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Experimental Investigation and Fibre Loading On Mechanical Properties of CFF/Wood Dust Reinforced Polyester Composite

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***Abstract*—Growth in the field of Natural and biomaterial composites have directed in the enlargement of various innovative materials and products which are eco-friendly as well as biodegradable. Many researchers used natural plant fibers like bamboo, coir, jute, sisal, cotton, wheat straw and wood etc. Here we found the CFF based composites and it is treated with rose water for the purification and bleaching. After that the processed feather have been mixed up with musafibre and wood dust to show cast the performance of combination. Testing specimens have been made with the compression moulding technique, various tests have been conducted to identify the unique property .By using the waste of poultry industry and to enhance the use of livestock waste in a sustainable growth of the earth and healthy environment.**

I.INTRODUCTION

An estimated 15 million tons of chicken feathers are available globally each year as a by-product of meat manufacture. The raw material is tough and chemically resistant. Currently the feathers are disposed of in landfill, burned or processed to make a low-grade animal feedstock. These methods are environmentally unsound and are restricted. More expensive disposal method is to use as a low quality protein feed. However demand is less. Feathers are made from protein keratin there are two forms of microcrystalline keratin in the feathers. These are the fiber and the quill. Thermal energy required to perturb the quill is less than that required by fibers .Therefore the feather fiber can withstand both thermal and mechanical stress. Feathers are chemically keratin just as WOOL, but the surface area is much larger because the diameter of the fiber is much smaller. When it is been treated with ethanol and bleaching .it gives out the best result. When it is used in ideal manner it won't worked out and so the mixture of musafibre with this makes the better bonding to withstand the material stability and its functioning. After that wood dust is mixed up with this in various proportions to analyse the properties.

II.MATERIAL & METHODS:

A.Chicken Feather

Chicken feathers are deliberated as a waste product of the poultry industry. Large amount of waste feathers generated and disposed each year by poultry processing plants results in severe solid waste trouble. Feathers are greatly ordered, hierarchical branched structures that is standing among the most complex of keratin structures establish in vertebrates. It contains keratin (91%), lipids (1%), water (8%).By generally the purification and bleaching have been done to make the chicken feather fibre more stable in the atmosphere, if we are failed to treat, it will start decomposing by the keratin in it.From ancient days ethanol have been used to done this methodology but we tried it with rose water which is an antibacterial agent to release the odour too.

Fig 2.1 Chicken feather

B.Musa Fibre

Banana fibers were collected from the bark of banana plant of species Musa ornata (Sagor Kala) from Curzon Hall area. The fibers were about 30 cm long. When banana plants got matured, the bark of the plant was cut down into small pieces and separated layers were tied up in bundles. The bundles were put under fresh water in two separate buckets for twenty days. Then compost fertilizer was mixed with the water and bundles were kept for five more days. When rotten, the barks were taken out of the bucket and washed thoroughly with water several times and dried in open air without exposure to sunlight. The removal of impurities such as dirty materials and gummy substances was carried out by immersing dry fibers in

a solution of 6.5 g detergent per liter of water at 70–75°C for 30 min in a beaker.

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Fig 2.2 Musa fibre

C.Wood Dust

The wood was sawn using a saw mill machine and the Wood sawdust was collected. The sawdust was then oven dried at 70°C - 80°C to a moisture content of 3% - 5%, then stored in polyethylene bag until needed. The particle sizes of the sawdust were in the range between 80 and 100 mesh. This has been collected and been stored to make the dust more sustainable.

III.EXPERIMENTATION

A Composite Fabrication

Polymer composite has been made in the dimensions of 270 x 270 x 3 mm^3 were fabricated by the pure resin with chicken feather fibre, musafibre, wood dust as a reinforcement. Two plates are manufactured by using the proportion of 5% wood dust, 20%CFF and 10% musafibre for one plate and 10% wood dust, 20%CFF and 5% musafibre for another one. The plates have been cutted out after the accomplishment of proper specimen. It's been cut by saw cutter as per ASTM standards to proceed it for various tests.

Fig 4.1 Fabricated Composite

B Tensile Testing

The tensile test specimens were prepared according to ASTMD 3039. For testing the specimen was mounted in the grips of the Instron universal tester with 10 mm gauge length with the speed of 200 mm/min. The stress strain curves was plotted during the test for the determination of ultimate tensile strength and elastic modulus. From the stress strain curve, a straight line was drawn and from the slope of the line the Young's modulus or elastic modulus was determined. Average of three tests results was taken. Finally the graphs are drawn as per the status achieved.

C Impact Testing

Impact test specimens were prepared according to ASTM D 256. The specimen was clamped into the pendulum impact test fixture with the notched side facing the striking edge of the pendulum. The energy loss was obtained from reading at scale plate. The fracture values were calculated by dividing the energy absorbed by cross sectional area of the specimen. Impact test drawings are plotted in sequence to determine the proper materialistic value.

D Compression Testing

The test was carried out in accordance with ASTM D 695 on specimen with a configuration of 125 x 25 x 3 mm^3. The test specimens were placed between the plates of the Universal Testing Machine and compression force was applied. Three tests were taken and the graph drawn as per result achieved.

IV.RESULTS AND DISCUSSION

The Testing done here are tensile, compression, impact The following results are described here.Tensile strength, Tensile Modulus and % elongation at break of 5% wood dust and 10% wood dust For proper understanding of the effect of fibre content on tensile strength, tensile modulus and percentage of elongation at break separate charts have been plotted 5% and 10% of wood dust combination

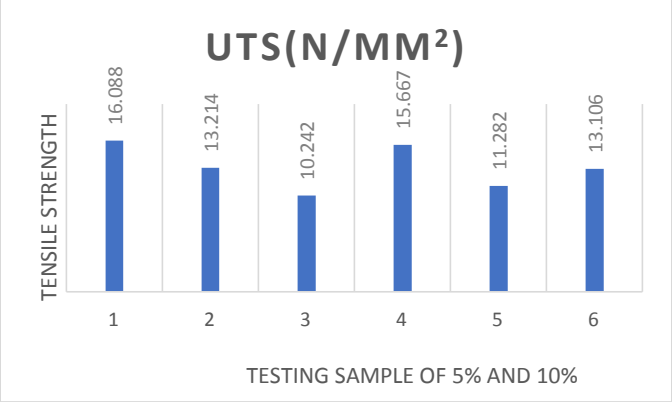

Fig 4.2 Variation of Tensile Strength for each sample

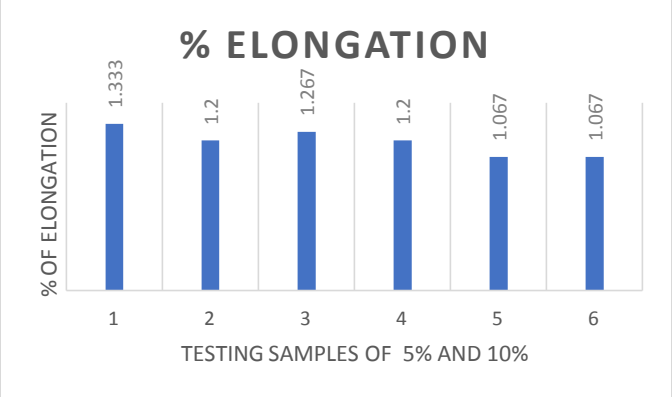

Fig 4.3 Variation of % of elongation of a Specimens

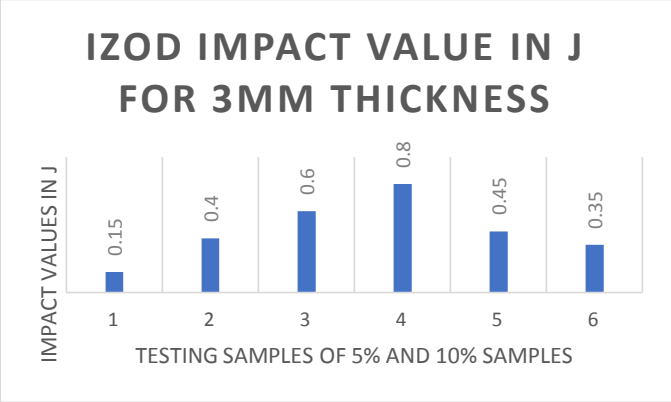

Fig 4.4 Variation of Impact Values of a Specimens

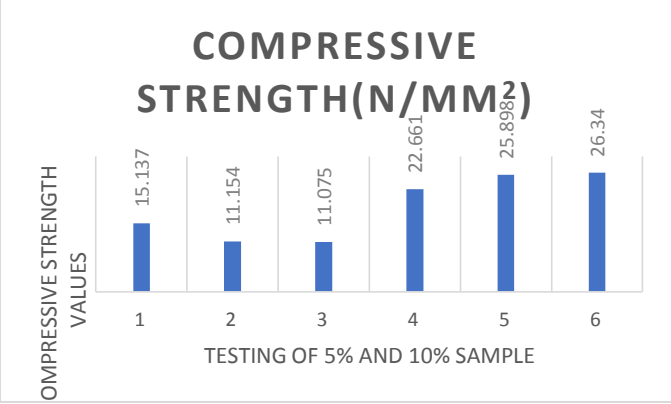

Fig 4.5 Variation of Compressive Strength

V.CONCLUSION

From the above project, it is found that on examining the mechanical behavior such as its Tensile Strength, Impact Strength and Compression Test of various combination of chicken feather fibre, musa fibre, and wood dust reinforced Polyester composites, higher tensile strength and Impact Strength is found in CFF/WOODUST. Moreover the final result is as 10% wood dust makes the specimen makes stronger. Increase in wood dust increases the compression and impact and decreases the tensile. Similar projects on natural eco-friendly materials can be carried away to reduce the plastic usage and to make use of natural resources which are wasted in current scenario and for predicting the optimum properties and apt materials which will suit variety of application such as automotive, packaging, etc…

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