Ilkogretim Online - Elementary Education Online, 2020; Vol 19 (Issue 3): pp. 4618-4625
http://ilkogretim-online.org
doi: 10.17051/ilkonline.2020.03.735615

Mechanical Property Of Glass Fiber With Coir Fiber For Automobile Mudguard

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Abstract—In the current scenario, Automobile Industries focuses on enhancing the strength and reducing the weight of body parts. The two wheelers mudguard is provided to prevent the dirt's and sand particles in tire from entering and damaging other parts. Presently most of which are made from ABS/Polypropylene plastics. They are of high cost and not completely degradable. The attempt has been made to use strong and abundantly available glass fiber with coir fiber and sisal fiber as reinforcement in epoxy resin to make low cost, high strength and less weight substitute for mudguard. This process is based on the working principle of Hand Lay-up Method. The materials required in this process are E-Glass Fiber, Coir and Sisal Fiber, Epoxy Resin (LY556) and hardener (HY951). This method is used to manufacture the hybrid composite material ofGlass Fiber with Coir Fiber of the required dimension. The Mechanical properties such as Tensile test and Compression Test has been done on both the composite material. From the Final Testing result, we conclude that the Glass Fiber with Coir Fiber has high strength and less weight substitute for manufacturing two-wheeler Mudguard.

Keywords—Automobile, two wheelers, mudguard, polypropylene plastics, sisal fiber, coir fiber, composite material, mechanical properties

I. INTRODUCTION

Fiber/Epoxy composite. Based on comprehensiveliterature review of various aspects in developing Glass Fiber/epoxy composite material, it is observed that extensive work has been done related to manufacturing and mechanical characterization of current material composites are most promising materials for components of current and future engineering structures, with a significant demand at present in aircraft and aerospace industries[4]. Modal analysis is the study of the natural characteristics of structures. Understanding both the natural frequency and mode shape helps to design any structural system for noise and vibration applications. In this paper analysis of free vibration of cantilever beam for the composite as well as steel material are carried out. Natural frequency and mode shape of the plates has been determined using FFT analyzer. Also comparative study of Steel, E glass epoxy and FRP is done for stress analysis with the help of UTM. These materials are used for vibration analysis to observe the effect of a modal parameters of cantilever beam subjected to free vibration is analyzed with the help of FFT analyzer in experimental setup..

II. PREPARATION OF SPECIMENS

In this Experiment two Specimens are made with Natural fibers like coir fiber and sisal fiber. In the Second Specimen Carbon fiber is added. The hardener like epoxy (Araldite LY556) and Araldite HY951 is used to manufacture the composite combination. The Composite plates were prepared by Hand layup method.

A. Hand Lay-Up Method

Hand lay-up is the simplest and oldest open molding method of the composite fabrication processes. It is a low volume, labor intensive method suited especially for large components, such as boat hulls. Glass or other reinforcing mat or woven fabric or roving is positioned manually in the open mold, and resin is poured, brushed, or sprayed over and into the glass plies. Entrapped air is removed manually with squeegees or rollers to complete the laminates structure. Room temperature curing polyesters and epoxies are the most commonly used matrix resins. Curing is initiated by a catalyst in the resin system, which hardens the fiber reinforced resin composite without external heat. For a high quality part surface, a pigmented gel coat is first applied to the mold surface. Maintaining the Integrity of the Specifications.

B. Specimen A

Specimen A consist only of natural fibers (coir and sisal). The Composite is prepared by Hand lay-up method. Glass fiber is set as base material. Coir fiber and sisal fiber are kept over other consisting of 7 layers. At the end of the process thickness is 6.7 mm.

Fig. 1. Specimen A

C. Specimen B

Specimen B consist only of natural fibers (sisal fiber) and Glass Fiber. The Composite is prepared by Hand lay-up method. Glass Fiber is set as base material. Sisal fibers kept over with another layer of glass fiber consisting of 7 layers. At the end of the process thickness is 6.5 mm.

Result:
Fmax: 5.71KN UTS: 67.80Mpa

SAMPLE NUMBER-2(E-Glass and coir 2)Test method-ASTMD638
Input data
Mode of test -Tension Sample type-flat Thickness-6mm Width-15mm
Gauge length-180mm
Final gauge length-0.000mm Final gauge width-0.000mm

Fig. 2. Specimen B

III. TESTING

A. Tensile Test of Specimen A

The universal standards we used for this experiment is ASTM. The material specimen is prepared as per the ASTM D638 Standard. Two samples are taken for testing. A universal testing machine with maximum load rating of 400 KN is used for testing. The material is held by the grips and load is applied till failure occurs. Ultimate tensile test is noted. A stress versus strain graph is generated. Dimensions of the Samples are as follows

Result:
Fmax: 9.63KN UTS: 196.26Mpa

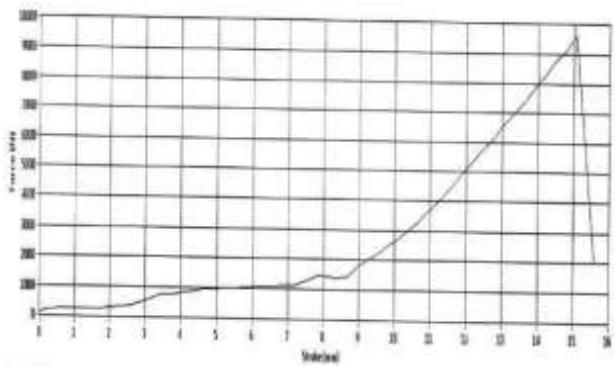

Fig. 4. Tensile test sample 2

TABLE I. DIMENSIONS OF TENSILE SAMPLES OF SPECIMEN A

Dimension	Sample A1	Sample A2
Gauge Length	1MM	1MM
Width	13.25 MM	13.2 MM

Thickness	6.88mm	6.87mm

SAMPLE NUMBER-1 (E-Glass and coir 1)Test method-ASTMD638
Input data
Mode of test -Tension Sample type-flat Thickness-6.32mm Width-33mm
Gauge length-182mm
Final gauge length-0.000mmFinal gauge width-0.000mm

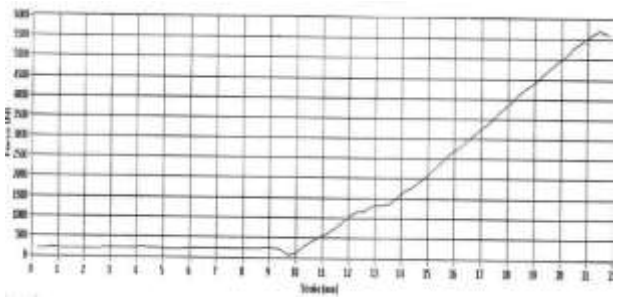

Fig. 2. Tensile test sample 1

B. Compression Test

SAMPLE NUMBER-1 (E-Glass and Sisal Fiber)Test method-ASTMD638
Input data
Mode of test -Compression testSample type-flat
Thickness-6mmWidth-20mm
Gauge length-120mm
Final gauge length-0.000mmFinal gauge width-0.000mm

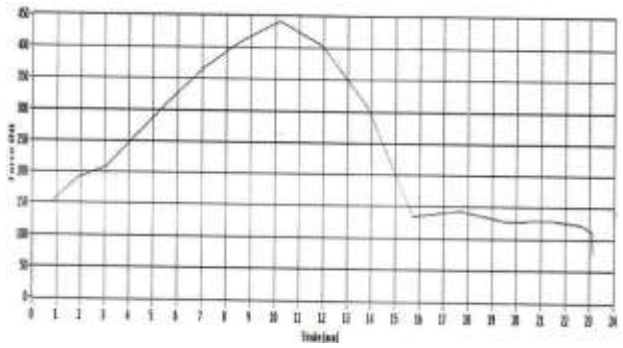

Fig. 5. Compression test sample1

Result:
Fmax:,0.44KN

SAMPLE NUMBER-2 (E-Glass and Coir 1)Test method-ASTM D790

Input data
Mode of test -Compression testSample type-flat
Thickness-5.50mmWidth-45mm
Gauge length-112mm
Final gauge length-0.000mmFinal gauge width-0.000mm

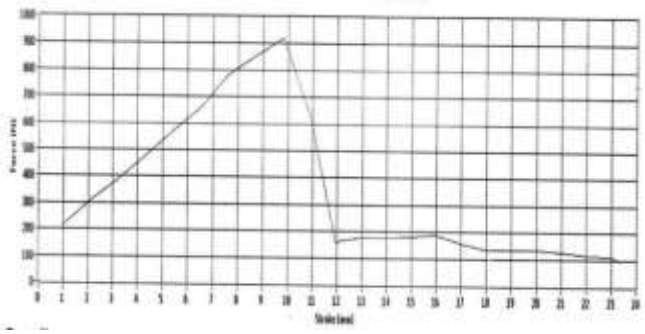

Fig. 6. Compression test sample 2

Result:
Fmax: 0.92KN

SAMPLE NUMBER-3 (E-Glass and Coir 2)Test method-ASTM D790
Input data
Mode of test -Compression testSample type-flat
Thickness-6.50mmWidth-50mm
Gauge length-115mm
Final gauge length-0.000mmFinal gauge width-0.000mm

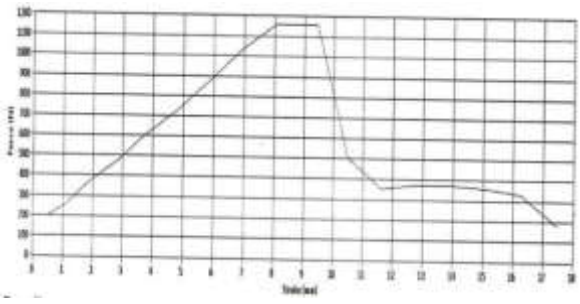

Fig. 7. Compression test sample 3

Result:
Fmax:1.16KN

C. Compression Test- Result

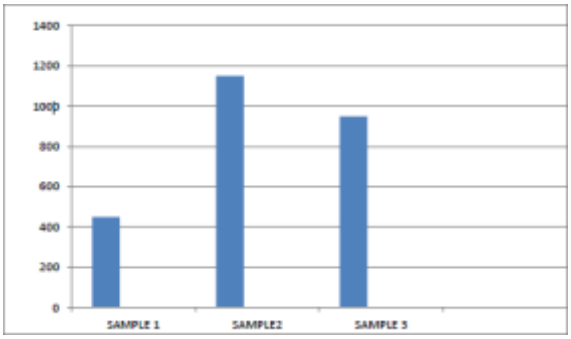

Fig. 8. Compression test result

Sample 1: E-Glass Fiber-30% and Coir Fiber-20%. Sample 2: E-Glass Fiber-30% And Coir Fiber-10%. Sample 3: E- Glass Fiber-30% And Sisal Fiber-20%.

D. Tensile Test- Result

Fig. 9. Tensile test result

Sample 1: E-Glass Fiber-30% and Coir Fiber-20%. Sample 2: E-Glass Fiber-30% And Coir Fiber-10%. Sample 3: E- Glass Fiber-30% And Sisal Fiber-20%.

IV. CONCLUSION

- From above graphs it is clear that Natural frequency is higher at initial model for Epoxy mudguard and slightly less at higher order frequencies.
- The values obtained in the mode shape results indicates that there is less deflection in Glass Epoxy fiber than Steel Mudguard and the frequency values obtained in experimental results have Epoxy Glass Fiber values higher than steel mudguard and so the stiffness is maximum in Epoxy Glass Fiber as the natural frequency is directly proportional to the stiffness of material.
- The Natural Frequencies obtained in the Analysis & Testing results are almost same so, the validation of the result is done.
- Hence 58% reduction in mass is achieved which finally helps in increasing mechanical efficiency of vehicle as it'scontrolled by mass of components

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