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MANUFACTURING AND EVALUATING NEW HYBRID MATERIALS HAND LAY UP TECHNIQUE USING KEVLAR BASALT AND CHOPED MATE WITH HORN POWDER

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ABSTRACT

The mixing of two or more materials having dissimilar chemical or physical characteristics results in a composite material. And which, even after construction is complete, may be identified by microscopic or macroscopic means. In other words, the components do not combine into a single mass, but they do not disintegrate either. The market share of fibre materials has been steadily increasing for many years. Compared to conventional engineering materials, composite fibres are inexpensive, lightweight, and ecologically benign. Using Basalt, chopped mate, kevlar, and powdered GOAT horn was the major focus of this research. Combinations of the aforementioned three reinforcements with epoxy resin will yield BASALT+10% GOAT HORN POWDER, CHOPPED MAT FIBER+10% GOAT HORN POWDER, KEVLAR FIBER+10% GOAT HORN POWDER, BASALT+ CHOPPED MAT FIBER+10% GOAT HORN POWDER, CHOPPED MAT FIBRE + KEVLAR FIBER+10% Ten percent powdered goat horn is a frequent ingredient in many mixtures. The qualities of the composite was produced the crossover material which are evaluated provisionally in accordance with ASTM standards, including tensile, flexural, impact, and hardness testing. Whichever material you end up deciding on for your car's bumper, keep its real-world applicability in mind. Stress, strain, deformation, and shear stress utilising best material and Gmat material may be determined when a model is created in Catia and subjected to a static analysis in Ansys.

INTRODUCTION OF FIBERS

According to most definitions, a composite is a blend of at least two distinct components. Fiber-reinforced polymer (FRP) is a popular composite in which the polymer serves as a lattice and the strands serve as support. The structure functions as glue, holding the stands together and increasing their weather resistance. Because the grid, unlike the network material, is more fragile than the filaments, mechanical properties such as hardness, strength, and sturdiness are required to let them to expand when they are united. Because filaments are often orientated in the same direction (unidirectional), their properties are anisotropic, resulting in outstanding properties along the fiber course. Near isotropic properties can be produced if the strands are put freely in a multidimensional framework (multidirectional). Polymer lattice composites (PMCs) are a form of composite made of polymer lattices (polymer grid composite). Composite matrix composites (CMCs) and metal network composites (MMCs) are two forms of composites (clay framework composites). Because composites are equally robust but much lighter than metals, they are routinely utilized to replace them. This idea, in any case, only applies to PMCs.

INDUSTRIAL APPLICATIONS OF FIBER REINFORCED COMPOSITES MATERIALS

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(a)Military and aerospace applications

Figure 12 Light weight natural composites military Helmet

Figure 13 Carbon Fiber Reinforced Composite Surfboards

LITERATURE REVIEW

[1] The motivation behind this exploration is to set up cut evidence material comprised of shear thickening liquid (STF) and Kevlar fiber. In this exploration, silica/ethylene glycol suspension was ready for the utilization as STF and it was assessed by remoter. From the outcomes, it was seen that STF displayed a converse fluid strong progress at a specific shear. Kevlar was treated as STF by 1 plunge 1 nip technique and mechanical and cut safe properties were examined. Subsequent to survey both the outcomes, STF impregnation exhaustively overhauled the wound opposition of Kevlar against the spike dangers and the wellbeing part of Kevlar was additionally expanded extensively.

[2] The cut safe covering was performed by considering one STF, smoldered silica/ethylene glycol suspension of Kevlar texture to upgrade the presentation of the material. From this exploration, broad redesigns in cut insubordination were seen particularly in extreme speed stacking condition. It was seen that the expansion didn't change or decay the adaptability of STF. From the outcomes, we caused that seethed silica/Kevlar composite texture would be a fine material for body defensively covered applications

[3] Moreover, various materials that are consolidated to deliver an individual part. The two materials that were explored were Kevlar poly (p-phenyleneterephthalamide) and santoprene. Here in this examination, the Kevlar fiber was utilized two, the principal type was, it was utilized without changing it and the subsequent kind was utilized in the wake of adjusting it.

[4] The Kevlar which was utilized without altering reinforced the santoprene to cite a degree and it overhauled not many properties of the composite, in particular low strain modulus and rigidity however it likewise had a disadvantage, extending at break decreased intensely. To conquer this, the Kevlar was adjusted and henceforth its surface was hydrolyzed maleic anhydride-grafted polypropylene (MA-g-PP). There were clear benefits of

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utilizing the changed Kevlar over the stock one. The properties upgraded and the downsides were diminished to nil. This blend showed further developed pressure circulation because of better surface holding between the fiber and lattice .

[5] From that point, Fluorinated and Oxy fluorinated Short Kevlar Fiber-Reinforced Ethylene Propylene Polymer This paper looks at crude Kevlar and surface treated Kevlar. Assessment on its warm properties showed an expansion in warm dependability and capacity modulus because of steady support of filaments. It is additionally noticed that it keeps on expanding on account of bull fluorinated and fluorinated Kevlar fiber-built up EP.

[6] Fluorinated and oxy fluorinated Kevlar fiber's rigidity expanded significantly. This presumes that fluorination and oxy fluorination affected the surface morphology giving better bond of filaments and the framework

[7] Moreover, correlation of properties like glasslike, warm, mechanical of syndiotatic polystyrene composites with surface adjusted Kevlar fiber.

[8] In contrast with ox fluorinated Kevlar built up fiber, fluorinated Kevlar fiber arrives at higher crystallization temperature. There is a huge expansion in warm conductivity in the event of changed Kevlar fiber support. It additionally moves to a higher worth displayed by differential examining calorimeter and dynamic mechanical examination. A solid bond between sPS lattice and oxy-fluorinated Kevlar fiber was discovered and it is by all accounts better compared to different composites displayed by nuclear free microscopy. From this exploration it was discovered that it helps up the warm dependability and capacity modulus of the composite

[9]The cut safe covering was performed by considering one STF, smoldered silica/ethylene glycol suspension of Kevlar texture to upgrade the presentation of the material. From this exploration, broad redesigns in cut insubordination were seen particularly in extreme speed stacking condition. It was seen that the expansion didn't change or decay the adaptability of STF. From the outcomes, we caused that seethed silica/Kevlar composite texture would be a fine material for body defensively covered applications

[10] Moreover, various materials that are consolidated to deliver an individual part. The two materials that were explored were Kevlar poly (p-phenyleneterephthalamide) and santoprene. Here in this examination, the Kevlar fiber was utilized too, the principal type was, it was utilized without changing it and the subsequent kind was utilized in the wake of adjusting it.

[11] The Kevlar which was utilized without altering reinforced the santoprene to cite a degree and it overhauled not many properties of the composite, in particular low strain modulus and rigidity however it likewise had a disadvantage, extending at break decreased intensely. To conquer this, the Kevlar was adjusted and henceforth its surface was hydrolyzed maleic anhydride-grafted polypropylene (MA-g-PP). There were clear benefits of utilizing the changed Kevlar over the stock one. The properties upgraded and the downsides were diminished to nil. This blend showed further developed pressure circulation because of better surface holding between the fiber and lattice.

[12] However, the properties of Kevlar polypropylene dependent on composite material under high strain rate stacking utilizing Split Hopkinson Pressure bar (SHPB). Level covered Kevlar composite of 16, 24 and 30 layer where examination formed and laser machined to acquire round and hollow example of wanted shape dependent on SHPB try. To report compressive material conduct as extension of developing strain rate, the pressure strain plots were get and broke down. The examinations propose that for better execution of composite

[13] In this work creators are accounted for about the execution and analyze the qualities of the novel auxetic Kevlar composite. This examination was especially founded on break and effect qualities. To investigations and separate, Kevlar interlinked composite was utilized alongside polyurethane examination and without it. Short

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nylon filaments of two recognized fiber estimation and 3 recognized fibers recognized fiber densities were combined.

FABRICATIONS AND EXPERIMENTAL SETUPS

OBJECTIVES:

Following are the objectives that have been outlined:

1. Fabrication of a new class of epoxy-based hybrid composite reinforced Basalt with 10% Horn powder, Chopped mate with 10% Horn powder, Kevlar with 10% Horn powder, Kevlar Basalt with 10% Horn powder, Chopped mate Basalt with 10% Horn powder, Chopped mate+ Kevlar with 10% Horn powder, Basalt +Chopped mate + Kevlar with 10% Horn powder.
2. Investigation and Evaluation of Mechanical properties such as tensile strength, flexural strength, hardness.
3. To study the potential utilization of Basalt with 10% Horn powder , Chopped mate with 10% Horn powder, Kevlar with 10% Horn powder, Kevlar Basalt with 10% Horn powder, Chopped mate Basalt with 10% Horn powder, Chopped mate+ Kevlar with 10% Horn powder, Basalt +Chopped mate Kevlar with 10% Horn powder as reinforcement material in epoxy-based composites for various applications.
4. Take out and cool the specimen until room temp about 24 hrs and Ensure proper weighing is maintain.
5. To assess whether the fabricated hybrid composite can be used as an alternate material
6. For synthetic fiber reinforced composites.
7. Cut to appropriate dimension as per ASTM Standard and Impact, flexural, hardness and tensile
8. Behavior of fabricated were calculated by various Mechanical testing's done.
9. To design and Analysis of Car Bumper using Existing dimension.
10. Increase the Car bumper strength compared to the existing materials we consider.
11. The Kevlar Material with New Material who is the best properties find out in 7 orientations.
12. Find out the Von-misses stresses, Shear stress and deformations in static analysis.
13. Finally concluded the suitable material for the Car Bumper .

METHODOLOGY

I: Collecting data and information identified with regular filaments and manufactured strands.

II: Arrangement of examples utilizing hand layup procedure

III: Conducting tensile, impact, hardness and flexural tests.

IV: Plot outlines for the outcomes and manual estimations are directed.

V: Identify better fiber among 7 Fiber.

VI:A completely parametric model of the Car bumper is made in CATIA software.

VII: Model got in IGS. Broke down utilizing ANSYS 15.0(workbench), to acquire stress, strain and deformations.

VIII: Taking limit conditions and conducting static examination.

IX: Finally, we contrast better among these seven outcomes acquired from ANSYS and looked at changed materials.

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MATERIALS

On among various kinds of pitches and hardener. Epoxy LY556, hardener HY951and Horn powder in all orientations is picked. The materials taken to manufacture the examples are Kevlar, basalt and chopped matt. These are taken in the various proportions and various mixes. The seven distinct composites are examined the tensile, impact, hardness and flexural tests.

HORN POWDER:

Figure 14 Horn powder

Horn powder	Values
Density(g/cm^3)	1.56
Tensile Strength(Mpa)	540
Young's Modulus (Gpa)	200
Melting Point	1566 °C
Possion's Ratio(u)	0.29

Table 2 Material properties of Horn powder

KEVLAR

Kevlar has numerous applications, going from bike tires and hustling sails to tactical armor carriers, all because of its high elasticity to-weight proportion; by this action it is multiple times more grounded than steel. It likewise is utilized to make present day walking drumheads that withstand high effect. Kevlar is a manufactured plastic, and it's made of a chemical compound called **poly-para-phenyleneterephthalamide.** This chemical is made from creating a chemical reaction between an acid and a chemical solution containing nitrogen and hydrogen

Figure 15 Kevlar

BASALTFIBER

The basalt is simply washed and then melted. The manufacture of basalt fiber requires the melting of the crushed and washed basalt rock at about 1,500 °C (2,730 °F). The molten rock is then extruded through small nozzles to produce continuous filaments of basalt fiber.A hard, dense volcanic rock that can be found in most countries across the globe,basalt is an igneous rock, which means it began in a molten state. For many years,basalt has been used in casting processes to make tiles and slabs for architecturalapplications.Additionally,castbasaltlinersforsteeltubingexhibitveryhigh Abrasionresistanceinindustrialapplications.Incrushedform,basaltalsofindsuseasaggregateinconcrete.

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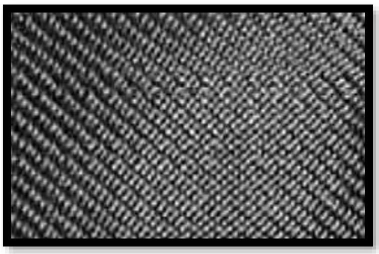

Figure 16 Basalt

CHOPPED MATT

Chopped strand mat is a non woven reinforcement fiber for the production of fiber-reinforced plastic.

Figure 17 Chopped matt

FABRICATION OF COMPOSITE SPECIMENS (HAND LAYUP)

Hand lay-up procedure is the straightforward and least expensive strategy for composite handling.

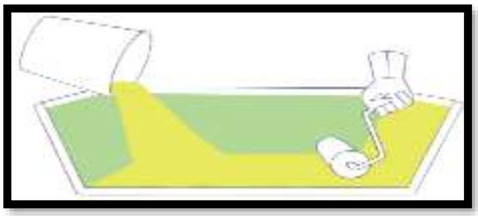

Figure 18 Fabrications of composite specimens

With the help of a brush, the polymer is evenly distributed. Then second layer of fiber is placed on the polymer surface and another layer of polymer is applied after this is closed with another thin plastic sheet after squeezer is moved with a gentle pressure on the thin plastic sheet to remove air .The consequential mold is cured for 24 hours at room temperature.

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Figure 19 Complete sequential process for fabrication

Figure 20 Tensile test specimens

FLEXURAL TESTING OF COMPOSITES

Three point bowing test are carried out as per ASTM-D790M-86 test procedure 1, system A to extract flexural properties, the specimens are 100 mm long , 25 mm wide and 4.5 mm thick . Two indistinguishable specimens are subjected for flexural testing. In three point bowing test, the external rollers are 70 mm separated and specimens are subjected at a strain rate of 0.2 mm/min. Flexural stress are determined by the following relations.

$$\text{Flexural stress } S = \frac{3\,P\,L}{2\,b\,t^2}$$

P= load in N

L= length between supports (70mm)

b= Width in mm

d= Thickness in mm

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Figure 21 specimen's flexural test

IMPACT TESTING OF COMPOSITES

Impact test is also known as charpy v notch, Impact tester was sway analyzer supplied by M/S International Equipments, Mumbai, was used to test the impact properties of fiber Reinforced composite specimen. The Impact tester has four working abilities of effect quality i.e. 0-2.71 J.0-5.42 J,0-10.84 J and 0-21.68 J, with a base determination on every size of 0.02J, 0.05 J, 0.1 J and 0.2 J individually .Four scales and comparing mallets (R1,R2,R3,R4) are presented in equipment.

Standard test procedure, ASTM D256-97, for effect properties of fiber composites has been used to examine the unidirectional composite specimens. The specimens to be examined are of dimensions 63.5mm long, 12.36mm wide and 6mm in thick. A V-point is placed in impact tester record having an included point of 450 at the focal point of the specimen, and at 90¬¬0 to the specimen pivot. The profundity of the specimen to be examined under the indent is 2 mm.

Figure 22 Impact machine for impact testing

Impact strength was calculated by the following relation

$$\sigma = \frac{2P}{A}$$

P= Energy observed in J

A= Area in mm

Figure 23 before testing impact testing

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In this test, the configuration is limited to unidirectional and continuous fibers equal to the length of the specimen. The hardness properties of the composites are studied by applying indentation load normal to fibers diameter and normal to fiber length. The effect of fiber loading and post curing time on Rockwell hardness is illustrated in Figures 3 and 4. Generally, fibers that increase the module of composites increase the hardness of the composite. This is because hardness is a function of the relative fiber volume and modulus.

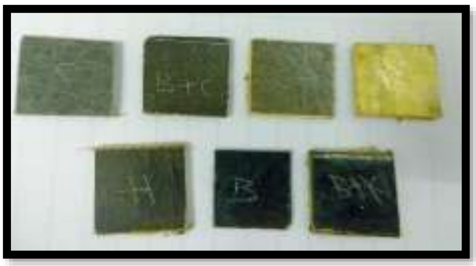

Figure 24 before Testings hardness test

TESTING IMAGES AT LABORATORY:

Figure 25 TESTING PROCESS OF SPECIMENS

AFTER TESTING:

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Figure 26 AFTER TESTING FLEXURAL SPECIMENS

Figure 27 AFTER TESTING OF IMPACT SPECIMENS

Figure 28 AFTER TESTING OF HARDNESS SPECIMENS

RESULTS AND DISCUSSION

MECHANICAL CHARACTERISTICS OF COMPOSITES

The properties of the Kevlar, Basalt, chopped mate, Kevlar + basalt, basalt+chopped matt, Kevlar +chopped matt & Kevlar basalt+ chopped matt fibers and basalt reinforced epoxy hybrid composites with of fiber under this investigation are presented in below Table 4.1. I have taken each composite for each test. Details of processing of these composites and the tests conducted on them have been described in the previous chapter. The mechanical properties of Synthetic fiber reinforced composites are largely depends on the chemical, structural composition, fiber type and soil conditions and also on atmospheric conditions at the time of fabrication of the specimens.

S.NO	Composites	Tensile test		Flexural test		Impact test
		Load in N	Elongation in mm	Load in N	Elongation in mm	Strength in J
1	Basalt	6000	8.2	1800	8.0	4.7
2	Kevlar	8485	21.3	1430	7.0	3.43
3	Chopped matt	8020	17.1	1400	8.33	4.4
4	Basalt+ Kevlar	8820	16.8	1310	7.3	3.3
5	Basalt+ Chopped matt	7121	8.4	1810	8.0	4.8
6	Kevlar+ Chopped matt	9750	23.2	1870	8.6	3.7
7	Kevlar + Basalt+ Chopped matt	8525	22.1	1925	6.8	3.5

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Table: 1 Specimen testing results

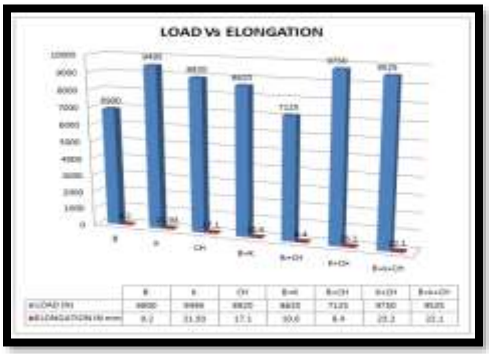
TENSILE STRENGTH

Fabrication and testing successfully completed in this project the tensile properties of Kevlar, Basalt, chopped mate, Basalt + chopped matt, Kevlar + Basalt, Kevlar+ Basalt+chopped matt, Kevlar+ chopped matt fabricated by using hand lay-up method. The tensile strength was calculated by the relation

S.NO	Composite	Load in N	Elongation In mm	Tensile strength N/mm²	% of elongation
1	Basalt	6900	8.2	9.50	3.60
2	Kevlar	9492	21.93	13.07	12.98
3	Chopped mate	8920	17.1	12.28	10.42
4	Basalt+ Kevlar	8620	10.6	11.87	6.40
5	Basalt+ Chopped mate	7125	8.4	9.81	5.12
6	Kevlar+ Chopped mate	9750	23.2	13.42	14.14
7	Basalt+ Kevlar+ Chopped mate	9525	22.1	13.11	13.47

Table: 2 tensiletestresults for7composites

After successful completion of the tensile strength we are getting maximum values fortheKevlar with chopped mate 9750 N.



Graph 1 tensiletestresultgraph

FLEXURALSTRENGTH

Fabrication and testing successfully completed in this project the flexural strength of basalt, Kevlar, chopped mate and basalt chopped mate, basalt Kevlar, Kevlar chopped mate, basalt Kevlar chopped mate with Horn powder are fabricated by using hand lay-up method. The flexural strength was calculated based the follow ingrelation

$$\textbf{Flexural strength S} = \frac{3PL}{2bt^2}.$$

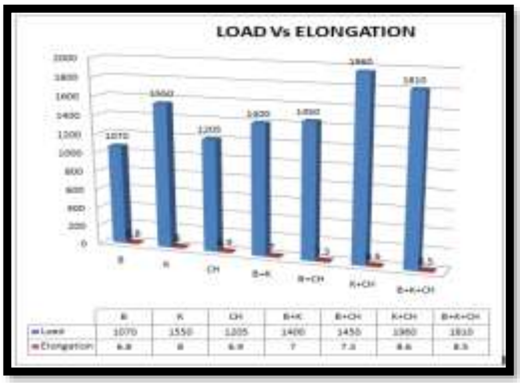
P= load in N; L= length between supports (70mm);b= Width in mm; d= Thickness in mm

After testing the Flexural strength and elongation are summarized in table. The percentages of elongations for all the composites are also calculated with the following formula.

$$\textbf{\% elongation} = \frac{changeinlength}{originallength} \times 100$$

- Basalt : % of elongation $= \frac{6.8}{70} \times 100 = 9.71\%$
- Kevlar: % of elongation $= \frac{8}{70} \times 100 = 11.42\%$
- Chopped matt: % of elongation $= \frac{6.9}{70} \times 100 = 9.85\%$
- Basalt+Kevlar: % of elongation $= \frac{7}{70} \times 100 = 10\%$
- Basalt+chopped matt: % of elongation $= \frac{7.3}{70} \times 100 = 10.42\%$
- Kevlar + Chopped matt: % of elongation $= \frac{8.6}{70} \times 100 = 12.28\%$
- Kevlar+ Basalt+Chopped matt : % of elongation $= \frac{8.5}{70} \times 100 = 12.14\%$

Based on the flexural strength finally concluded that Kevlar+ Chopped mate ofHorn powder epoxycompositepossesshighflexuralstrengthcomparedtoremainingcompositeasshowninfigure.AndBasalt+ Kevlar+ Chopped mate having a second highest flexural streng thcomparedto remaining composite



Graph 2 Flexural test result graph

IMPACT STRENGTH

Fabrication and testing successfully completed in this project I also focused onimpact strength of basalt,Kevlar, choppedmateandbasaltchoppedmate,basalt Kevlar, Kevlar choppedmate, basalt Kevlar choppedmatewith Horn powder fabricatedbyusinghandlay-upmethod.AndfinallyconcludedtheKevlar+ Chopped mate materialpossess high impact strengthcompared toremaining compositions as shown figure

IMPACT TEST	JOULES
Basalt	3.7
Kevlar	5.45
Chopped mate	5.4
Basalt+ Kevlar	5.3
Basalt+ Chopped mate	3.9
Kevlar+ Chopped mate	5.7
Basalt+ Kevlar+ Chopped mate	5.5

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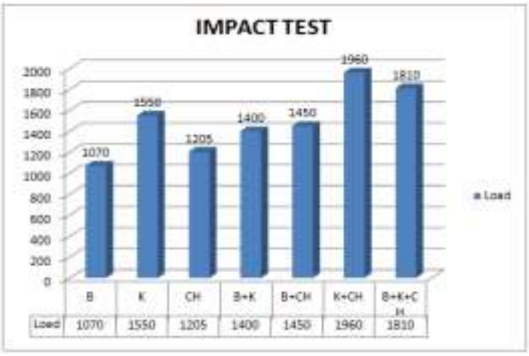
Table:3 Impacttestingresultsfor7composites



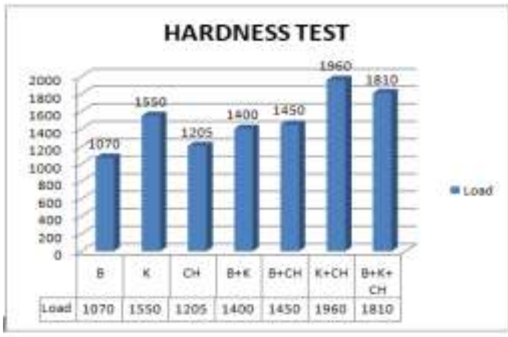
Graph 3Impactstrengthresultgraph

HARDNESSNUMBER:

Brinellhardnessvaluesofthesenaturalcomposites.Experiment gives the Kevlar with chopped mate having maximum Brinell hardnessvalue 18.3 ,whereWt% ratio of resin & hardener: On the other hand,epoxy withbasalt reveals theminimum hardness value13.9.Brinell hardness vs. experiment number graph of the composite. Figure reveals thegraphindicatingBrinellhardnessvaluescorrespondingtotheexperimentnumber.The graph shows, experiment with kevlar with chopped mate gives the higher value of Brinell hardness. On the other hand, experiment with basalt gives the lower Brinellhardnessvalue.

COMPOSITE	HARDNESS NUMBER
Basalt	13.9
Kevlar	16.5
Chopped mate	15.3
Basalt+ Kevlar	17.8
Basalt+ Chopped mate	14.1
Kevlar+ Chopped mate	18.3
Basalt+ Kevlar+ Chopped mate	16.5

Table:4Hardnesstestingresultsfor7composites



Graph 4Hardnessnumber resultgraph

INTRODUCTION TO CATIA

Welcome to **CATIA (Computer Aided Three Dimensional Interactive Application)**. As a new user of this software package, you will join hands with thousands of users of this high-end CAD/CAM/CAE tool worldwide. If you are already familiar with the previous releases, you can upgrade your designing skills with the tremendous improvement in this latest release.

.DESIGN PROCEDURE IN CATIA:

Design process of maruthisuzuki a lot car bumper Go to the sketcher workbench create the 1200x300 c shape using profile and thickness is 8mm after apply pad using part design workbench again go to the front view xy plane create the front part gill area and light area apply pocket as per dimensions .

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Figure 29 Multiple view of car bumper

INTRODUCTION TO ANSYS

ANSYS is a large-scale multipurpose finite element program developed and maintained by ANSYS Inc. to analyze a wide spectrum of problems encountered in engineering mechanics**.**

PROGRAM ORGANIZATION:

The ANSYS program is organized into two basic levels:

- Begin level
- Processor (or Routine) level

The Begin level acts as a gateway into and out of the ANSYS program. It is also used for certain global program controls such as changing the job name, clearing (zeroing out) the database, and copying binary files. When you first enter the program, you are at the Begin level.

FINITE ELEMENT METHOD:

The Basic concept in FEA is that the body or structure may be divided into smaller elements of finite dimensions called “Finite Elements”. The original body or the structure is then considered as an assemblage of these elements connected at a finite number of joints called “Nodes” or “Nodal Points”. Simple functions are chosen to approximate the displacements over each finite element. Such assumed functions are called “shape functions”. This will represent the displacement with in the element in terms of the displacement at the nodes of the element.

Basic Steps in FEA

- Discretization of the domain
- Application of Boundary conditions
- Assembling the system equations
- Solution for system equations
- Post processing the results.

. MATERIAL PROPERTIES:

MATERIALS PROPERTIES	KEVLAR	KEVLAR+CHOPPEDMATE +10grms horn powder
Density(kg/m^3)	1380	1423
Poisson's ratio	0.35	0.32
Young's Modulus(GPa)	76	84
Tensile Strength(N/m^2)	$29*10^6$	$31.5*10^6$

MESH AND BOUNDARY CONDITIONS:

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The meshed model of bullet proof jacket of nodes =10129 and elements is 4845 Using Material as finalized material from above mentioned Kevlar with chopped matt call it as a hybrid and existing material for car bumper of alto Maruthi car

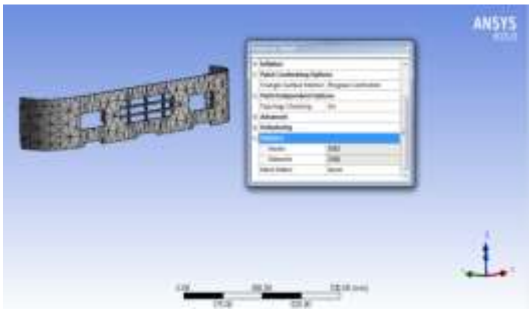

Figure 30 MESHING: NODES: 5363 ELEMENTS: 2268

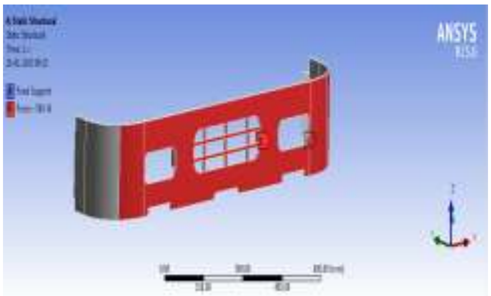

Figure 31 BOUNDARY CONDITIONS FORCE: 500N

ANALYSIS ON ANSYS

STRUCTURAL STATIC ANALYSIS:

A static analysis calculates the effects of study loading conditions on a structure, while ignoring inertia and damping effects, such as those caused by time varying loads. A static analysis can however include steady inertia loads and time varying loads that can be approximated as static equivalent loads. Static analysis is used to determine the displacements, stresses, strains and forces in structures or components caused by loads that do not induce significant inertia and damping effects. Steady loading and response conditions are assumed, i.e. the loads and the structure's responses are assumed to vary slowly with respect to time. The kinds of loading that can be applied in static analysis include:

- Externally applied forces and pressures.
- Steady state inertial forces
- Imposed displacement
- Temperatures

Static Analysis of Kevlar fiber + 10grms Horn powder Material:

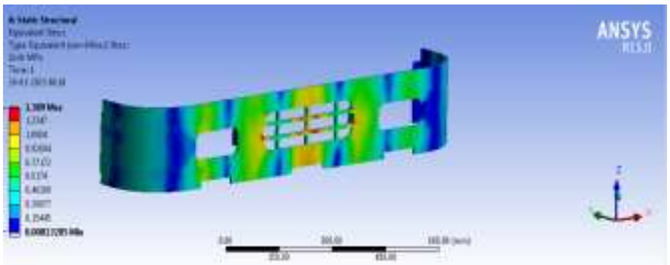

Figure 32 Von-misses stress of Kevlar fiber + 10grms Horn Material.

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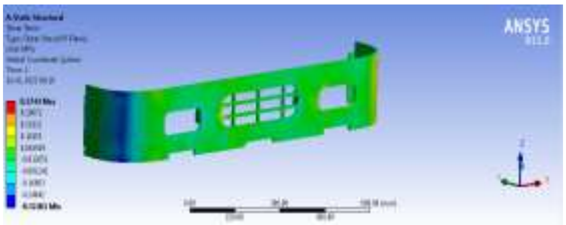

Figure 33 shear stress of Kevlar fiber + 10grms Horn powder Material

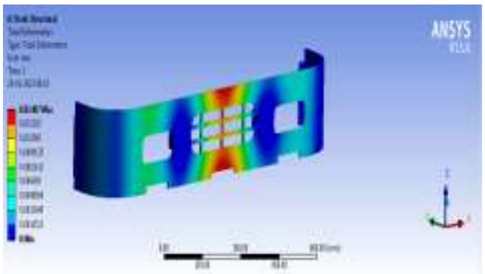

Figure 34 Total deformations of Kevlar fiber + 10grms Horn powder Material

STATIC ANALYSIS OF ALB390 MATERIAL:

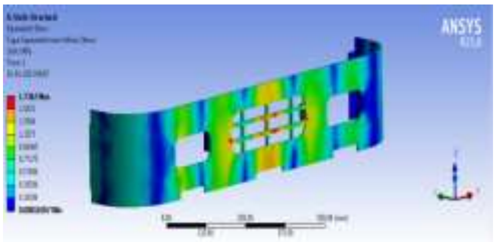

Figure 35 Von-misses stress of ALB390 Material

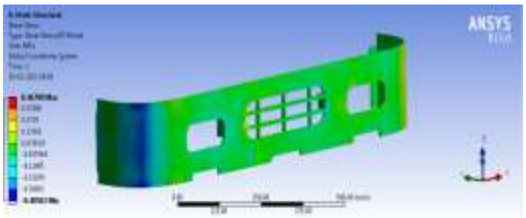

Figure 36 Shear stress of ALB390 Material

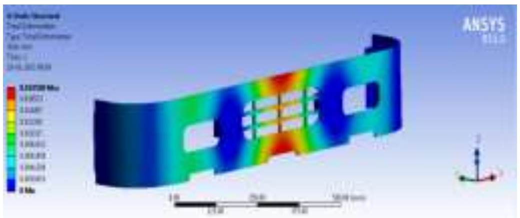

Figure 37 Total deformations of ALB390 Material

GRAPHS:

VON-MISSES STRESS GRAPH:

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The below graph von-misses stresses of two different materials like KEVLAR+CHOPPED MATE WITH 10% HORN POWDER and ALB360 MATERIAL. Finally observed KEVLAR+CHOPPED MATE WITH 10% HORN POWDER Have low von-misses stress 1.389Mpa compared to ALB360

Graph 6 Von misses stresses of existing and proposed material

TOTAL DEFORMATION GRAPH:

Graph 7 Total deformation for existing and proposed material

SHEAR STRESS GRAPH:

Graph 8 Strain for existing and proposed material.

CONCLUSION

1) The tensile stress has substantially increase in sample of hybrid composite epoxy reinforced with chopped mate with Horn powder resin and Kevlar fibers than sample of composite epoxy reinforced with basalt fibers and remaining hybrids. Because Kevlar fiber with chopped matt was continuous fibers which have high tensile strength and tensile modulus than chopped and basalt fibers which have random arranged.

2) Flexural strength results show that the hybrid composite (epoxy reinforced with chopped mate and Kevlar fibers) have a higher value than the sample of epoxy chopped Horn powder fiber composite as Kevlar fibers have a good adhesion (bonding) with epoxy than basalt fibers

3) Results of hardness test show that hybrid composite have a lower value of Brinell number composite (epoxy chopped Kevlar fibers composite). In generally the hardness decreases with increases of materials elasticity.

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4) The sample of hybrid composite reinforced with Horn powder Kevlar fibers with chopped mate have a higher value of impact strength than sample of composite reinforced with basalt and chopped mate fibers because of existence of Kevlar fibers in hybrid composite which have a higher strength and impact resistance.

5) As modeling and static analysis also shows better stress, strain and deformation values for chopped matt with Kevlar among the existing Kevlar fiber. Among all these testing's and static analysis considerations we are finally concluded that Kevlar with Chopped matt with Horn powder combination is better than reaming six compositions

6) Car bumper Design process done in catia software and Analysis done in ansys software with two materials KEVLAR+CHOPPED MATE WITH 10% HORN POWDER and ALB360 MATERIAL Finally KEVLAR+CHOPPED MATE WITH 10% HORN POWDER is the best material because of Low von-misses stress, deformation, Shear stress.

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