COMPARISON OF WEAR PROPERTIES OF ALUMINUM MATRIX COMPOSITES AND BRAKE DISC MATERIAL

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Introduction

Wear is removal of material from a solid surface by the sliding action of another solid. Wear occurs by five principal processes: Adhesive, Abrasive wear, corrosion, surface fatigue and erosion [1-3].

Brake disc provides friction force with minmum weight loss on application of brake [4-6]. Aluminum matrix composite (AMCs) material is expected to have sufficient friction force and coefficient of friction to support the braking system. The weight loss of material can be determined using a multi specimen tester where AMCs test samples are rotated under various loading condition to record the weight loss. Coefficient of friction can also be determined under using rotating speeds and loads.

In this study, wear properties of alumina particles reinforced aluminum matrix composites (AMCs) are study and compared brake disc material in practice. The aim of the study was to identify a new material for replacement of brake disc material in practice.

Experimental

Material

Aluminum Matrix Composites (AMCs) reinforced with 30%volume of alumina particles and cast iron is used in this study for wear properties. The wear properties of AMCs are compared with cast iron for weight loss and coefficient of friction.

Apparatus and Procedures

Multi Specimen Tester (TR-701-M6)

Multi-specimen equipment is used in this study for obtaining data under various parameters. Scanning electron microscope (SEM) is used to characterize the surface at each loading and speed for both materials and type of wear is identified.

Results and Discussion

Effect of Speed on Weight Loss

Figure 1-a, shows that the increase in speed caused increase in weight loss for both materials at a constant load 25N.

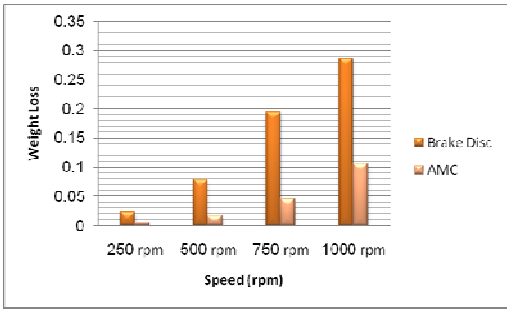

Figure 1-a: Comparison of weight loss between brake disc and AMCs, at 25N

Scanning electron micrographs of test samples after testing at various speed are given as Figures 1-b,c, d,&e.

Effect of Speed on Coefficient of Friction

Figure 2-a, shows that an increase in speed reduce the coefficient of friction (COF) at a constant load 25N for both materials; brake disc and AMC. Surface wear was of adhesive and abrasive at 500 rpm and at

750rpm, all three adhesive, abrasive and fatigue wear was observed on the surface of brake disc material (5-6).

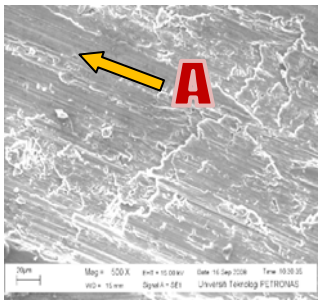

Figure 1-b: AMC before test

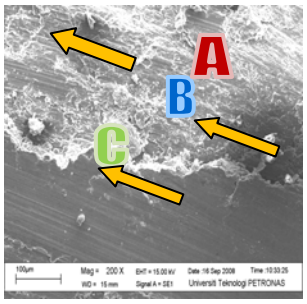

Figure 1-c: AMC at 250rpm &25N

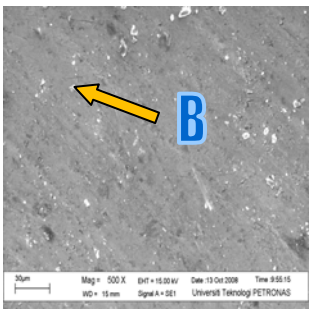

Figure 1-d:Brake disc before test

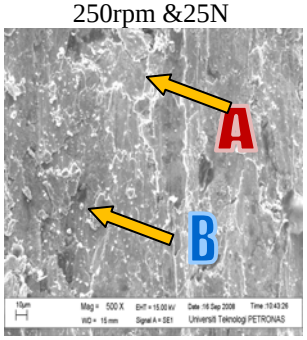

Figure 1-e: Brake Disc at 250rpm &25N

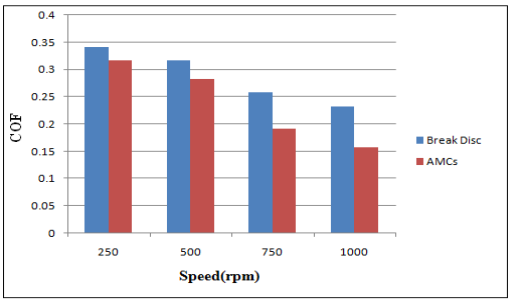

Figure 2-a: Comparison of COF Vs speed Between AMCs and brake disc

Figures 3-a show, weight loss recorded at different loads. As increase in load increased the weight loss for both brake disc material and AMCs at 250 rpm (2-3).

Effect of Load on Coefficient of Friction

The coefficient of friction (COF) decreased as the load increase for both materials at rotating speed of 250rpm (3-4).

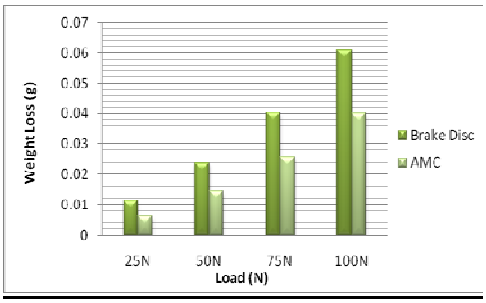

Figure-3 Comparison of weight loss Vs load

Conclusion

Data of wear properties and coefficient of friction showed, approximately 52%. Percentage weight loss of aluminum matrix composites (AMCs).The percentage of weight loss was decreased to 34% at higher load of 75N to 100N. The coefficient of friction was almost the same for both materials at lower load. At 100N, the percentage differences between both materials increased up to 25%.

References

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