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EXPERIMENTAL INVESTIGATION ON THE PROPERTIES OF POLYMER MATRIX COMPOSITE USING VIRGIN PLASTIC POWDER MIXED WITH NATURAL FIBER

N.S.Mohan S [*1], .Karthikeyan [*2] A.Balakumaran[*3]
K.Vijay[*4],T.Sridhar[*5],S.Velmurugan[*6],G.Mohanaaravind[*7]

[*1.*2,*3] Asst. Professor, Mechanical Engineering, Erode Sengunthar Engineering College, Tamilnadu, India
[*4,*5,*6,*7] Student, Mechanical Department, Erode Sengunthar Engineering College, Tamilnadu, India

A B S T R A C T

Presently the use of plastics is expanding quicker in rate in auto area, common fiber composites are one of the best approaches to supplant the plastics. Improvement of composites with common strands and polymers as manageable elective material for some designing application. The progressions in the field of utilization draw in us to consider the conduct of regular fiber built up polymer composites. There are various examination work done in the field of composites materials. Be that as it may, the blend of two distinctive characteristic strands, epoxy resin to make polymer composite which will deliver the better strength contrasted with single regular fiber. Investigation of polymer lattice composite had become a significant theme for scholastic and modern examination.

The momentum push for materials which are ecological amicable, and biodegradable made scientists to move on to the substitute alternatives to engineered materials. One significant zone of exploration toward this path is in the region composite of polymer lattice with regular filaments. We are utilizing to virgin plastic container scrap and coconut coir blending it in with of epoxy resin and hardener. In our work virgin plastic powder is mixed with natural fiber in various orientations as per ASTM standards and the studies were made in-order to obtain the physical and mechanical behavior of the produced component.

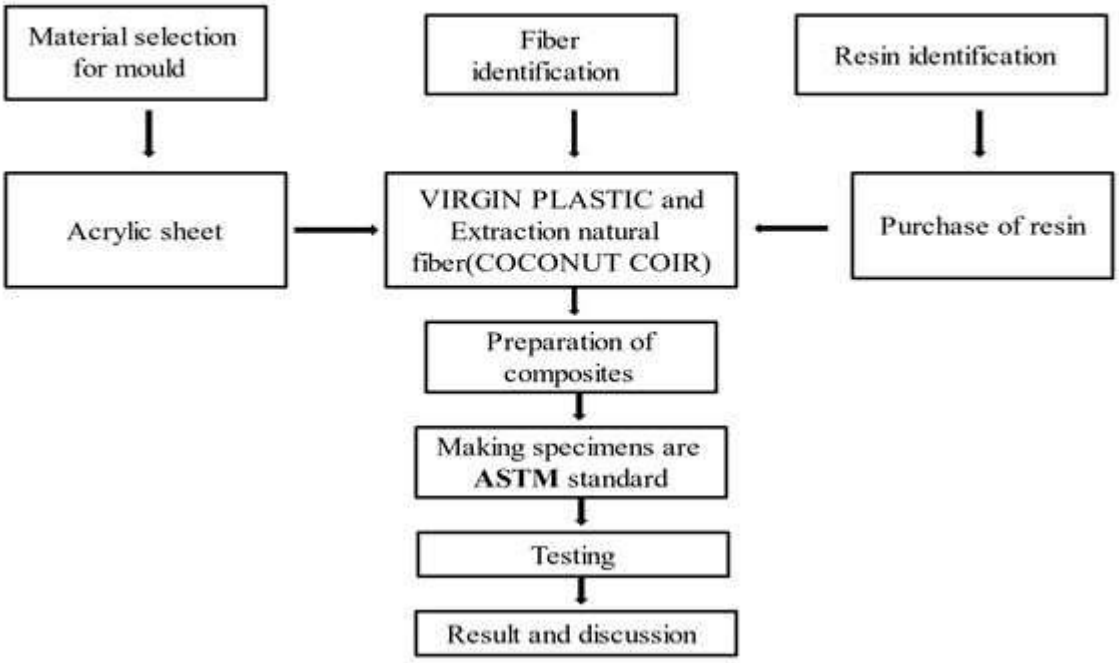
Keywords: Virgin plastic, Coconut coir, Epoxy resin, Hardener, mechanical test

1. Introduction

Characteristic fiber, any hairlike crude material straightforwardly realistic from creature, vegetable, or mineral source and convertible into nonwoven textures like felt or paper or, subsequent to turning into yarns, into woven fabric. Most material filaments are thin, adaptable, and moderately solid. By and by there are a wide range of cures are recognized to supplant the weighty materials despite the fact that they can't ready to supplant the composite materials. Composite material assumes an imperative part in our everyday piece of life. Composites are a technique for creating new sort of materials by joining at least two materials in various arrangements by various networks. Significantly there are three different types of composites are accessible, they are metal network, fired framework and fiber (polymer) lattice. They are created by various techniques, for example, Hand lay-up strategy, pressure forming, shower lay-up technique, etc. As of late explores are essentially moving in creating the bio-composites in the sense where they are effectively accessible source (accessibility) and to make exceptionally successful by diminishing destructiveness on account of essence of regular fixings. Examine the mechanical conduct for various syntheses regular fiber built up composite polymer composite.

2. Methodology

- We use single use VIRGIN PLASTIC for our work (Polyethylene Terephthalate). It is a type polymer matrix. These VIRGIN PLASTIC are crushed with shredder machine and converted to a powder form by pulverization method.
- Next we are used COCONUT COIR (natural fiber).The coconut coir are extracted and converted to chapped form.
- The powder stage of VIRGIN PLASTIC and coconut coir mixed with EPOXY RESIN and HARDNER.
- Mould preparation is carried out with the help of acrylic sheet.
- The samples are prepared with different fiber orientation.



3. Material Used

- Coconut coir
- Virgin plastic
- Epoxy resin
- Hardener

COCONUT COIR:

Coir comes from the cut of coconut fruit fiber has extra life compared to totally different natural fibers thanks to its high chemical Coir comes from the cut of coconut fruit fiber has extra life compared to totally different natural fibers thanks to its high chemical compound content. fibre (Fiber) reinforced with thermosetting and plastic. The mechanical property of the composite depends on surface adhesion of fiber to the matrix material. Fiber showed really high surface adhesion below dry conditions.

Fig 1 . coconut coir

Properties of coconut fiber:

Coconut fiber has some special standard properties are **;**

Table. properties of coconut coir

Plant fiber	Density (Kg/m^3)	Tensile strength (Mpa)	Young's modulus (Gpa)
Coconut coir	1150-1250	106-175	6-8

VIRGIN PLASTIC:

Virgin plastic is that the organic compound made directly from the organic compound feed stock like fossil fuel or rock oil, that has ne'er been used or method before. The raw materials for plastic exercise plans ar nothing however the used plastic from the customers, essentially that also are Virgin Mary plastic.

Properties of virgin plastic:

Virgin plastic has some special standard properties are;

Properties	Virgin plastic	Recycled plastic
Tensile strength (kg/cm^2)	140.5	220.0
Breaking stress (kg/cm^2)	82.2	42.2
Break elongation (%)	6.96	5.00
Young's modulus kg/cm^2)	5690	10500

EPOXY RESIN:

Starting materials for epoxy matrix are low-molecular-weight organic liquid resin containing a number of epoxide group, which are three-member rings of one oxygen atom and carbon atoms, Epoxy resin is Reliable in use has good mechanical properties. Epoxy resin contribute strength, durability and chemical .

Fig 2 . Epoxy resin

Properties of LY556:

Excellent chemical resistance especially to acids at temperature up to 80˚c.)

HARDENER:

The HY-951 (Tri-ethylane-Teyramie) hardener may well be a activity agent to be properly and fully mixed with synthetic resin to achieve a decent mechanical properties.

Fig. 3. Hardener

Properties of HY-951:

ARADUR HY 951 Viscosity at 25°C : 10-20 mPa*s / Specific Gravity at 25°C : 0.98 g/cm³/ Appearance : Clear liquid / Flash point : 110°C / Mix ratio : 100:10.

4. Mould Preparation

STEPS OF MOULD PREPARATION:

Step 1:
To mark the point require dimension (2cm) on the acrylic sheet with help of measuring scale and marking pen.

Step 2:
To make the line for mark the point with help of measuring scale and marking pen.

Step 3:
To cut the acrylic sheet for marking the line with help of acrylic sheet cutter.

Step 4:
To collect the Acrylic sheet cutting pieces.

Step 5:
Cutting pieces of the acrylic sheet are creating the rectangular shape with help of fevibond and flex kwik.

Stepb 6:
Bottom of the rectangular shape is attached to the OHP sheet with help of fevibond.

5. Materials Used

1)Acrylic sheet 2) Acrylic sheet cutter 3)Fevibond

4)Flex Kwik

4)Flex Kwik sheet

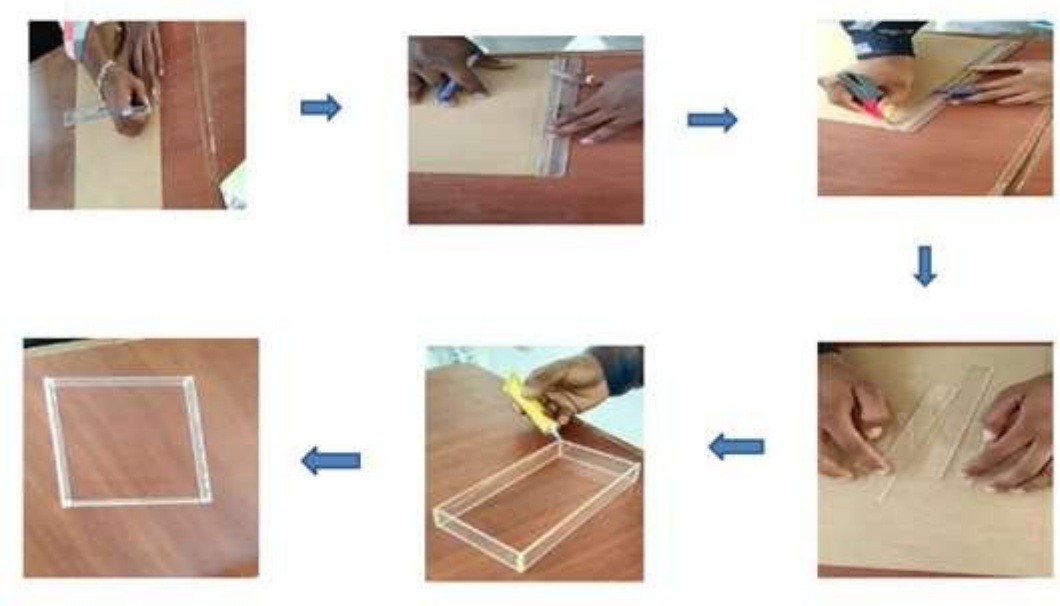


Fig 4. Process

6. Fabrication of Plate

VIRGIN PLASTIC ONLY:(sample-1)
300ml Epoxy resin + 100ml Hardener + 120g Virgin plastic powder.

Fig. 5 Virgin plastic plate

VIRGIN PLASTIC POWDER MIXED WITH NATURAL FIBER (RANDOM ORIAENTATION):

(sample-2)
Coconut coir (20gm) + Epoxy resin 300ml + Hardener 100ml

Fig.6 Random orientation plate

VIRGIN PLASTIC POWDER MIXED WITH NATURAL FIBER (PREFERED ORIENTATION):

(sample-3)

Coconut coir(20gm) + Epoxy resin 300ml +Hardner 1000ml

Fig. 7 Prefered orientation

7. Preparation The Specimen For Testing

Cutting the specimen as per ASTM size for different testing and image of the specimen for testing is shown below.

Cutting the Specimens in dimensions as per the ASTM Standards are

- *Tensile Test ASTMD638*

  Length = 180mm, Wide = 20mm, Thickness = 8mm

- *Flexural Strength Test ASTMD790*

  Length = 150mm, Wide = 13mm, Thickness = 8mm

- *Impact Test ASTMD6110*

  Length = 55mm, Wide = 10mm, Thickness = 8mm

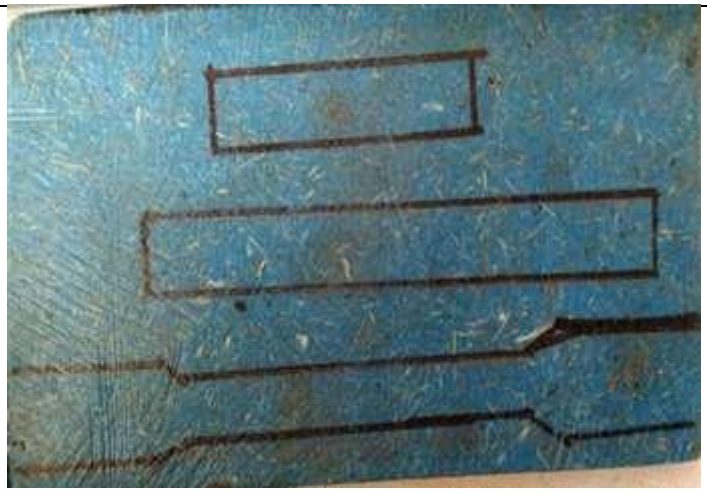


Fig 8 .Speciman marking for Tensile, Flexural and impact test.

8. Result and Analaysis

- Impact test
- Flexural test
- Tensile test

IMPACT TEST:

Impact take a look at determines the quantity of energy absorbed by a cloth throughout fracture. This absorbed energy may be a live of a given material's toughness and acts as a tool to check temperature-dependent brittle-ductile transition. it's to work out whether or not the fabric is brittle or ductile in nature.

Fig. Impact testing machine

Izod impact strength take a look at is associate ASTM normal technique of deciding the impact resistance of materials. A pivoting arm is raised to a selected height (constant potential energy) and then free. The arm swings down touch a notched sample, breaking the specimen. The energy absorbed by the sample is calculated from the peak the arm swings to once touch the sample. A notched sample is usually wont to confirm impact energy and notch sensitivity

SPECIMAN SAMPLES:

Before testing specimen **After testing specimen**

TABLE:

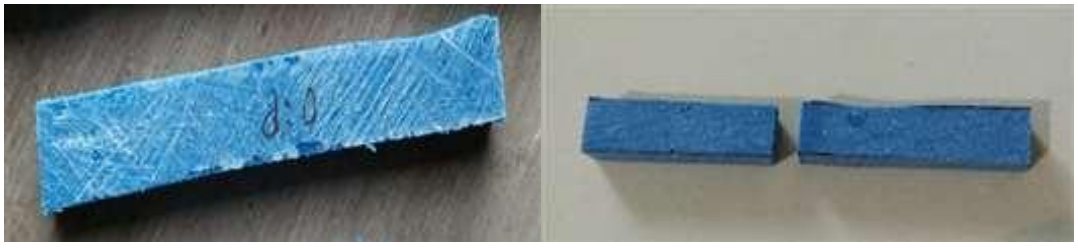
Tested values of Izod Impact Strength on three different composition specimens.

SAMPLE NO	THICKNESS	IZOD IMPACT VALUE
1	0.8	1.15
2	0.8	0.75
3	0.8	0.40

FLEXURAL TEST:

The flexure takea look at technique measures behavior of materials subjected to straightforward beam loading. it's conjointly known as a crosswise beam take a look at with some materials. most fiber stress and most strain area unit calculated for increments of load. Results area unit premeditated during a stress-strain diagram. Flexural strength is outlined because the most stress within the outer fiber.

SPECIMAN SAMPLS:



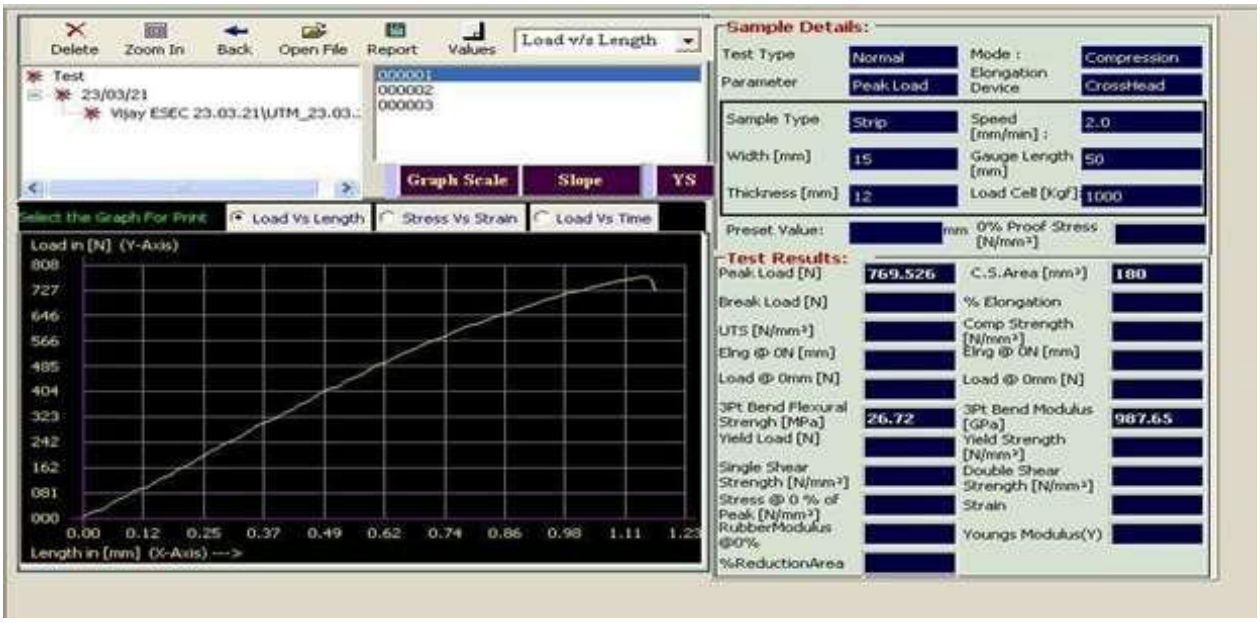
Before testing specimen **After testingspecimen**

TABLE:

Tested values of flexural strength on three different composition specimens

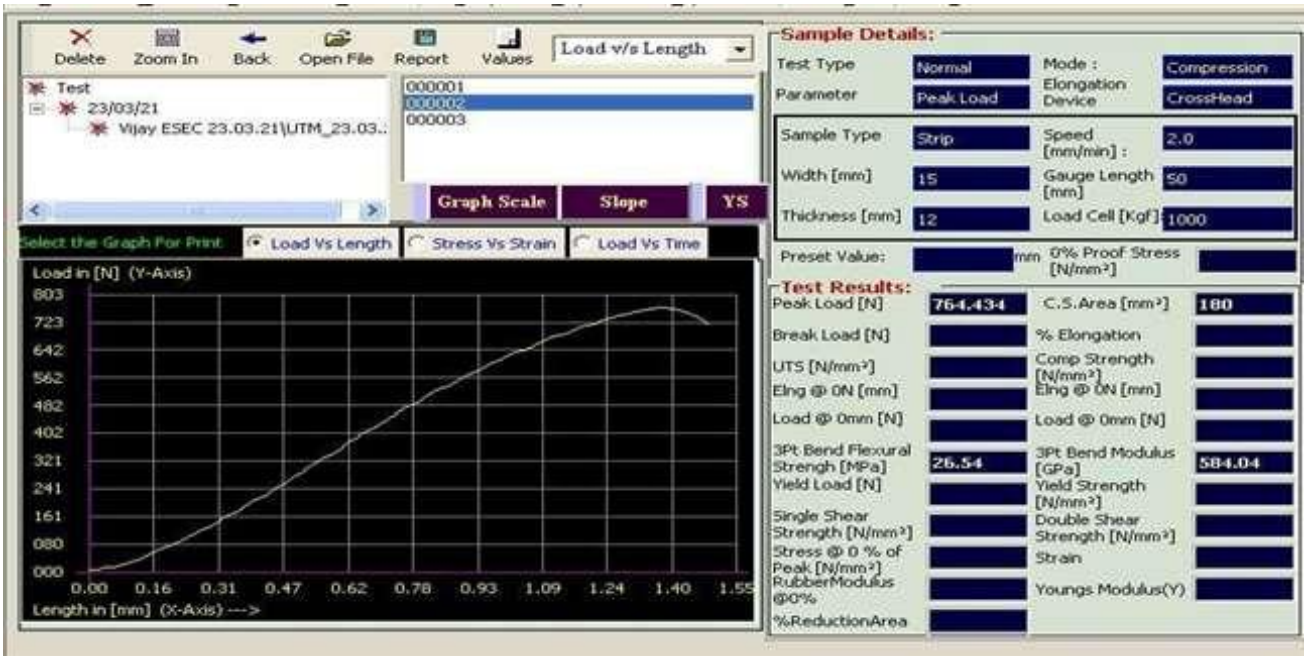
SAMPLE NO	CS AREA (mm^2)	PEAK LOAD(N)	FLEXURAL STRENGTH(MPa)	FLEXURAL MODULUS(GPa)
1	180.000	769.526	26.720	987.646
2	180.000	764.434	26.543	584.037
3	180.000	651.404	22.618	811.233

Sample-1 Flexural test graph:

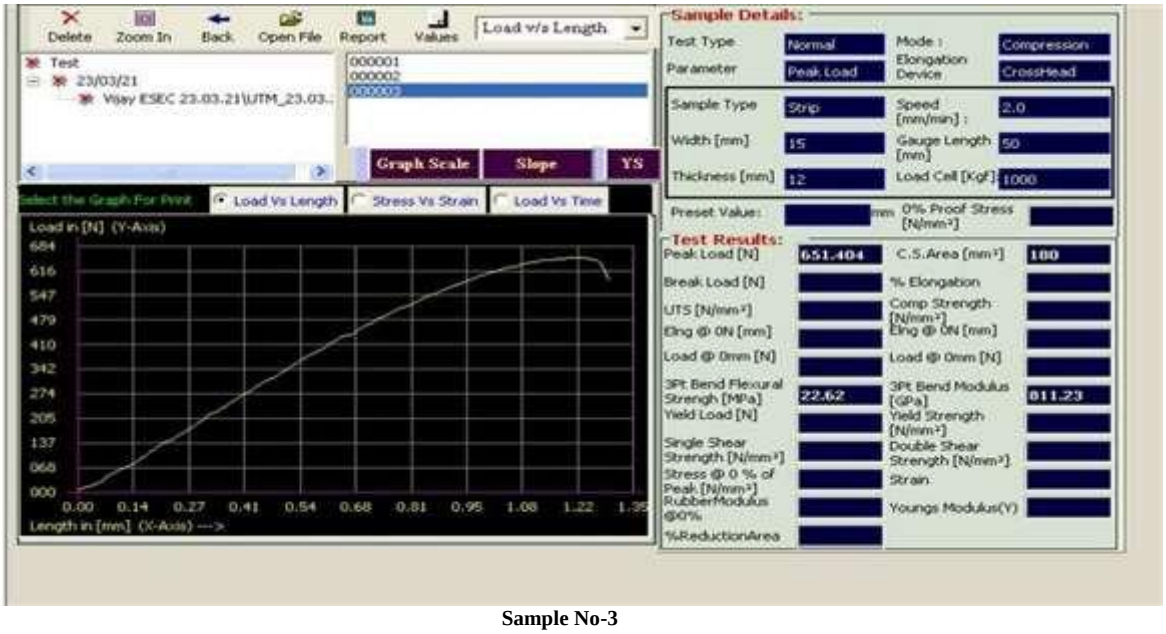


Sample No-1

Sample-2 Flexural testing graph:



Sample-3 Flexural testing graph:



Sample No-3

TENSILE TEST:

Tensile strength is that the ability of a fabric to face up to a propulsion (tensile) force. Tensile check is employed to work out the durability of the specimen,

% elongation of length and a pair of reduction of space. Tensile check is sometimes allotted in universal testing machine.

Fig. Universal Testing Machine (Tensile Testing Setup)

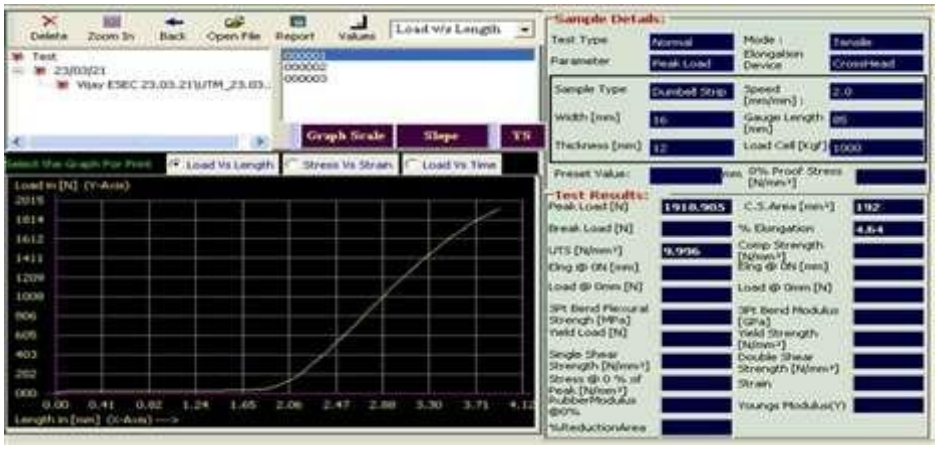
A universal testing machine is used to universal test tensile strength (UTS) of materials. The test carried as per ASTM Standard D3039 170mm long, 20mm wide, 5mm thickness same for all different compositions of natural fiber reinforced composites (NFRPC).

SPECIMAN SAMPLES:


Before testing specimanAfter testing speciman

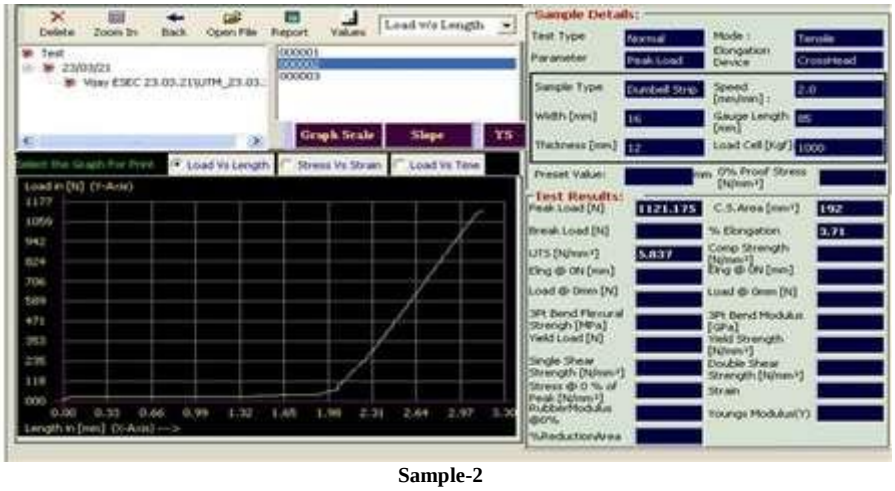
SAMPLE NO	CS AREA (mm^2)	PEAK LOAD(N)	% ELONGATION	UTS(N/MM^2)
1	192.000	1918.905	4.640	9.996
2	192.000	1121.175	3.710	5.837
3	192.000	1444.267	-3.660	7.524

Sample-1 Tensile test graph:



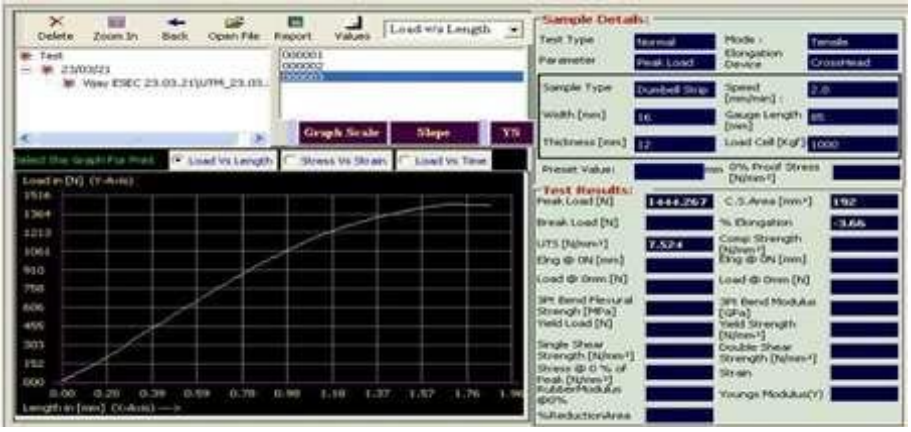
Sample-1

Sample-2 Tensile test graph:



Sample-2

Sample-3 Tensile test graph:



Sample-3

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