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WEIGHT OPTIMIZATION OF INDUSTRIAL LIFT PLATFORM BY USING COMPOSITE STRUCTURES WITH HELP OF ANSYS WORKBENCH

[1]Shewale Ganesh Pratap, [2]Nayar Vishal Vijay, [3]Godase Ajay Vasant, [4]Jadhav Soham Shantanu
[5] Sargar V.J

[1]UG Scholar, Mechanical Engineering Dept., Adarsh Institute Of Technology & Research Center vita.
[2]UG Scholar, Mechanical Engineering Dept., Adarsh Institute Of Technology & Research Center vita.
[3]UG Scholar, Mechanical Engineering Dept., Adarsh Institute Of Technology & Research Center vita.
[4]UG Scholar, Mechanical Engineering Dept., Adarsh Institute Of Technology & Research Center vita.
[5]Assistance Professor, Mechanical Engineering Dept., Adarsh Institute Of Technology & Research Center vita

vishalnayar70@gmail.com

ABSTRACT :- Sandwich panels are modeled in CATIA. The top and bottom plates, core parts are modeled by using CATIA. The three parts are assembled by using assembling command. Then the assembled part is saved in STP format and imported to ANSYS workbench. In ANSYS Workbench the STP format is imported and math will show three contact sets. Materials properties are given to the individual part i.e., top and base plates are chosen and gentle steel properties are given to them. Presently network the calculation as free planned cross section and primary investigation is finished by fixing the plate at base and power is applied at top face of the plate. Presently by addressing the design the redirection and von misses stress are noted. By changing the corrugated core and same is modeled and analyzed the variation in deflection and von misses and weights are compared.

Key ward: CATIA, ANSYS, Optimization, Sandwich Panel.

I. INTRODUCTION

This construction has often used in lightweight applications such as Lift, EOT crane beam, vehicle body, aircrafts, marine applications, wind turbine blades. In principle two approaches exist to develop efficient structures either application of new structural design. A proven and well-established solution is the use of sandwich structures. In this way high strength to weight ratio and minimum weight can be obtained. The sandwich structures have weight reduction, these solutions can often bring space savings, noise control. Laser-welded metallic sandwich panels offer a number of outstanding properties allowing the designer to develop light and efficient structural configurations for a large variety of applications. These panels have been under active investigations during the last 15 years in the world.

Light Structures Technology Program, researched assembling, plan and plan improvement of steel sandwich boards. The European examination project SANDWICH united between the principle entertainers in Europe and proceeded with the improvement dependent on past public tasks. The undertaking pointed toward broadening the field of utilizations of sandwich boards in different surface vehicle areas, by further improving the sandwich panel properties by implementing local filling material into the panels, developing and validating reliable design formulations within the design tool.

This paper focuses on steel sandwich panels welded by laser. The steel sandwich panels can be constructed with various types of cores as summarized in Figure 1. The choice of the core depends on the application under consideration. The standard cores such as Z-, tube- and hat profiles are easier to get and they are typically accurate enough for the demanding laser welding process. The special cores, such as corrugated core (V-type panel) and I-core, need specific equipment for production, but they usually result with the lightest panels.

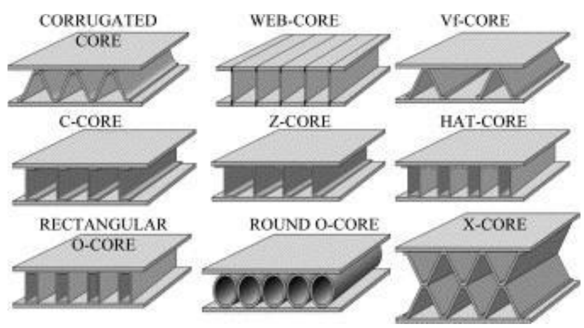

Figure 1: Different sandwich structure with various cores.

1.1 Objective

Following are the major objectives of Project.

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 Impact of identical weight on composite design.
4. Analyze Effect of weight on composite design. Compare the numerical, experimental result with FEA analysis result.

II. FINITE ELEMENT ANALYSIS

a. Boundary Condition 4000N for rectangular cross section

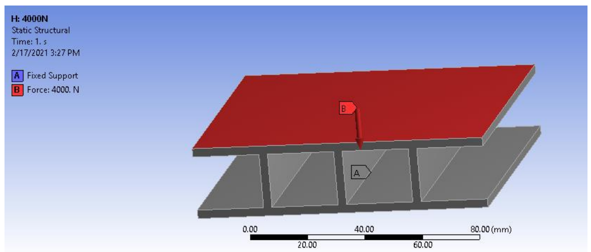

Fig.2. Boundary Condition (4000N) applied on rectangular cross section in ANSYS

Stress

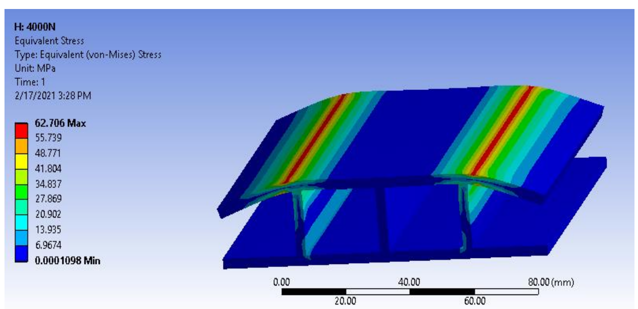

Fig.3. Stress due to applied load of 4000N on rectangular cross section in ANSYS

Deformation

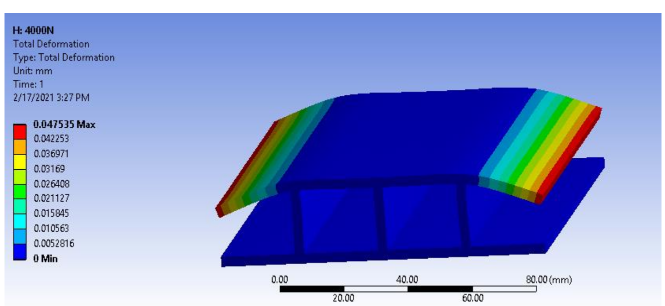

Fig.4. Deformation due to applied load of 4000N on rectangular cross section in ANSYS

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b. Boundary Condition 4000N for triangular cross section

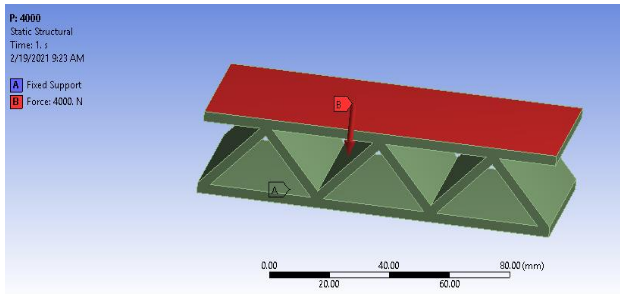

Fig.5. Boundary Condition (4000N) applied on Triangular cross section in ANSYS

Stress

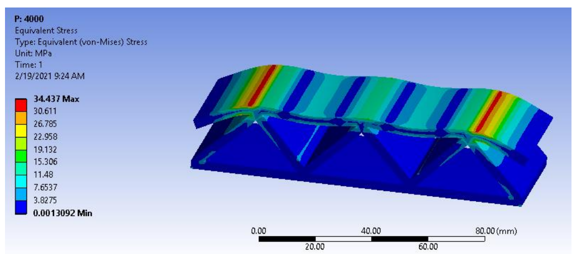

Fig.6. Stress due to applied load of 4000N on Triangular cross section in ANSYS

Deformation

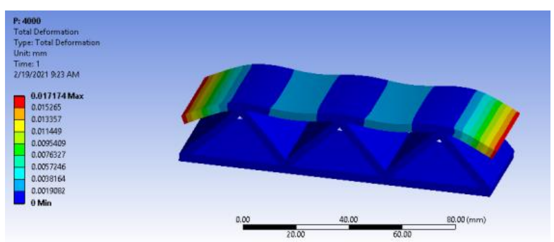

Fig.7. Deformation due to applied load of 4000N on Triangular cross section in ANSYS

c. Boundary Condition 4000N for Circular cross section

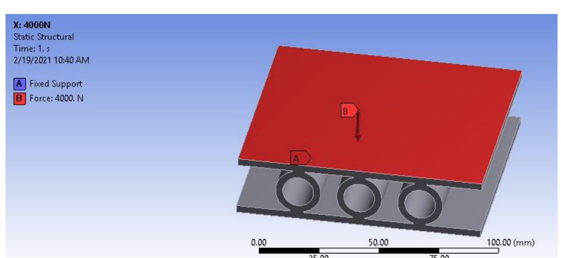

Fig.8. Boundary Condition (4000N) applied on Circular cross section in ANSYS

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Stress

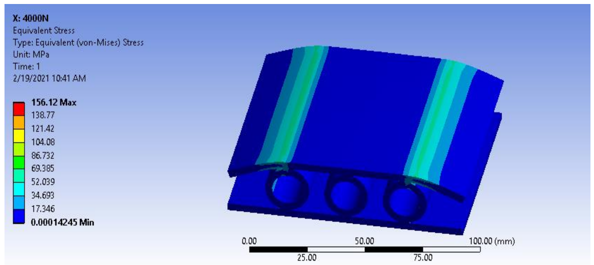

Fig.9. Stress due to applied load of 4000N on Circular cross section in ANSYS

Deformation

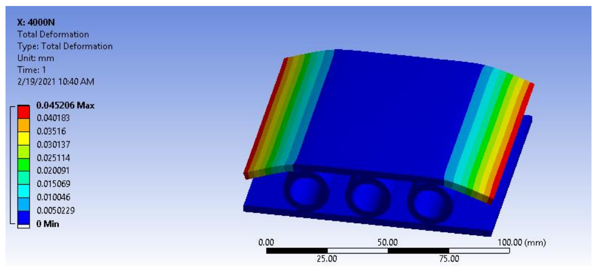

Fig.10. Deformation due to applied load of 4000N on Circular cross section in ANSYS

III. PRACTICAL TESTING

A universal testing machine (UTM), also known as a universal tester, materials testing machine or materials test frame, is used to test the tensile strength and compressive strength of materials. An earlier name for a tensile testing machine is a tensometer. The "universal" part of the name reflects that it can perform many standard tensile and compression tests on materials, components, and structures.

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Fig. 11 UTM Testing Machine

IV. RESULTS

Sr. No.	Shape	Stress (MPa)	Deformation (mm)
1	Rectangular	62.706	0.0475
2	Triangular	34.43	0.0171
3	Circular	156.12	0.0452

Table.1. Results of all composite shape by applied force of 4000N

UTM Result

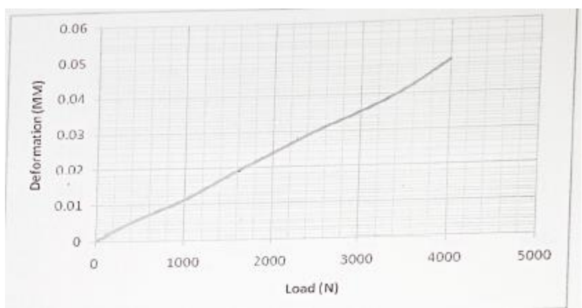

Fig. 12 load Vs Deformation for rectangular cross section

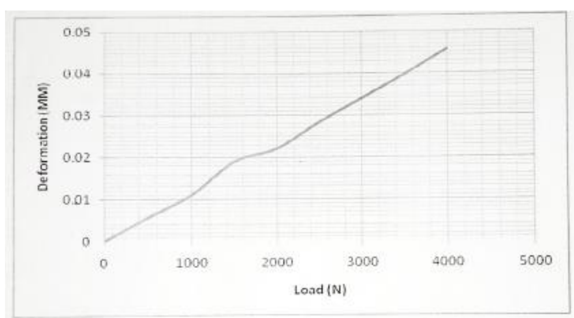

Fig. 13 Load Vs Deformation of Circular cross section

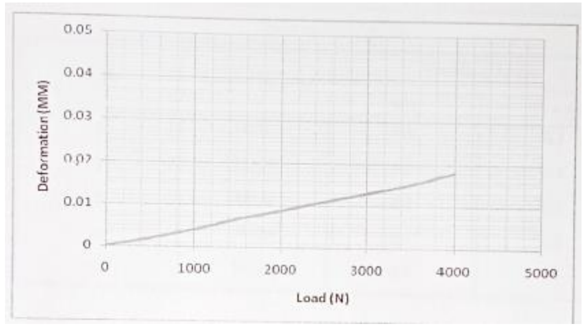

Fig. 14 Load Vs Deformation of Triangular cross section

V. CONCLUSIONS

The composite structure models in CATIA are efficiently imported into ANSYS workbench structural analysis is done and max stress and total deflection is observed.

For given span of the structure, decreasing the weight of composite structure also the strength increases and weight is reduced. The weight of composite structureis decrease of 19-40% as analyzes to steel structure. And furthermore expands the strength of composite construction as contrast with steel structure.

By contrasting Triangular composite design and Rectangular and round composite construction it is seen that Triangular composite construction have least anxieties and furthermore have least avoidance.Also in practical testing result on UTM we observe that triangular cross section having minimum deformation against an applied load. Hence we final a triangular cross section for our lift base.

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