Finite Element Stress Analysis of Supra Saeindia Chasis using ANSYS

Vidyadhar Biswal
Assistant Professor
Department of Mechanical Engineering
Chandigarh University Gharuan, Punjab

Vinay Sen
UG Student
Department of Mechanical Engineering
Chandigarh University Gharuan, Punjab

Rakesh Godara
UG Student
Department of Mechanical Engineering
Chandigarh University Gharuan, Punjab

Navdeep Singh
Assistant Professor
Department of Mechanical Engineering
Chandigarh University Gharuan, Punjab

Abstract

The stress analysis of a supra sae chassis plays a major role during design stages. There are a lot of research papers and many development programs are available in the markets which are very much similar to this research work. This research paper shows the most important research work in chassis frame design of supra sae. This paper will focused on stress analysis of the supra chassis using finite element package ANSYS. The results of reading this research paper will give the researcher a summary of some fresh and new developments in the field of vehicle chassis design using finite element stress analysis.
Keywords: Stress Analysis, Finite Element Analysis, Supra Chassis, ANSYS

I. INTRODUCTION

The key characteristics while selecting chassis material are strength to weight ratio, stiffness of chassis, manufacturability (ease of welding and bending), cost, fabrication time, safety of the driver. While designing role cage the main focus was to use continuous tubing where possible to reduce welding and improve strength. Gussets are provided at appropriate joints because by just adding gussets we can reduce the maximum stress by 17% – 21%

II. MATERIAL SELECTION MATRIX

According to this matrix IS 3074CDS4 is best suitable for our purpose because of its availability, cost and material properties according to our requirements. Analysis procedure: 1-d meshing (hyper mesh) of the wire frame structure and checking for orientation errors. Apply appropriate beam sections, material properties to the mesh collectors. After setting the loading conditions and constraints results were viewed on hyper view. We have used variable dimension and geometry tubes i.e. square pipes (for suspension pick up points) and circular pipes (rest portion of frame) because by just increasing 10% of weight strength of square pipe increases by 49%. All the bracing members are of size 25.4 x 1. 651mm.IS 3074 (CDS 4) It is an Indian Standard carbon steel. It is mainly used in the automotive industry in the country. It is well suited for the purpose.

A. Chemical Composition

Table - 1
Chemical Properties

Mechanical Properties	Metric
Hardness, Brinell	134
Tensile Strength, Ultimate	570 MPa
Tensile Strength, Yield	460 MPa

B. Mechanical Properties

Table - 2
Mechanical Properties

Element	Content
Carbon, C	0.30 - 0.40 %
Iron, Fe	98.81 - 99.26 % (as remainder)
Phosphorous, P	0.040 %
Sulfur, S	0.040 %

C. Stress Analysis of Material

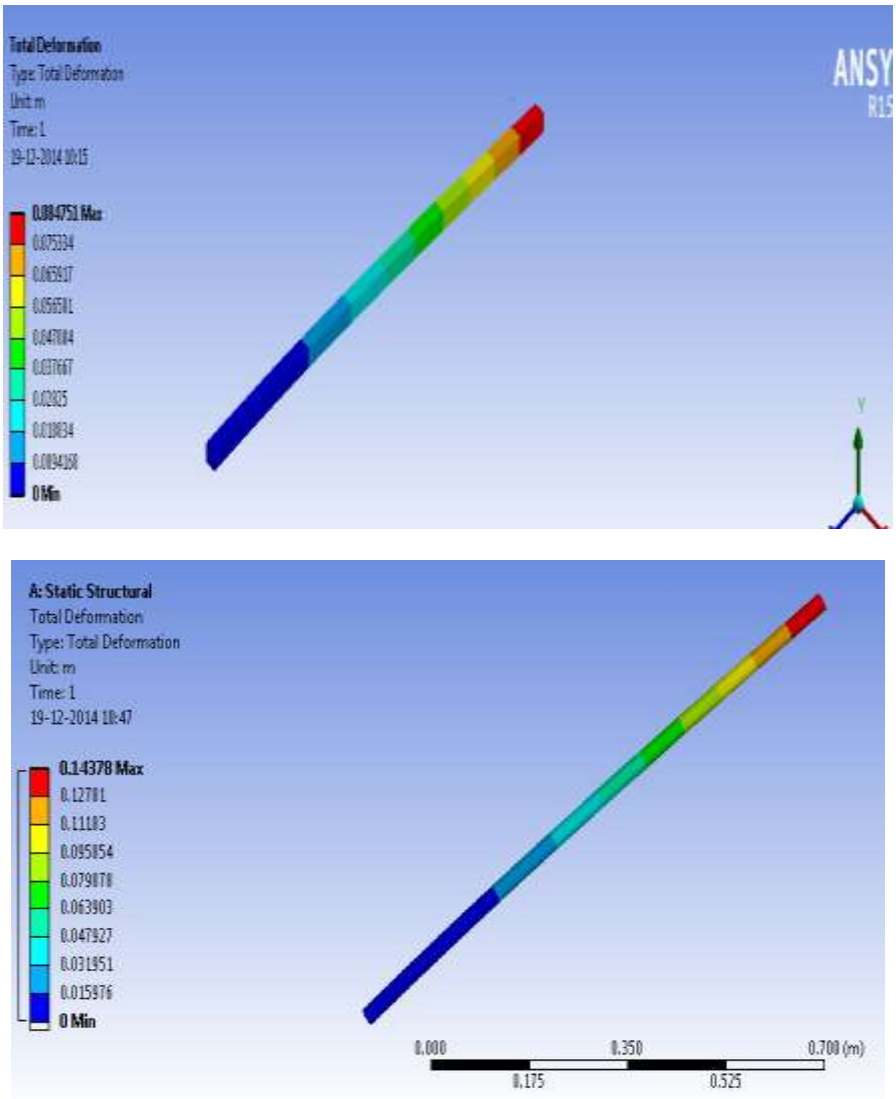
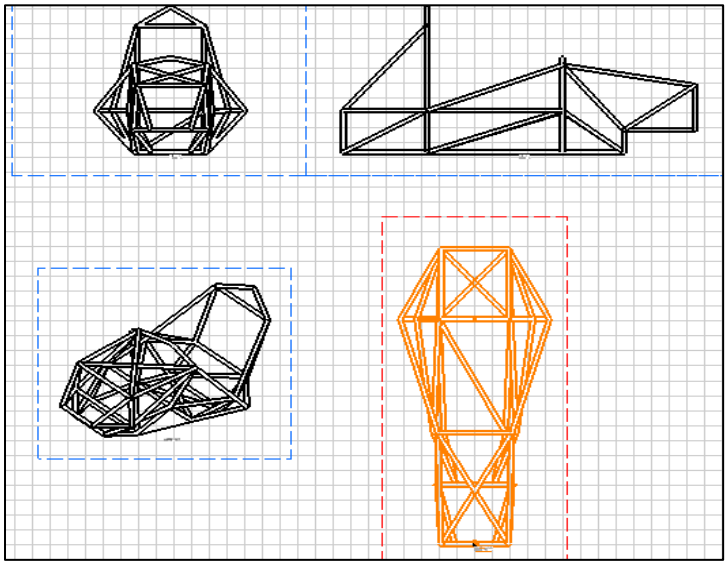
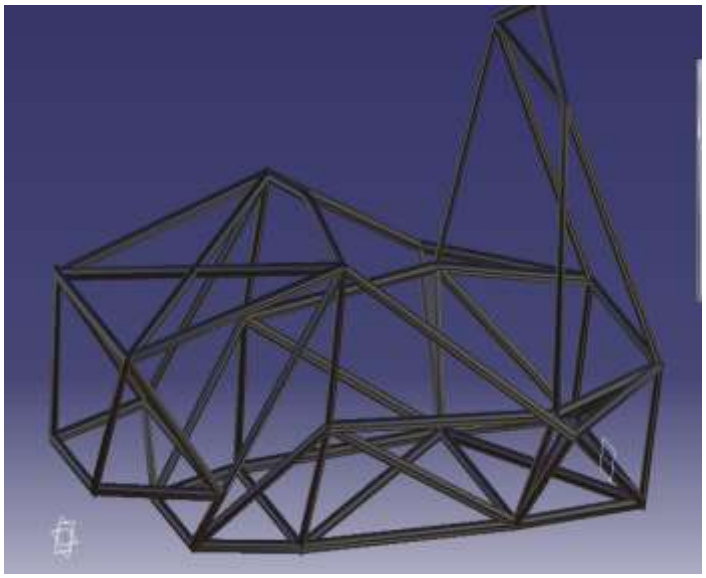


Fig. 1: Stress Analysis Properties

Above analysis is showing the variation of deflection of a beam under similar width, length, material and loading conditions in both square and circular beam. In circular pipe deflection found 144 mm and on square pipe it is found 85 mm. Hence variation can be seen clearly.





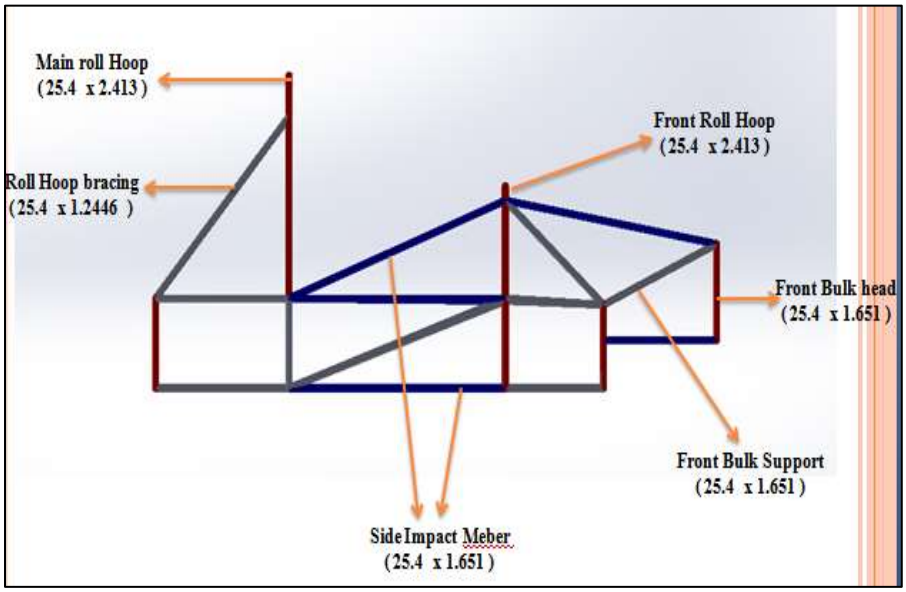


Fig. 2: Analysis is showing the variation of deflection of a beam

III. CONCLUSION

Vehicle structural design and optimization has been the focus of a lot of previous works. The review of some of the previous conducted work related to vehicle structural design, analysis and optimization using software Ansys is surveyed. It is to be found that the chassis analysis mainly consists of stress analysis to speculate the weak points and fatigue analysis to speculate the life time of the chassis. This makes a case for furthermore investigation on the design of supra sae chassis using FEA Ansys software.

IV. SCOPE OF FUTURE WORK

There is a high scope for furthermore research in chassis simulation to solve the mode shape related problem. This chassis structure can be further improved on the overall performance specially on behavior and quality.

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