IOSR Journal of Engineering (IOSRJEN) **www.iosrjen.org**
ISSN (e): 2250-3021, ISSN (p): 2278-8719
Vol. 04, Issue 10 (October. 2014), ||V3|| PP 28-32

Characterization Of Mechanical Properties Katinting Boat Material Home Industry Products Barang Ca'di Island Makassar South Sulawesi

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Abstract: **-** The need for traditional fishing boats generally requires, in addition to a means of transport boat is also used as a means to catch fish. Currently fishing boats, especially boats made of Fiber Composites or Polyester Composite material which is made of fiber (fiber) as reinforcement and matrix using polyester, known to the public under the name of glass fiber due to difficulty in obtaining the wood for material for boats.Barang Ca'di island community using composite materials instead of wood for boat building are greatly appreciated even if they are generally Fishermen, boat is a boat that they make but the problems they face is not knowing the mechanical properties and resistance to the environment from which they products. This research aims to tes the mechanical properties and microstructure examination of material Katinting fiber glass boat. The results showed the following mechanical properties Specific of Density 0.00445 g/mm^3, Tensile Strength 23.97 N/mm^2, MOE 223.375 N/mm^2, Compressve Strength 23.78 N/mm^2, Flexural Strength 5.49 N/mm^2 , MOR 228.80 N/mm^2 and micro structure observations seen bonding fibers and resins are not perfect and visible presence of pores which will result in reducing the strength of the material.

Keywords: *composite boats, mechanical testing, mechanical specifications.*

I. INTRODUCTION

The need for traditional fishing boats generally requires, in addition to a means of transport boat is also used as a means to catch fish. In general, the fishing boat made of wood, but over time the boat craftsmen difficulty to obtain a suitable timber for boat building.

Currently fishing boats in particular are widely used Katinting boat made from Polyester Fiber Composites Composites or where the material is made of fiber (fiber) as reinforcement and matrix materials using polyester which is known to the public under the name of fiber glass.With the rapid development of technology today, requires the availability of material with good performance to replace wood.The material that must be met include lightweight, has high strength and low production costs.

Composite material is one that has a comparative strength (strength) and stiffness (stiffness) of the weight, the cost of making relatively.The composite can be fabricated directly into final shape with a bit of machining, so the scrap produced fewer than metal fabrication. steps taken Barang Ca'di Island people using composite materials instead of wood for boat building are greatly appreciated even if they are generally Fishermen, boat is a boat made Katinting.Barang Ca'di Island is one of a cluster of islands with a population of about Makassar approximately 500 people and generally work as a fisherman. Island Barang Ca'di can be taken about 1 hour by boat from the port of the island community Makassar.The conducted Barang Ca'di and new discoveries keep popping up with increasing demand for certain material properties, it is surely increase the vocabulary of the type, nature and the characteristics of the composite at this time.

Breakthroughs not only involves engineering existing material, but open in the natural phenomena which apparently gives something unforeseen, such as the presence of natural or composite biocomposite.Struktur natural materials, although composed of a substance which occurs at low temperatures there are times when provide the mechanical properties of the composite toughness.Based reinforcement is a composite fiber (fiber composites) in which reinforcement (reinforcement) shaped fiber (fiber) .Fiber as reinforcement elements determine the mechanical properties of the composite in which the amplifier as the successor to the load is distributed by the matrix , the strength of composites is influenced by many factors, including the form of fibers, fiber direction, the manufacturing process and the amount of fiber that is often expressed in fiber volume fraction. Composites were prepared by the Society for Barang Ca'di Island boat is fiber composite materials (fiber compisites) where reinforcement (reinforcement) shaped fiber (fiber) by the wet lamination method. The number of boats in Barang Ca'di Island of each group of artisans average 3-4 units every month but the difficulties faced by the artisans if the consumer asks the quality / specification of their homemade boat, so we need some research that aims to determine specifications mechanical or mechanical properties of the boat katinting:,, tensile strength and flexural strength compressive strength, physical properties, namely: density, elastic modulus, and strain the material that they are made to be used as a basis for improving a

product that will come with implementing composites manufacturing technology to produce qualified and will certainly increase the sale value of the boat so that the development community in the field of welfare will increase.

II. METHODOLOGY

The method used is an experimental method to make composites with wet lamination method of making material in accordance with the boat on the way home industry Barang Ca'di Island, then perform tests on the composite. Tests were conducted on composites include density testing, tensile testing according to ASTM D-638, cmprestion the test based on ASTM D-790, flexural testing based on ASTM-793 and microstructure observations using Scanning Electron Microscope (SEM) .This material composite material (fiber reinforce composite) is used as the matrix resin, fiber rovings and mat as reinforcement.

Test material is made directly by the island boat craftsmen Barang Ca"di with the following process: First prepare the fiber rovings and mat fibers and resin that has been mixed with a catalyst. Then unite with resin fiber sheet with the first sheet (1) above the mold and then smeared the mixture of resin and catalyst by using a brush and then place the second sheet (2) above then spread again the resin and catalyst, following the third sheet (3) is placed on top to form sheets with a three-layer laminate sheets, laminate sheet after it let stand at room temperature until the resin solidifies as a whole, then cut the material for the test sample in accordance with the standards for testing specific of dencity, drag, tap, flexible and microstructural observations

Figure 1. Composite Sheet Production Process

Figure 2 Sample Test

Implementation of mechanical properties testing done in the laboratory while the Makassar BLKI for micro structure observations carried out at the Laboratory of the Department of Metallurgy and Materials SEM Faculty of Engineering, University of Indonesia. Observations were made on SEM is the condition of the bond between the fibers with resin.

III. RESULTS AND DISCUSSION

3.1 Dencity Test

Based on test data specific dencity test results can be seen in Table 3.1.

Table 3.1 Specific of Dencity Testing Results

No	Dencity (gr/mm^3)
1	0,00441
2	0,00444
3	0,00424
4	0,00461
5	0,00451
6	0,00452
R	0,00445

3.2 Tensile Test

Based on the data obtained by tensile test results of tensile strength, strain and elastic modulus, the results can be seen in Table 3.2.

Table 3.2 Results of Testing Tensile

No	Tensile Strength (N/mm^2)	Elongation (%)	Elastic Modulus (N/mm^2)
1	23,96	0,021	221,7
2	24,14	0,023	230,2
3	23,73	0.024	234.4
4	24,19	0,021	23105
5	23,81	0,022	213,8
6	24,03	0,021	229,1
R	23,97	0.022	223,375

3.3 Compression Test

Based on data from the test results , the results can be seen in Table 3.3.

Table 3.3 Results of Testing Compression

No	Compression Strength(N/mm^2)
1	23,62
2	23,59
3	24,01
4	23,78
5	24,02
6	23,65
R	23,78

3.4 Flexural Test

Based on data from the test results arches, the test results can be seen in Table 3.4 ..

Table 3.4 Results of Testing

No	Flexural Strength (N/mm^2)	Elastic Modulus (N/mm^2)
1	5,46	228,96
2	5,32	227,12
3	5,52	228,27
4	6,02	231,14
5	5,27	229,16
6	5,39	228,18
R	5,49	228,80

3.6 Observations Microstruktur

3.6.1 SEM Observations

The results of SEM observation shows the bond between the reinforcement matrix (polyester), cracks, pores in the interfacial region. The observation can be seen in Figure 3.1; 3.2 3.3 and 3.4.

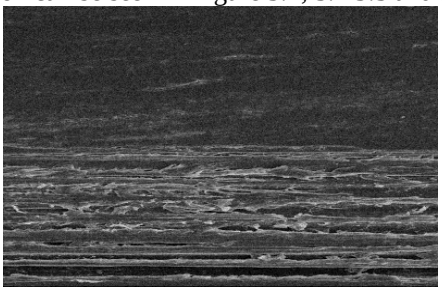

Figure 3.1 Form of bonding between the fiber and the resin without disabilities

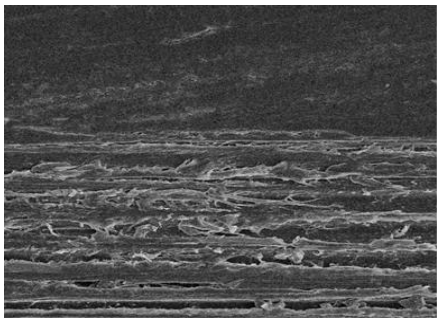

Figure 3.2 The form of the bond between resin and fibers are not perfect

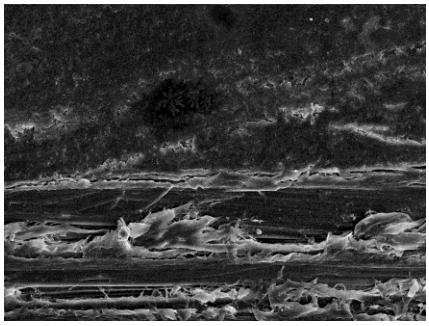

Figure 3.3 The shape of cracks and pores in the fiber and resin bond

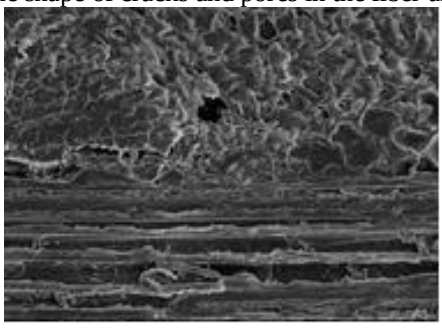

Figure 3.4 The form of the pores in resin

3.7 DISCUSSION

3.7.1 Characteristics

Based on the data and the results obtained can be shown in Table 3.5 can be stated that the mechanical properties of the material characteristics of the boat is the value of the tensile strength of 23.97 N/mm^2, it indicates that the composites are made by craftsmen are able to accept the imposition of tensile and compressive strength values of 23.78 N/mm^2 was also quite high so it is not wrong if the boat building katinting made from composite materials, which have very small strain and high elastic modulus material that is suitable for boats that require great strength with very small strains and stiffness high, but showed a bending strength value of 5.49 N/mm^2 is very small so if use composite boat should not accept the burden of a large curved or collisions that would result in the boat easily broken.

Table 3.5 Summary of Mechanical Properties

No	Dencity (gr/mm^3)	Tensile Strength(N/mm^2)	MOE (N/mm^2)	Compression Strength (N/mm^2)	Bending Strengt (N/mm^2)	MOR (N/mm2)
1	0,00441	23,96	221,7	23,62	5,46	228,96
2	0,00444	24,14	230,2	23,59	5,32	227,12
3	0,00424	23,73	234.4	24,01	5,52	228,27
4	0,00461	24,19	23105	23,78	6,02	231,14
5	0,00451	23,81	213,8	24,02	5,27	229,16
6	0,00452	24,03	229,1	23,65	5,39	228,18
R	0,00445	23,97	223,37	23,78	5,49	228,80

3.7.2 Micro-Structure

Preparation of test specimens using hand lay-up method also allows the occurrence of defects, because at the time of manually rolling a lot of air bubbles. The presence of defects due to air cavities cause incomplete wetting of the fiber, resulting in reduced mechanical strength. High void content which can lead to decreased strength and increasing variations in mechanical properties. This occurs as a result of the occurrence of stress concentration which can initiate the delamination at the fiber surface. Pores and cracks that occur can be seen in Figure 3.3 and 3.4.The pores and cracks can occur during the process of merger between the polymer-based materials in the liquid phase and the reinforcing material based organic material, allowing the bond to the radical.

The phenomenon of bonding mechanism between matrix and reinforcement material surface can occur due to the interaction between the valence radical or interlocking surfaces. At the microstructural observations as Figure 3.2 on the interfacial area between the matrix and reinforcing identify wetting (wettability) between matrix and reinforcement so that the presence of pores and cracks will lead to lower mechanical .

IV. CONCLUSIONS

Based on the results of research material Mechanical Properties Characterization boat Katinting then be deduced as follows:

1. Specific of Dencity 0.00445 gr/mm^3 , Tensile Strength 23.97 N/mm^3, MOE 223.375 N/mm^2, Comprestion Strength 23.78 N/mm^2, Flexural Strength 5.49 N mm^2, MOR 228.80 N / mm^2.
2. Strength Curves show value low enough so that it can be stated that this composite material can not receive shock loads or impact.
3. Observations visible microstructure fiber and resin bonding is not perfect and visible presence of pores resulting in a decrease in the mechanical strength of the material.

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