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ANALYSIS OF THE BANANA FIBRE WITH EXPOXY RESIN

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Abstract

This study provides an overview of the applications of natural fibre in the automobile sector as well as the building industry, as well as a scientific comparison of natural fibre to other traditional building materials. The advantages of employing natural fibre materials rather than conventional building materials are explored, as well as the potential for growth in this industry in the future. A significant portion of the article is devoted to discussing the methodical development of natural fibre composites in India as well as the varied efforts made by a variety of organisations in the direction of technological advancement. The technological void that had existed in the overall development of natural fibre composites in their many forms and in their application around the world has also been filled.

Keywords :- Natural fiber, automotive, building materials, fiber composites

INTRODUCTION

It is possible to increase the performance efficiency of an aircraft by making the structure of the aircraft more stiff while also making it lighter [1]. Traditional materials such as metals and alloys were only capable of partially satisfying these requirements [2]. As a consequence of this, new materials that have properties that are superior to those of ordinary metals and alloys need to be developed [3]. Composite materials are a type of structural material that are created when two or more constituents are combined together at the macro level to create the material. [4] There are two distinct phases present in composite materials: the matrix, which is a continuous phase, and the reinforcement, which is a discontinuous phase [5].

METHODOLOGY

The banana fibre epoxy laminates were used to prepare the specimens in accordance with the standard set out by ASTM [6]. The items were being put through a series of mechanical tests using a Universal testing machine as well as an Impact testing machine [7]. These findings were evaluated both with and without the presence of aluminum alloy. The Banana Fiber with Epoxy Resin is Depicted in Figure 1.

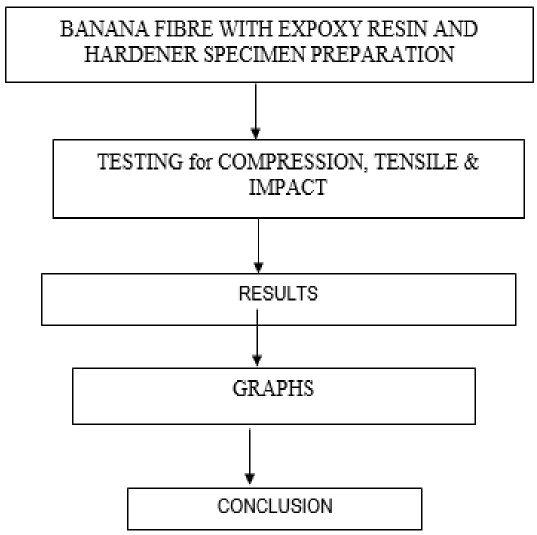

Figure 1 Banana Fibre With Expoxy Resin

Composites natural fibres in India Because of their low weight, high strength-to-weight ratio, and resistance to corrosion, natural fiber-based composites are becoming an increasingly important component in the fields of construction and civil engineering [8]. Synthetic fiber-based composites, despite their usefulness in service, are notoriously difficult to recycle once they have reached the end of their planned service life [9]. On the other hand, natural fiber-based composites offer significant advantages to the environment. The following paragraphs provide a brief overview of some of the more noteworthy natural fiber-based composites that have been developed as a result of many years of research and development work that went into their creation.

The current state of the natural fibre composites industry in the country

Natural fibre reinforcement is becoming increasingly common in composite matrices (such cement and polymer), which are gaining popularity as a component of low-cost building items. Natural fibres are easily accessible close to one's house because they are manufactured from resources that can be replenished. Today, India is responsible for the production of more than 400 million tonnes of natural fibres. The approximate production of a variety of natural fibres is outlined in Table 1. A composite material is a combination of two or more materials that maintains its individual properties even while it functions in conjunction with other materials. In most cases, these materials are made up of a reinforcing component, like a fibre, and a matrix component, such a resin. Composite materials are frequently utilised in the creation of prostheses and orthotics; some examples include nylon, fibreglass, and carbon fibres, as well as polyester, acrylic, and epoxy resins. The performance and strength of composite materials can be significantly impacted by a number of different elements. Both the mechanical properties of the resin and the fibre, as well as the adhesion at the interface between the fibre and the resin, have a significant impact on the performance of the composite. The processing processes utilised to produce the composite, as well as factors such as the fibre length, orientation, and ratio of fibre to resin, all have an impact on the qualities of the composite. In this particular endeavour, the ratio of banana fibre to epoxy is exactly one to one. Composite materials include the likes of nylon, fibreglass, carbon fibres, polyester, acrylic, and epoxy resins. Other examples are nylon, fibreglass, and carbon fibres. The initial part of my evaluation consisted of assessing the composites' tensile strength (ASTM D 638). In this experiment, epoxy and acrylic resins were combined with commonly used fibres such carbon fibre, nylon glass, and fibreglass, each of which had a different orientation. The fabrication of test samples involved the use of standard resin transfer moulding procedures, which are also utilised in orthotics and prosthetics.

COMPOSITE MATERIALS: AN OVERVIEW

High levels of strength and stiffness, in addition to a low overall weight, are fundamental prerequisites for improved performance efficiency in aircraft. Only to a limited extent were traditional materials like metals and alloys able to fulfil these needs using their properties alone. This resulted in the requirement for the development of new materials that could have qualities that were superior to those of ordinary metals and alloys. These new materials were eventually created. A structural material is considered to be a composite if it is composed of two or more constituents that have been mixed at a macroscopic level. A composite material is made up of two different types of parts: a continuous phase known as the matrix and a discontinuous phase known as the reinforcement. The matrix both provides the reinforcement with a shape and shields it from the outside world. In addition to this, it causes the individual fibres that make up the reinforcement to work together and provides the laminated composites with transverse shear strength as well as stiffness. The transverse modulus and strength of the matrix, the shear modulus and strength of the matrix, the compressive strength of the matrix, the inter-laminar shear strength of the matrix, the thermal expansion co-efficient, the thermal resistance, and the fatigue strength of the matrix all contribute to the mechanical performance of composites. The thermal expansion coefficient can be controlled by reinforcement, which also gives strength and stiffness. Additionally, it assists in the development of directional properties. Fibers, particles, or flakes can all be utilised as different types of reinforcements. The length, orientation, shape, and composition of the fibres all play a role in the composite's overall mechanical performance. The fiber-matrix interface is the component of composites that, in addition to the fibre and the matrix, plays a role in determining the material's overall mechanical performance. It provides an estimate of how efficiently load is transferred from the matrix to the fibres. The shape of the reinforcement, which can be particles, flakes, or fibres; and the type of matrix, which can be polymer, metal, ceramic, or carbon. These two criteria are used to classify composites. Polymer matrix composites are the type of advanced composites that are utilised most frequently. These composites are made up of a polymer like epoxy, polyester, or urethane, and they are reinforced with thin-diameter fibres like carbon, graphite, aramid, boron, glass, and so on. Because of their low cost, high strength, and straightforward manufacturing methods, they are most frequently utilised in the process of repairing aircraft structural components.

COMPOSITE LAMINATE PREPERATION

LAMINATE PREPARATION

- The laminate size is 300mm × 300mm x 3 mm

RESIN

- Resin is to transfer stress between the reinforcement fibers, act as a glue to hold the fiber together.
- Commonly used resin are:
    - Epoxy, polyester and vinyl ester
    - Epoxy LY556 is selected.

Moulding preparation

- Two rectangular mirror steel plate having dimensions of 500mm × 500mm x 8 mm.
- Chromium plated to give a smooth finished as well as to protect from rusting.
- Four beading are used to cover compress the fiber after the epoxy is applied.
- Bolt and nuts are used to lock the plate.

Types of hardener

- HY951 – at room temperature.
- HT927 – temperature ranging from 80˚C - 130˚C
- HT974 - temperature ranging from 70˚C - 80˚C
- HZ978 - temperature ranging from above 100˚C

Preparation of Epoxy and Hardener

- Epoxy LY556 and it mixed with Hardener HY951.
- Ratio of mixing epoxy and hardener is 10:1

Specimen preparation for fiber

- The mould should be well cleaned and dry.
- Release agent is applied.
- The epoxy mixture is uniformly applied.
- First woven mat is laid into the moulded.
- Apply the resin on mat by brush.
- Banana is laid with epoxy resin.
- Repeated the process up to 3mm
- Mould is closed.

4.2 LAMINATE PREPARATION

Read the data sheet supplied with the product to determine the ratio of your particular epoxy. Although usually given on a volume basis (e.g. 5:2 parts resin to hardener respectively), some systems also give a weight ratio, which is nearly always different. For instance, a system of 5:2 mix ratio by volume may be 3:1 by weight.

METHOD: HAND LAY-UP

The lay-up of pre-impregnated material by hand is the oldest and most popular way of production for advanced composite structures. This is despite the fact that the approach has been superseded by automated procedures in recent years. In addition, the fundamental aspects of the method have not been altered in any way. In order to end up with a composite laminate of good quality after the processing, each step has to be completed in the exact order that they were introduced. This section will provide a description of these steps. The first step involves cleaning the surface of the tool and then applying a release agent to it. In the event that the surface is not thoroughly cleaned, the releasing agent will not operate as intended. The releasing agent may take the shape of a liquid or it may take the form of a solid film. (Some of the pictures in the photo essay feature a hand-held pointer or knife so that the viewer may get an idea of the size of the subjects depicted.).In Step 2 involves the application of an optional sacrificial coating to the surface of the tool. This layer is typically composed of a fiber glass fabric that is fabricated using the identical resin method as the composite laminate. During the manufacturing process, the sacrificial layer prevents the laminate from being damaged by surface abrasion and surface imperfections. In Step 3 involves placing a peel ply on top of the layer that will be sacrificed. Once the processing is complete, the peel ply will be removed. In Step 4 involves cutting the pre-impregnated plies to the exact dimensions required by the pattern. They can be hacked by hand utilizing either shears or a knife with a steel blade. On the other hand, automated cutting machines have essentially supplanted the practice of manually cutting materials. A reciprocating knife system, the Gerber knife was initially created for use in the textile industry. It cuts exceedingly quickly and may simultaneously cut up to 20 plies of material. Cutting has been done using lasers in the past, but they are prohibitively expensive and have restrictions on the number of layers that can be cut simultaneously. A significant number of water-jet cutters are also put into widespread use. These cutters have the capability of simultaneously cutting more than forty plies of material, although the process of cutting causes some moisture to be absorbed. In addition to that, ultrasonic cutters have been employed. In Step 5 involves orienting the first prepreg ply and placing it upon the tool or mould. The subsequent plies are stacked one on top of the other, and then a roller or some other tiny hand tool is used to compact the plies and remove any entrapped air that may otherwise result in voids or layer separations in the final product. It is essential that the pre-impregnated material possesses a enough amount of tack so that it adheres marginally to the peel ply as well as the plies that are close to it. The tackiness of a pre-impregnated material is a measure of how sticky the plies are in comparison to one another when they are at room temperature. The tacky quality of the material that has been pre-impregnated will diminish as it ages. After some time, the plies will no longer adhere to one another, and in order to lay them down, it is possible that they will need to be heated somewhat. When the composite material is processed, oils and dirt that are on the surface of the pre-impregnated plies will lead to a reduction in the composite's strength. In order to prevent oils and dirt from the hands from contaminating the prepreg plies that are being laid down, technicians should wear gloves during the lay-up process. To lessen the likelihood of the prepreg plies being tainted by contamination during the hand lay-up method, it is often necessary to do the process in a clean room. The sixth step involves anchoring a flexible resin dam to the sacrificial layer roughly 3 millimeters from the border of the laminate. Within the laminate's plane, the dam obstructs the flow of resin that would otherwise exit the laminate. Silicon rubber, cork, and release-coated metal are some of the materials that can be used to make flexible dams. (Because there is not going to be a sacrificial layer utilized in this technique, the flexible dam is going to be secured to the peel ply.).The Step 7 consists of placing a second peel ply on top of the laminate for the purpose of protecting the laminate surface. The Step 8 consists of covering the dam and the laminate with a sheet made of a porous release film. The porous release film will act as a barrier to prevent the composite laminate from attaching to the secondary materials that are to come after it. The release film, known as the peel ply in this example, is covered with bleeder plies before moving on to step 9. To the very edge of the laminate, the bleeder plies have been applied. Either through the application of a resin flow process model or the application of empirical observation, one can determine the appropriate number of bleeder plies to be utilized for a specific laminate. The final fiber volume fraction of the composite laminate will rise in proportion to the number of bleeder plies that are used to make it. At some point, the number of bleeder plies will reach its maximum, at which point there will be no further rise in the fiber volume percentage.

The Step 10 consists of laying down yet another porous release ply on top of the bleeder plies that extend beyond the flexible dam. This keeps a vacuum passage into the composite laminate while preventing an excessive flow of resin into the breather material. The Step 11 involves placing breather plies over the entirety of the lay-up. The breather plies are going to be the ones to carry the vacuum path into the laminate. It is of the utmost importance to make sure that the laminate contains an adequate amount of breather material throughout its entirety. It is occasionally necessary to add extra layers of breather material to creases and areas with shallow curvature in order to be certain that the breather plies do not collapse in these locations. This is done for quality assurance purposes. In most cases, two or three breather plies are enough to do the job.The Step 12 In order to connect the edge bleeder to the vacuum ports, follow these steps. There is nothing more to an edge bleeder than a strip of breather material that has been folded along its length a number of times. It is positioned in such a way that it covers the breather material that is all around the laminate and extends out to a spot that is convenient for the positioning of the vacuum port. The Step 13 In certain instances, the caul plates are positioned on top of the lay-up. The caul plate is a plate made of steel or aluminum that functions as a heat sink and gives the surface a smooth, non-wavy appearance. Its primary function is to protect the surface from sudden temperature spikes. Caul plates are plates made of smooth metal that are free of surface defects, the same size and shape as a composite lay-up, and are used in contact with the lay-up during the curing process to transmit normal pressure and provide a smooth surface on the finished laminate. Caul plates are also of the same size and shape as a composite lay-up.The Step 14 If a caul plate is being used, additional breather or bleeder plies will need to be positioned over the plate in order to safeguard the vacuum bag from becoming punctured. In step 15, sealant tape is applied all the way around the lay-exterior up's perimeter. In Step 16 involves cutting the vacuum bag to the appropriate size and placing it on top of the lay-up. In Step 17 involves pushing the bag over the sealant tape in order to complete the sealing process. Before moving on to the next step in the processing cycle, it is of the utmost importance to check and make sure that the bag has been properly sealed. When the vacuum breaks down in the middle of the processing, it causes excessive voids, insufficient resin flow, and incomplete consolidation, all of which lead to the scrapping of many parts.IN Step 18 involves the installation of the suction port via the bag, after which the contents are removed. Now we will check the bag to see if it has any leaks. In the event that any are found, they are fixed before the procedure begins. In most cases, a leak test will need the application of a vacuum to a particular level (cm of Hg), followed by a hold time of between 30 and 60 minutes. During the hold, the bag is removed from its connection to the vacuum source, and the pressure level inside the bag is measured continuously. During the first thirty to sixty minutes, there should be no change in the vacuum level if the bag is properly packed and there are no leaks. Because it is normal for there to be some leaking, the question of whether or not the capacity of the vacuum pump is sufficient to maintain the desired vacuum level arises. Once the vacuum has reached an acceptable level, the composite item is prepared to be processed. The particular composite material being processed dictates the specific processing stages that must be taken, and the operation of the autoclave is determined by the particular make and model of the device being used. In the parts that follow, we will go through some general topics on the processing and autoclave aspects. It should come as no surprise that the manual lay-up of composite parts requires a large amount of labour performed by people with specialised skills. Each individual phase serves a distinct purpose throughout the process. This method of manufacture takes the most time, but it also offers the greatest degree of flexibility, and when combined with autoclave processing, it produces parts of an exceptionally high quality. Cutting the pre-impregnated material to size and positioning it on the tool surface can both be done by machine with the help of automated equipment. The economics of manufacturing demand that a reasonably high volume of components be produced in order to ensure that automated machinery is produced at a price that is competitive. In the next sections, we will go over a few of these automated approaches.

COMPOSITE OF BANANA FIBER PHOTOS

Alkali Treated With Temperature Figure 2 shows Composite Curing Period For 24hrs. Figure 3 shows Composite Sample Preparation And Prepared Test Samples

MIXING OF BANANA FIBER WITH SODIUM HYDROXIDE (N/10)

Figure 2 Composite Curing Period For 24hrs

Figure 3 Composite Sample Preparation And Prepared Test Samples

Tests of Tensile Strength

Tests of tensile strength are carried out for a variety of purposes. The outcomes of tensile testing are factored into the process of selecting materials for use in engineering applications. In order to guarantee the material's quality, tensile qualities are typically specified in the specifications. During the development of new materials and processes, tensile characteristics are frequently measured so that a variety of materials and processes can be compared to one another. Last but not least, tensile characteristics are frequently utilised in the process of predicting how a material will behave when subjected to forms of stress other than uniaxial tension. The strength of a material is frequently the major worry that people have with it. The strength that is of interest can be measured in terms of either the stress that is required to generate noticeable plastic deformation or the stress that is the material's absolute limit before it begins to deform significantly. These indices of toughness are utilised in the engineering design process, albeit with the proper amount of caution (in the form of safety factors). The ductility of the material, which can be thought of as a measurement of how much it can be deformed before it breaks, is another aspect of the material that is of interest. In most cases, ductility is not directly incorporated into the design; rather, it is included in the material requirements in order to guarantee both quality and resilience. A low ductility in a tensile test is frequently coupled by a low resistance to fracture when subjected to other types of loading. The elastic properties of a material may also be of importance; however, in order to accurately measure these properties during tensile testing, specialised procedures are required. Ultrasonic techniques, on the other hand, can produce more accurate measurements.

Testing Machines and Specimens of Tensile Strength Tensile Specimens.

Take the standard tensile specimen, for example. It has shoulders or terminals that are expanded for better grasping. The gauge section of the specimen is the most critical part of the specimen. The gauge section has a smaller cross-sectional area in comparison to the rest of the specimen. This is done to ensure that any deformation or failure will be confined to the area surrounding the gauge section. The length across which measurements are taken is referred to as the gauge length, and it is located smack dab in the middle of the reduced section. In order to prevent the larger ends of the gauge section from inhibiting deformation within the gauge section, the distances between the ends of the gauge section and the shoulders need to be sufficiently large. Additionally, the gauge length should be relatively long in comparison to the gage's diameter. If this does not occur, the condition of stress will be more complicated than basic tension. In Chapter 3 and subsequent chapters on the tensile testing of individual materials, detailed descriptions of conventional specimen shapes are provided. The end can either be pinned to the grip or screwed into a threaded grip. Butt ends can also be utilised, and the grip piece can be held between wedges. There are many ways to accomplish this. When choosing a way of grasping, the most important thing to consider is whether or not the specimen can be held at the maximum weight without slipping or breaking in the grip portion. This is the most crucial consideration. There should be as little bending as possible.

The Universal Testing Machine is comprised of Universal testers are the most frequent type of testing machine since they can test materials in tension, compression, or bending simultaneously. The major purpose of these equations is to generate the stress-strain curve that will be discussed in the subsequent portion of this chapter. Both electromechanical and hydraulic systems can be found in testing machines. The application of the load represents the primary point of differentiation between the two. An electric motor with a variable speed, a gear reduction system, and one, two, or four screws that move the crosshead up or down are the fundamental components of electromechanical machines. This motion applies a load, either tension or compression, on the specimen. Altering the rotational speed of the motor will result in different crosshead speeds. It is possible to create a closed-loop servo system that is based on a microprocessor in order to achieve precise control over the speed of the crosshead. The crosshead can be moved up or down by hydraulic testing devices like the one shown in Figure 3, which are based on either a single or dual-acting piston. On the other hand, the vast majority of static hydraulic testing equipment only have a single acting piston or ram. Controlling the rate of loading in a machine that is operated manually requires the operator to make adjustments to the aperture of a pressure-compensated needle valve.

For more accurate control in a closed-loop hydraulic servo system, the needle valve is replaced by an electrically controlled servo valve.

Curves of Stress and Strain

Mounting the specimen in a machine, such as those mentioned in the preceding section, and then applying tension to it are the two steps involved in conducting a tensile test. When measuring tensile strength, the gauge length is increased gradually while the tensile force is recorded.Figure 4(a) shows a typical curve for a ductile material. Such plots of tensile force versus tensile elongation would be of little value if they were not normalized with respect to specimen dimensions. Engineering stress, or nominal stress, *s*, is defined

as

$s \; F/A_0$

where *F* is the tensile force and

A_0 is the initial cross-sectional area of the gage section. Engineering strain, or nominal strain,

e, is defined as *strain* DL/L_0 (Eq 2)

Where L_0 is the initial gage length and

D*L* is the change in gage length (L - $L0$).

When force-elongation data are converted to engineering stress and strain, a stress-strain curve (Fig. 4b) that is identical in shape to the force-elongation curve can be plotted. The advantage of dealing with stress versus strain

Rather than load versus elongation is that the stress-strain curve is virtually independent of specimen dimensions.

TENSION–SHEAR

This is the later stage of penetration, where the striker deforms the laminate under membrane tension. Subsequently, the projectile penetrates through the composite and the deformed material undergoes tension–shear mode of damage.

STRUCTURAL VIBRATION

This is the end of the penetration process and the laminate is perforated. The striker goes through the composite plate under dynamic friction. The kinetic energy gained by the composite laminate is dissipated through structural vibration and material damping.

Compression Test

A compression test determines behavior of materials under crushing loads. The specimen is compressed and deformation at various loads is recorded. Compressive stress and strain are calculated and plotted as a stress-strain diagram which is used to determine elastic limit, proportional limit, yield point, yield strength and, for some materials, compressive strength

IMPACT TESTING

Impact testing is testing an object's ability to resist high-rate loading. An impact test is a test for determining the energy absorbed in fracturing a test piece at high velocity. Most of us think of it as one object striking another object at a relatively high speed.

Important of Impact Testing

Impact resistance is one of the most important properties for a part designer to consider, and without question, the most difficult to quantify. The impact resistance of a part is, in many applications, a critical measure of service life. More importantly these days, it involves the perplexing problem of product safety and liability. One must determine:

1. The impact energies the part can be expected to see in its lifetime,
2. The type of impact that will deliver that energy, and then
3. Select a material that will resist such assaults over the projected life span.
4. Molded-in stresses, polymer orientation, weak spots (e.g. weld lines or gate areas), and part geometry will affect impact performance. Impact properties also change when additives, e.g. coloring agents, are added to plastics.

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A sort of single-blow impact test that utilises a pendulum, and the specimen, which is typically notched, is supported at both ends as a basic beam before being shattered by a falling pendulum. Impact strength or notch toughness can be assessed by the amount of energy that is absorbed, which can be determined by the following rise of the pendulum. Either the Charpy or the Izod test can be used to evaluate a material's impact toughness (also known as impact strength). These tests were devised in the early 1900s before the idea of fracture mechanics was known. They are named for the individuals who initially developed them. In fracture mechanics calculations, impact properties are not directly used; nevertheless, cheap impact testing are still used as a quality control approach to determine notch sensitivity and for evaluating the relative toughness of different engineering materials. Both of these tests make use of a pendulum-testing equipment, but the specimens that are examined and the ways in which they are held in place differ between the two procedures. In both instances, the specimen is destroyed as a result of a single overload event brought on by the pendulum's strike. After the specimen has been fractured, a stop pointer is utilised to keep track of how far the pendulum swings back up after it has been released. The measurement of the amount of energy that is taken up in the fracture of the specimen is what determines the impact toughness of a metal. This can be easily determined by noting the height at which the pendulum is released and the height to which it swings after it has struck the item. The difference between these two heights is your answer. The potential energy of the pendulum is calculated by multiplying its height by its mass; the difference between the potential energy of the pendulum at the beginning of the experiment and its potential energy at the conclusion of the experiment is equal to the amount of energy that was absorbed. Because temperature has such a significant impact on toughness, a Charpy or Izod test is frequently carried out multiple times, with each specimen being subjected to the evaluation at a distinct temperature. A graph depicting the material's impact toughness as a function of temperature is produced as a result of this process. It is clear that the material becomes more brittle and has a lower impact toughness when it is exposed to low temperatures. When heated to high temperatures, a material becomes more ductile and exhibits increased impact toughness. The temperature at which the behaviour changes from brittle to ductile is known as the transition temperature, and this temperature is frequently one of the most essential factors to take into account when choosing a material. Photos of Samples Being Tested are Shown in Figure 4.

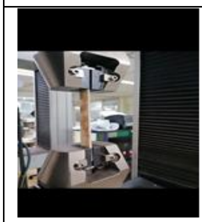
TENSILE TEST		**COMPRESSION TEST**	
			
IMPACT TEST		**MACROSTRUCTURE**	
			

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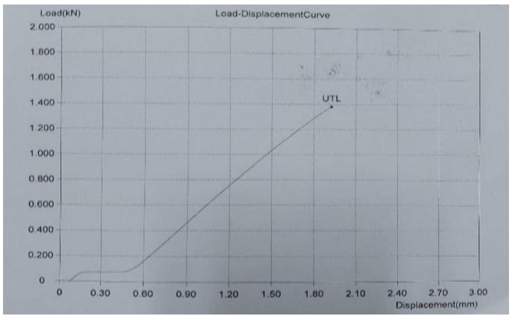
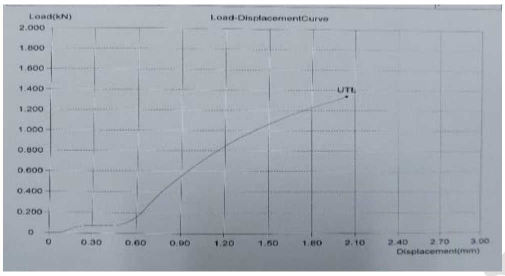
Figure 4 Sample Testing Photos

RESULT AND DISSCUSSION

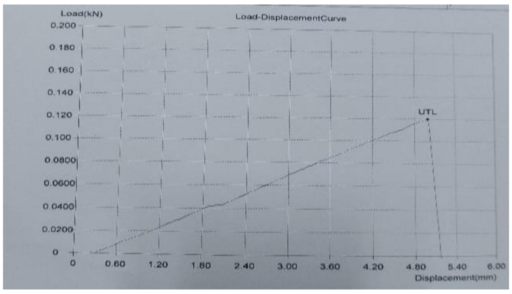
Graphs of various conditions is shown in Figure 5.



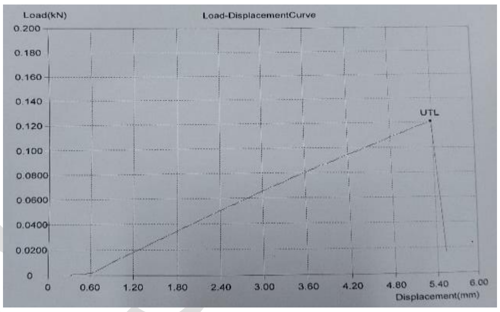
Load Vs Displacement Graph for Tensile Strength on Sample 1



Load Vs Displacement Graph for Tensile Strength on Sample 2



Load Vs Displacement Graph for Compression Strength on Sample 1



Load Vs Displacement Graph for Compression Strength on Sample 2

Figure 5 Load Vs Displacement Graph

Table 1 shows Banana Fibre Epoxy Composite and Table 2 shows Impact Test

Sl.no.	**Testing process**	**Sample I. D.**	**Gauge thickness (mm)**	**Width thickness (mm)**	**Original cross sectional area(mm^2)**	**UTL (KN)**	**UTS (Mpa)**
1	Tensile	1	3.70	26.32	97.38	1.38	14
		2	3.85	26.25	101.06	1.34	13
2	Compression	1	3.84	25.93	99.57	0.12	0.12
		2	3.70	24.97	92.39	1	1

Table 1 Banana Fibre Epoxy Composite

Parameters	Banana fiber with Epoxy Resin			
Dimension (mm)	3.3 × 8 × 80			
Energy (Joules)	S1	S2	S3	Average
	2	2	4	2.67

Table 2 Impact Test

CONCLUSION

The hand layout approach is used in the preparation of the epoxy-based composites that are reinforced with short banana fibre. The optimal strength of the composites was achieved by using a fibre matrix weight ratio of 40 percent. We investigated how the application of an alkali treatment to the surface of the banana fibre affected the tensile strength, the impact strength, and the fracture toughness of banana fibre epoxy composites. When compared to composites that had not had the surface treated, you will notice an improvement in the mechanical properties. According to the findings of this research, the banana fibre that had been treated with alkali was the most effective reinforcement for increasing the compressive, tensile, and impact strengths of natural fibre reinforced epoxy composites.

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