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Natural Fiber Composites For Automotive and Transportation Industry Application

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***Abstract*—**Fiber surface compound alterations and medications were considered alongside preparing conditions for eco-polyester normal fiber composites. Why the recharged enthusiasm for regular fiber composites over fiber glass in the car business on the grounds that the re-established enthusiasm for common fiber composites are rising as a feasible choice to glass fiber fortified polymer (GFRP) composites for some reasons. Common fiber can be 25% - 30% more grounded than glass fiber for a similar weight and can convey a similar exhibition for lower weight. In car parts, bio composites produced using common filaments diminish the mass of the segment and can bring down the all out vitality devoured in delivering this material by 80% and furthermore as a response to the vulnerability of the oil supply. The benefits of regular strands over engineered or man-made filaments, for example, glass and carbon are its minimal effort, low thickness, adequate explicit quality properties, utilization of less vitality, manufacturability, and sound retention properties, and it being an eco-accommodating and biodegradable item and thermoplastic polymers, for example, polypropylene and polyesters. They are utilized in the car business as a composite materials for seat backs, arm rests, entryway boards , sunshades , bundle plate , main event, and trunk truck applications, and so forth., Natural fiber composites more secure, displays ideal no weak break on effect and preferable sound retention over fiberglass. Anyway normal fiber composites are more eco-accommodating than fiberglass it predominantly relies upon sun oriented vitality by development. Then again, glass fiber creation requires 5 – multiple times more non sustainable power source the common fiber generation.

Keywords— Fortified polymer, glass, fiber, banana fibre, composite

I. INTRODUCTION

Characteristic strands are sustainable and acquired from normal assets that present a few preferences, including: low thickness, adequate explicit quality properties, great sound decrease ability, low abrasively, minimal effort, high biodegradability and presence of immense assets. What's more, toward an incredible finish cycle these can be burned for vitality recuperation, since they have a decent calorific worth. Various analysts have misused the support capability of kenaf, flax, hemp and jute for creating thermoplastic and thermo set composites utilizing a few unique procedures; these composite materials have been effective in the semi-basic just as auxiliary applications. A few employments of bio-based composites incorporate inward entryway trim, seat-back trim, dashboard bolsters, back racks and outside parts, for example, transmission covers. Banana strands which are acquired from the dried stalk of banana trees, a waste result of banana development, offer conceivable outcomes for building applications, including car. Banana fiber has great explicit quality properties tantamount to those of ordinary materials, similar to glass filaments. Besides, this material has a lower thickness than glass strands. In any case, banana filaments are related with certain difficulties including high dampness take-up, low warm soundness and low holding with polymers. Past examinations have demonstrated that with fitting surface medications the mechanical properties, (for example, pressure, flexure and pressure) can be improved. Salt medications have been demonstrated successful in expelling polluting influences from the fiber, diminishing dampness sorption and empowering mechanical holding, and in this way improving network support association.

Fig 1: Banana Fibre

The goal of this paper is to set up and improve a creation procedure for banana fibre composites(Fig 1) reasonable for car and transportation applications. For this reason

soybean based polyester (alluded to as eco-polyester) is utilized to bond the strands alongside Methly Ethly Ketano paoxide (MEKP) as a hardener and Cobalt quickening agent are utilized. It is additionally a worry in this examination to portray the subsequent composites regarding their mechanical properties and the impact of ecological impacts, especially dampness take-up on the subsequent properties.

II. LITERATURE REVIEW

As of late, the enthusiasm of researchers and architects has turned over on using plant filaments as viably and financially as conceivable to create great quality fiber-fortified polymer composites for auxiliary, building, and different needs. It is a direct result of the high accessibility and has prompted the advancement of elective materials rather than traditional or man-made ones. Numerous kinds of normal filaments have been explored for their utilization in polymer, for example, wood fiber (Maldas et al 1995), Sisal (Joseph et al 1999) ,kenaf (Rowell et al 1999), pineapple (Mishra et al 2001), jute (Mohanty et al2006), banana (Pothan et al 2003) and straw (Kamel 2004).Bax and Mussig 2008 examined the mechanical properties of PLA strengthened with cordenka rayon strands and flax filaments, separately.

A poor grip was watched utilizing Scanning electron microscopy analysis.The most noteworthy effect quality and elasticity were found for cordenko fortified PLA at fiber extent of 30%.Mwaikambo and Ansell 2003 assessed the physical and mechanical properties of the common fiber composites to survey their workableness. Treated strands with most noteworthy quality were utilized as support for cashewnut shell fluid framework and decided malleable properties, porosity and furthermore analyzed crack surface geography of the composites. The goal was to boost the measure of ease characteristic fiber asset in the composite. They inferred that the nearness of lignin in the untreated hemp fiber offers extra cross connecting locales and the untreated fiber surface is progressively good with CNSL (Cashew Nut Shell Liquid pitch) than soluble base treated surface. The utilization of regular filaments as mechanical segments improves the natural manageability of the parts being developed, particularly the car showcase. In the structure business, the enthusiasm for normal strands is for the most part conservative and specialized, regular filaments permit protection properties higher than current materials.

III. EXPERIMENTAL WORK

In this work banana fibers were used as small non-woven fibers (4–9 mm). The fiber is mechanically separated from the banana stalk and then dried in hot air.

- Natural Fiber: BANA Fiber, Jute Fiber, LUFFA Fiber
- Synthetic Fiber: Glass Fiber
- Resins: Eco - Polyester
- Hardener: Methylene athlete Ketano Poxide (MEKP)
- Accelerator: Cobalt accelerator

Glass reinforced polymer composites were prepared using hand lay-up (HLU) technology. Creating banana fiber network, jute fiber network and envelope fiber fragments. Tame the resin, hardener and accelerator. Mix the resin properly with the hardener first add the accelerator. Will Unsaturated polyester resin is a liquid that solidifies in the hardener when the hardener is added. It is specially formulated to cure at room temperature. Hardener, MEKP (methyl ethyl ketone peroxide) is also added to treat and harden the resin. (Volume base ie 60% resin, 30% MEKP and 10% cobalt accelerator). Place a sheet of glass on top of the banana network at that place and apply resin mixture on it, then apply other material, then resin and another banana network. Then apply some pressure for proper connection between the material by placing load on it or pressing it in UTM machine. Leave to dry one day after that process. Take the number of samples required in all combination pieces. Various tests have been done to see which material is giving good results.

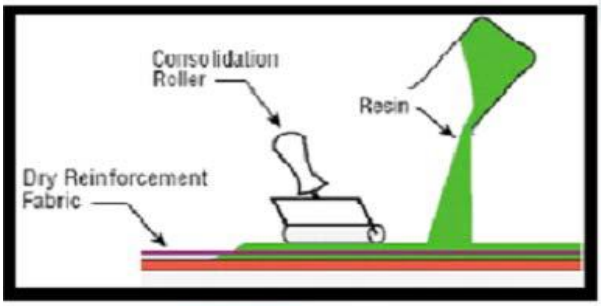

Fig 2: Experimental set up for the hand layup technique

IV. EXPERIMENTAL TESTING

Flexural Strength

The flexural quality and modulus of the composites was resolved utilizing the three point twisting test technique as per ASTM D 790-03, method B, utilizing a SATEC T-500 screw driven machine. Tests were cut into rectangular areas of 19 mm width and L/d proportion of 36/1. The heap was applied halfway between the backings with a crosshead speed of 5.4 mm/s. Each example was stacked to disappointment.

Fig 3 : Beam under 3 point bending

Hardness Testing

Hardness of the three separate samples and three strengthened composite material is ditermined by utilizing Rockwell Hardness Testing Machine. The sample size utilized here is a rectangular of length of 65mm X 65mm. Hardness is a proportion of the protection from limited plastic disfigurement actuated by either mechanical space or scraped spot. Naturally visible hardness is for the most part portrayed by solid intermolecular bonds, however the conduct of strong materials under power is perplexing; in this manner, there are various estimations of hardness: scratch hardness, space hardness, and bounce back hardness.

V. RESULTS

Flexural Strength

Table 1: Flexural Strength

MATERIAL	Load (N)	Width x Breadth x Length (mm)
BANANA FIBER	608	21.40 x 51.50 x 200
BANANA FIBER WITH LUFFA	708	22.50 x 50.75 x 200
BANANA FIBER WITH JUTE	609	24.00 x 51.30 x 200
BANANA FIBER WITH GLASS FIBER	543	19.68 x 50.51 x 200

The values are plotted on the graph and are showed in the Fig 4.

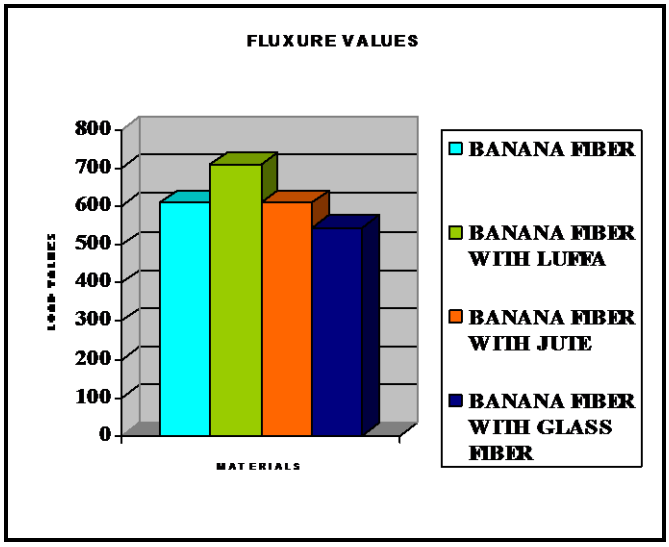

Fig 4: Materials vs Flexure Values

Hardness Test

Table 2: Sample Size Will Be 40mm X 50mm X 50mm

MATERIAL	HARDNESS VALUES (HRB)
BANANA FIBER	34
BANANA FIBER WITH LUFFA	47
BANANA FIBER WITH JUTE	49
BANANA FIBER WITH GLASS FIBER	61

Results obtained during the hardness test for the sample size of dimensions 40 x 50 x 50 mm are plotted on the graph which is showed in the Fig 5.

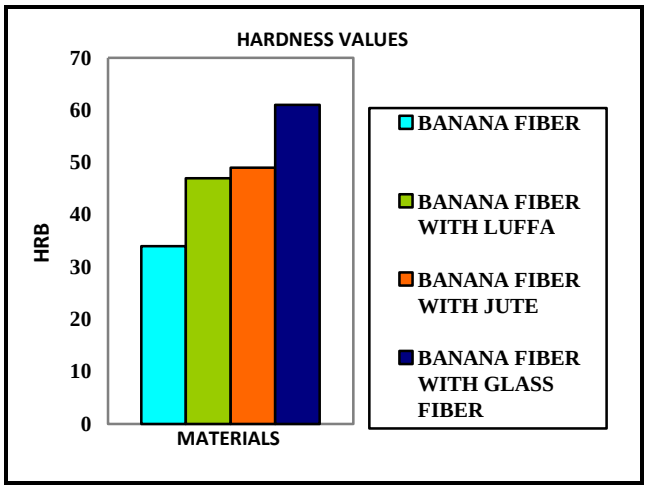

Fig 5: Material vs hardness values

VI. CONCLUSION

The banana strands are utilized as a fortifying material with polyester framework, the composites have been manufactured and physical attributes of these materials are analyzed. Banana fiber composite material will invigorate a decent and great surface completion contrast with other composite materials. It is an awesome substitute material for regular fiber rein constrained polymer composite. The banana fiber composite materials with all other regular materials led different mechanical testing's coming up next are the outcomes.

- Banana fiber material with glass fiber composite is giving great outcomes contrast with every single other composite.
- Banana fiber with Luffa fiber composite giving better outcomes beside the glass fiber composite.
- Banana fiber with other Jute fiber composite having moderate outcomes.
- Purely banana fiber composite materials having less mechanical properties than contrast with every one of the mixes.

Last end is contrast and every one of the outcomes blend of banana fiber and luffa fiber composite material having better outcomes and it is normal fiber effectively bio degradable contrast with banana fiber with glass fiber is it additionally having great outcomes however it half and half materials.

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