Design & Analysis on Truck Chassis By Using Fem

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Abstract: *The automotive chassis is the backbone of the entire vehicle. A good chassis absorbs all sudden loads, torsional loads and impacts without damaging other parts of the chassis and offers the driver the best driving behavior and handling. Now the Indian auto market is growing and with it the demand for light commercial vehicles. Determined the stresses and deformation at various stacking conditions. Proposed the best reasonable material for undercarriage plan. Furthermore, all out deformation and comparable stresses was 2.6 mm and 25 mpa. The FEA Analysis Of Tata Ace Chassis configuration is worked with low thickness AL 7050-T7451 (2690Kg/m3) since it is a less weight and has a superb strength weight proportion and shows great bowing and twist firmness contrasting and other material thus FEA Analysis of truck with fiber material is a best elective plan for the light weight undercarriage plan.*

Keywords: Chassis, FEA, LCV, Aluminum Alloy, Engine, Vehicle.

Introduction

The chassis is the component of an automobile which acts as a chassis to support the vehicle body. Provides strength and stability to the vehicle when exposed to different conditions. He kept the engine part, the cabin, the transmission, the axles, the suspension system and other chassis components. Ladder chassis are considered to be one of the oldest types of automobile chassis. Since the ladder frame has a higher load capacity, they are used in most SUVs and heavy commercial vehicles. A higher chassis load capacity ensures good driving dynamics and a high level of driving comfort. As a result, stair frames are widely preferred over monocoque frames and frames. The lead frame is made up of lateral elements, called lateral bars and fixed with crosspieces. The lead frames are also made up of supports to support the body and silent iron as a cushion for spring shackles. Chassis components are connected by riveted connections, welded connections or screws.

The lead frame is mounted on the front and rear to absorb the spring effect of the suspension system. The frame is narrowed in the front for better steering lock.

The different sections used in the construction of the frame include the channel, the box, the cap, the double channel and the section I. A stress analysis is performed on the frame to determine the critical point with the maximum stress. The critical point is the crucial element that leads to the failure of the frame fatigue. The service life of the fire truck chassis depends entirely on the strength of the stress. This modal and static structural analysis works on ladder structures.

Static structural analysis includes identification of the maximum load area. The chassis must be rigid and sufficiently resistant to absorb the vibrations caused by the engine, suspension and transmission line. The most commonly used materials for the frame are steel and aluminum. However, it has been discovered that carbon fibers are advantageous over these conventional materials since carbon.

Figure 1: Conventional Frame.

II. Methodology

1.1 Design Strategy

TATA Ace model ref for analysis

Table 2.1: Dimension details of LCV chassis concept-1

Parts	Dimensions
Total length of Chassis	3700 mm
Height of chassis	450 mm
Type of cross section	Rectangular Tubular and Rectangular Cross section

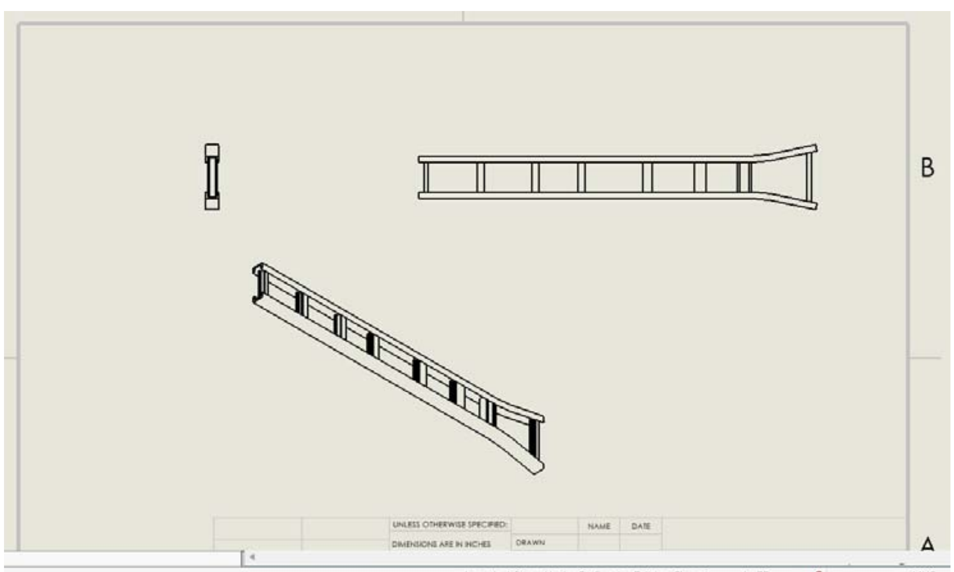

Figure 2: sketch diagram of chassis.

III. Modeling & Simulation

CASE-1 CAD Model Developed in SOLIDWORK

For carrying out the FE analysis of the frame the CAD model is prepared using Solidwork software used as per Figure 3(a), imensions used as in Table 4.1 and then the analysis was done in ANSYS 19.2 workbench as shown in figure 4. Meshing was done using the auto mesh mode of ANSYS workbench. The mesh model has 38946 elements and 97161 node.

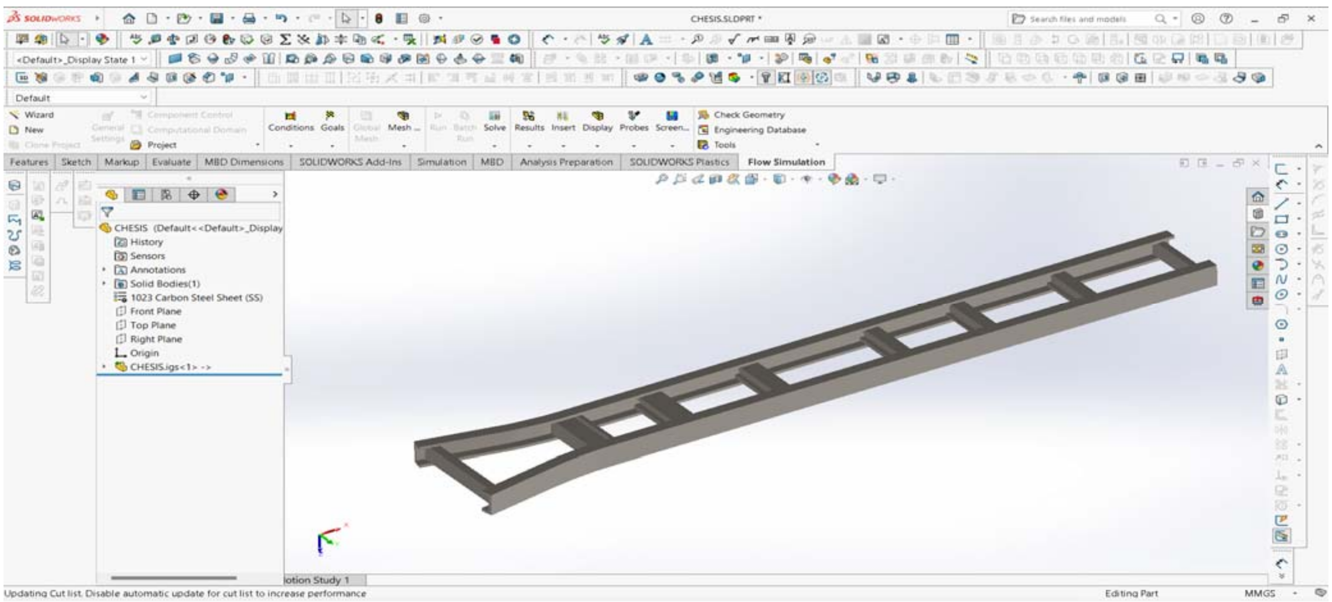

Figure 3: CAD Model Developed in Solid work.

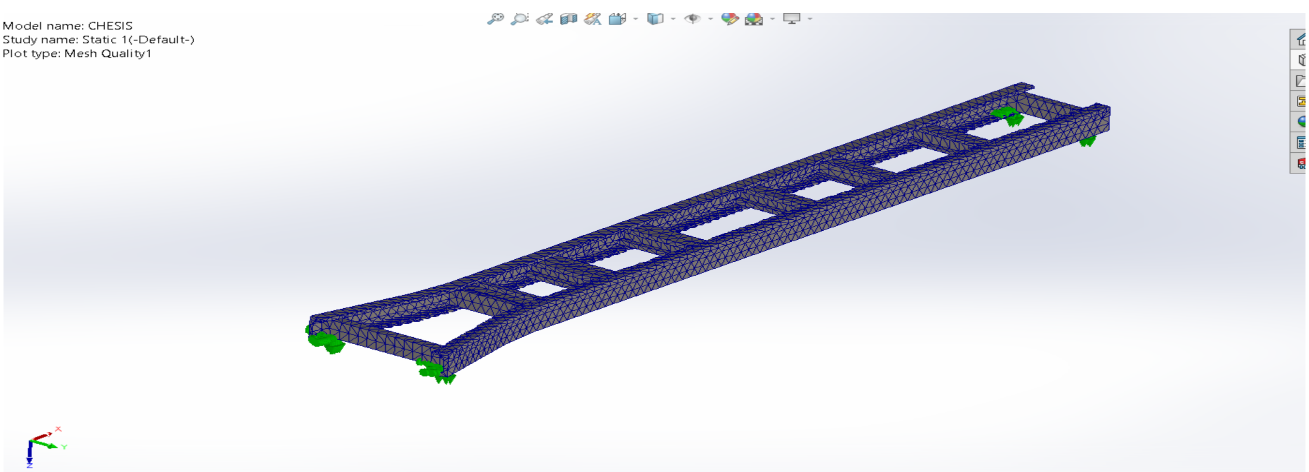

Figure 4: Mesh model.

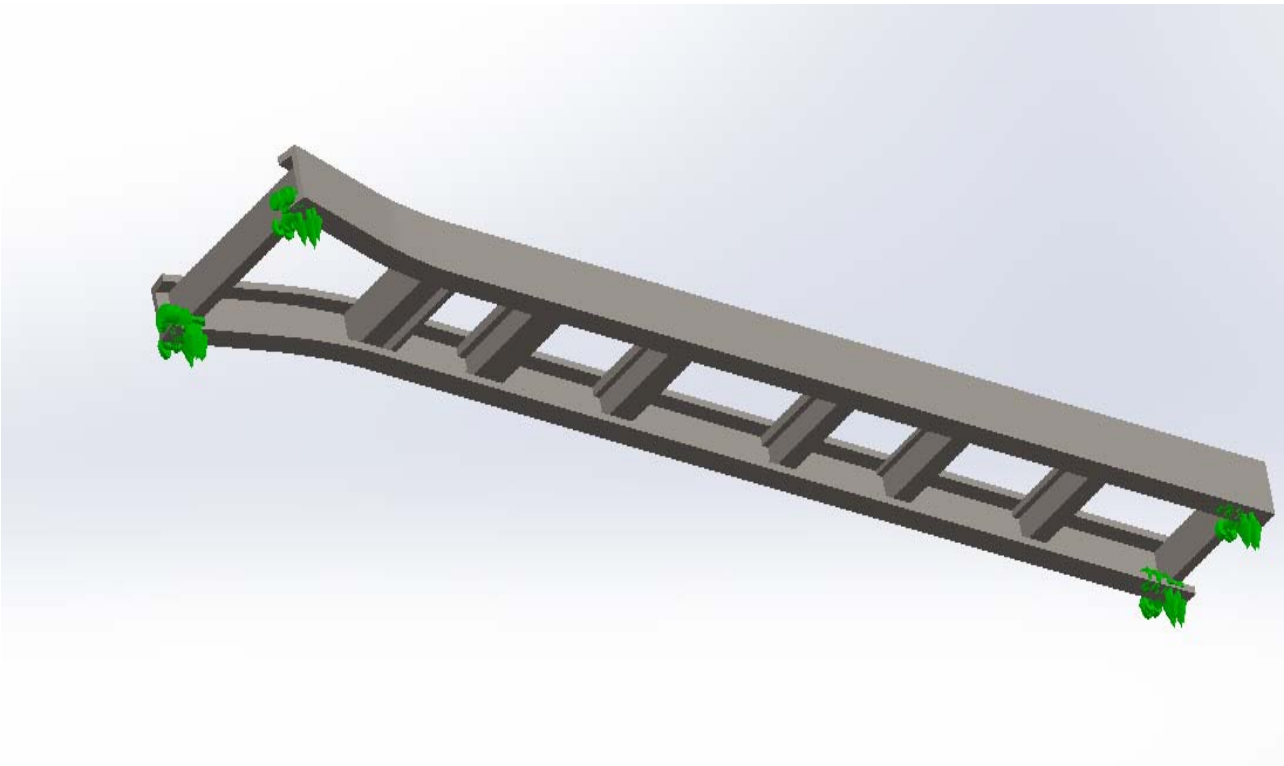

Figure 5: CAD Model chassis fixed support applied.

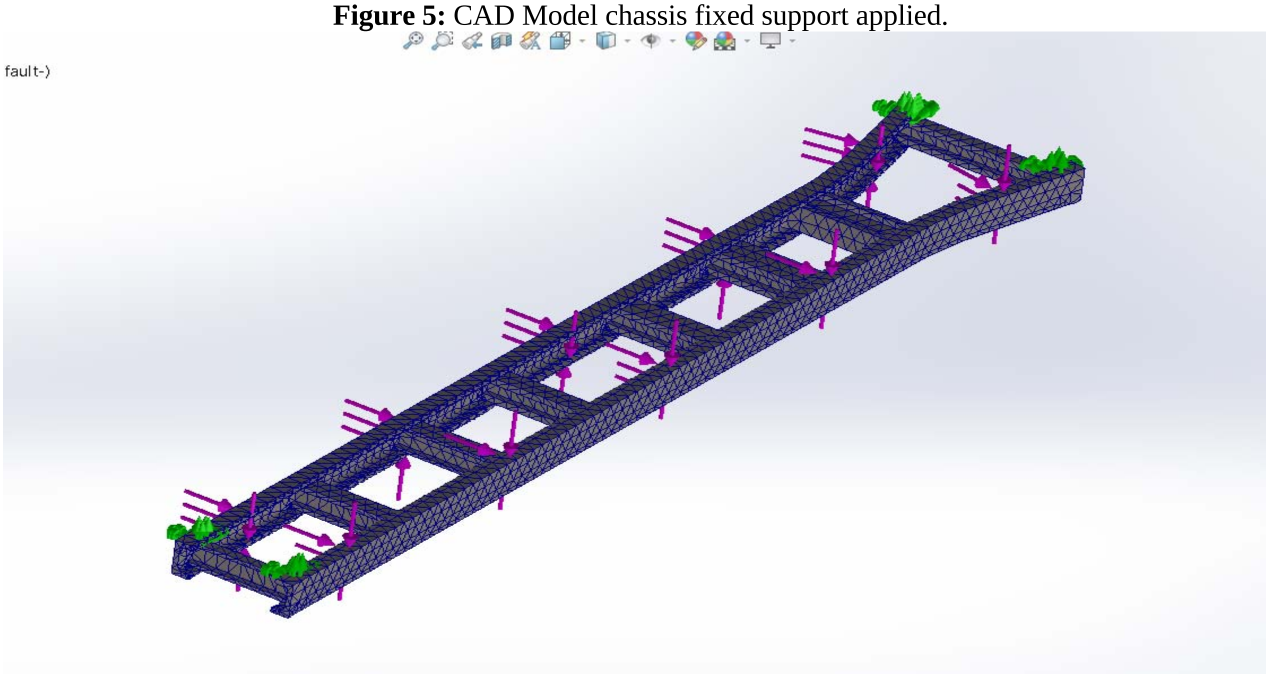

Figure 6: CAD Model chassis forced both side applied.

IV. Material Properties

CASE-I [AL 6061- T-6]

Table 4.1 AL 6061- T-6

Elastic Modulus	6.9e+10	N/m^2
Poisson's Ratio	0.33	N/A
Shear Modulus	2.6e+10	N/m^2
Mass Density	2700	kg/m^3
Tensile Strength	24084000	N/m^2
Yield Strength	55148500	N/m^2
Thermal Expansion Coefficient	2.4e-05	/K
Thermal Conductivity	170	W/(m·K)
Specific Heat	1300	J/(kg·K)

CASE – II [AL -7050- T7451]

Table 4.1 AL -7050- T7451

Elastic Modulus	7.2e+10	N/m^2
Poisson's Ratio	0.33	N/A
Shear Modulus	2.69e+10	N/m^2
Mass Density	2830	kg/m^3
Tensile Strength	525000000	N/m^2
Compressive Strength		N/m^2
Yield Strength	470000000	N/m^2
Thermal Expansion Coefficient	2.36e-05	/K
Thermal Conductivity	157	W/(m·K)

V. Results

1.2 Defining Boundary Condition

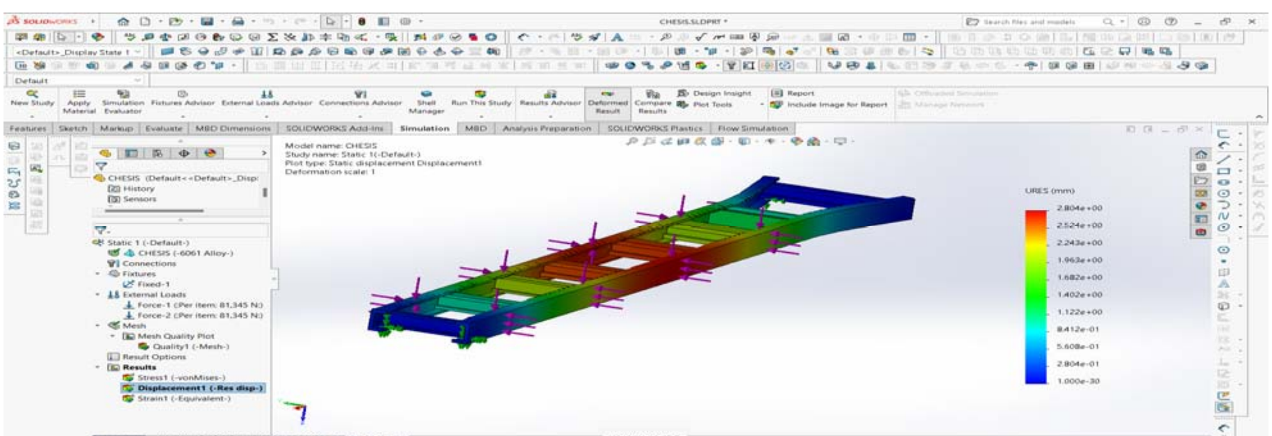

Figure 7: AL 6061- T-6 deformation results.

Defining Boundary Condition

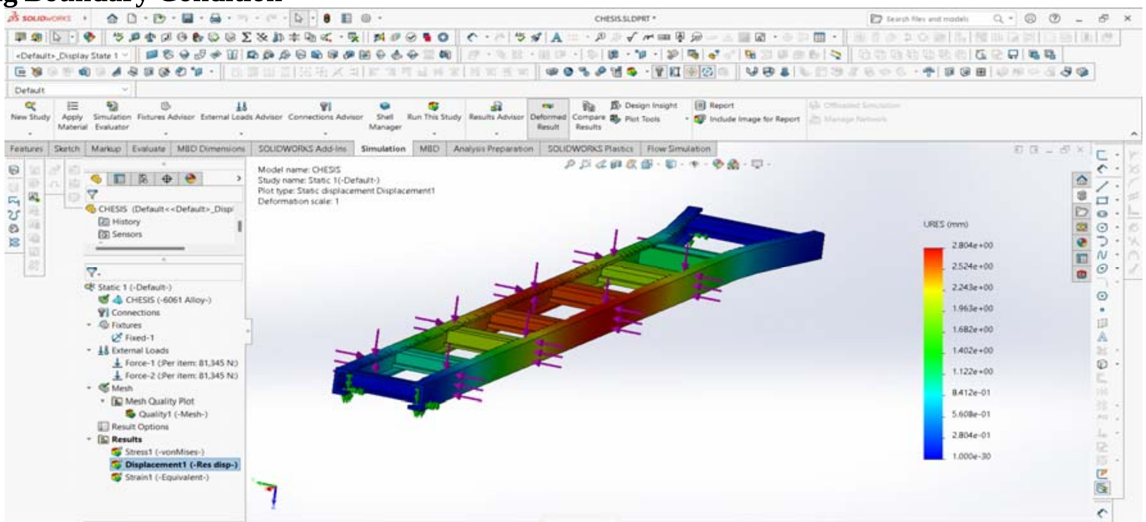

Figure 8: AL 6061- T-6 deformation results.

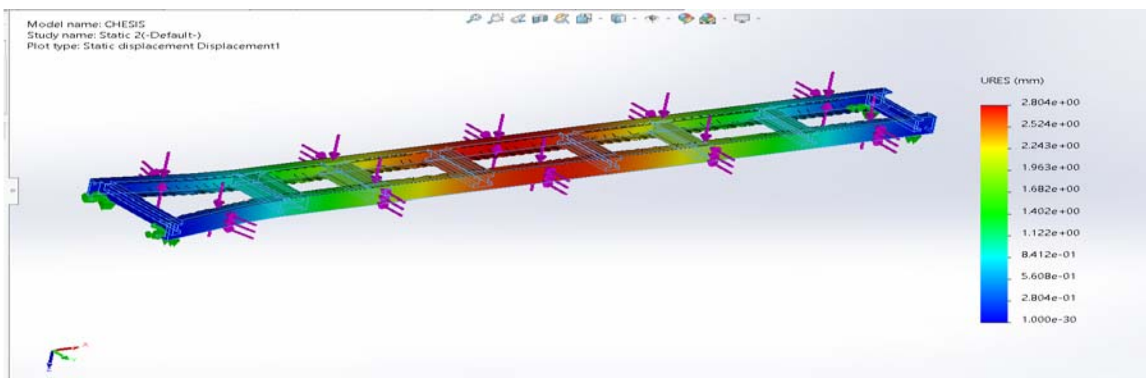

Figure 9: AL 6061- T-6 deformation results.

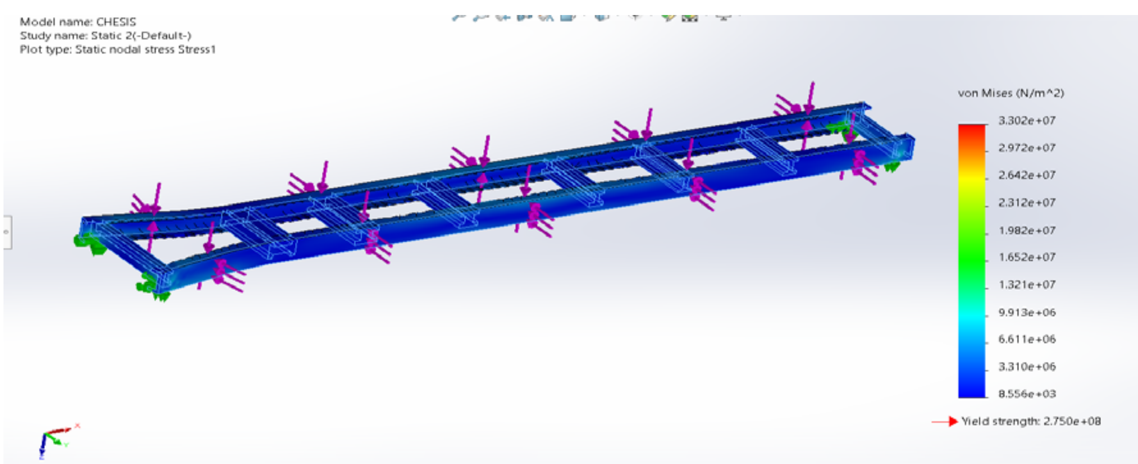

Figure 10: AL 6061- T-6 stresses results.

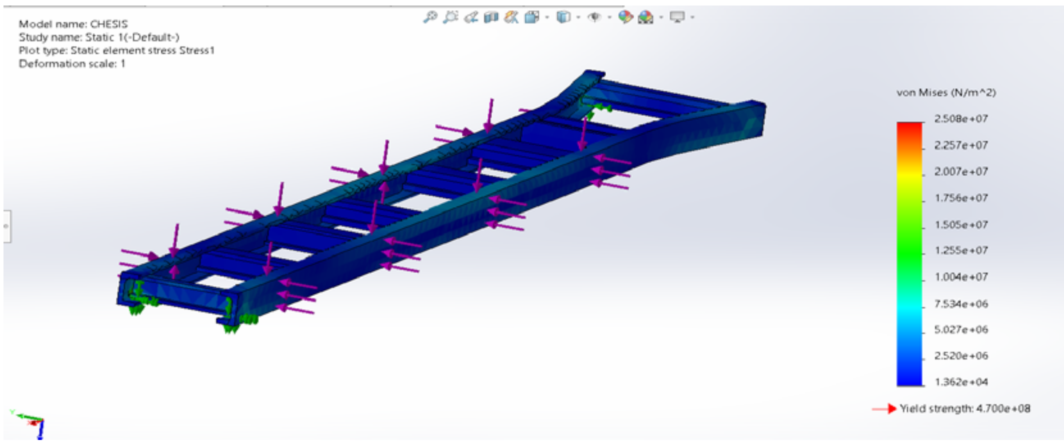

Figure 11: AL 7050-T7451 stresses results.

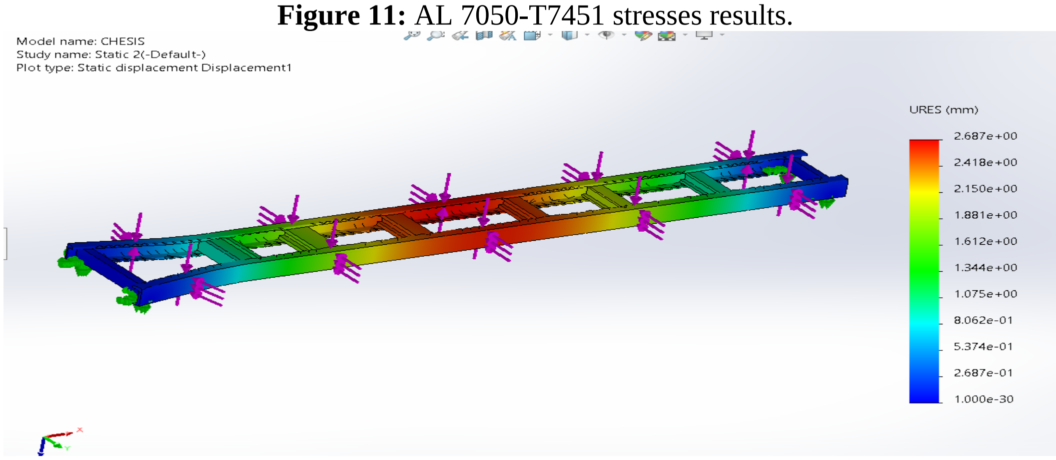

Figure 12: AL 7050-T7451 deformation results.

FEA Analysis of TATA ACE Chassis (CASE-1)

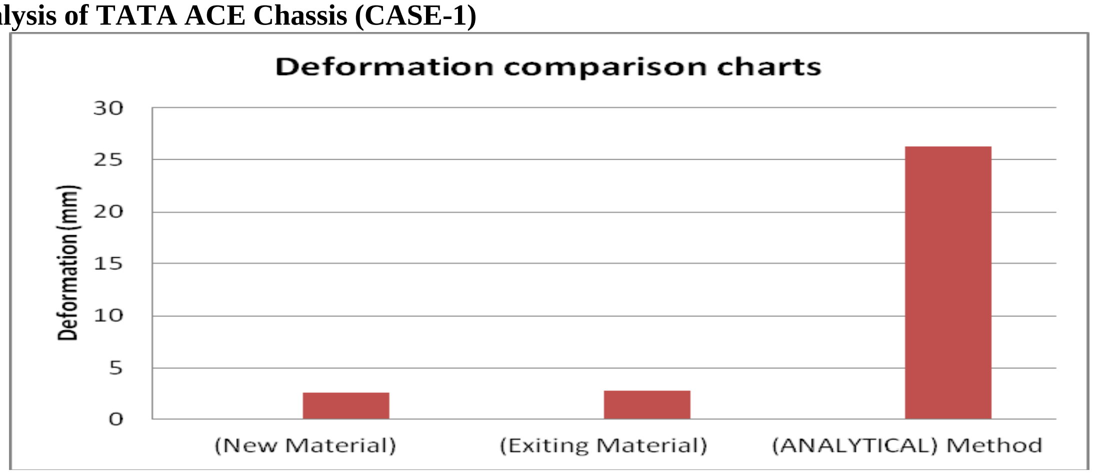

Figure 13: Deformation comparison charts.

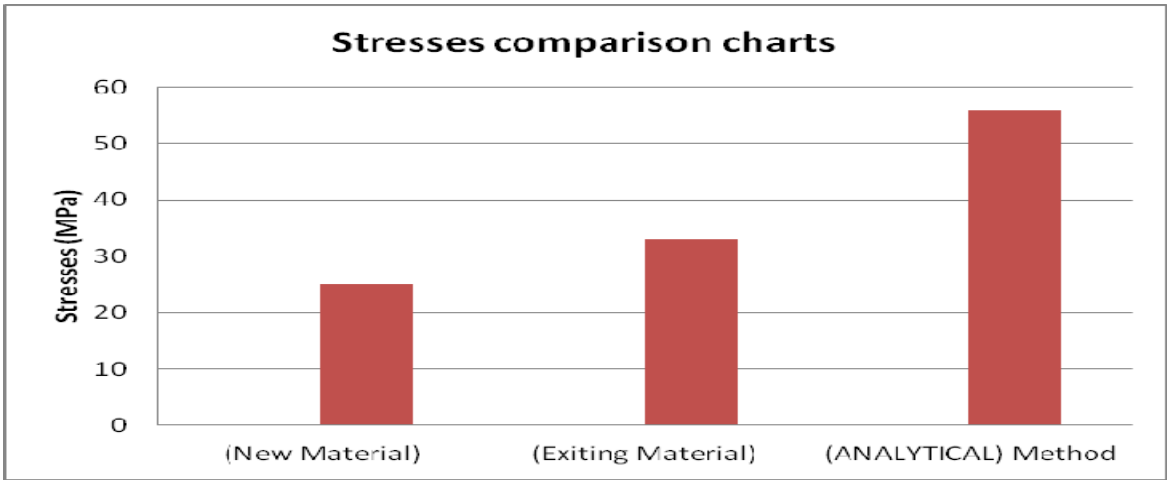

Figure 14: Stresses comparison charts.

VI. Conclusion

1. In this test TATA Ace chassis is analyzed with two different materials in the concept-1 and the concept-2.
2. The LCV chassis analysis of both case 1 and case-2 with material AL 6061- T-6 and AL 7050-T7451.
3. And total deformation and equivalent stress was 33 MPa and 25 MPa.

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