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Effect of Tungsten Carbide on Wear Characteristic of Natural Fibre Reinforced Polymer Composites

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ABSTRACT: The main aim of the project is to give the valuable product for our future and it has good wear resistance, weight reduction and good load carrying capacity. In the present scenario weight reduction has been the main focus of machine parts and it can be achieved by introduction of the better material and better manufacturing process. In our project we introduce tungsten carbide with coconut fiber composite material. Here we can discuss about the wear rate and mechanical properties of the composite material.

KEYWORDS: Coir Fibre, Tungsten Carbide, Polyester Resin, Hand lay-up.

I. INTRODUCTION

The pulped coconut fiber composite has good flexural strength. The subject gives a brief look on the suitability of coconut composite material and their advantages. Polymeric materials reinforced with synthetic fibres such as glass, carbon, and aramid provide advantages of high stiffness and strength to weight ratio as compared to conventional construction materials, i.e. wood, concrete, and steel. Despite these advantages, the widespread use of synthetic fibre-reinforced polymer composite has a tendency to decline because of their high-initial costs, their use in non-efficient structural forms and most importantly their adverse environmental impact. On the other hand, the increase interest in using natural fibres as reinforcement in plastics to substitute conventional synthetic fibres in some structural applications has become one of the main concerns to study the potential of using natural fibres as reinforcement for polymers. In the light of this, researchers have focused their attention on natural fibre composite (i.e. bio-composites) which are composed of natural or synthetic resins, reinforced with natural fibres. Efforts have been made to reduce the cost of coconut composite material to that of steel material. The achievement of weight reduction with adequate improvement of mechanical properties has made coconut composite a very replacement material for conventional steel. Material and manufacturing process are selected upon on the cost and strength factor. The design method is selected on the basis of mass production.

From the comparative study, it is seen that the coconut composite material are higher and more economical than conventional material.

II. RELATED WORK

M. A. Maleque*, F. Y. Belal Faculty of Engineering & Technology, Multimedia University Malaysia. Composite materials were known to mankind in the Paleolithic age (also known as Old Stone age). The 300 ft high ziggurat or temple tower built in the city center of Babylon was made with clay mixed with finely chopped straw. In recent years, polymeric based composite materials are being used in many applications, such as automotive, sporting goods, marine, electrical, industrial, construction, household appliances, etc. Polymeric composites have high strength and stiffness, light weight, and high corrosion resistance. In the past decade, extensive research work has been carried out on the natural fiber reinforced composite materials in many applications. Natural fibers are available in abundance in nature and can be used to reinforce polymers to obtain light and strong materials. Natural fibers from plants are beginning to find their way into commercial applications such as automotive industries, household applications, etc. A number of

investigations have been conducted on several types of natural fibers such as kenaf, hemp, flax, bamboo, and jute to study the effect of these fibers on the mechanical properties of composite materials. Mansur and Aziz studied bamboo-mesh reinforced cement composites, and found that this reinforcing material could enhance the ductility and toughness of the cement matrix, and increase significantly its tensile, flexural, and impact strengths. On the other hand, jute fabric-reinforced polyester composites were tested for the evaluation of mechanical properties and compared with wood composite, and it was found that the jute fiber composite has better strengths than wood composites. A pulp fiber reinforced thermoplastic composite was investigated and found to have a combination of stiffness increased by a factor of 5.2 and strength increased by a factor of 2.3 relative to the virgin polymer. Information on the usage of coconut fibers in reinforcing polymers is limited in the literature. In dynamic mechanical analysis, Laly et al. [9] have investigated coconut fiber reinforced polyester composites and found that the optimum content of coconut fiber is 40%. Mechanical properties of coconut-fiber-cement composites were investigated physically and mechanically by Corbiere-Nicollier et al. [10].

III. METHODOLOGY

Step 1: Selection of matrix material Polyester resin belonging to the catalyst and Accelerator was used as the hardener.

Step 2: Selection of reinforcement and Natural fibers Coconut coir, were taken to fill as reinforcements in the Polymer composite.

Step 3: Extraction of fibers Coconut Coir

Coconut Coir Fiber: Coconut coir- Coconut fruit peel were gathered and soaked in water. Later clean fibers were drawn manually from them

Step 4: Surface treatment of fibers Freshly drawn fibers generally include lots of impurities that can adversely affect the fiber matrix bonding. Consequently the composite material made from such fibers may not possess satisfactory mechanical properties. Therefore it is desirable to eliminate the impurity content of the fibers and perhaps enhance the surface topography of the fibers to obtain a stronger fiber-matrix bonding. The fibers were left to treat with 5% NaOH for 3-4 hrs. Later they were drawn and dried under sunlight for 1-2 hours.

Step 5: Wet Hand lay-up technique Hand lay-up technique is the simplest method of composite processing. The infrastructural requirement for this method is also minimal. The processing steps are quite simple. First of all, a release gel is sprayed on the mold surface to avoid the sticking of polymer to the surface. Thin plastic sheets are used at the top and bottom of the mold plate to get good surface finish of the product. Reinforcement in the form of woven mats or chopped strand mats are cut as per the mold size and placed at the/ surface of mold after perspex sheet. Then thermosetting polymer in liquid form is mixed thoroughly in suitable proportion with a prescribed hardner (curing agent) and poured onto the surface of mat already placed in the mold. The polymer is uniformly spread with the help of brush. Second layer of mat is then placed on the polymer surface and a roller is moved with a mild pressure on the mat-polymer layer to remove any air trapped as well as the excess polymer present. The process is repeated for each layer of polymer and mat, till the required layers are stacked. After placing the plastic sheet, release gel is sprayed on the inner surface of the top mold plate which is then kept on the stacked layers and the pressure is applied. After curing either at room temperature or at some specific temperature, mold is opened and the developed composite part is taken out and further processed. 1. The time of curing depends on type of polymer used for composite processing. For example, for epoxy based system, normal curing time at room temperature is 24-48 hours. This method is mainly suitable for thermosetting polymer based composites. Capital and infrastructural requirements less as compared to other methods. Production rate is less and high volume fraction of reinforcement is difficult to achieve in the processed composites. Hand lay-up method finds application in many areas like aircraft components, auto motive parts, boat hulls, diase board



Before Curing



After Curing



we try to three different weight ratio to produce the composite material

Ratio 1: Tungsten Carbide 20 %, Coir Fibre 40 %, Polyester Resin 40 %

Ratio 2: Tungsten Carbide 15 %, Coir Fibre 45 %, Polyester Resin 40 %

Ratio 3: Tungsten Carbide 10 %, Coir Fibre 50 %, Polyester Resin 40 %

IV. EXPERIMENTAL RESULTS

We take 4 test Wear test, Tensile Strength, Impact test, Hardness Test for the above different weight ratio composite material. Sample 1

Test	Value
Wear Test	0.21 m ² /N
Hardness Test	20
Tensile Strength	16.45 N/mm
Impact Test	25 .m

Test	Value
Wear Test	0.23 m ² /N
Hardness Test	21
Tensile Strength	13.45 N/mm
Impact Test	26N.m

Test	Value
Wear Test	0.27 m ² /N
Hardness Test	22
Tensile Strength	13.22 N/mm
Impact Test	28 .m

V. CONCLUSION

- The study explains the various Characteristic and properties of the composite Material.
- If the tungsten Carbide Weight percentage will be increased the value of the wear rate are decrease.
- When the tungsten Carbide are increased the tensile Strength of the material are also increased.
- So the above results are show clearly, the weight % of the WC increased it lead to a good tribological Characteristic.

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