Design And Fabrication Of Bike Centre Stand Using Composite Materials

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***Abstract*—** The importance of materials in modern world can be realized from the fact that much of the research is being done to apply new materials to different components. This paper presents development the design and fabrication of bike Centre stand by using composite material. In this paper, the aim is to manufacture the composite Centre stand and compare the results with conventional steel stand under different mechanical testing with evaluating of different mechanical properties such as tensile strength, bending strength, impact strength, fatigue strength by using appropriate experimental technique. The present work is carried out on modelling, analysis and testing of Centre stand is to replace by different composite material for two wheeler vehicle. The stress and deflections of the Centre stand is going to be reduced by using the new composite material. The Centre stand was modelled in Pro/Engineer and the analysis was done using ANSYS workbench software. The fatigue life of both steel and composite material is compared using ANSYS software.

Keywords: Bike centre stand,Composite material, Pro/Engineer, ANSYS and Mechanical properties

1.INTRODUCTION

Fibers produce high-strength composites because of their small diameter; they contain far fewer defects (normally surface defects) compared to the material produced in bulk. As a general rule, the smaller the diameter of the fiber, the higher its strength, but often the cost increases as the diameter becomes smaller. In addition, smaller-diameter high-strength fibers have greater flexibility and are more amenable to fabrication processes such as weaving or forming over radii. Typical fibers include glass, aramid, and carbon, which may be continuous or discontinuous. Fig.1 refer the arrangement of layers in composites.

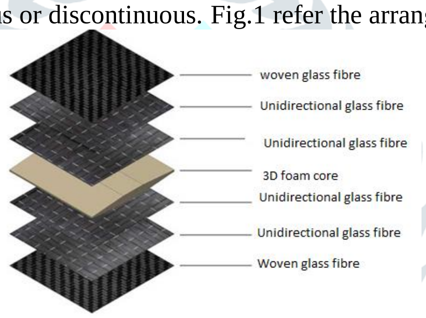


Figure.1.Arrangement of layers in composites

Shaik Shaheen et, al (2015) refers the rocket motor case is an inert or non-energy contributing missile component; the design objective is to make the case as lightweight as possible, within the bounds of technology and cost. The carbon-epoxy material results are compared with the D6AC steel material results to specify better efficient material. A.Dalabashi Esfahani et, al(2009).refers on the capabiltiy of nonlinear quasi-static element modeling in simulating the hysteretic behaviour of FRP-retrofitted reinforced concrete (RC) exterior beam-column joint under cyclic load. Bao-feng Pan et,al(2009) reveals a new type of SiO2-MgO-CaO (SMC) whisker was used to modify high density polyethylene (HDPE). The melting behavior and crystallinity were investigated by differential scanning calorimetry (DSC). The dispersion of whiskers and interfacial adhesion in the prepared HDPE/SMC whisker composites were investigated by scanning electron microscopy (SEM).Some of the researchers literatures are refered for the composte materials[9-14].

2.BIKE CENTRE STAND

A center-stand is intended primarily for maintenance work, not for routine parking of a bike. It allows you to get one (or both) of the wheels off the ground to enable chain maintenance or removing one or both of the wheels. By default (on most modern bikes) it is the rear wheel that is lifted. By lifting the rear wheel, you will no longer have any of the "parking brake" effect of putting the bike in gear to help prevent the bike from rolling forward. The side-stand is the one intended to be used for parking. It is considerably more stable laterally than a center stand. It takes much more effort to high side a bike (push over to the right) from the left side, side-stand than it is to tip it sideways off of the relatively narrow footing of a center-stand.

2.1.FAILURE OF BIKE CENTRE STAND

The failure caused significant damage to the motorcycle and a full investigation on the broken centre stand was undertaken to determine the cause(s) of the failure. There is a continuous and ongoing requirement for improvement in the mechanical properties of materials used in automotive industries. Manufacturers of motorcycles are responsible for making sure that defective parts do not make it into their products. If a motorcycle kickstand is defective, riders may become pinned under a heavy bike or suffer other injuries. Even if the parts are not defective, poor design can lead to similar accidents. For example, a center stand must be designed and built in such a way as to support the motorcycle and not to lose its effectiveness with repeated use.

3. METHODOLGY AND MODELING

To accomplish the objectives of this study, Finite Element Analysis was performed on models. The first task in this project was a parameter study which was performed by changing the outer diameter and rib length of a hollow, cylindrical shank model. Next, elliptical shapes were investigated in a similar fashion, using several different widths and an aspect ratio which was applied to each. The stress distributions and displacement were calculated through the finite element analysis program, Ansys workbench. Fig.2 refer the 3D modeling of the mould.

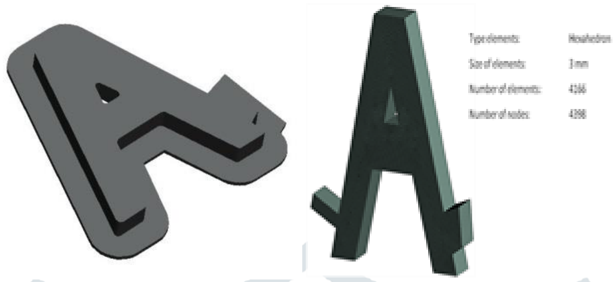


Figure.2.3D modeling of mould

3. EXPERIMENTAL PROCEDURE

3.1. WORK STATION PREPARATION

An initial preparation of all the materials and tools that are going to be used is a fundamental standard procedure when working with composites. This is mainly because once the resin and the hardener are mixed, the working time (prior to the resin mix gelling) is limited by the speed of the hardener chemically reacting with the epoxy producing an exothermic reaction. Also, as part of the initial preparation, the woven cloth must be cut according to the shape of the part. In this experiment two pieces of fiberglass material cut into one foot squares.

3.1. MOLD PREPARATION

Before starting with the layup process an adequate mold preparation must be done. Mainly, this preparation consists of cleaning the mold and applying a release agent in the surface of it to avoid the resin to stick. In this experiment the mold preparation is simply taping the plastic sheeting to the tabletop.

- Clean the mold with a clean cloth
- Apply and spread release agent in the surface of the mold
- Wait certain to set up the release agent
- Buff with clean cloth.

3.2. MOLD PREPARATION

THE LAYERS ARE ARRANGED WITH THIS SEQUENCE IT IS DRIED FOR 2HRS AND THEN THE MOULD IS REMOVED FROM THE PATTERN AND IT IS SHOWN IN FIG.3.

LAYER 1: SURFACE MAT

LAYER 2 :CHOPPED STRAND MAT(450GSM)

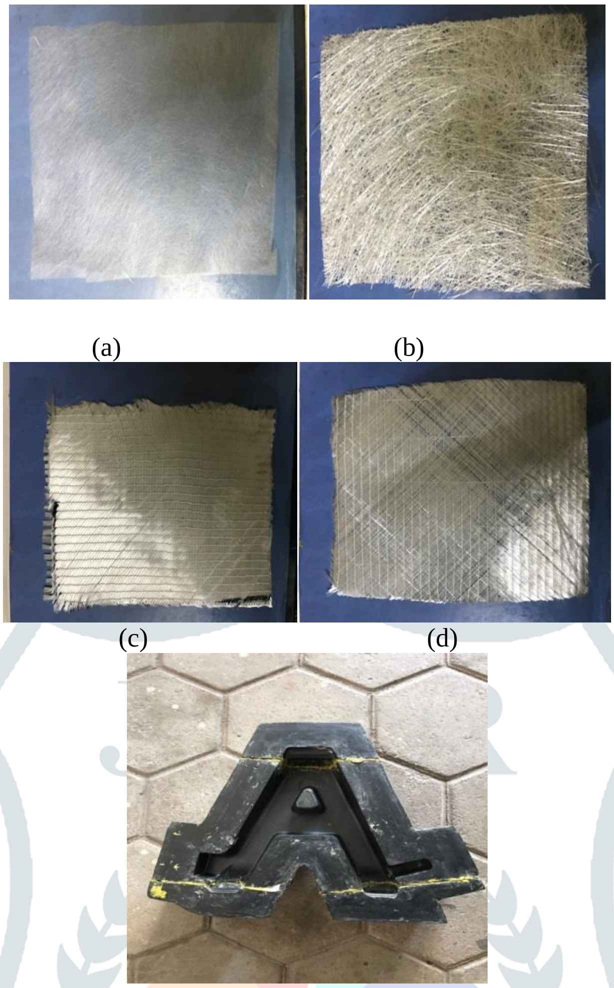
LAYER 3:BIAXIAL MAT(600GSM)

LAYER 4:UNI DIRECTIONAL MAT(900GSM)

LAYER 5:BI AXIAL MAT(600 GSM)

LAYER 6: CHOPPED STAND MAT(450GSM)

A mixture of araldite ly556 and aradur hy951 is mixed in a ratio of 1:2 and applied in between each layer.



(a) (b)

(c) (d)

(e)

Figure.3.Structure of the mould (a) Surface mat (b) Chopped stand mat (c) Undirection mat (d) Bi axial mat

4. RESULTS AND DISCUSSION

Selecting the proper boundary condition has an important role in structural analysis. Effective modeling of support conditions at bearings and expansion joints requires a careful consideration of continuity of each translational and rotational component of displacement. For a static analysis, it is common to use a simpler assumption of supports (i.e. fixed, pinned, roller) without considering the soil/ foundation system stiffness. However for dynamic analysis, representing the soil/foundation stiffness is essential. In most cases choosing a [6×6] stiffness matrix is adequate. The boundary conditions used here are those corresponding to a double-pinned axle. The model is prevented from translation and from rotation in all directions.

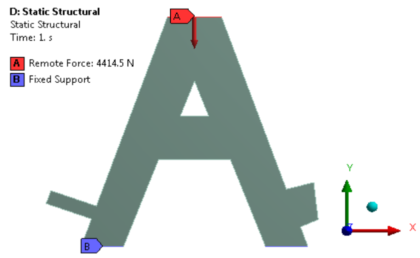
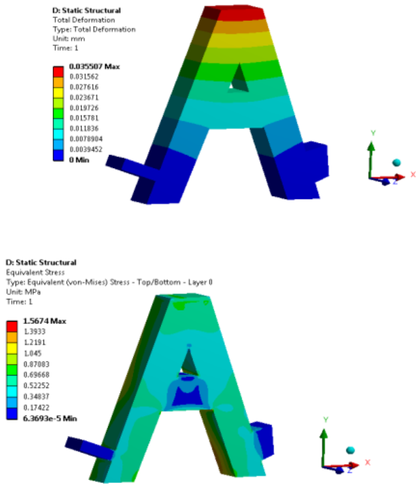


Figure.3.Load case

4.1. STRUCTURAL ANALYSIS

4.1.1 CASE 1

In this case all the four layers of glass fibre are bonded and then it is analysed using ANSYS .The total deformation and the equivalent stress are given below.



4.1.2 CASE 2

In this case, only biaxial layer of glass fibre is bonded and then it is analysed using ANSYS .The total deformation and the equivalent stress are given below**.**

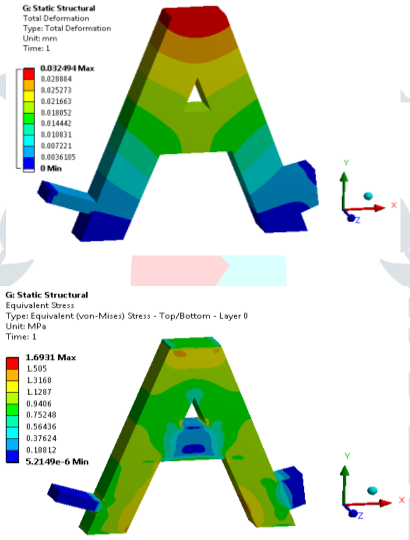


Figure.5.Case 2 deformation and equivalent stress

4.1.3 CASE 3

In this case, only unidirectional layer of glass fibre is bonded and then it is analysed using ANSYS. The total deformation and the equivalent stress are given below.

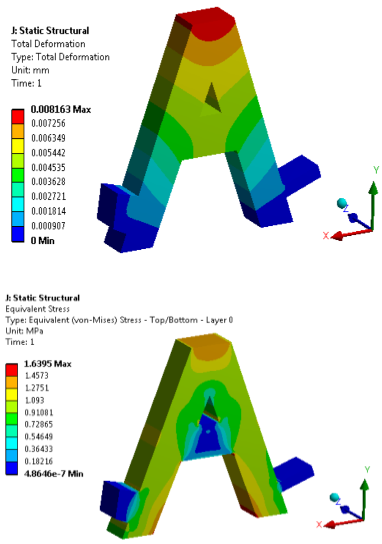


Figure.6.Case 3 deformation and equivalent stress

4.1.4 CASE 4

In this case, both biaxial and unidirectional layers of glass fibre are bonded and then it is analysed using ANSYS .The total deformation and the equivalent stress are given below.

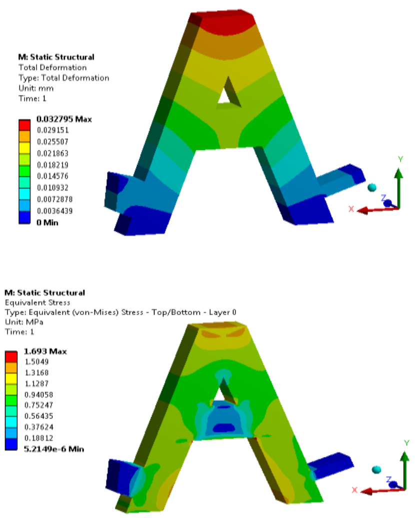


Figure.7.Case 4 deformation and equivalent stress

5. FABRICATION OF CENTRE STAND

5.1. PRODUCT FABRICATION

The product is fabricated using hand layup processh and lay-up is an process of open molding which is suitable for wide varieties of composite products.Its feasible to produce substantial production quantities using multiple molds.it is the simplest composite molding method offering low cost tooling .simple processing and a wide range of part sizes. Design changes are readily made.

In this process the mould is fully polished using wax.and then surface mat is cutted in the shape of the mould and placed inside that mould .after that gel coat is applied over

Figure.8.Glass Fibre centre stand

the surface mat and then chopped strand mat is placed over it and it is cured for an period of 15 minutes.Now unidirectional mat is placed in +45° and -45° orientation over that and it is dried .and then biaxial mat is placed and then this hand layup process is continued for 3 to 4layers or upto the desired thickness and its completely allowed to cure for 24hours and then the fabricated product is removed from the mould.Fig.8 shows the glass fibre centre stand.

Figure.9.Laminated centre stand

Fig.9 represents the laminated centre stand.The process of laminating the centre stand to another material in order to provide strength and support to that material.Since Fiberglass is composed of very fine strands of glass. It has many different purposes, one of which is used for strength. The strength of fiberglass depends on the size of the glass strands, the temperature, and the humidity. This process is Started by applying the epoxy to the centre stand. Continuously and quickly until all areas are sufficiently covered by the epoxy paint with help of roller The same resin mixture is subsequently given to the covered fiberglass with moderately cured resin in the second step. This second glaze which covers the first fills in the empty spaces between the fibers.

6. CONCLUSIONS

The model of laminated composite plate has been developed to investigate the influence of the lamination angles of layers on the effective engineering elastic constants and the stress and strain values of the four-layered angle-ply symmetric laminated plates. In numerical analysis, coupled with classical lamination theory of the layered plates, the results for same time combined loads by the resultant force. The results of strain and stress analysis of developed models could be helpful to optimal design of laminated composite structures. Based on the results presented in this paper, the careful analysis of the stress values showed the great influence of the lamination angles of layers, and possibility of predicting deformations and stresses in composite plates.

Table.1 .Results of composite layers

	Total Deformation (mm)	Equivalent Stress (MPa)
Case 1	0.035	1.56
Case 2	0.032	1.69
Case 3	0.008	1.63
Case 4	0.033	1.68

The result optioned in the Table.1 shows the better model of the composites layers.

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