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REVIEW OF ANALYSIS OF EXISTING C-SECTION MINI TRACTOR TROLLEY CHASSIS

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ABSTRACT

A Chassis is one of the key components of tractor trolley. It consists of an internal framework that supports the container of tractor trolley in its construction and use. The strength of the chassis is an important issue for the industry when the weight of the chassis is reduced.Various small scale industries areadopting for designing andmanufacturing the machine components. One such industryproducing tractor trolleys for agricultural use has beenidentified for this study.As the chassis design is not proper and excess material is used to overcome the failure, the self-weight of the chassis get increases. Due to which, the self-load of trolley applied on the chassis, leaf spring and axle of the trolley causes failure in dynamic condition. Failure such as breakage of axle hub assembly, breakage of leaf spring, axle bending occurs.

Keywords: Chassis, Cad model, FEA.

I. INTRODUCTION

It is the most crucial element that gives strength and stability to the vehicle under different conditions. Automobile frames provide strength and flexibility to the automobile. An important consideration in chassis design is to have adequate bending stiffness along with strength for better handling characteristics. The Chassis is used to support the container on which the load is to be carried out.

1.1 Chassis

Chassis is a French term and was initially usedto denote the frame parts or basic structure ofthe vehicle. It is the back bone of the vehicle. A vehicle with-out body is called chassis. The components of thevehicle like Power plant, Transmission System, Axles, Wheels and Tyres, Suspension, Controlling Systems like Braking, Steering etc., and also electrical system parts are mounted on the Chassis frame. It is the main mounting for all the components including the body. So it is also called as Carrying Unit.Material properties for chassis are below,

Table:1 Material Properties of Structural Steel used for chassis.

Young's Modulus	200 x E9 pa
Poisson's Ratio	0.3
Density	7.85e-006 kg/mm³
Tensile Yield Strength	250. Mpa

1.2 Characteristics of Automobile Chassis

The chassis receives the reaction forces of the wheels during acceleration and braking and also absorbs aerodynamic wind forces and road shocks through the suspension. So the chassis should be analysed and built to maximize payload capability and to provide versatility, durability as well as adequate performance.All real physical structures, when subjected to loads or displacements, behave dynamically. The additional inertia forces, according to Newton's second law, are equal to the mass times the acceleration. If the loads or displacements are applied very slowly, then the inertia forces can be neglected and a static load analysis can be justified, but in reality the loads are dynamic in nature. Hence, in this work, an effort is made to investigate the static and dynamic response of truck chassis due to road undulations.

Fig. 1 Chassis of Mini Tractor Trolley Chassis.

1.3 Functions of Chassis

- To carry load of trolley with goods carried in the body.
- To withstand the forces caused due to the sudden starting or stoping.
- To withstand the stresses caused due to the uneven surface condition.
- To withstand centrifugal force while cornering
- To support the load of the body, engine, gear box etc.
- To carry load of the passengers or goods carried in the body

II. SPECIFICATION OF EXISTING MINI TRACTOR TROLLEY CHASSIS.

The total capacity of the trolley is 50 KN but the self weight of trolley and the other accessories is 37 KN. So here the gross weight come over is 87 KN is considered the existing chassis consists of 'C' section having cross section area 150mm x 75mm x 5.7mm and the material used for manufacturing is mild steel. The specifications of tractor trolley is shown in table 2 which is collected from industry itself.

Table: 2 Specification of Tractor Trolley.

General	Overall Length	Box 3900mm
		Chassis :- 1800mm
Overall	width	1370 mm
Load	Payload Capacity	5000 kg
	Unloaded Weight including weight of chassis	2220 kg
	Gross Weight considering factor of safety 1.2	8664kg

III. STRUCTURAL ANALYSIS OF CHASSIS

In The Present Study, Market Available Tractor Trolley Chassis Is Selected And Its Dimension Is Noted. The Possible Loads Acting And The Place Of Loads Are Noted. According To The Dimensions, Tractor Trolley Chassis Is Modeled Using PRO E Software. It Is Then Imported To Design Modeler Software ANSYS**.**

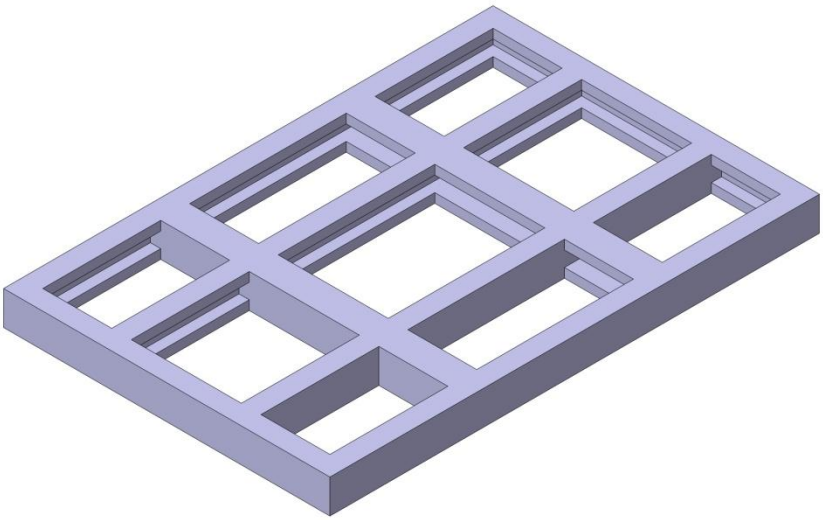

Fig.3.1 Cad Model of C section Mini Tractor Trolley Chassis

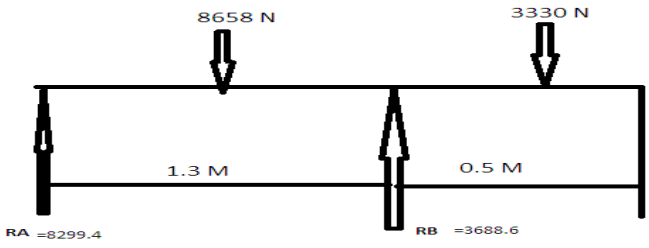

Fig.3.2 Load Diagram of Chassis

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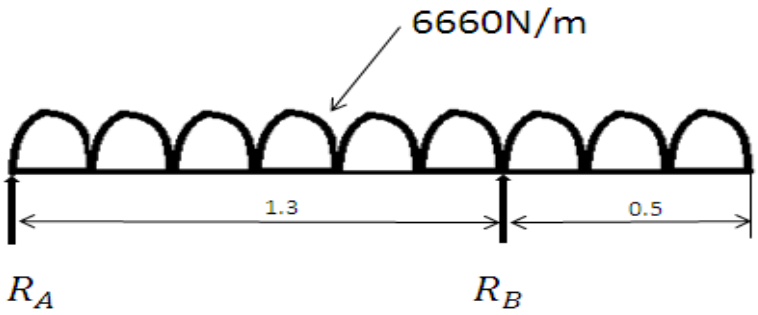

Fig.3.3 Reaction Diagram of Chassis

IV. ANALYSISOF EXISTING 'C' CROSS SECTION CHASSISUSING ANSYS TOOL

The Existing Chassis Geometry Is Generated In Ansys Workbench 11 By Selecting Toolbox Where Various Commands Like Draw, Dimensioning, Constraints, Extrude, Generate, Rotate Etc. Are Used. Then Mesh Is Generated On The Model And After That Load Points Are Defined And Load Values Are Given. Then The Results Are Generated Automatically For Stresses And Deformation In Solution Phase. Figure 5 Shows The Ansys Results For Mesh Generated, Deflection, Equivalent (Von Misses) Stress, Shear Stress, Normal Stress, Load.

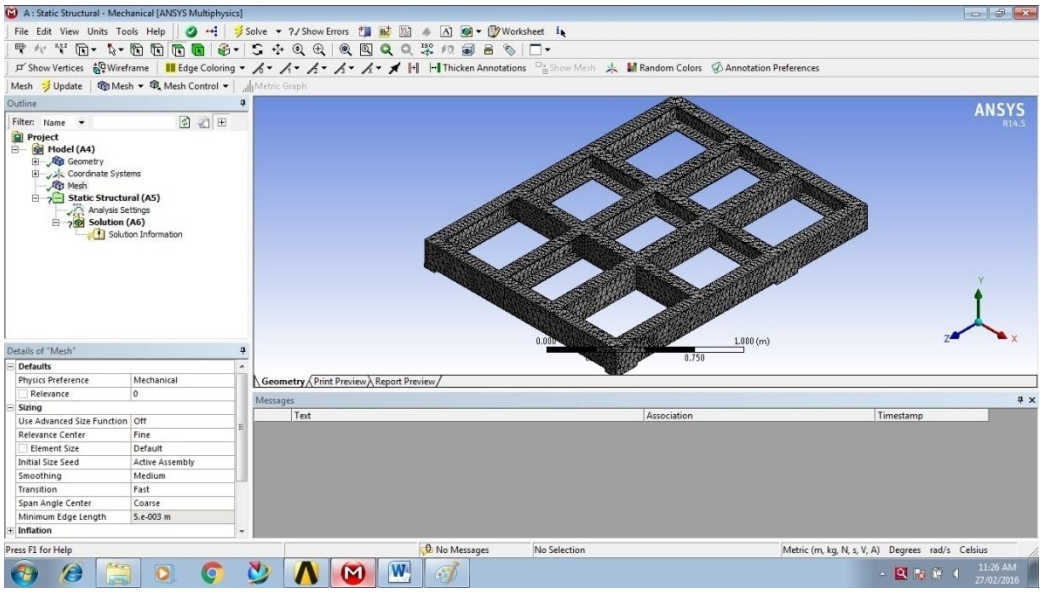

Fig.4.1 Meshing of Chassis

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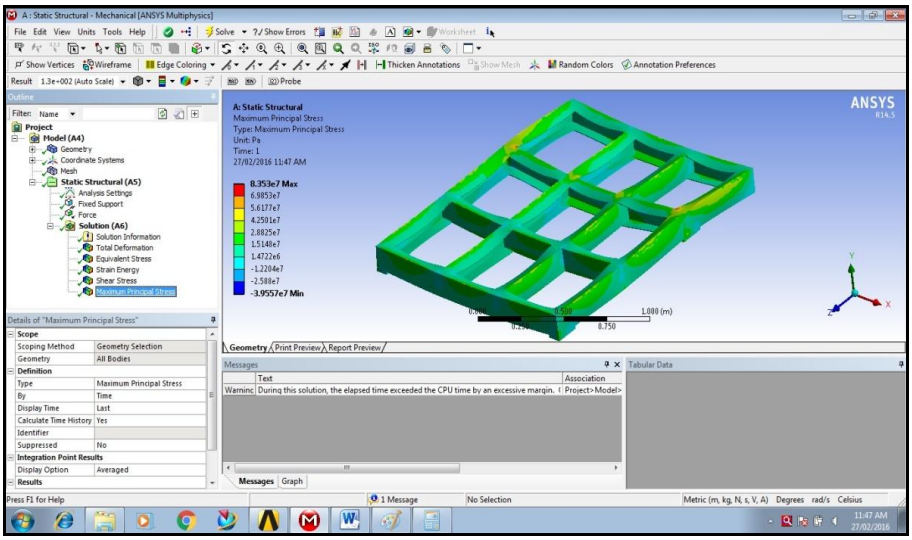

Fig.4.2 Maximum Principal Stress

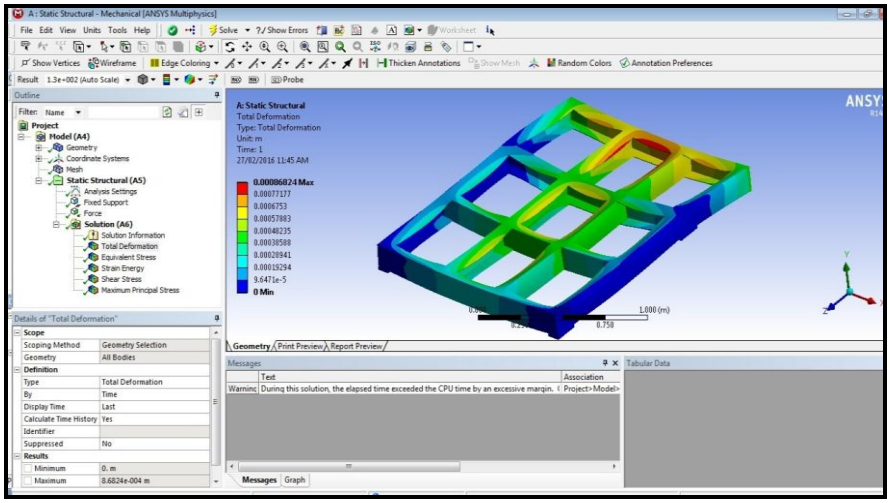

Fig.4.3Total Deflection of Chassis

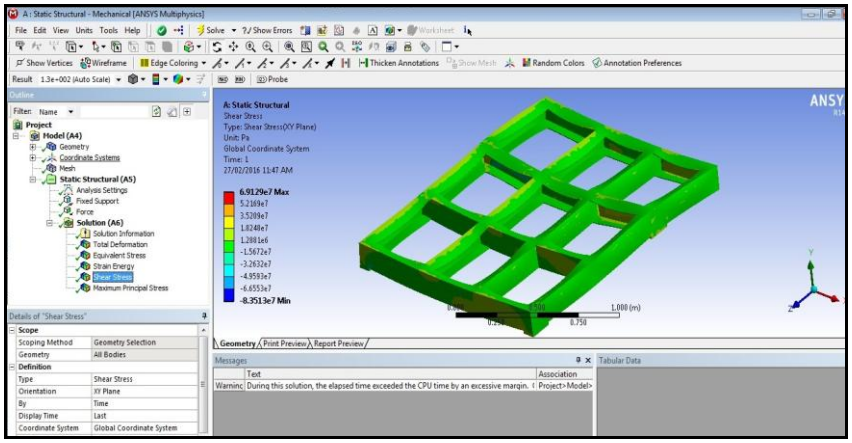

Fig.4.4 Shear Stress produced in Chassis

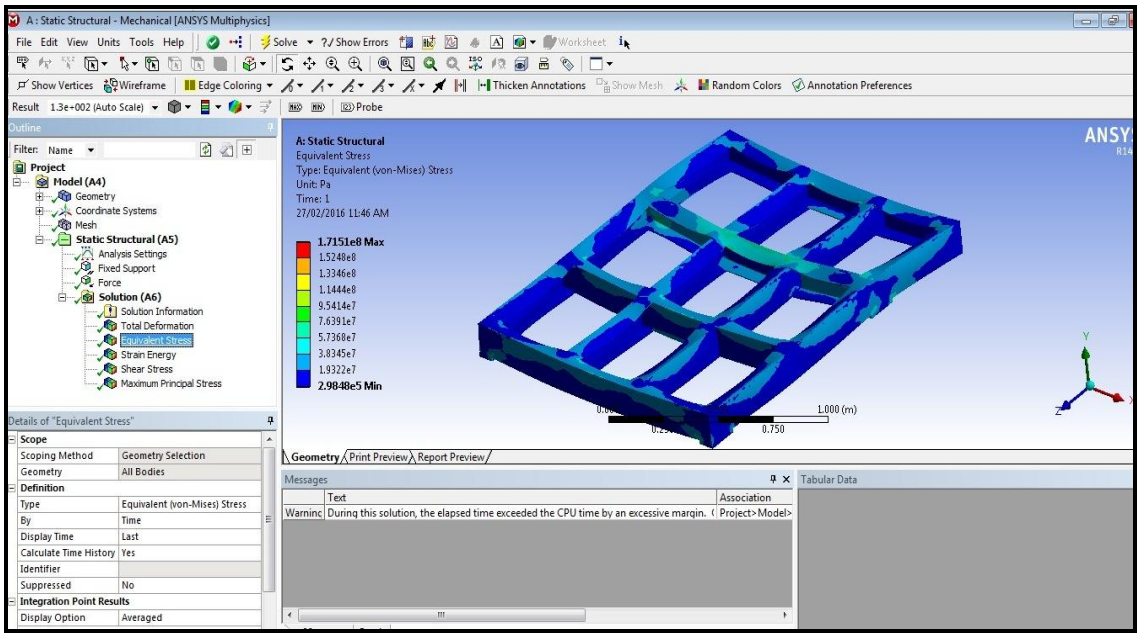

Fig.4.5Normal Stress

Table: 3 Stresses, Deflections and Stiffness to Weight Ratio.

Sr. No	Values
Bending Stress	85.49 N/ mm^2
Deflection	1.38 MM
Stiffness to weight ratio per mm	28.53

V. CONCLUSION

The study shows that with the use of the finite element analysis we find that the Mini TractorTrolley chassis is over weighted due to use of excessive material. The material used for manufacturing of chassis is C channel but it in study we find that the thickness of existing c channel is large. It carries also the stresses but due to excess weight the cost of production as well as material cost increses.The Principal Stress, Shear stress, Normal Stress and Deflection shows that, it is necessary to redesign the Chassis for better results and reduction in use of material.

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