A Review paper on Design Analysis and Optimization of crane platform base on composite Structural sandwich plate

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Abstract: A structural sandwich consists of two thin face sheets made from stiff and strong relatively mild steel material welded to a thick light weight material called core made up of same material. This construction has often used in lightweight applications such as aircrafts, marine applications and wind turbine blades.

In this paper the structural study of maximum type of core sandwich panel.

I. INTRODUCTION

The demand for bigger, faster and lighter moving vehicles, such as ships, trains, trucks and buses 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.

Proposals for the construction of sandwich-like components were made in different industrial branches as early as the 1950's.

However, the application of laser welding started to be increasingly discussed only after the high power laser sources became available on the market at more affordable prices. Due to its high energy intensity resulting in a low heat input and a deep penetration effect, laser welding offers a number of benefits for the production of all-metal and hybrid-metal sandwich panels. High pre-fabrication accuracy of the components, high welding speed and the possibility to connect internal stiffeners with the face sheets from outside have led to a wide application of laser welding in the construction of metal sandwich panels.

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. These panels have been under active investigations during the last 15 years in the world.

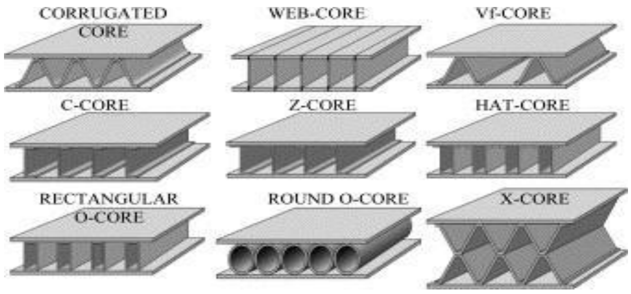

Fig 1.Different steel sandwich structure with various cores

II. 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 designed in 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

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.

III. Need for study

During the last decade extensive research has been carried out in Europe and the USA to investigate the behavior and design of sandwich panels for different failure conditions including that of local buckling effects of profiled sandwich panels.

Occupants of industrial lifter for heavy duty lift we find that self-weight of the platform are high.

IV. Solution

For a structural design problem we used two methods for design a light weight and height strength structure are flowing Design New Material. Design Composite wall as present material. The use of sandwich panels in the construction of building structures offers many advantages as it leads to structures that are lightweight, cost effective and durable. The sandwich panels have been used as structural building components in many industrial and office buildings in Europe and the USA.

Find to replace existing structural panel of plat form body with sandwich structure in lift have light weight and high strength.

V. Proposed work

Design and Analysis of Sandwich Structures.

Sandwich panels are modeled in CATIA. The top and bottom plates are modeled by using extrude command and the core part is modeled by using sweep command. The three parts are assembled by using assembling command. Then the assembled part is saved in IGS format and imported to ANSYS workbench. In ANSYS Workbench the IGS format is imported and geometry will show three contact pairs. Materials properties are given to the individual part i.e., top and bottom plates are selected and stainless steel properties are given to them. Now core is selected and mild steel properties are given. Now mesh the geometry as free mapped mesh and structural analysis is done by fixing the plate at bottom and pressure is applied at top face of the plate as shown in fig. now by solving the structure the deflection and von misses stress are noted. By changing the wave length of corrugated core and same is modeled and analyzed at a constant pressure the variation in deflection and von misses are compared.

VI. Compression test

Steel sandwich structure with stainless steel faces and mild steel core are joined by welding and compression test is conducted on Universal testing machine (UTM) and ultimate stress and deflection are studied. The in plane compression testing of sandwich structure was performed on universal testing machine (UTM) having capacity 400KN. The samples were placed between hardened end plates in order to protect the surface of the machine's platens. Load is applied uniformly and deflection and compression strength are noted.

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