

# Structure Analysis at the Micro Iron Pour at Gray Brake

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## Structure Analysis at the Micro Iron Pour at Gray Brake

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**Abstract**— The use of gray cast iron brake drum as the material is the most appropriate choice, because it has properties which have good heat conductivity, hardness, toughness, good friction properties and the ability to absorb vibration. The purpose of this study to determine the ratio of the microstructure on both original material drum that is new and original drum ex-wear. With the aim of analysis is expected to be used as basis in planning the development of better vehicle brakes. Of all the test results it can be mentioned chemical composition of test results with the main alloying elements, to drum new original: C 4:13%, 2:51% Si, 0.15% S, 0.65% Mn, 0.0054% P, and the original drum ex-wear: C 4:13%, 2:17% Si, 0.15% S, 0.53% Mn, 0.0054% P. So the comparison of properties of the resulting structure after the testing process on each drum is the hardness and resistance to wear and tear on a new original drum better when compared with the original drum ex-wear.

**Keywords**— Material brake; gray iron castings; structures.

### I. INTRODUCTION

In drum brakes operational experience shock loads and excessive friction, so the drum should really have the strength and good friction properties. Micro structure of cast iron will be formed depending on the cooling rate and thermal behavior that occurs in the material. Because of this structural change is in itself the properties owned mechanical changes as well.

In order to facilitate research and get the results of targeted testing is necessary to limit the problem, so the goal can be achieved by testing the maximum. Limits taken here are (1) Drum to be studied there are two kinds of new and original drum drum original ex-disposable products for the motor Yamaha Vega with YIMM code 37J-00. (2) Testing the microstructure using an optical microscope.

The purpose of this study to determine the comparative characteristics of the mechanical properties and the microstructure of the material both original drum drum that is new and original drum ex-wear. With the aim of analysis is expected to be used as basis in planning the development of better vehicle brakes.

#### A. Iron Pour (Cast Iron)

Cast iron is an eutectic alloy of iron and carbon. Thus, relatively low melting temperature ( $1200^{\circ}\text{C}$ ). This is advantageous because the liquid, fuel consumption more efficient and simpler furnace. Molten metal is poured

because it can easily fill complex molds with ease. Therefore, cast iron is a cheap material and versatile in terms of product design.

#### B. Micro Structures

This testing method requires a fairly thorough preparation and meticulous, in order to obtain good results metallografi. Therefore, it takes some steps in preparation are:

1. Cutting Objects Test
2. Mounting
3. Grinding
4. Polishing
5. Etching
6. Micro Structure Testing
7. Brakes Tromol

Drum brake (drum brake) is a component of a motor vehicle which serves to resist compressive force and friction caused by the friction brake with brake contact area as a result of braking by the driver to stop or slow down the vehicle.

### II. TESTING METHODS AND RESULTS

#### A. Diagram Testing Process Flow

Flowchart of the testing process can be seen in Figure 13. which illustrates the steps to be taken in the final task of the research process from preparation to the test object with data

retrieval, data analysis and conclusions of the research has been done.

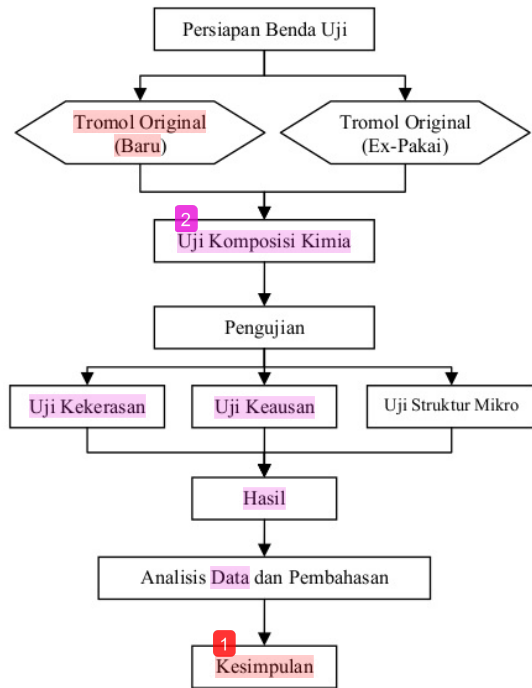


Figure 1. Diagram Testing Process Flow

### B. Test objects

The material used for the testing process consists of two kinds, namely the original drum (new) and original drum (ex-wear). With the form of a cylindrical plate having dimensions: inner diameter = 110 mm, outer diameter = 113 mm, height = 35 mm and a thick plate = 1.5 mm as shown in figure 2 below.

### C. Installation And Testing Results of Micro Structures

In this test aims to determine the microstructure of a metal, which includes the shape and direction of the grain structure. Tools that support testing in the micro structure consisting of several kinds of tools including:

1. Grinding machine
2. Polishing machine
3. Optical microscope

The preparation of the specimen is performed as follows: Cutting. Cutting is done using a hacksaw. Cutting is done carefully to avoid overheating.

## III. DISCUSSION TESTING MICRO STRUCTURE

Testing of micro structure on a new and original drum drum original ex-wear done on two sides, namely on the side of the drum and the side friction.

Micro structure of the drum is a new original cast iron gray. On the side of the drum will look lamellar graphite AB type, where type is the result of eutectic structures that decompose perfect and generally only found in middle areas

of cast iron, cold. The area was known as mottled areas and consists of a mixture of gray cast iron and white cast iron. On the side of the friction drum will look perlitik structure, where perlitik structure consists of pearlite and graphite. Perlite is a special mixture consisting of two phases and is formed when austenite with eutectoid composition transformed into a fine ferrite crystals and fine cementite crystals, in which the pearlite structure consisting of ferrite and cementite pelat-pelat/lamel arranged side by side. While the graphite serves to absorb vibration energy.

Test results on the micro structure of the original drum ex-wear is not much different from the original drum the new. On the side of the drum will look lamellar graphite type A. This type is the result of eutectic structures that decompose perfect. Individual size of graphite flakes is determined by the size of the austenite crystals formed around. On the side of the friction drum will look perlitik structure, but there has been corrosion attack. Corrosion enter through the side of the graphite material with a depth of 0.137 mm-0, 160 mm. Photo metallografi results can be seen in the picture below.



(a)

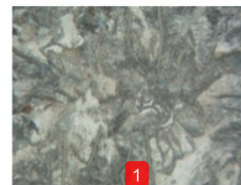


(b)

Figure 2. Photographs metallografi side drum by etching in Nital 2% magnification of 500x. (a) Tromol new original (b) Tromol ex-wear



(a)



(b)

Figure 3. Photographs metallografi side friction drum with 2% Nital etching 500x magnification. (a) Tromol new original (b) original Tromol ex-wear

#### IV. CONCLUSIONS

From the results of the study, the test specimen and the discussion of the data then can be drawn a conclusion, namely:

1. The results of the chemical composition of the main alloying elements in the new original drum: 4:13% C, 0.13% Ni, 0.14% Cu, and the original drum ex-wear: 4:13% C, 0.18% Ni, 0.12% Cr. Ni and Cu elements in the new original drum can improve corrosion resistance and produce a strong iron. While the original drum ex-wear elements Ni and Cr in addition resistant to corrosion, is also able to increase the stability pearlit and will increase the strength of the matrix.

2. Results of testing hardness gray cast iron with Brinell method on a new original drum has an average hardness value of 208.33 kg/mm<sup>2</sup>, unlike the original drum ex-wear that has a higher hardness value of 214.33 kg/mm<sup>2</sup>. This is due to the influence of pearlite matrix and different types of graphite flakes.

3. Results of wear testing on a new original drum mm<sup>2</sup>/kg 0078, while the original drum ex-wear bigger the mm<sup>2</sup>/kg 0080. No comparison is significant in both the drum. Due to the influence of alloying elements of good chemical composition and carbon content is high, causing the material becomes more resistant to wear drum.

4. The results in both material metallografi drum have the same structure that is perlitik. However, there are differences in the types of graphite lamellae. In a new original drum lamellar graphite type AB, while the original drum-mix ex lamellar graphite type A. In addition there has been a corrosive attack on ex-wear original drum that goes through the graphite to a depth of 0.137 mm-0, 160 mm.

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