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Design And Analysis of Sandwich Structure For Light Weight Application

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ABSTRACT

Sandwich has increased the importance of efficient structural arrangements. In principle two approaches exist to develop efficient structures: either application of new materials or the use of new structural design. A proven and well-established solution is the use of composite materials and sandwich structures. In this way high strength to weight ratio and minimum weight can be obtained.
The sandwich structures have potential to offer a wide range of attractive design solutions. In addition to the obtained weight reduction, these solutions can often bring space savings, fire resistance, noise control and improved heating and cooling performance. 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.

Keywords- **Structural Analysis, ANSYS 14.5, Sandwich structure.**

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I. INTRODUCTION

Sandwich panels in general can be classified as: composite sandwich and metallic sandwich panels. Composite sandwich panels consist of non-metallic components such as FRP, PU foam etc. and are typically applied as load carrying structures in naval vessels and leisure yachts, and mainly as non-load carrying elements on merchant and large cruise ships. For metallic sandwich panels there are basically two types of panels: panels with metallic face plates and bonded core such as SPS panels and panelswith both metallic face plates and core welded together. The metal material can be either regular, high tensile or stainless steel, or aluminium alloys. 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. Naturally, during the production process or after welding of faceplates plates and core together, the steel sandwich panels can also be filled with some polymer, mineral or rock wool, concrete etc. to improve the behaviour for specific targets.

II.PROBLEM STATEMENT & SOLUTIONS

In Industrial lift they used large thickness of base for the lift to carry maximum amount of load on platform of lift.

Due to this consideration I found that there is a use of more thick material used for base of lift due to this weight of lift increased. For this they used more capacity of motor to run that lift. If we optimize that base of the lift, then also reduced the motor capacity and electricity used for lift.

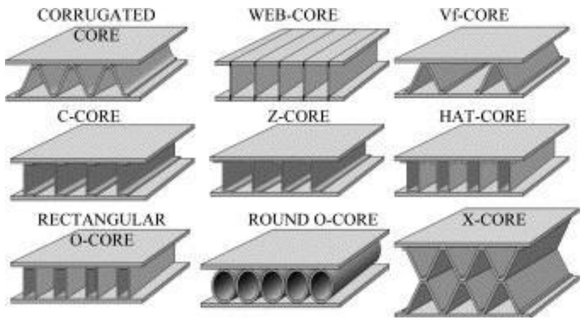

Fig 1.Different steel sandwich structure with various cores

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.

III. LITERATURE REVIEW

1. A Review In Design And Manufacturing Of Stainless Steel Sandwich Panels

Laser welded stainless steel sandwich panels have big potential in wide range of attractive design solutions. The correct design of the details of the sandwich constructions is of great importance as well as the analysis of deflections, stresses and buckling loads. Joint of sandwich panel to other sandwich panels or to other structures is one of the key elements in the practical applications of these constructions. The results of the studies have indicated that austenitic stainless steel grade 1.4301 (AISI 304) can be used in laser welded sandwich panels offering good mechanical properties and corrosion resistance. The use of higher strength austenitic stainless steel as sandwich panels was shown to be reasonable when substantial weight reduction of load bearing structures is desired. In addition to laser welding the development of resistance and spot welding, adhesive bonding and weld-bonding processes will increase the variety of efficient techniques in manufacturing of stainless steel sandwich structures in the future.

2. Steel Sandwich Panels in Marine Applications

There has been a lot of research activities in Europe related to the development of laser welded steel sandwich panels. The work carried out includes the development of design formulations for the ultimate and impact strength, analysis of fatigue strength for the joints, and development of solutions to improve the behavior under fire and noise. New factories have been established to produce these types of panels, which enables larger scale implementations of the panels for various types of ships in the near future. Optimal design of steel sandwich panel applications in ships is a complex task, comprising many subtasks, such as load modeling, response calculations and optimization. Following this principle, a redesign of hoist able car deck was performed, including the minimization of weight and cost of production. Two advanced sandwich alternatives were suggested instead of the traditional paneled structure and were then optimized. Paper gives evidence that the hoist able car deck with sandwich paneling can now be designedin the preliminary faze without using the finite element methods. This seriously shortens the design time, which is of great importance to a designer. One optimization run, on a typical PC, took only couple of minutes, thus enabling the variability and offering more freedom to designer to explore new concepts.

3. Finite Element Analysis and Design of Sandwich Panels Subject to Local Buckling Effects

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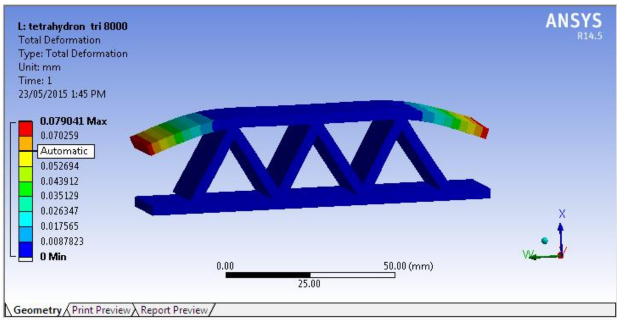
An extensive series of experiments and finite element analyses was conducted to investigate the local buckling behavior of foam supported steel plate elements. Appropriate finite element models were developed to simulate the behavior of foam-supported steel plate elements used in the laboratory experiments as well as sandwich panels used in various building structures.The finite element model was validated using experimental results and then used to review the current design rules. The results reveal the inadequacy of using the conventional effective width approach. It is concluded that for low b/t ratios (<100) current effective width design rules can be applied, but for slender plates these rules cannot be extended in their present form. Based on the results from this study, an improved design equation has been developed considering the local buckling and post buckling behavior of sandwich panels for a large range of b/t ratios (<600) for design purposes.

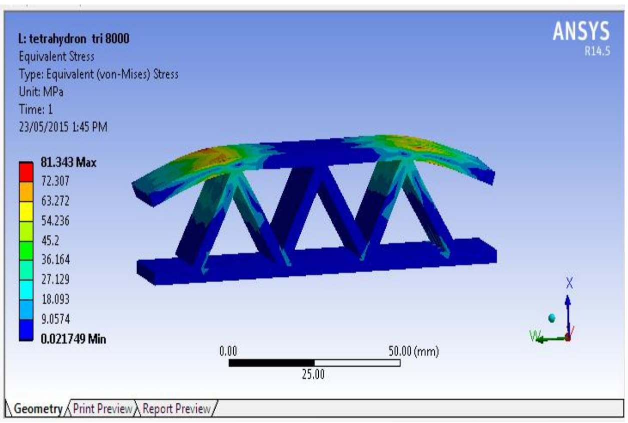
ANSYS RESULT

A) Triangular Structure

TOTAL DEFORMATION:

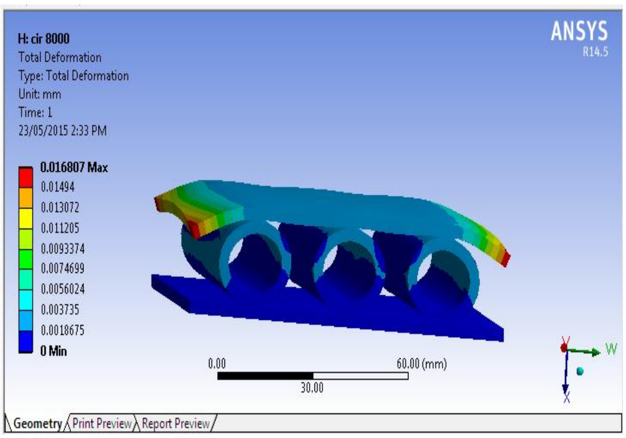


EQUIVALENT STRESS:



B)Circular Structure

TOTAL DEFORMATION



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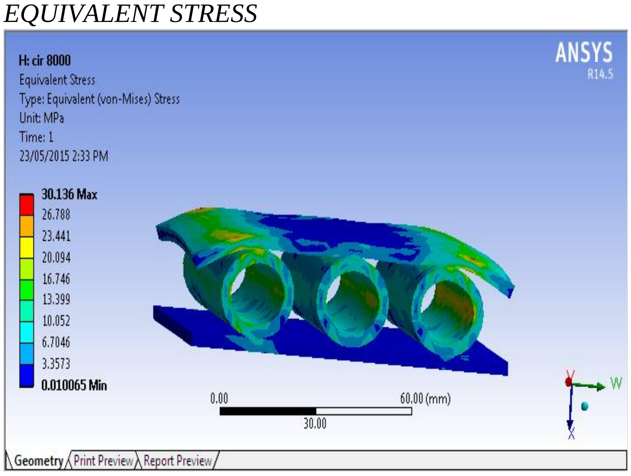
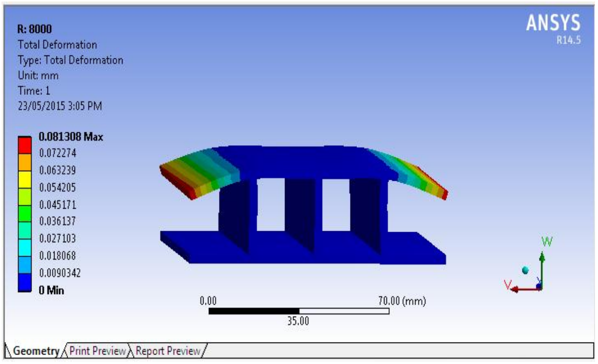


C) Square Structure

TOTAL DEFORMATION



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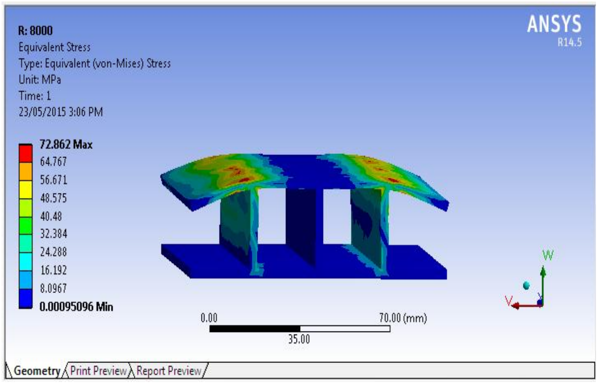

ITS ALL FOR 8000N FORCE

Sr. No.	SHAPE	STRESS	DEFORMATION
1	TRINGUAR	81.343	0.079041
2	CIRCULAR	30.136	0.016807
3	SQUARE	72.862	0.081308

IV.CONCLUSION

From above result we concluded that circular section is most use full for structural application.

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