Journal of Mechanical Engineering and Vocational Education (JoMEVE)

Jurnal Homepage: https://jurnal.uns.ac.id/jomeve

EXPERIMENTAL STUDY OF PERFORMANCE OF BRAKING NATURAL FIBER BRAKE CAMPING WITH FIBER FILM IN WET CONDITION AS A ALTERNATIVE MATERIAL OF MOTOR BRAKE CAMPAS

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KEYWORDS

Asbestos Substitute, Natural Fiber Fibers, Prony Brake, Coefficient of Friction, wet condition brake lining

ABSTRACT

Asbestos mining often impacts on environmental damage. In addition, the use of asbestos as a raw material for making brake pads also has a negative impact on human health, because this material contains carcinogenic substances, so it needs innovation as an alternative substitute that is environmentally friendly and can be used in dry or wet tracks. One of the alternative raw materials to replace asbestos using natural fiber. This study aims to determine the effect of brake fibers made from palm fiber on testing the coefficient of friction in wet conditions. This study uses an experimental method with object 4 composition of natural fiber brake canvas. Each material composition was replicated into 3 specimens (1A, 1B, 1C, 2A, 2B, 2C, 3A, 3B, 3C, 4A, 4B, 4C). Testing of brake pad using the Prony Brake with wetting by spraying on the brake pad. The results of this research are processed using quantitative descriptive methods. Based on the results of the study it can be concluded: (1) The results of the coefficient of friction of brake lining in the fibrous wet conditions are composition variation 1 is 0.411, composition 2 is 0.355, composition 3 is 0.354, composition 4 is 0.364 and OSK comparison brake pads is 0.355. (2) The high use of palm fiber influences the higher the coefficient of friction.

INTRODUCTION

More and more resource needs are used by humans everyday, resulting in the depletion of the stock of natural resource availability on earth. Efforts to anticipate the scarcity of these raw materials need to be carried out research in order to get alternative mining materials that are cheap and environmentally friendly.

Based on research conducted by WHO and IARC asbestos, it has a carcinogenic content, so that it can cause cancer in the lungs from dust produced by these materials. In contrast to non-asbestos materials do not produce toxic dust so it is environmentally friendly and when exposed to water the braking power is still optimal, in addition, non-asbestos materials can withstand temperatures above 300 ºC.

The purpose of this study is to determine the coefficient of friction brake pads made from fiber fibers in wet conditions through prony brake test equipment. The test is expected to be able to produce alternative brake materials commonly used by vehicles in general and can be used in dry or wet conditions.

RESEARCH METHODS

This research is a descriptive quantitative research with experimental methods. This research was conducted at the Automotive Laboratory of the Mechanical Engineering Education Study Program of the Teaching and Education Faculty of Sebelas Maret University. This research was conducted in order to obtain data related to the effect of the coefficient of friction between variations of non asbestos brake lining made from fibers, brass (CuZn), polyester

resin, magnesium oxide (MgO) with OSK brand brake linings in wet conditions during performance tests with prony test equipment brake.

Tools and materials used in this brake lining research include :

1) Research Tools

a) Mesin *Prony Brake*

Figure 1. Prony Brake Engine

This tool serves as a tool for testing the brake friction coefficient of the brake.

b) Digital Scales

Figure 2. Digital Scales 1

Figure 3. Digital Scales 2

This tool is used as a mass gauge with fiber fibers, magnesium oxide (MgO), polyester resin and brass powder using the scales in Figure 3.2 because it has an accuracy of up to 0.01 kg as well as a data collection tool for the coefficient of friction of the brake lining with the scales at Figure 3.3 because it has a maximum compressive strength of up to 16 kg.

c) Dies / Mold brake lining

Figure 4. Dies / mold brake

Used to print a composite mixture of natural fibers to form a sample of brake lining.

d) Hot Press Engine

Figure 5. Hot Press Engine

This tool serves as a compacting brake pad mold so that the sample of the material is getting denser and stronger and is useful as a heating specimen so that all materials can be easily integrated.

2) research material

a) fiber fibers

Figure 6. Fibers

The main ingredient of natural fibers from dried palm leaves is used as a filler and constituent in the manufacture of brake pads.

b) Magnesium Oksida (MgO)

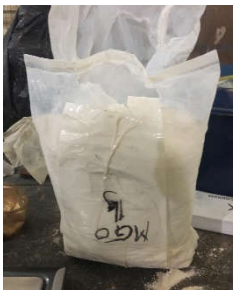

Figure 7. Magnesium Oksida

This material is used as a filler material mixture of brake lining and can increase the friction on the brake lining.

c) *Resin Polyester* BTQN 157 (*Unsaturated Polyester*)

Figure 8. Resin Polyester

This material is used as a matrix binder and filler in a mixture of natural fiber brake linings.

d) Brass Powder (Cu-Zn)

Figure 9. Brass Powder

One of the materials used as a filler for making composite brake pads.

e) Katalis

Figure 10. Catalis

Material used as a hardener so that the brake lining quickly hardens.

f) Epoxy glue

Figure 11. Epoxy Glue

This material is used as a brake lining adhesive that will be applied to the brake shoes.

Data analysis method used in this research is quantitative descriptive method.

Table 1. Composition Material of Fiber Fiber Brake Pads

Sampel	Serat ijuk	Resin *Polyester*	Magnesium Oksida (MgO)	Kuningan (Cu-Zn)
1	55%	10%	20%	15%
2	45%	10%	20%	25%
3	25%	10%	20%	45%
4	15%	10%	20%	55%

The results of the data obtained from testing are then processed into tables, and made in graphical form, then analyzed and compared the data. Samples of material to be taken in table 1. Composition Material of Fiber Brake Pads

RESULTS AND DISCUSSION

The results obtained from this research use quantitative descriptive method with two variables, the dependent variable is the coefficient of OSK brand brake friction coefficient and the independent variable is a mixture of the composition of the fibers natural fiber fibers brake material. Testing of brake lining using Prony Brake engine test equipment and the results of this study which are explained among others photo of brake canvas samples, macro photos of brake canvas samples, graphs and tables of the coefficient of friction coefficient of natural fiber fibers of palm fibers and OSK brand brake linings.

1. **Photo of Brake Pad Samples**

   The following is a sample photo of a brake pad made after CHAPTER III

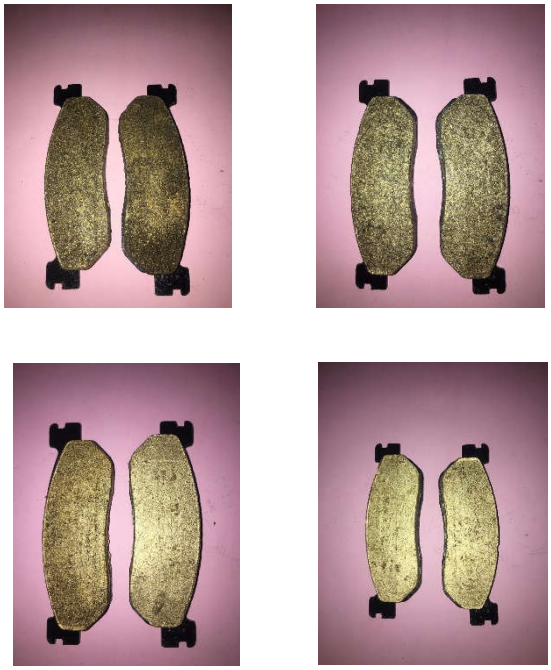

Figure 12. Fiber Brake Pads

Image Photo of Material I Specimen, Material II Specimen, Material III Specimen, Material IV Specimen and OSK Brake Pad Material Sample

2. **Macro Photos**

   Macro photos also function to obtain homogeneous properties in a variety of natural fibers brake fibers, magnesium oxide (MgO), polyester resin, brass. The tool used to obtain macro photos is the Iphone 6s cellphone with a 12 megapixel resolution camera and implemented at the Automotive Laboratory, Faculty of Teacher Training and Education, Sebelas Maret University.

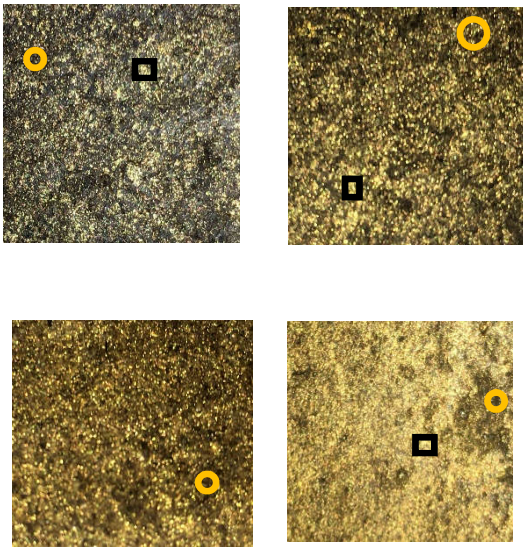

Figure 13. Image of Macro Fiber Fiber Brake Lining Macro Photo

Macro photo taking was also carried out on the OSK brand brake lining as a comparison of the fibers natural fiber brake lining against the structure of the brake pad compiler. However, after taking a photo has not been obtained clearly the composition of the OSK brand brake linings in Figure as follows:

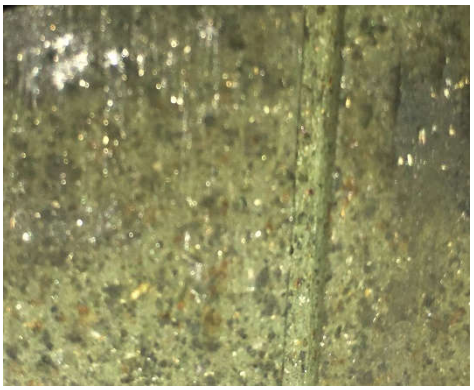

Figure 14. The composition of the OSK brand brake

3. Results of Brake Pad Friction Coefficient

The following is the coefficient of friction produced by brake linings in wet conditions in table below:
Table Final Results of the Coefficient of Fiber Brake Lining with Comparison of OSK Brand Brake Lining

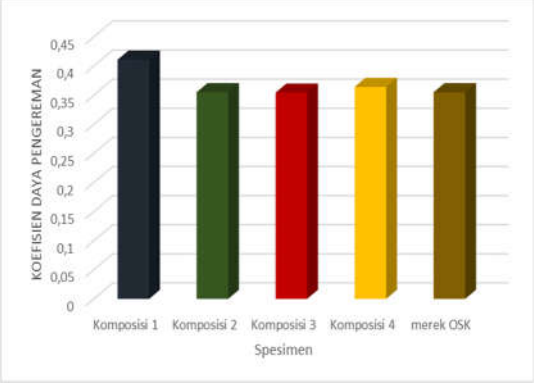

Figure 15. Final Results of the Coefficient of Fiber

The final result of the coefficient of friction then made a comparison histogram between the natural fibers brake lining with the OSK brand brake lining comparison. Figure 4.4 Histogram of the Final Result of Brake Pad Friction Coefficient Based on the results of testing the brake friction coefficient data in Table 4.2 obtained information that specimen 1 has the highest coefficient of friction compared with other material compositions of 0.411 while specimen 4 has a coefficient of friction of 0.364 so that the fiber fibers affect the results of the brake friction coefficient results. The more fiber fibers, the greater the coefficient of friction produced. This study does not take the results of the largest friction coefficient data but the coefficient of friction that approaches the OSK brand brake lining comparison. The results of OSK brand comparator brake testing were 0.355, then the results of the friction coefficient of palm fiber brake pads that approached the comparison were specimens 2 and 3 namely 0.355 and 0.354.

CONCLUSION

There is an influence of the composition of the manufacture of brake lining with variations in fiber fibers, magnesium oxide, polyester resin and brass on the testing of the coefficient of friction in wet conditions. Specimen 1 has a coefficient of friction of 0.411, specimen 2 has a coefficient of friction of 0.355, specimen 3 has a coefficient of friction of 0.354 and specimen 4 has a coefficient of friction of 0.364.

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