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A review on "Fabrication and mechanical characterization of composites using hemp and glass as a reinforcement material polyester resin matrix material and cenosphere as filler material for engineering applications".

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Abstract - *The recent approach towards the biodegradable, ecological, and recyclable materials have results in a drastic shift from a man-made/synthetic to a natural fiber. Thus, the usage of natural fiber such as hemp fibers as reinforcement in composite materials has expanded in recent years. Hemp fibers are produced from the stem, which make them stiff and these are the properties required for composite material reinforcement. This fibers offer mechanical properties similar to glass fibers. The diversity in their qualities, on the other hand, is their main flaw. Hemp fiber combining with thermoplastic, thermoset, and natural matrices have excellent mechanical characteristics. Several hemp fiber surface treatments, which were employed to increase fiber and matrix interfacial bonding, significantly improved the mechanical properties of the resultant material.*

Key Words: **biodegradable, ecological, recyclable, natural fibre, hemp fiber, composite material**

1. INTRODUCTION

[1] Researchers all over the world are now focusing on the use of biodegradable, locally accessible, and low-cost natural fiber-reinforced material for a variety of applications. Hemp, which is lightweight and quick-growing, is having a lot of potential from its mechanical features. Filler materials is utilized for the improvement of specific mechanical qualities while lowering material costs. Composite specimens with various weight fractions of hemp, glass textiles, and filler are tested for tensile and flexural. polyester as a matrix material for a cenosphere

2. METHODOLOGY

Patents, journals, and internet references were gathered, researched in-depth, and the literature study was summarized at the literature review stage. The material will be cut into conventional forms and tested for flexural, tensile, and impact resistance after fabrication.

3. MATERIALS

[1]Hemp Fabric- is a type of fiber derived from hemp (Cannabis sativa) plant, which are both extremely tensile and durable. The majority of hemp Fiber reinforced composites utilized in-vehicle for manufacturing interior components. This project uses hemp from Virushka Composites in Andhra Pradesh.

[1]Glass Fabric- is a type of synthetic material that is used to strengthen composites and improve their qualities. The current project makes use of glass fiber from Suntech Fibers in Bangalore. The glass fiber used is of 360 GSM.

Polyester Resin- It is a synthetic resin obtained from the reaction of dibasic organic acids and polyhydric alcohols. Supplied by Sentech fibers Bangalore.

[1]Cenosphere- is a light, inert by-product of the coal combustion in the power plants. Kolkata-based Cenosphere India Pvt. Ltd is the provider.

3.1Applications Hemp[4]

1. Rope, linen, food, lighting oil, and medication are all made from hemp.
2. Hemp fibers are currently employed in the production of banknotes.
3. These were highly prized before the invention of petrochemical-derived plastic fibers.
4. Hemp hurds can be used as an aggregate when combined with a hydraulic lime binder.
5. In a lime/hemp hurd combination, hemp fibers were introduced as tensile reinforcement.

3.2 Cenosphere

[5] cenosphere constitute of silica and alumina which are filled with air or an inert gas and these are created as by-product of coal combustion from the thermal power plants. They are in the form of hollo sphere which are light weighted. Ceno spheres range the color from grey - virtually white, with a density of 0.4–0.8 g/cm3 (0.014–0.029 lb/cu). Cenospheres are tough and stiff, plus they are also light, waterproof, odorless, and insulative. Thus, it can be widely used as a filler since it helps in the lowering of the total weight of the material. It is used a filler in low-density concrete. Few of the producers have recently started incorporating cenospheres with metals and polymers to manufacture lighter composite materials with a greater strength than in other types of foam materials. Syntactic foam is the name given for such composite materials. Syntactic foams which constitute aluminium are having different applications in automotive sector.

4. FABRICATION

[2] Hand lay-up is an oldest manufacturing technique which is most used for the composite material. A material with the desirable qualities are created by layering unidirectional or weaving composites. Each layer is positioned in such a way that its properties are fully utilized. To enhance the effectiveness of the laminated composite material, layers of each different materials (different fibers in different directions) can be mixed. Hand-impregnated resins are applied to fibers in the form of a woven, knitted, stitched, or bonded fabrics. Rollers or brushes are commonly used to do the process, with the growing usage of nip-roller impregnators, which use rotating rollers and a resin fluid to force the resin into fabrics. The laminates are allowed to cure in normal conditions.

5. TESTING

5.1 Mechanical Strengths of Composites

5.1.1Tensile testing

- [3] Three distinct tensile test samples are fabricated from the constructed composite plates by ASTM D638. The tensile test is carried out by a digital UTM machine by applying an equal and opposing loads to the prepared samples until they fractured, and the associated data were recorded. The same techniques were used to acquire different ranges of tensile strength for the comparison of the test results for the remaining samples made in the identical composite plates.

5.1.2 Flexural Testing

- [3] Three distinct flexural test samples are fabricated from the constructed composite plates by ASTM D790. With the use of a hacksaw, the three test specimens of each composite plate of hemp and glass fiber including epoxy composites are sliced. By using digital UTM machine, the prepared test samples were put to the test by delivering three-point bending stress. For the each specimen, the flexural modulus and associated displacement test result are obtained for the comparison.

6. RESULTS AND DISSCUSSION

Hemp fibers was combined with the glass fibers in this experiment, and several composite plates were created to test the mechanical qualities. The test specimens are prepared according to ASTM standards, with the necessary finishing provided by the fabricated composite specimen. By using a digital UTM machine and flexural test machine, mechanical testing of the composites such as tensile and flexural samples was done.

7. CONCLUSION

Researchers are now concentrating their efforts in the area of composite materials to create ecologically sound natural composites without sacrificing the ability to replace the man-made or traditional components in the automotive sector. The tensile and flexural properties of hemp and glass Fiber integrated composite speciments were recorded and analyzed. The findings are drawn for these experimental experiments based on acquired mechanical readings.

As of last, the natural Fiber hemp polyester composites can lead to the green manufacturing and can also be used for a sustainable green environment, which has the ability to replace conventional materials.

There is big possibility that the the artificial/synthetic Fiber incorporated composite materials would be replaced by the hemp and glass Fiber combined with polyester composite materials in the future.

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