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Improvement in Strength of Existing Material Steel Using Reinforcement of Natural Composite Material

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ABSTRACT

The increase in awareness of the damage caused by synthetic materials on the Environment has led to the development of eco-friendly materials. The researchers have shown a lot of interest in developing such materials which can replace the synthetic Materials. There is an increase in demand for commercial use of the natural Fiber-based composites in recent years for various industrial sectors. Natural fibers are sustainable materials which are easily available in nature and have advantages? Like low-cost, lightweight, renewability, biodegradability, and high specific properties. The sustainability of the natural fiber-based composite materials has led to upsurge its applications in various manufacturing sectors. In this Project, we have reviewed the Different sources of natural fibers, their properties, modification of natural fibers, etc. Natural fiber concentrates with control the environment effect, reduce the product weight and reduce cost of products. The natural fiber incorporation to the benefit of more automotive and strong construction materials like metals. Recently more researches are done made by natural fibers. Wide range applications are publish using these composite materials. Our research concentrates to find equal strength materials. Review aim is to view made best materials using natural fiber with Existing material Steel.

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I. INTRODUCTION

Natural fibers have been used to reinforce materials for over 3,000 years. Recently they have been employed in combination with plastics. Many types of natural fibers have been investigated for use in plastics including Flax, hemp, jute, straw, wood fiber, rice husks, wheat, barley, oats, rye, cane (sugar and bamboo), grass reeds, kenaf, ramie, oil palm empty fruit bunch, sisal, coir, water hyacinth, pennywort, kapok, paper□mulberry, raphia, banana fiber, pineapple leaf fiber and papyrus. Naturalfibers have the advantage that they are renewable resources and have marketing appeal. The Asian markets have been using natural fibers for many years e.g., jute is a common reinforcement in India. Natural fibers are increasingly used in automotive and packaging materials. The increase in awareness of the damage caused by synthetic materials on the Environment has led to the development of eco-friendly materials. The researchers have shown a lot of interest in developing such materials which can replace the synthetic Materials. There is an increase in demand for commercial use of the natural Fiber-based composites in recent years for various industrial sectors. Natural fibers are sustainable materials which are easily available in nature and have advantages like low-cost, lightweight, renewability, biodegradability, and high specific properties. The sustainability of the natural fiber-based composite materials has led to up surge. Its applications in various manufacturing sectors. In this Project, we have reviewed the Different sources of natural fibers, their properties, modification of natural fibers, etc. Natural fiber concentrates with control the environment effect, reduce the product weight and reduce cost of products. The natural fiber incorporation to the benefit of more automotive and strong construction materials like metals. Recently more researches are done made by natural fibers. Wide range applications are publish using these composite materials. Our research concentrates to find equal strength materials. Review aim is to view made best materials using natural fiber with Existing material Steel.

Problem Statement

To analysis of light weight materials, the jute fiber composite is selected as the material of the reinforcement on

exiting stainless steel in order to achieve the improvement in impact energy.

II. LITERATURE SURVEY

[1] Braga, R. Aet al.; 2015 In this paper it presents the utilization of jute fiber adhered with polyester resin in the car business in the creation of a back bumper of incubate vehicle. The shaped part acquired great visual attributes, great geometric development and surface without air pockets and defects in the fiber and resin composite.

[2] P. Ragupathiet al.; 2018 In this paper it looks at the effect quality, cost and weight of jute-based composite bumper with that of the current steel bumper. The jute composite bumper was created by applying a progression of jute fibber layers and liquid resin layers. Charpy impact test was completed to discover the effect quality of 2 composite bumpers which was seen to be 7.14 J/mm. When contrasted and the steel bumper, the composite bumper is 58% less in cost and a weight decrease of 56.1% is accomplished. The effect quality of jute fibber composite bumper is 2 3.89 J/mm more than that of the steel bumper of a similar size, i.e., 54.5% expansion for jute fibber composite bumper. The weight and cost of the jute fibber composite bumper were seen as diminished by 56.1% and 58%, individually in correlation with the steel bumper. Since the effect quality of the jute fibber composite bumper is far more prominent than that of the steel bumper with the upside of diminished weight and cost, the discoveries of this investigation can be applied to car applications.

[3] Prashanth S. al.; 2018 In this review the material used is mild steel and composite material (glass epoxy). The composite material designed gives lower stress compared to mild steel, and also composite material weight is less compared to mild steel.

[4] N. Kaur1, IEEE2017. This review study presented the concerns related to the environment have broadened in the last two decades .Previously attention was on the issues related to the energy sources but the same has been shifted to the more technical issues as well as the former one. Further, it provided a summary of need of natural composites especially BFRP; over synthetic composites and proving that the natural fibers composites are renewable and cheaper substitute than synthetic fibers. Taking into account the thermal and mechanical properties of the BFRP, it has a great potential to make lightweight sustainable finished products that can reduce tremendous amount of energy consumption in the aerospace industry.

[5] V. K. Srivastava, et al. Analysis of particles loaded fiber composites for the evaluation of effective material properties with the variation of shape and size.

[6] Noorunnisa Khanam, et al. Studied the tensile, flexural and compressive strength of hybrid composites with different fiber lengths of coir/silk in unsaturated polyester matrix. Coir/silk fibres taken ratio of 1:1 and incorporated with unsaturated polyester resin with different lengths such as 1, 2 and 3 cm. Finally observed that 2 cm fiber length produced higher, flexural and compressive strength than others.

[7] Mylsamy and Rajendran, et al. Reinforced raw and alkali treated chopped agave fibres in epoxy matrix. Its prepared 3 mm, 5 mm and 7 mm length raw and alkali treated fibres. It found alkali treated fiber withstood more fracture strain than the other one. Out of the three different fiber length reinforcements, alkali treated 3 mm agave fiber reinforcement superior better mechanical properties.

[8] Frederico, et al. Investigated the dynamic-mechanical behaviour of epoxy matrix composites reinforced with ramie fibres. The temperature variation of the dynamic-mechanical parameters of epoxy matrix composites incorporated with up to 30% in volume of ramie fiber was investigated by DMA tests. Parameters storage modulus, loss modulus and tangent delta are investigating temperature from 20 to 200°C in equipment operating in its flexural mode at 1 Hz under nitrogen. It shows result that incorporation of ramie fiber tends to increase the viscos.

III. DESIGN AND ANALYSIS

In the project we are creating 3D CAD Model Drawn in the SOLID WORKS software show in the figure 1.

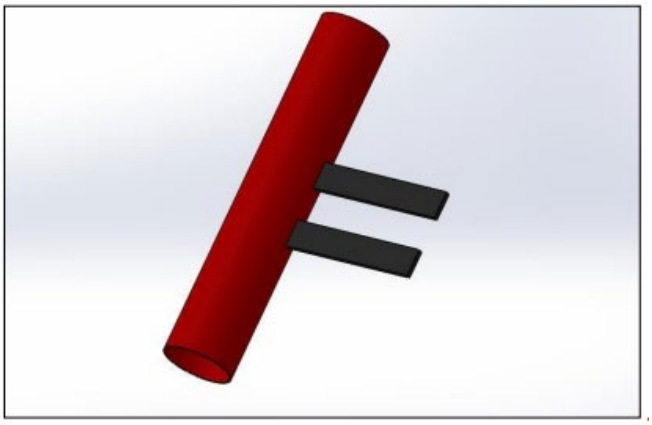

Fig. 1: Stainless steel Pipe Model in Solid works

The figure 1 show that 3D CAD model of pipe after completing the 3D model we moved for the drafting of the component. The drafting of the component are show in the figure 2 and providing the dimension of the component. Computer-aided design (CAD) is the use of computer systems (or workstations) to aid in the creation, modification, analysis, or optimization of a design. CAD software is used to increase the productivity of the designer, improve the quality of design, improve communications through documentation, and to create a database for manufacturing. CAD output is often in the form of electronic files for print, machining, or other manufacturing operations. Its use in designing electronic systems is known as electronic design automation (EDA). In mechanical design it is known as mechanical design automation (MDA) or computer-aided drafting (CAD), which includes the process of creating a technical drawing with the use of computer software. CAD software for mechanical design uses either vector-based

graphics to depict the objects of traditional drafting, or may also produce graphics showing the overall appearance of designed objects. However, it involves more than just shapes. CAD may be used to design curves and figures in two-dimensional (2D) space; or curves, surfaces, and solids in three- dimensional (3D) space.

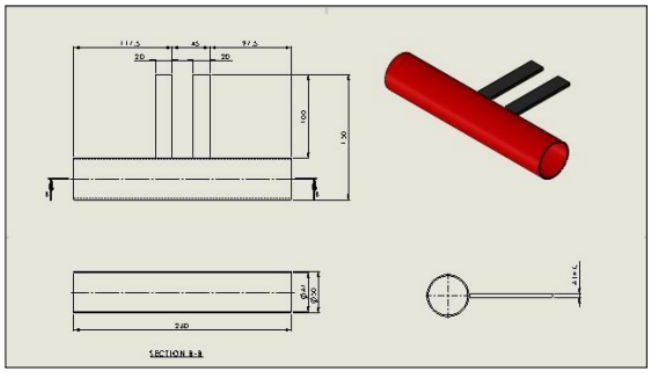

Fig. 2: Drafting of Steel Pipe Model

CAD is an important industrial art extensively used in many applications, including automotive , ship building, and aerospace industry industrial and architectural design, prosthetics, and many more. CAD is also widely used to produce computer animation for special effects in movies, advertising and technical manuals, often called DCC digital content creation. The modern ubiquity and power of computers means that even perfume bottles and shampoo dispensers are designed using techniques unheard of by engineers of the 1960s. Because of its enormous economic importance, CAD has been a major driving force for research in computational geometry, computer graphics (both hardware and software), and discrete differential geometry. The design of geometric models for object shapes, in particular, is occasionally called computer-aided geometric design (CAGD).

IV. TESTING RESULT

Experimental Testing of Jute Fiber epoxy Reinforcement component taken on the UTM machine, In this we have performed the compression test of the three point bending test.

Fig 3. Results on UTM

During the experimental test is performed with load of 8300 N. Observe for the failure

of the component. (By the boundary condition of 1 mm Displacement)

FEA Analysis value of Jute = 10720 N

Experimental Value of Jute Reinforcement = 8300 N

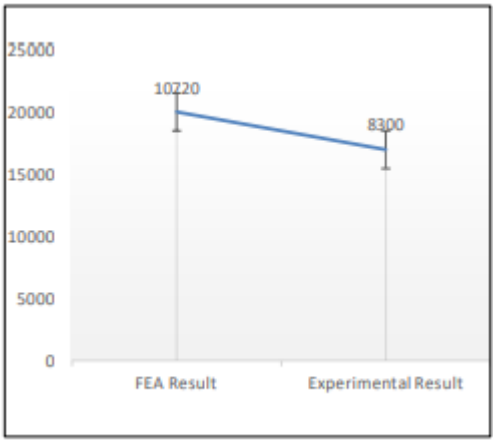

Fig 4. Comparison of Result

By the result of FEA simulation and Experimental Testing we have achieved the result by 22% of error.

V. CONCLUSION

In present investigation existing material is compared with composite material and displacement is applied to determine stress, strain energy and force reaction.

It is observed from analysis that force reaction obtained through jute epoxy is greater than existing material. So, it can be used to enhance the impact energy with significant increase in weight of component.

Another Analysis is performed for the specific weight reduction purpose then also we get the better result than the existing material.

Hence we have successfully completed the Project by Achieving all Objective of the project.

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