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RESEARCH ARTICLE

DESIGN AND ANALYSIS OF ENGINE GUARD USING COMPOSITE OF HEMP AND FLAX FIBRE

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ABSTRACT

Composite material is a material produced using at least two constituent materials with essentially extraordinary physical or compound properties that, when consolidated, produce a material with qualities not the same as the individual segments. Composite materials are broadly utilized these days in different fields because of their extraordinary property in weight decrease, high quality and unbending nature and minimal effort. In the present correspondence it manages manufacture and examination of half breed normal composite produced using kenaf strands and flax filaments as support with epoxy sap as matrix The singular parts stay discrete and unmistakable inside the completed structure, separating composites from blends and solutions The new material might be favored for some reasons: basic models incorporate materials which are more grounded, lighter, or more affordable when contrasted with conventional materials. Here the composites are utilized in making a bike motor gatekeeper utilizing fix and flax fiber.

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INTRODUCTION

Composite materials (or composites for short) are building materials produced using at least two segments. One part is frequently a solid fiber, for example, fiber glass, quartz, Kevlar or carbon fiber that gives the material its elasticity, while another segment (regularly called a lattice) is regularly a gum, for example, polyester or epoxy that ties the filaments together and renders the material firm and inflexible. Composites, otherwise called fiber-Fortified polymer (FRP) composites, are produced using natural polymer lattice that is strengthened with a built, man-made or characteristic fiber or other fortifying material. The network shields the strands from ecological and outer harm and exchanges the heap between the filaments. The filaments thus give quality and firmness to strengthen the grid and help it oppose breaks and cracks. The segment materials don't totally mix or loses their individual characters.

Types of Composites

Metal Matrix Composites (mmc): Metal Grid Composites have numerous points of interest over solid metals like higher explicit modulus, higher explicit quality, better properties at raised temperatures, and lower coefficient of warm extension. Due to these properties metal framework composites are under thought for wide scope of uses viz. burning chamber spout (in rocket, space transport), lodgings, tubing, links, heat exchangers, basic individuals and so forth.

Ceramic matrix composites (cmc): One of the principle goals in delivering fired grid composites is to expand the strength. CMCs are a subgroup of composite material just as a subgroup of earthenware production, comprising of clay strands inserted in a fired lattice. Normally it is trusted and in fact frequently discovered that there is a corresponding improvement in quality and firmness of artistic grid composites.

Polymer matrix composites: Most generally utilized network materials are polymeric. By and large the mechanical properties of polymers are insufficient for some auxiliary purposes. Specifically their quality and firmness are low contrasted with metals and pottery. These challenges are overwhelmed by fortifying different materials with polymers. Also the preparing of polymer network composites need not include high weight and doesn't require high temperature. Additionally supplies required for assembling polymer network composites are less difficult. Therefore polymer lattice composites grew quickly and before long ended up famous for basic applications. Composites are utilized in light of the fact that general properties of the composites are better than those of the individual segments for instance

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polymer/fired. There are two types of PMC such as Fiber reinforced polymer composite (FRPC) and Particle reinforced polymer composites (PRPC).

Literature Survey: This part plots a portion of the ongoing reports distributed in writing on mechanical conduct of characteristic fiber based epoxy composites with exceptional accentuation on bast fiber strengthened epoxy composites. Because of the expanding interest for ecologically cordial materials and the craving to diminish the expense of conventional filaments (i.e., carbon, glass and aramid) new bio-based composites have been produced. Specialists have started to concentrate consideration on characteristic fiber composites (i.e., bio composites), which are made out of regular or manufactured tars, strengthened with normal filaments. Characteristic filaments display numerous worthwhile properties; they are a low-thickness material yielding moderately lightweight composites with high explicit properties. Late advances in the utilization of characteristic filaments (e.g., cellulose, jute, hemp, Straw, switch grass, kenaf, coir and bamboo) in composites have been surveyed by a few creators . The ends drawn from this is, the achievement of consolidating vegetable normal filaments with polymer grids results in the improvement of mechanical properties of the composite contrasted and the lattice material. These fillers are modest and non-harmful can be acquire from inexhaustible source and are effectively recyclable. Progressively over in spite of their low quality, they can prompt composites with high explicit quality due to their low thickness.

MATERIALS AND METHODS

Flax Fiber: Coarser evaluations are utilized for the assembling of twine and rope, and generally, for canvas and webbing hardware. Flax fiber is a crude material utilized in the top notch paper industry for the utilization of printed banknotes, research facility paper(Blotting and Filter).Flax is the most grounded among the characteristic cellulosic strands Flax fiber is delicate, glossy, and adaptable Flax is an exceptionally solid fiber since it's extremely crystalline polymer framework the normal length fiber different from 18-30 inch. The lengthening at break is roughly 1.8% (dry) and 2.2% (Wet). Flax is a few times more grounded than cotton fiber, yet less versatile. Flax fiber has an imperative application as composite material. It is a cellulosic fiber, similar to wood and plant filaments; it has the potential for use as burden bearing constituents in composite materials because of their alluring properties, for example, high firmness to-weight proportion that makes cellulosic fiber composites perfect for some auxiliary applications. Strands from flax plants are extricated by any one or in mix of mechanical and compound retting forms. The decision of the extraction technique depends generally upon the nature of fiber to be recaptured. For a considerable length of time, the utilization of hand scrubbers, gruff and bow molded blades, wooden mixer and hand comber has been basic for fiber extraction. These days, filaments are separated precisely. The flax stalk goes through different procedures of extraction, via, retting and scotching subsequent to collecting. Flax is collected just before the seed is ready, tied in groups and following a couple of days drying, seed and leaves are expelled by a procedure called undulating. The plants in the wake of undulating are spread out on grass and left to age for a little while by the activity of climate. The fiber is removed from the stalks by different retting forms.

Water retting is ordinarily utilized in India. Dew retting is drilled in European landmass.

Hemp Fiber: Hemp, or mechanical hemp, normally found in the northern side of the equator, is an assortment of the Cannabis sativa plant species that is developed explicitly for the modern employments of its inferred items. It is one of the quickest developing plants and was one of the primary plants to be spun into usable fiber 10,000 years ago. It can be refined into an assortment of business things including paper, materials, dress, biodegradable plastics. Hempfiber is gotten from the bast of the plant Cannabis sativa L. It develops effectively to a tallness of 4 m - without agrochemicals and catches extensive amounts of carbon. The fiber is a standout amongst the most important parts of the hemp plant. It is usually called bast, which alludes to the strands which develop outwardly of the plant's stalk. Bast filaments give the plants quality. Hemp strands can be between roughly 0.91 m (3 ft) and 4.6 m (15 ft) long, running the length of the plant. Later the strands might be sliced to shorter lengths. Contingent upon the handling used to expel the fiber from the stem, the hemp may normally be rich white, dark colored, dim, dark or green.

In Europe and China, hemp filaments have been utilized in model amounts to reinforce concrete, and in other composite materials for some development and assembling applications. A blend of fiberglass, hemp fiber, kenaf, and flax has been utilized to make composite boards for autos. The main distinguished coarse paper, produced using hemp, dates to the early Western Han Administration. Hemp shives or hurds are the center of the stem. The world-driving maker of hemp is China, which delivers over 70% of the world yield. France positions second with about a fourth of the world generation. To isolate the woody center from the bast fiber, a grouping of rollers (breakers) or a hammermill are utilized. The bast fiber is then cleaned and checked to the ideal center substance and fineness, here and there pursued by slicing to measure and baling. In the wake of cleaning and checking, auxiliary advances are regularly required. These incorporate tangling for the generation of non-woven tangles and wools, pulping (the breakdown of fiber packages by compound and physical strategies to create filaments for paper making), and steam blast, a synthetic expulsion of the normal fasteners to deliver a weavable fiber. Complete handling lines for fiber hemp have yields going from 2-8 short tons/hour (1.8-7.2 t/hr).

S - Glass Fiber: S-glass ("S" for "Quality") is utilized when high elasticity (modulus) is imperative, and is hence essential in composites for building and flying machine development. Glass fiber is a material comprising of various very fine strands of glass. Glassmakers from the beginning of time have explored different avenues regarding glass strands however mass production of glass fiber was just made conceivable with the development of better machine tooling. In 1893, Edward Drummond Libby displayed a dress at the World's Columbian Work joining glass filaments with the width and surface of silk fibers. Glass fiber has generally tantamount mechanical properties to different strands, for example, polymers and carbon fiber. Despite the fact that not as solid or as inflexible as carbon fiber, it is a lot less expensive and fundamentally less weak when utilized in composites. Glass filaments are in this way utilized as a fortifying specialist for some polymer items; to shape a solid and moderately lightweight fiber-strengthened polymer (FRP) composite material called glass-fortified plastic (GRP), likewise prominently known as "fiberglass".

This material contains practically no air or gas, is increasingly thick, and is an a lot more unfortunate warm encasing than is glass wool. S-Glass is commonly utilized for polymer network composites that require improved mechanical properties contrasted with E-glass based composites. This is regularly the situation when the material is worked under increasingly outrageous conditions. S-Glass has a commonplace ostensible arrangement of SiO2 65wt%, Al2O3 25wt%, MgO 10wt%. Some different materials may likewise be available at polluting influence levels. Glass filaments are for the most part created utilizing melt turning strategies. These include dissolving the glass creation into a platinum crown which has little openings for the liquid glass to stream. Consistent strands can be drawn out through the openings and wound onto axles, while short filaments might be delivered by turning the crown, which powers liquid glass out through the gaps divergently. Filaments are sliced to length utilizing mechanical methods or air jets. Fiber measurement and to some degree properties can be constrained by the procedure factors, for example, liquefy temperature (henceforth thickness) and drawing/turning rate. It ought to be noticed that S-glass is increasingly hard to process contrasted with E-glass. As filaments are being delivered, they are ordinarily treated with measuring and coupling specialists. These decrease the impacts of fiber-fiber scraped area which can altogether corrupt the mechanical quality of the individual strands. Different medicines may likewise be utilized to advance wetting and adherence of the grid material to the fiber. High solidness, Moderately low thickness, Non-combustible, Impervious to warm, Great substance obstruction, Generally harsh to dampness, Ready to keep up quality properties over a wide scope of conditions are a portion of the novel properties which separate S-glass fiber from different kinds of glass filaments..

E-Glass Fiber: E-glass is an alumino-borosilicate glass. Most glass filaments have restricted dissolvability in water however are exceptionally reliant on pH. Chloride particles will likewise assault and break up E-glass surfaces. E-glass does not really dissolve, yet diminishes rather, the conditioning point being "the temperature at which a 0.55– 0.77 mm measurement fiber 235 mm long, stretches under its very own load at 1 mm/min when suspended vertically and warmed at the rate of 5 °C per minute". The strain point is achieved when the glass has a thickness of 1014.5 balance. The toughening point, which is where the inner burdens are decreased to an adequate business limit in 15 minutes, is set apart by a consistency of 1013 balance.

Epoxy Resin: Epoxy tars are low sub-atomic weight pre-polymers or higher sub-atomic weight polymers which ordinarily contain no less than two epoxide gatherings. The epoxide assemble is additionally some of the time alluded to as a glycidyl or oxirane group. A wide scope of epoxy gums are created modernly. The crude materials for epoxy pitch generation are today to a great extent oil determined, albeit some plant inferred sources are presently ending up monetarily accessible (for example plant inferred glycerol used to make epichlorohydrin).Epoxy pitches are polymeric or semi-polymeric materials, and all things considered once in a while exist as unadulterated substances, since variable chain length results from the polymerization response used to deliver them. High virtue evaluations can be delivered for specific applications, for example utilizing a refining filtration process. One drawback of high virtue fluid evaluations is their inclination to shape crystalline solids because of their exceptionally normal structure, which expect liquefying to empower preparing.

Releasing Agent: A discharge specialist is a substance used to keep different materials from clinging to surfaces. It can give an answer in procedures including mold discharge, die cast discharge, plastic discharge, cement discharge, and tire and web discharge. It give the basic hindrance between an embellishment surface and the substrate, encouraging partition of the restored part from the shape. Without such an obstruction set up, the substrate would wind up melded to the form surface, bringing about troublesome tidy up and sensational misfortune underway effectiveness. Notwithstanding when a discharge specialist is utilized, factors, for example, unpredictable applications or inappropriate discharge operator decision may dramatically affect the quality and consistency of the completed item. In this investigation the table best will be secured with plastic sheeting to go about as the discharge operator. Some other discharge operators utilized in industry are waxes, splash discharges, discharge films, interior discharges (added to gel coat or tar framework). Discharge operators are typically connected to the composite shape or tooling in a different assigned territory as they can go about as a pollute if inadvertently incorporated into the composite layup.

Hand Layup Method: The hand layup procedure is one of the most seasoned and most regularly utilized strategies for production of the composite parts. The infrastructural prerequisite for this strategy is less. The handling steps are very basic. First and foremost a fluid paraffin is splashed on the form surface to stay away from the adhering of fiber to the shape surface. Slender plastic sheets are utilized at the best and base of the shape to get great surface completion of the item. The strands which are as woven mats are cut according to the form estimate and put at the outside of shape. At that point the fluid structure epoxy gum and the endorsed hardener (polymer) is blended altogether in appropriate extent with a proportion of 10:1 and it is poured on to the shape surface where the fiber is put. The polymer is consistently spread with the assistance of roller. Second layer of the fiber is then set on the polymer surface and a roller is moved with a mellow weight on the fiber-polymer layer to evacuate any air caught just as the overabundance polymer present. The procedure is rehashed for each layer of polymer and fiber, till the required layers.

Cleaning: Once that part is prepared to be restored, it must be moved to a satisfactory area. For this situation it tends to be moved to a restoring broiler or basically left to fix set up until the following day. At that point a cleanup must be done before leaving the class. Every one of the materials utilized (brushes, rollers, blending devices, scissor), including the table, must be cleaned utilizing CH3)2CO and fabric. Likewise, whatever is left of the fiberglass woven support must be gathered from the table and floor. The most effective method to discard CH3) 2CO: Cleanser and water can be utilized on skin whenever uncovered. Some shop hand cleaners (Go Jo) function admirably too. Any abundance CH3)2CO ought to be legitimately discarded, it is a smart thought to place it in an appropriate transfer can with top and discarded accurately

Cutting and Testing: Cutting procedure is finished by grating water-stream cutting machining. water fly machining (WJM) and grating water fly machining (AWJM) are two non-custom or non-ordinary machining process.

They have a place with mechanical gathering of non-regular machining process like ultrasonic machining (USM) and rough fly machining (AJM). in these procedures (WJM and AJWM), the mechanical vitality of water and rough stages are utilized to accomplish material evacuation or machining. In any case, in all variations of the procedures, the essential strategy continues as before. Water is siphoned at an adequately high pressure,200-400MPa (2000-4000bar) utilizing intensifier innovation. An intensifier chips away at the straightforward standard of weight intensification utilizing pressure driven barrels of various cross segments as utilized in "jute Chime presses". at the point when water at such weight is issued through a reasonable opening (for the most part of 0.2-0.4mm dia), the potential vitality of water is changed over into active vitality, yielding a high speed stream (1000m/s). such high speed water stream can machine slim sheets/foils of aluminum, cowhide, materials, solidified sustenance and so on. In unadulterated WJM, economically unadulterated water (faucet water) is utilized for machining reason. be that as it may, as the high speed water fly is released from the opening, the fly will in general go into barometrical air and flares out diminishing its cutting capacity. Henceforth, regularly stabilizers (long chain polymer) that thwart the discontinuity of water stream are added to the water. In AWJM, grating particles like sand (SiO2), glass dabs are added to the water fly to improve its cutting capacity by numerous foldaway are essentially of two sorts entrained and suspended sort as referenced before. In entrained type AWJM, the rough particles are permitted to entrain in water stream to frame grating water fly with noteworthy speed of 800m/s. such high speed rough fly can machine practically any material. The photographic perspective on a business CNC water stream machining framework alongside close up perspective on the cutting head.

RESULTS AND DISCUSSION

Tensile Test: Tensile Sample A, The dimensions of the tensile test is 13.34*3.76mm and area is 50.16mm^2 and this specimen withstands 59Mpa of ultimate tensile stress and the tensile load is 2.940KN. Tensile Sample B, The dimensions of the tensile test is13.34*3.54mm and area is 47.22mm^2 and this specimen withstands of ultimate tensile stress 63Mpa and the tensile load is 2.985KN. Tensile Sample C, The dimensions of the tensile test is 13.25*3.31mm and area is 43.86mm^2 and this specimen withstands of ultimate tensile stress 58Mpa anthe tensile load is 2.535KN**.** Thus we conclude that 2.820KN of ultimate tensile load and 60Mpa of ultimate tensile stress is calculated in average.

Table 4.2.3. Layer Combination

S.NO	DESCRIPTION	SAMPLE 1	SAMPLE 2
1	Top layer	E-Glass fiber 1 nos	S-Glass fiber 1 nos
2	Second layer	Kenaf fiber 1 nos	Kenaf fiber 1 nos
3	Third layer	E-Glass fiber 1 nos	S-Glass fiber 1 nos
4	Fourth layer	Flax fiber 1 nos	Flax fiber 1 nos
5	Fifth layer	E-Glass fiber 1nos	S-Glass fiber 1nos

Flexural Test: Flexural sample A, The dimensions of the flexural test is 13.11*4.08mm and area is53.49mm^2 and this specimen withstands of ultimate tensile stress 3Mpa and the tensile load is 0.155KN. Flexural sample B, The dimensions of the flexural test is13.10*3.92mm and area is 51.35mm^2 and this specimen withstands of ultimate tensile stress 4Mpa and the tensile load is 0.210KN. Flexural sample C, The dimensions of the flexural test is 13.04*3.74mm and area is 48.77mm^2 and this specimen withstands of ultimate tensile stress 4Mpa and the tensile load is 0.195KN

Charpy test:

RESULTS

Glass fiber	Test temp	Notch type	Specimen Size(mm)	Absorbed Energy(j)			average
E Glass	24	Un Notched	4*13*65	4	8	6	6.00
S Glass	24	Un Notched	5*13*65	4	8	6	6.00

Tensile Test: Original cross section area of ramie fibre composite is = 47.08 mm^2

Ultimate tensile load is = 2.820KN =2820N

Ultimate tensile strength is = 60 N/mm^2

Flexural Test: Flexural strength of hemp and flax fiber is = 112.90 N/mm^2

Charpy impact test: Energy absorbed by the material is = 6 joules

DISCUSSION

From the above result we found Ultimate tensile load of 2.820KN and the Ultimate tensile strength of 60 N/mm^2 with Flexural strength of 112.90 N/mm^2 and we have found that the material has more flexural strength, tensile strength. So this material can be used in automobile, and in many other mechanical industries.

Conclusion

The composite materials are reasonable for the application where medium burden is experienced it tends to be adequately traded to the customary material because of their focal points, for example, less weight, good load bearing capacity, thus it can go about as are arrangement for some materials. In future composite material, will locate the expansive application in numerous fields the attributes like high burden ability to the load ratio, easy creation methods, cheap accessibility of crude materials will make it appropriate for different application

REFERENCES

Abrao, A.M., Faria, P.E., Campos Rubio, J.C., Reis P. and Paulo Davim J. 2006. 'Drilling of fiber reinforced plastics: A review' Elsevier - Journal of Materials Processing Technology 186 (2007) 1–7

Ali, M.S. et al. 1990. 'Carbon Fiber Composite Bone Plates: Development, Evaluation and Early Clinical Experience', J. Bone & Joint Surg. [Br], 72-B, 586-91.

Amir Abbas Zadpoor, "Finite element method analysis of human hand arm vibrations" Biomechanical Engineering Division, Department of Biomedical Engineering,

Amirkabir University of Technology, Hafez Ave., Tehran 15914, Iran.

Baixauli, et al. 1995. Carbon Fiber Composite Bone Plates for Fixation of Forearm Fractures, J. Bone & Joint Surg. [Br], 77-B (2), 227.

Barbero, E.J. 1989. On A Generalized Laminate Theory with Application to Bending, Vibration, And Delamination Buckling In Composite Laminates, Ph.D Thesis, Virginia University.

Blazewicz, S. et al. 1997. Experimental Study of Mechanical Properties of Composite Carbon Screws, Biomaterials, 18, 437-439.

Boeree, N. R., Dove, J., Copper, J. J., Knowles, J. and Hastings, G. W. 1993. Biomaterials, 14, 793.

Brendamari Rodríguez, Annette Romero, Omar Soto and Oswaldo de Varorna, 2004. Biomaterials for Orthopedics May Applications of Engineering Mechanics in Medicine, GED – University of Puerto Rico, Mayaguez

Cameron, J. R., Skofronick, J. G. and Grant, R. M. 1999. Physics of the Body 2nd Edition. Madison, WI: Medical Physics Publishing, p. 96.

Craig M. Clemons and Daniel F. Caulfield 1994. 'Natural fibers' Sage Journals – Journal of Reinforced Plastics Composite s - 1354-66

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