Effect of Addition of Pineapple Leaf Fiber and Palm Fiber on The Bending Strength of Polypropylene Composites as Materials Candidate Unmanned Aerial Vehicle

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Abstract. Currently, the use of polymer composites with natural fibers is widely developed because the price is relatively cheap and environmentally friendly. The aim of this study was to determine the bending strength of polypropylene composites with pineapple leaf and palm fiber as reinforcement. The method used is compression molding and heated in the oven at 250º C for 60 minutes. The variations used in this study were volume fractions of 15%, 20% and 25%. The results of specimen testing showed that the highest bending strength occurred at 15% volume fraction of 68.76 MPa and the lowest bending strength occurred at 25% volume fraction of 46.84 MPa. Based on the results of the SEM test, it can be seen that there are voids and fractures in the composite. Therefore it can be concluded that the increasing fiber of pineapple leaves and palm fiber, the bending strength decreases.

Keywords : Pineapple leaf fiber, Palm fiber, Polypropylene, bending test

1 INTRODUCTION

Aircraft design considers many factors such as safety, efficiency, reliability and comfort, but the importance of all these aspects depending on the type of aircraft being designed can vary from fighter aircraft, commercial aircraft to Unmanned Aerial Vehicles [1]

The manufacture of UAV aircraft requires materials that are lightweight but strong, one of the materials that has these conditions is composite.[2][3]

Composites from pineapple leaf fibers and palm fiber can be made in various sizes and thicknesses according to needs. The manufacturing process uses simple technology so that the resulting product is cheaper, environmentally friendly and has good mechanical properties. so that it can be used as a candidate material for the Unmanned Aerial Vehicle (UAV).

Pineapple leaf fiber (pineaplle-leaf fiber) is a type of fiber derived from plants (vegetable fiber) obtained from the leaves of the pineapple plant. The pineapple plant,

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which also has another name, namely Ananas Cosmosus, is generally a type of annual plant.[4]

Palm fiber has a scientific name, namely arenga pinnata. This black fiber produced from palm trees has many features including being durable, not easy to decompose, and resistant to acids and sea salt.

Pineapple leaf fiber, palm fiber and polypropylene are used as Unmanned Aerial Vehicle (UAV) materials due to their advantages of low price [5], materials that are easy to obtain in the surrounding environment and prioritize environmentally friendly aspects.[6][7].

2 RESEARCH METHOD

Materials for make composite

1. Leaf pineapple fiber
2. Palm fiber
3. Plastic polypropylene (PP)
4. Alkaline (NaOH 6%)

Process making composite

1. Plastic polypropylene cut size 10 mm , pineapple leaf fiber and palm fiber cut size 4mm , then piece fiber leaf pineapple, palm fiber aren and Plastic polypropylene is mixed in the mold evenly.
2. The mold is placed in the oven at 250ºC for 60 minutes, then pressed with a hydraulic tool so that the mold is solid , hold for 5 minutes then the specimen is removed from the mold.

2.1 Bending Test

Bending test is one from a number of common testing used for know characteristic mechanic from one material, simple bending test done with clamp second end bending test specimens on the frame bending test load [8].
Testing done theree point bending, formulated as following.

$$S = \frac{3PL}{2b\,d^2} \quad (1)$$

Where:
S : Bending (MPa) L : Long span (mm)
P : Load (N) b : Wide (mm)
d : Thick (mm)

2.2 Scanning Electron Microscope (SEM)

Principle SEM 's work is with describe surface object or materials with file reflected electrons with energy high. The exposed surface of the material or caught file electron will reflect return file electron or named file electron secondary to all direction

3 RESULT AND DISCUSSION

Testing the bending strength of the composite material reinforced with pineapple leaf fiber and the polypropylene palm fiber matrix aims to determine the value of the bending strength of the composite fiber variations of 15%, 20%, and 25%.

Table 1. RESULTS TEST *BENDING*

No.	Volume Fraction Variation	Average Bending Strength (MPa)
1.	15%	68,76
2.	20 %	57,63
3.	25 %	46,84

Viewed from results mark strength composite bending fiber leaf pineapple and palm fiber aren (table1.) this addition content fiber resulted decline bending strength because the more lots amount fiber pineapple leaves and palm fiber aren used, resulted the more a little matrix binder between fiber pineapple leaves and palm fiber. Result testing highest of 68.76 MPa on variation volume fraction of 15%, so composite can used as candidate for Unmanned Aerial Vehicle materials.
SEM testing was carried out for know structure of the composite.

SEM photo with 50X magnification (figure 1.), it is clear that there are voids and fractures due to uneven mixing between the matrix and the reinforcement and when printing there is still trapped air.

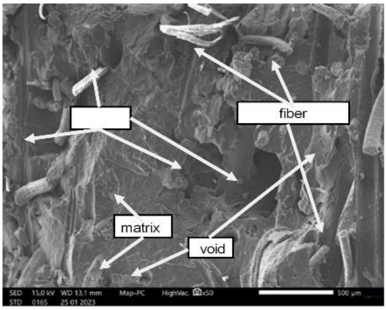

Fig. 1. SEM with enlargement 50X

4 CONCLUSION

The results of the bending test on the composite pineapple leaf and palm fiber fibers have mark strength highest that is on variation volume fraction 15% which produces an average strength of 68.76 MPa while the lowest at 25% volume fraction variation produces an average strength 46,84 MPa. This occurs because the more the amount of fiber resulted amount bond between fiber and matrix No sufficient .

The result scanning electron microscope (SEM), it can be seen that there are still many unresolved failures like voids and fault. Void this happen Because distribution fiber No equally so that a tough polypropylene matrix enter into the gap between fiber.

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