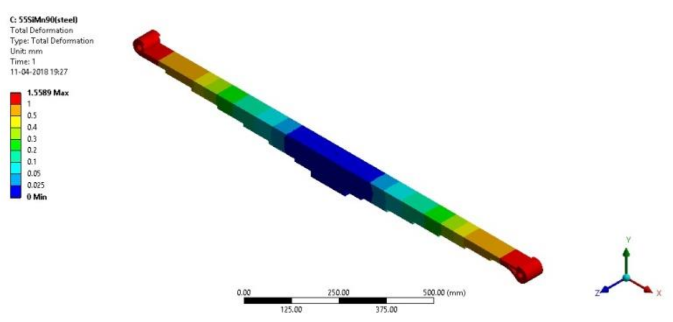


- *Von Mises Stress*

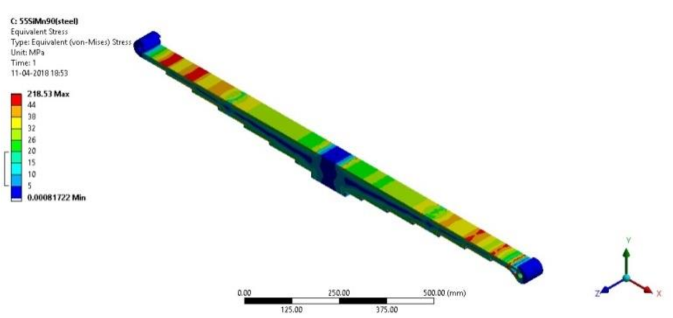


B. Results for 55SiMn90 (STEEL)

- *Deformation*

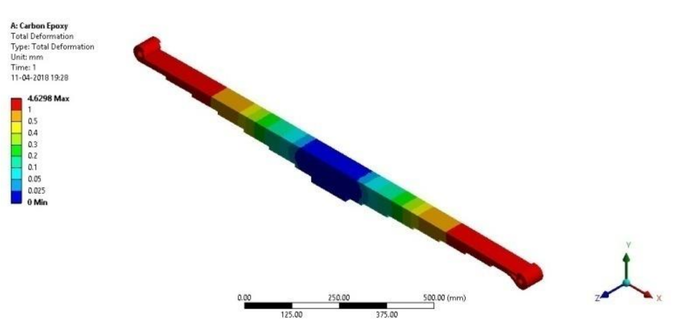


- *Von Mises Stress*

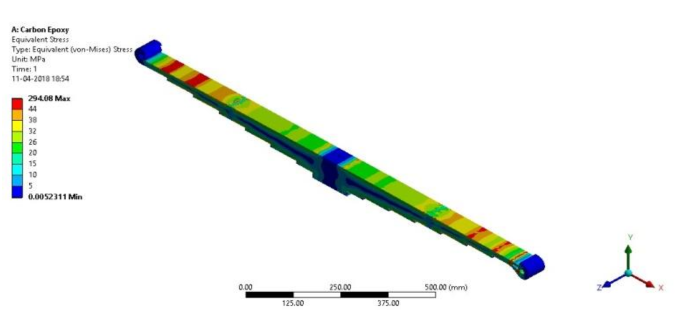


C. Results for CARBON EPOXY

- *Deformation*

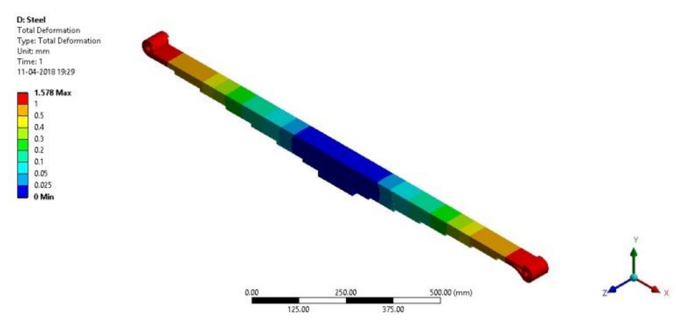


- *Von Mises Stress*

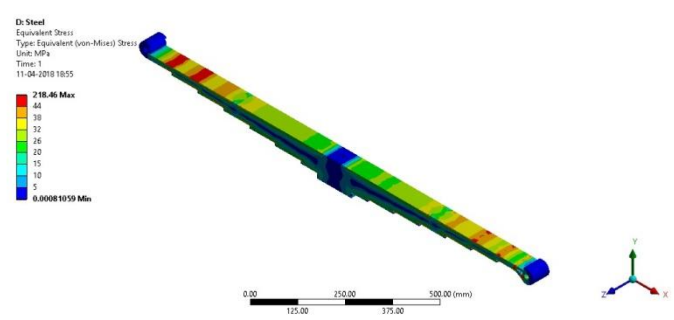


D. Results for STEEL

- *Deformation*

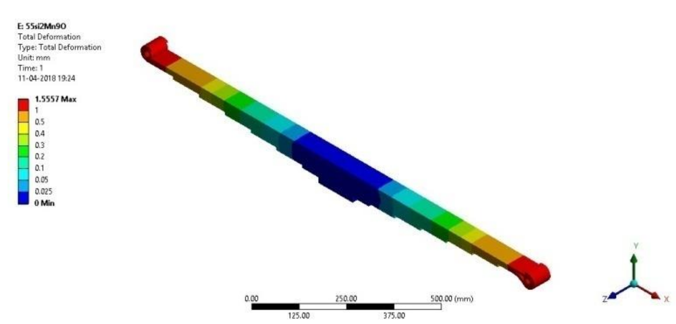


- *Von Mises Stress*

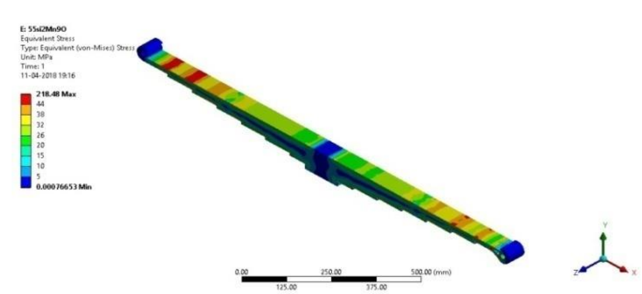


E. Results for 55Si2Mn90

- *Deformation*



- *Von Mises Stress*



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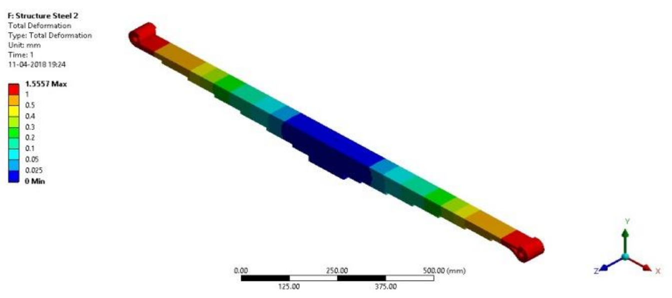
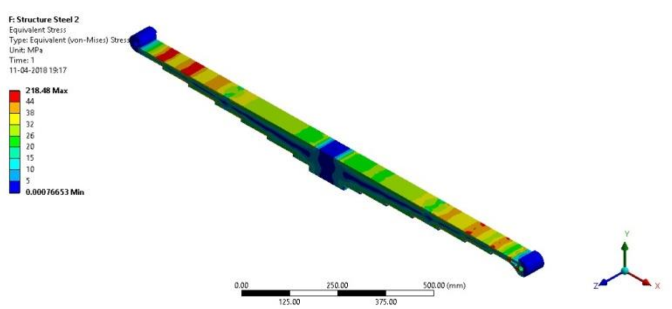
F. Results for STRUCTURE STEEL 2

- *Deformation*

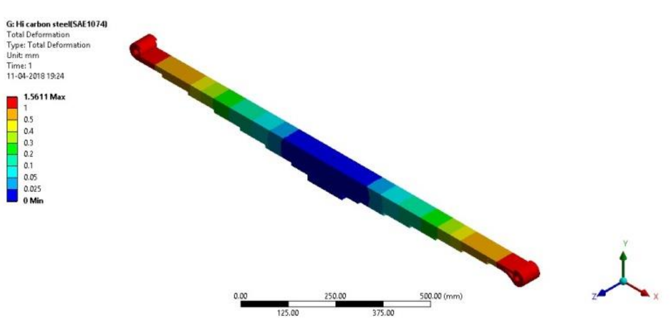


- *Von Mises Stress*

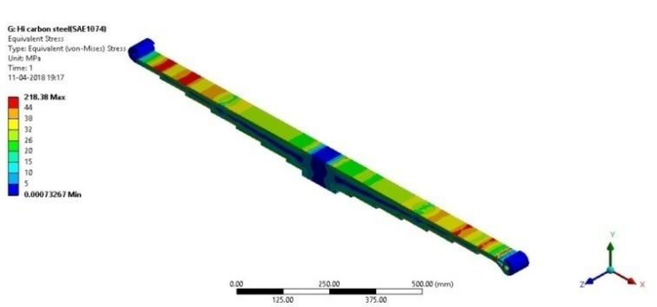


G. Results for HIGH CARBON STEEL (SAE1074)

- *Deformation*

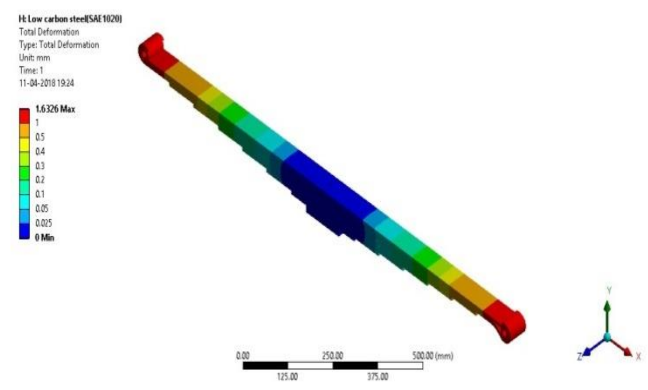


- *Von Mises Stress*

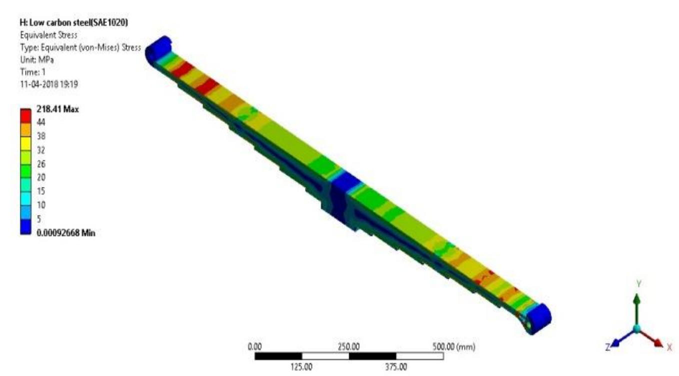


H. Results for LOW CARBON STEEL (SAE1020)

- *Deformation*

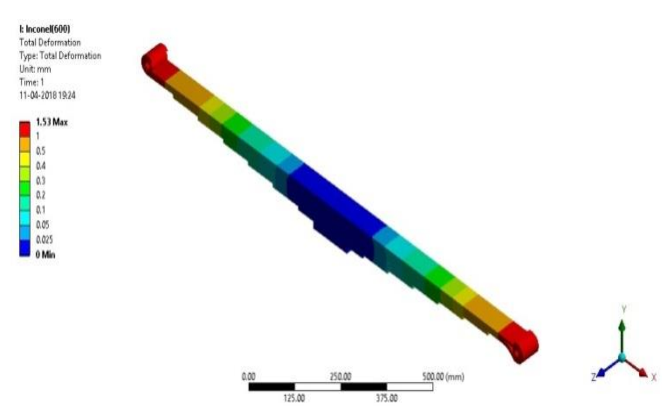


- *Von Mises Stress*

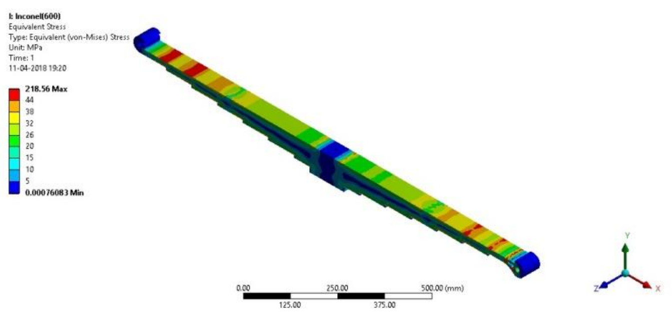


I. Results for INCONEL (600)

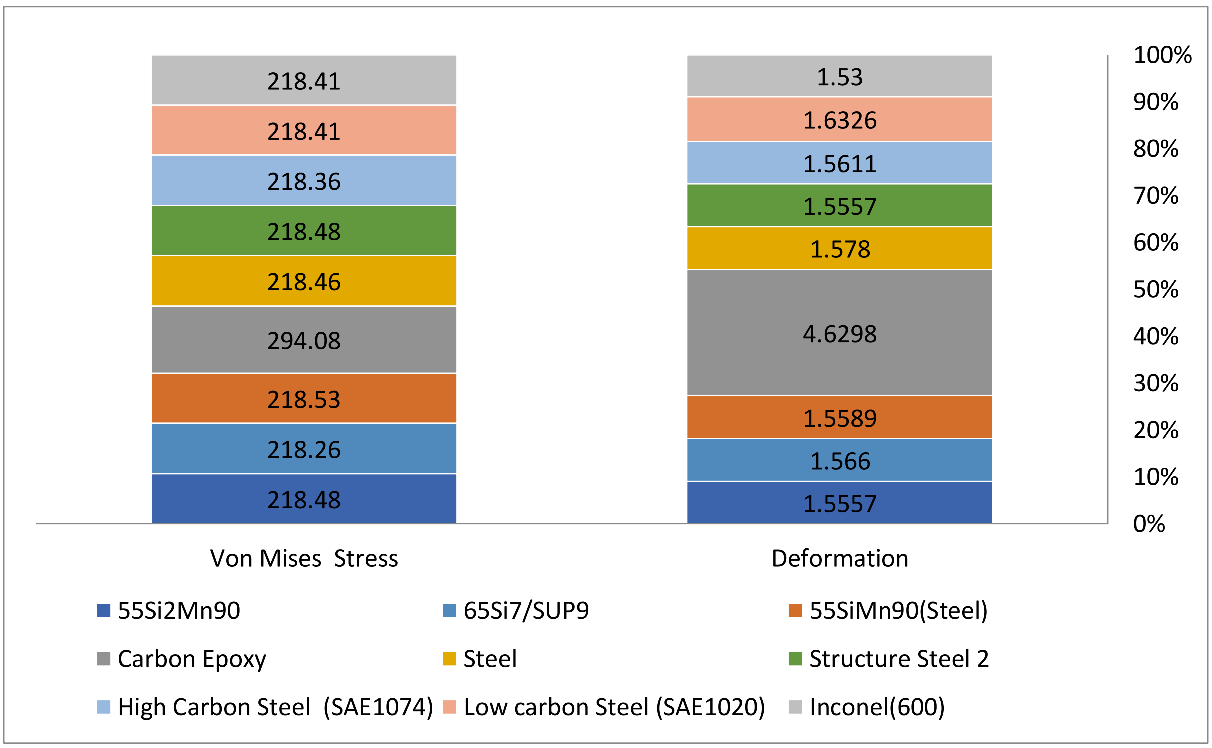
- *Deformation*



- *Von Mises Stress*



Material	Von – Mises Stress (MPa)	Deformation (mm)
65Si7/SUP9	218.26	1.566
55SiMN90 (Steel)	218.53	1.5589
CARBON EPOXY	294.08	4.6298
STEEL	218.46	1.578
55Si2Mn90	218.48	1.5557
Structure Steel 2	218.48	1.5557
HIGH CARBON STEEL (SAE1070)	218.36	1.5611
LOW CARBON STEEL (SAE1020)	218.41	1.6326
INCONEL (600)	218.56	1.53



XVIII. CONCLUSION

We performs Analysis of Leaf Spring using multiple materials after we got deformation and stress, High carbon Steel (SAE1074) Material spring predict best results. So High Carbon Steel is best for Leaf Spring for IVECO Daily Van.

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