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DEVELOPMENT OF E-GLASS FIBER REINFORCED & SISAL EPOXY COMPOSITE FOR STRUCTURAL APPLICATIONS: A CASE STUDY

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Abstract: ***The present investigation is an endeavor to take an outline of the work done in the zone of characterization of Glass Fiber/Epoxy composite material. Distinctive manufacturing techniques are utilized for creating Glass Fiber/Epoxy composite. In view of exhaustive writing audit of different aspects in creating Glass Fiber/epoxy composite material, it is seen that good work has been identified with respect to developing technique and mechanical property evaluation for chosen material, though restricted examinations completed to investigate tensile, shear and flexural quality by changing volume division of glass fiber and epoxy materials. The behavior of material under tension, shear and flexure made of different manufacturing techniques of laminated Glass Fiber/Epoxy composite are the principle areas of research for of research scholars.***

Keyword: Composite, Characterization, Fiber, Epoxy

I. INTRODUCTION

A composite material can be characterized as a blend of at least two materials that outcomes in preferable properties over those of the individual parts utilized alone. Rather than metallic combinations, every material holds its different synthetic, physical, and mechanical properties. The two constituents are reinforcement and a matrix. The principle preferences of composite materials are their high quality and stiffness, combined with low density when compared with bulk materials, taking into consideration a weight decrease in the completed part.
Composite materials have turned out to be basic piece of the present life on account of numerous applications and preferences. There are numerous works going on in the field of building structure and advancements to improve the mechanical properties and heat resistant properties, for example, stiffness, fatigue, corrosion resistance, high solidness to weight ratio and so on. Fiber fortified polymer (FRP) is normally made of polymer matrix reinforced with short or continuous fibers/strands.

II. LITERATURE SURVEY

Jayaramudu, Agwuncha, Ray, Sadiku, and Rajuluet. al. [1] studied with natural fiber with epoxy composite. The vaccum bag technique was used to fabrication of hybrid composite at room temperature. The surface modification was done by the process of alkali treatment. The hybrid composite suggested for various applications in building and construction industries as panels for partitioning, flooring, storage tanks and table taps, etc.
Barnasree, Kumar, and Bhowmiket. al. [2] particle reinforced in epoxy based composite for analysis of mechanical behavior. The particle used as reinforcement and LY 556 epoxy for resin. Tensile and flexural test were carried out using UTM and sample size based on ASTM Standard. Composite materials can be used for applicationsin automobile interior parts, electronic packages, ceiling roofs, building constructions, sports goods and furniture etc.
Dinesh and Jagdish et. al. [3] research focused on wear study of sisal fibre reinforced epoxy based composite materials. LY-556 and HY 951 used as resin and hardener respectively. 10%, 20%, and 30% sisal fibre used as reinforcement during fabrication of composite by vacuum bag moulding method. By increasing the percentage of the sisal fibre in fabrication work enhance the weight loss of the specimen of wear test.

III. FIBER SELECTION

Sisal fiber
Sisal fiber is one of the natural fibers most widely used and is very easily grown. Sisal fiber is completely biodegradable ; it is an energy resource that is highly renewable. Sisal fiber with minimal wear and tear is exceptionally durable and low maintenance.
Sisal Fiber is a hard fiber from the sisal plant's leaves (Agave sisalana). Each sisal plant produces approximately 200-250 leaves and each leaf contains 1000-1200 fiber bundles consisting of 4% fiber, 075% cuticle, 8%dry matter and 87.25% water. Thus a sisal leaf typically weighing about 600gm will yield about 24grams of the fiber with each leaf containing about 1000 fibres. Figure shows longitudinal micro structural features sisal fiber.

Fig: sisal fiber

E-glass

E-glass (electrical grade glass) at the beginning developed for standoff Insulators for electrical wiring.
It was later identified having excellent fibre forming capabilities and is now used almost completely as the reinforcing segment in the material frequently regarded as fibre glass.

Fig: Fabrication of E-Glass

Some key characteristics of E-glass fiber is as below:

1) The glass fiber is the material consisting of numerous extremely fine fiber of glass
2) The most common types of glass fiber used in fiber glass is E-glass
3) E -glass fiber which is almino - boro silicate glass
4) The E-glass fiber key properties are;

- Low cost
- High strength
- High stiffness
- Non- flammable
- Resistant to heat
- Good electrical resistant

IV. METHODOLOGY

Preparations

In the present study the composite laminate specimens are prepared using the vacuum bag molding technique and the specimen are subjected to the investigation is carried out as per the ASTM standards.
Selection of vacuum bag molding as fabrication process is as follows:

- ✓ This process can produce laminates with a uniform degree of consolidation
- ✓ Thus reducing the finished void content
- ✓ Efficient laminating can be obtained

The easiest manufacturing approach adopted concerned vacuum bag type fibers over a polished mold surface previously treated with a releasing agent: after this a liquid thermosetting resin is applied into the reinforcement with a brush. The process is repeated number of times equal to the number of layers required for the finished composite. Resin and curing agents are premixed and usually designed to cross-link and harden at room temperature. The principal advantage of this manufacturing technique is its high-quality flexibility, meaning that it fits most common mold sizes and complex shapes. It can be re-used for quite a few runs and the authentic cost of the raw materials make this technique economically feasible. As a result, uniform pressure close to one atmosphere is applied to the surfaces of the object inside the bag, retaining parts collectively while the adhesive cures. The entire bag may additionally be placed in a temperature controlled oven gently heated to speed up curing process.

Fig: Sisal with resin

Fig: E-glass with resin

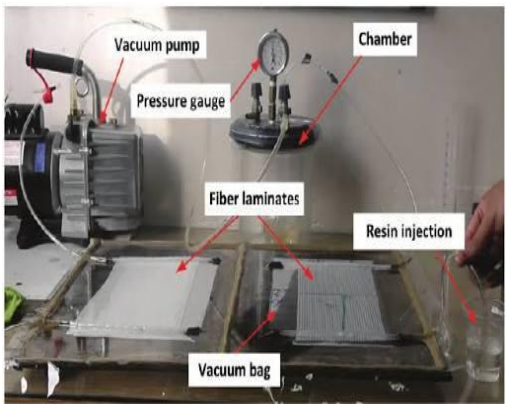

Fig: vacuum bag molding process

V. CONCLUSION

The important emphasis of the present work was on the development and testing of E-glass natural fibers and sisal to know their suitability and adaptability for quite number structural applications. The E-glass has a property of excellent electrical resistance in which it has the application in change boards and different electrical needs.
The developed composite possess high tensile and bending strength which are very much essential properties for aerospace doors, helmets, boat, furnishings and decorative items. The further researches on the sisal and E-glass fiber will assist in the determination of mechanical and dynamic properties which in turn helps to suit for greater purposes in more than a few fields.

REFERENCES

[1] **Karthik S N, Srinath K T, and Kemparaju C R** 2018, IJRTER | Volume 4, Issue 1 Synthesis and characterization of 20% hybrid fiber - epoxy resin composites.

[2] **Kemparaju C R, Karthik S N, and Santhosh A N** 2018, IJRTER | Volume 4, Issue 1 Development and evaluation of mechanical properties of 30% hybrid fiber - epoxy resin composites.

[3] **Jayaramudu, Agwuncha, Ray, Sadiku, and Rajulu** 2017, IJEDR | Volume 5, Studied with natural fiber with epoxy composite

[4] **Barnasree, Kumar, and Bhowmiket** 2017, IJEDR | Volume 5, Particle reinforced in epoxy based composite for analysis of mechanical behavior.

[5] **Dinesh and Jagadish** 2017, IJEDR | Volume 5, Research focused on wear study of sisal fibre reinforced epoxy based composite materials.

[6] **Srinath K T, Karthik S N, and Santhosh A N** 2015, IJERT| Volume 4, Issue 6 Fabrication and characterization of PVP: Aluminium nitride polymer nano composites.