Use Of Fiber Midrib Tree Of Bananas As The Material Alternatives In The Making Brake Drum Motorcycles (Non-Asbestos)

A Prayoga[1]
[1] Department of Mechanical Engineering,Faculty of Engineering, University of Bandar Lampung, Bandar Lampung, Lampung, Lampung, 15 to 16 September 2017

Abstract. brake lining is an important component in a motor vehicle as security aspects memeperlambat drive that serves as the vehicle speed when the driver drove at speeds tinggi.Peneliti will conduct testing using the stem of banana tree fiber materials instead of making materials that use asbestos brake linings, mixed with other filler materials in accordance with the predetermined composition is grafhite, barite, brass, calcium carbonate, and epoxy resin. Manufacture of brake linings made by mixing all the ingredients that have been determined evenly which further pressed with a load of 1 ton for 30 minutes, then the ovenwith a temperature of C for 10 minutes. After the specimen so then tested friction with a load of 2 kg for 3 minutes, so that the obtained level keasusan canvass and a brake lining wear time. Once done then it can test the results of testing dilakukan.Bahwa brake with the stem of a banana tree fiber use feasible inuse because it has a wear rate of 2.05 x grams/detik. which is approximatelythe brake lining wear-owned manufacturer that is 1.64 x grams / .detik. Keywords. brake, brake drum, wear and tear, banana trees

1. Introduction

The brakes are suatau vehicle parts whose role is very important in engine system, for example in car engines, motorcycles and so on. Besides brakes also have the disadvantage of brakes often suffer from tension, it is caused by lack of routine maintenance and the brake off (wear). In general, motorcycle brake pads made of asbestos and other additional elements such as SiC, Mn or Co. based on the manufacturing process, break pad (kamapas brake) motorcycle including on *particulatecomposite.*Composites of this type, as materialamplifier*(reinforced)*consists of particles uniformly dispersed in a matrix that serves as a binder, resulting in a solid form and good. Through the process of heating at the same emphasis at the time of molding *(sintering)* will produce maximum adhesion, heating is performed at *temperatures* ranging from 80^0-150^0, So that these materials undergochanges in the structure where the particles one another with mutual melekan particles and will obtain a good solid shape and strong bonding matrix. (sulistijono, 2004)

1.1 Objectives

The objectives of this trial are:

1. Harnessing the use of stem of banana tree fiber as asbestos substitute materials in the manufacture of brake *(brake* pad)
2. Reduce waste production stem of a banana tree.
3. Create new innovations that are environmentally friendly.

1.2 Limitation Of Problem

1. The main material used is the stem of a banana tree, with

mixedsome other supporting materials such as: Grafite, barite, $CaCO_3$ Epoxy Resin.

2. Comparison kompisisi different on each brake that created
3. Pressing done with a load of 1 ton for 30 minutes.
4. Tests were done on the brake is a friction test.

1.3 Benefits Research

1. For Authors: As a condition of completing thestudy to obtain a Bachelor of Engineering Department of Engineering, Faculty of Mechanical Hasanuddin University And also, the authors hope to gain additional knowledge from this research.

2. For Academic:
   From this study, it can be used as a reference for further research by students, especially students of Faculty of Engineering, University of Hasanuddin regarding the utilization of waste for the amplifier on various materials.
3. For the benefit of this research for society is, people can get the product out of materials having good properties and reliable, with a moreprice affordableand reduce environmental pollution.
4. For Industry

As a reference in determining the alternative materials kanpas brake safely and economically as well as a reference in improving the quality of the brake lining material to be produced. And also the utilization of waste stem of a banana tree unused.

2. Literature Review

Based on the development of brake lining Ma, Y. et al (2008) investigated the brake on the ability of the zircon pengruh friction brake. The composition used is araimind, FKF fiber, wollastonite, graphite, barite, zircon, and NBR powder, while the binder (metric) used is a resin penolic. Based on observations and tests performed, the value of the friction brake lining coefisien is 0.62

2.1 Teorilandasan Theorybasis A.Of Composite

Simply composite material means a composite material or a mixture of two or more materials on a macroscopic scale to form a third material that is more useful. This contrasts with a blend of alloy (alloy combined microscopically) so that the preparation is not visible anymore. (Jones, 1975). In general composite man-made can be divided into three main groups:

a) Composite Matrix Polymer (Polymer Matrix Composites / PMC)
This material is a composite material that is often used is called, Polymer Berpenguatan Fiber (Fiber Reinforced Polymers or Plastics / FRP) of this material using a polymer-based resin as matriknya, and some types of fibers such as glass, carbon and aramid (Kevlar) as its gain.

b) Metal Matrix Composites (Metal Matrix Composites / MMC) Found growing in the automotive industry, these materials use a metal such as aluminum as the matrix and the reinforcing fibers such as silicon carbide.

c) Ceramic Matrix Composites (Ceramic Matrix Composites / CMC) Used in very high temperature environments, these materials use a ceramic as the matrix and reinforced with short fibers, or fibers (whiskers) which is made of silicon carbide or boron nitride. (Jones, 1975).

2.2 Fiber

The size of the power of the composite material depends on the strength of its constituent fiber. The main element of the composite material is a fiber, the fiber is what determines the characteristics of a material such as strength, ductility, stiffness and other mechanical properties. Fiber composite differentiated into several types, among others:

a. Moven fiber composite (compositeShort fiber reinforced continuous).

The composite is not easily affected by the separation between the layers because of the composition of the fiber also binds between the layers. However, the arrangement of longitudinal fibers which are not so straight result is not as good strength and stiffness of continuous fiber type.

b. Continuous fiber composite (fiber-reinforced composite continuous)

Continuous or unidirectional, fiber composition has a long and straight, forming a matrix between the lamina. This composite type most widely used. Disadvantages of this type is the lack of strength between the layers. This is because the strength between layers is influenced by the matrix.

c. Chopped fiber composite (compositerandom short fiber reinforced).

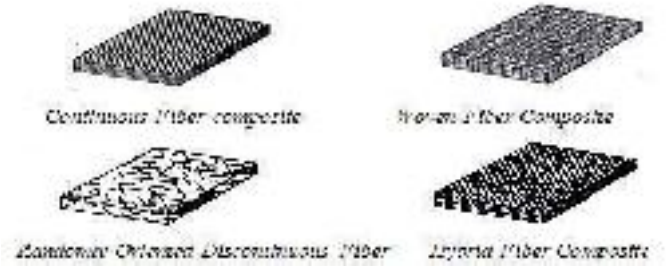
Discontinuous Fiber Composite is the type of composites with short fibers. This type is differentiated into three, as Figure 2.1 (Gibson, 1994):

1. Aligned discontinuous fiber

2. Off-axis aligned discontinuous fiber
3. Randomly oriented discontinuous fiber.

d. Hybrit composite (combinedcontinuous and random fibercomposites)

Hybrid Fiber Composite is a combination of the type of fiber composite straight with random fibers. This type is used in order to compensate for the lack properties of both types and can combine strengths.



2.3 Matrix

Matriximportant role as a binder fiber, the fiber load transfer and support. In fiber composites (fibrous composites) matik used was resin (plaastik the liquid berfasa).

2.4 Resinfrp

Epoxy Resinis a matrix material that is often used in the manufacture of composites, epoxy is manifold thermoset polymer, ie plastic that can not be recycled. Epoxy resin is comprised of two materials are epoxy resin itself and hardener or hardener (curing agent). Most resins epoxyare produced from a reaction between epichlorohydrin and Bisphenol-A. The first commercial trial to prepare resins from epichlorohydrin occurred in 1927 in the United States. Epoxy resins include thermosetting plastics group, which does not melt again when heated. Hardening occurs because the polymerization reaction, not freezing. Epoxy resins can be found in the form of one or two-component system, one component systems include solvent-free liquid resins, liquid resin paste, powder, pellet, and pasta. Two-component system consisting of a resin and a curing agent are mixed at the time will be used. Epoxy resin processing conditions depending on the agent curing used, such as epoxy resins and curing agents.

2.5 Banana Tree

Rod banana is one of the important components of the banana tree. Banana stem or often called gedebog actually not a trunk but pseudo-stem consists of a layered fronds towering rose from the bottom up so that it can sustain and banana leaves. Banana trunk containing more than 80% water and contains cellulose and high glucose society so often used as animal feed and as a growing medium for other crops (James, 1952). According to the Building Materials and Technology Promotion Council, the composition chemical fiber of banana. Barite is shown in the table below.

Table 1. the composition chemical fiber of banana

Komposisi Kimia	Kandungan (%)
Lignin	5-10
Selulosa	60-65
Hemiselulosa	6-8
Air	10-15

Sumber : Balai Material dan Teknologi Promosi Council)

3. Methods

3.1 Preparation of materials and tools

3.1.1 Preparation Materials

The materials used in this study are as follows:

a. Banana fiber is dried banana leaf is obtained from the gardens that surround the house, then the drying up daluhu to dry.
The fibers then puree in a blender until smooth.

Figure 1. Powder Banana

Figure 2 Barium

b. Barite
Barite di gunakan sebagai bahan pengisi pada kampas
c. graphite
Grafhite/ charcoal used as a filler and binder on canvas

Figure 3. Graphite

Figure4.CaCO3 (calcium carbonate)

d. Calcium carbonate (CaCO3)
Calcium carbonate is used as a filler and binder on canvas
e. Brass
brass powder is used as a filler material in order kamas have better traction.

Figure 5. Powder brassf. Epoxy Resin

Figure 6. Epoxy Resing. PlasticSteel Epoxy

Epoxy resin is used as an adhesive polymer materials which unites all the brake lining material. Plastic Stainlessadhesive is used as a specimen canvass on canvass shoes after just do it emphasis, canvas shoes are a major part on the brake as a tool to drum brake linings.

Figure 7. Plastic steelh. Canvas shoes

Figure 8. Shoe brake lining Drum

3.1.2 Setup Tool

In this study tools are used:

a. Blender

In use as a means of smoothing the stem of a banana tree

Figure 9. Blender

Figure 10 Digital Scalesc. Machine Press

b. Digital Scales

Digital scales are used as the weighing of the canvass after the test and before the test, as well as to measure the severity of a mix of materials used in the manufacture of brake linings. in use to exert pressure (pressing) canvas material after mixing.

Figure 11. Machine Pres

Figure 12. Ovene.

d. oven

Used as a sintering oven Adar brake that has been so has a more solid adhesion. This lining mold is a brake-forming media after all the material mixed secaramerata.

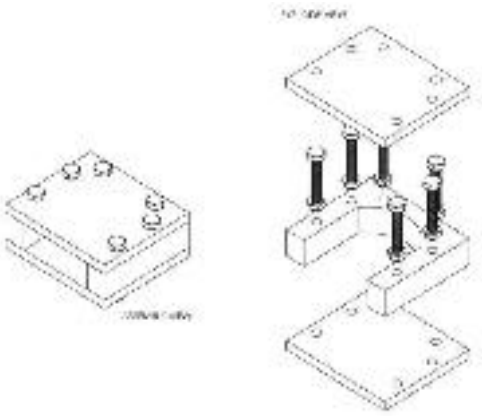


Figure 13. Sigmat

Figure 14. MoldDrum

Sigmat used as a tool to measure the thickness of the canvass sebelun and after testing.

3.2 Schematic Flow Diagram

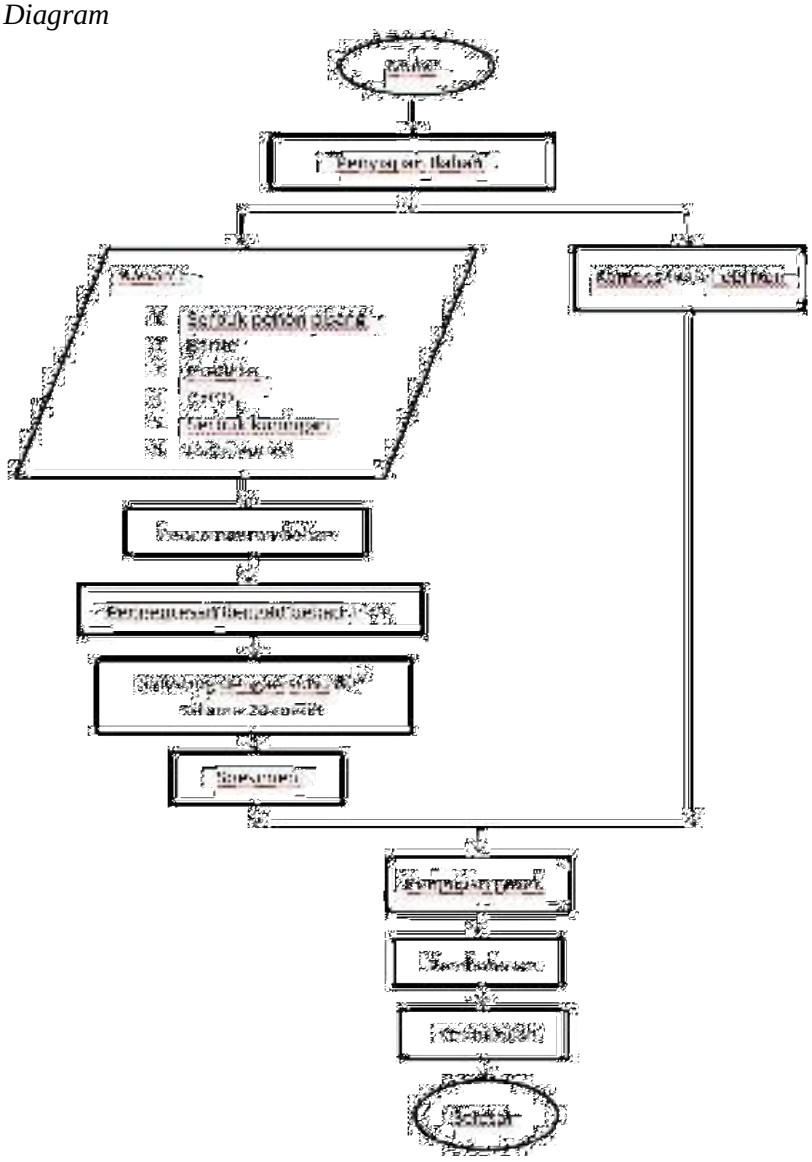


Figure 15. Flowchart

3.3 Process Specimens

Specimen in the manufacturing process, there are several steps taken and the method used, the following dilkukan process in the manufacture of brake linings specimens:

1) the process of mixing of
   powder materials and fibers that have been weighted by the percentage specified composition wherein the powder and fiber material comprising the stem of the banana tree pollen, grafhite, barite, $CaCO_{3)}$,Brass and resin. Then the mixture is placed in a glass container of used previously prepared mixture of epoxy resin and hardener according to the dose or scales. Once that is done mixing until the powder mixture evenly with resin and become a solid mix
2) formulations printing process specimens thatmixture have been preparedis then inserted into the dies on the specimen display devices. Once it is passed by the compacting process by jack hydraulic pressure of 1000 kg / cm2. After compacting pressure is achieved, given the holding time (holding time) in the compacting process within 30 minutes, which aims to canvass constituents of a mixture condenses and bonding that occurs between the material blends perfectly to obtain specimens canvass expected.
3) Sintering Process Specimen
   After the printing process is completed where the specimen still be inside directly inserted into the oven in a state room temperature, after the temperature inside the oven reaches a temperature of 80^0C to do anchoring for 30 minutes. After 30 minutes, the specimens were removed and allowed to cool, then glued on canvas shoes and do a test String.

4. Results

4.1 Test Result Swipe

Test Result Swipespecimen initialweight 81.93 g specimens do wear rate for 180 seconds, the braking load of 2 kg and a 3000 rpm motor rotation to the area affected by 270 mm, so that the specimen weight decreased be 81.77 mm, so that the rate keausannya (w).

Where:

W = The wear rate (grams / $^{second.}$Seconds)

$_0$ = Initial weight

$_1$ = Bearat end

A = Broad rubbed $^{(2)}$t = Time

Resolution:

Spesimen	Berat awal (Wo) gr	Berat akhir (W1) gr	Pengurangan berat (gram)	Luas permukaan (A) mm^2	Waktu (t) Detik	Laju keausan (W) gram/mm^2.detik
1	81,93	81,77	0,16	270	180	3,29 x 10^{-6}
2	85,67	85,46	0,11	270	180	2,26 x 10^{-6}
3	79,30	79,23	0,23	270	180	2,53 x 10^{-6}
4	101,22	101,03	0,06	270	180	1,23 x 10^{-6}

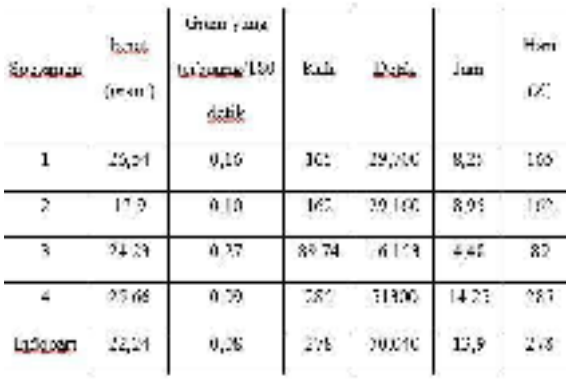
4.2 Age Calculation Resultslining

Calculation Results Specimen brake initial weight 26.54 grams after a given braking for 180 seconds weight decreased by 0.16 grams. Braking assumed in 1 day 3 minutes. So the life of the brake lining is!

Where:

z = lifespan of canvass (days)

$_0$= initial weight canvas
w = grams of wasted after rubbed (for 180 seconds)
Resolution:



testing done on specimens counted (3) three times for each specimen , So that the material has the highest hardness generally have a higher wear resistance (low wear rate). Therefore there is a correlation between the violence of the wear rate. From the results of testing some sample of specimens that have been made then tested in the above composition so obtained,: wear rate

1. specimens 1wear 3,29e-value of 6 grams / $^{2.}$Second,
2. the specimen 2 2,26e wear-value of 6 grams / $^{2.}$Second,
3. third specimen wear 5,55e-value of 6 grams / $^{2.}$Second,
4. the specimen 4wear-value 1,85e of 6 grams / $^{2.}$Second,

5. Conclusion

5.1 Conclusion

Conclusion that can be drawn from this test are as follows:

1. The use of fiber stem of a banana tree can be used as an alternative to asbestos materials in the manufacture of brake drum (brake pad). This is evidenced in the test results of friction with the brake lining wear0.11
2. lifespanMasanon asbestos brake pad using banana tree fiber midrib almost nearing the useful life of the brake lining brand manufacturers, so that brake non-13 asbestosis decent enough when used on vehicles ,
3. The composition of the mixture is very influential are no results manufacture of brake drum.

5.2.Suggession

After testing and research, the author has some suggestions that may dipakau for the process development and manufacture of brake linings, namely:

1. Further research should need a lot of rethinking the composition of a more varied and appropriate to generate a brake drum which is good.
2. The need for development of manufacturing technologies and further testing to produce the brake with better quality.
3. Pelunya performed additional testing on specimens such as Brinnel test tothe determine hardness level of the test specimen and heat resistance.
4. To get the maximum results in perlukannya canvass specific size just as the original.
5. For increase the value of wear rate and kepakeman, can add the number of fiber composition midrib banana trees and brass powder as a reinforcement brake bites.

From some of these suggestions may be taken into consideration in order to further studies sothatresearch suchis growing and rewarding.

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