Optimization of Industrial Lift Platform by using ANSYS Workbench

[1]Mr. Pramod P. Boga, [2]Prof. A.M. Kalje
[1]Student-ME Mechanical Design, [2]Professor
Mechanical Engineering Department
N. B. Navale Sinhgad College of Engineering, Kegaon, Solapur India

Abstract: In this paper, design and analyses of Sandwich structures are investigated for industrial Crane platform. Primary goal is to develop an equivalent cross section of structure material model that is a good substitute for the actual V Section core. By replacing the actual V Section structure with the other cross section model, during the finite element analyses, substantial advantages can be obtained with regard to ease of modeling and model modification, solution time and hardware resources. To figure out the best equivalent model among the approximate analytical models that can be found in the literature, a comparison is made.

Both models are analyzed under the same loading and the boundary conditions. In finite element analyses, ANSYS finite element program is used. The results are compared to find out the best performing equivalent model. After three major analyses loops, decision on the equivalent model is made.

I. INTRODUCTION

The most common type of sandwich structure consists of two thin, stiff and strong sheets of dense material separated by a low density material which have a lower stiffness and strength compared to the materials used as top and bottom faces. As a rough guide to the proportions, an efficient sandwich is obtained when the weight of the core is close to the combined weight of the both faces. Sandwich panels having the top and bottom plates as well as the core made of steel are called steel sandwich panels or steel sandwich structures. Steel sandwich panels can be divided according to the core structures: I-core with straight webs, O-core with rectangular beams as a core, Vf/V-core with hat or corrugated sheets as a core and X-core with two hats as a core, Fig. 1. Other types of the profiles such as C, U or Z can also be used as a core. By using sandwich structures, it is possible to obtain high strength to weight ratio, i.e. the sandwich structures were found to be 30 – 50 % lighter than the conventional steel applications (Kujalaet al, 2003).

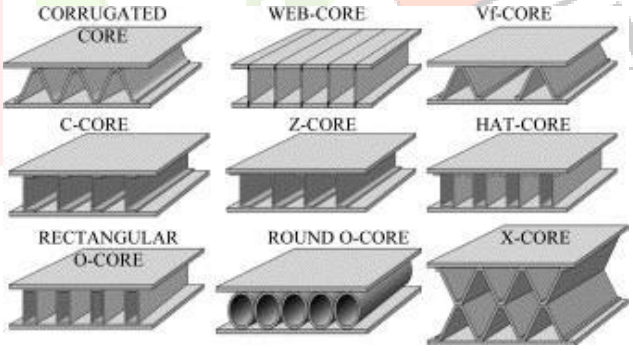

Fig 1.Different steel sandwich structure with various cores

II. Type of core panel

1. The major objective of the proposed research work is to enhance the equivalent stress at minimum weight.
2. To propose a material which sustain maximum possible strength at minimum weight.
3. Analyze Effect of equivalent stress on composite structure.
4. Analyze Effect of weight on composite structure
5. Compare the numerical, experimental result with FEA analysis result.

Importance:

Sandwich panels and in particular laser welded sandwich panels offer a number of benefits, such as:

• Good stiffness to weight ratio offering a weight saving potential of up to 50% as compared to traditional stiffened plates;

• Less space consumption and the smaller total height of structure, comprising steel decks and underlying systems like cables, tubes and insulation;

• Good properties regarding heat insulation, noise damping and fire safety, in particular when filling materials or top layers are implemented; weight and man hour consumption of external insulation can be drastically reduced due to the flat surface of the sandwich panels;

• Significantly improved crashworthiness, with filling materials further increasing crashworthiness;
• High pre-manufacturing accuracy and flatness, reducing the amount of fairing and fitting work in outfitting; no need for floor levelling for sandwich structures;
• Competitive prices which are in the same order of magnitude as conventional steel structures (standard steel sandwich panels without filling); fabrication prices can be further decreased with more standard applications, leading to series effects and potentially lower material prices;
• Larger unsupported span and drastic reduction of pillars, leading to more open rooms and more architectural freedom;
• Large variability for design modifications, allowing the tailor made panels for dedicated application cases.

III. Modeling of Core panel

All above core panel we final a three type of panel for manufacturing and testing purpose, those panel as per follow

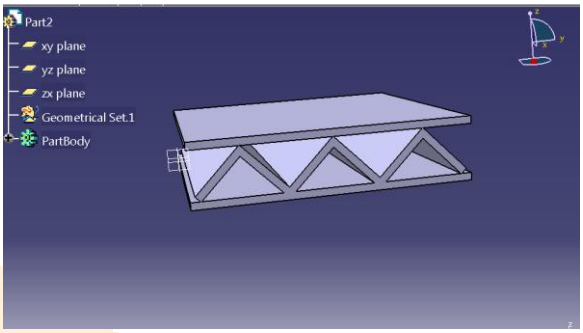

Fig. 2 V core Panel

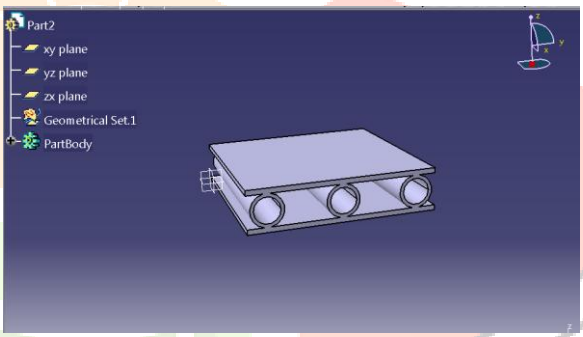

Fig. 3 O core Panel

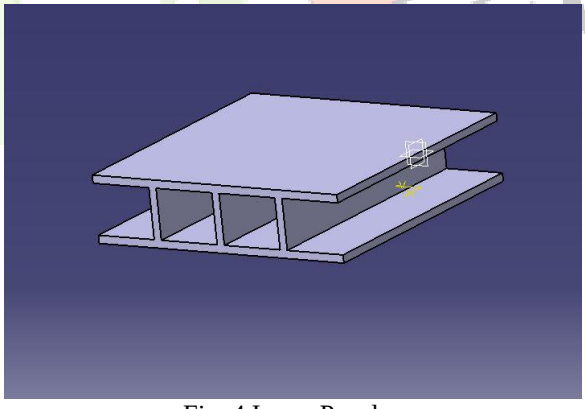

Fig. 4 I core Panel

This all three panel are easy to manufacturing as compare to other hence we used this panel for design, analysis and optimization work.

IV. Analysis Of all panels

We have done analysis of three type of panel in ANSYS workbench 14.5.

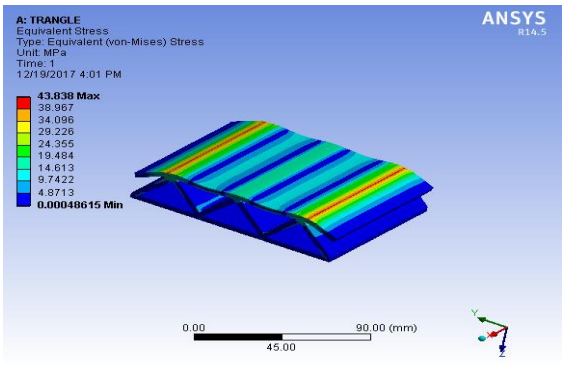

Fig.5 Stress due to applied load in V Section

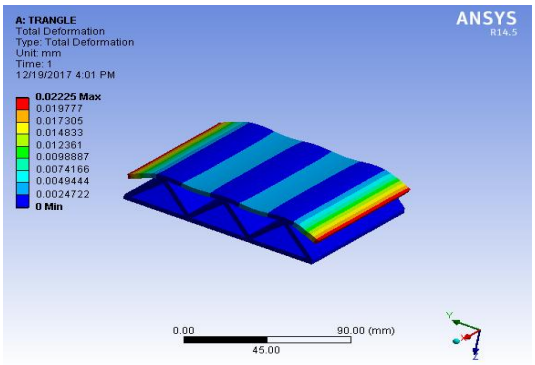

Fig.6 Deformation due to applied load in V Section

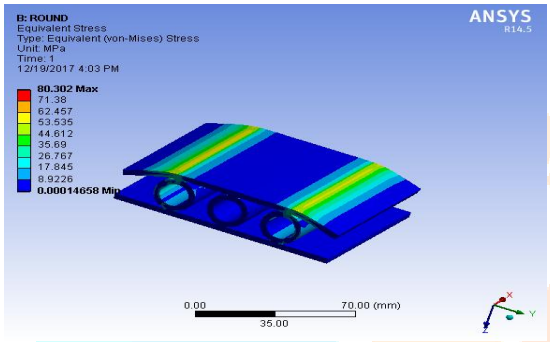

Fig.7 Stress due to applied load in O Section

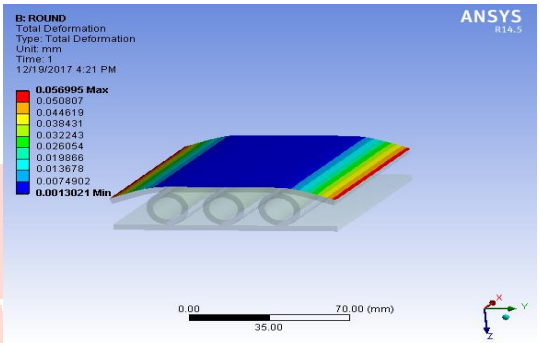

Fig.8 Deformation due to applied load in O Section

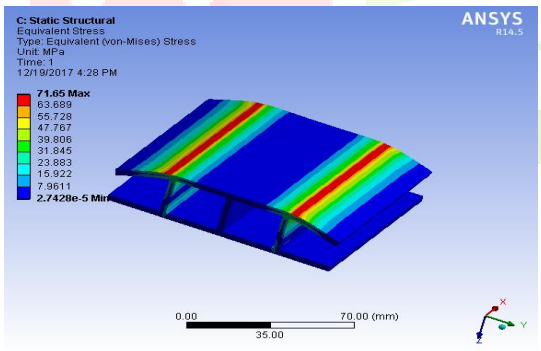

Fig.9 Stress due to applied load in I Section

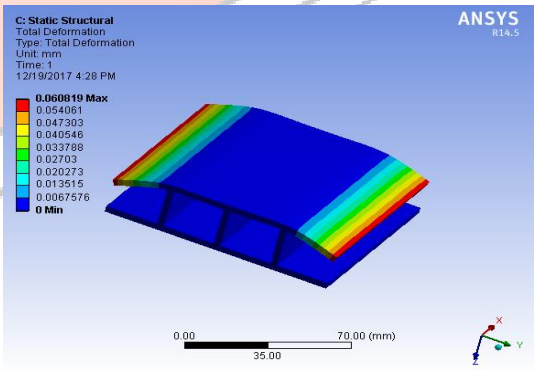

Fig.10 Deformation due to applied load in I section

V. Result

Sr.No.	Section	Stress MPa	Deformation mm
1	V Sec	43.83	0.02
2	O Sec	80.30	0.056
3	I Sec	71.65	0.06

VI. Conclusion

In this paper, the design and analyses of the sandwich structures are investigated. The main aim is to combine different equivalent models studied in the literature, thus coming up with a set of isotropic material properties which will represent the actual V Section core material most accurately. The actual
V Section structure is then analyzed by the finite element program "ANSYS", which is used as a reference model to contrast with the equivalent model.

VII. Reference

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