Investigation of Load Influence on Abrasive Wear Behavior of Aluminium Alloy

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ABSTRACT

Aluminum alloys have evoked a keen interest in recent times for potential applications in marines, aerospace and automotive industries owing to their superior strength to weight ratio, good wear and corrosion resistance. Wear is a cyclic continuous degradation process. Almost 70% failure is due to wear. Experimental investigation have been done to see the effect of normal load on aluminum alloy and to calculate weight loss due to wear. Experiment were done carried using a pin-on-disk test under normal load 0f 10 N TO 25 N, 1800 rpm. It was observed that weight loss increases on increasing load. Also minimum wear occur when specimen is held vertical and maximum wear occur when specimen is held horizontal.

KEYWORDS: Al 6061, Pin on disc, Abrasive wear, Mass loss.

INTRODUCTION

Industrial equipment's and machine parts fail mainly due to wear. Recent studies show that normal load, geometry, relative surface motion, sliding speed, surface roughness, heat treatment, working temperature, time of load, and type of material, atmospheric conditions influence the rate of wear. But normal load, speed of sliding and orientation plays the vital role in the wear of metals. Increase in hardness improves the wear resistance in case of abrasive and lubricated sliding wear. Studies show that addition of Al_2O_3, TiB_2 increases the wear resistance. The objective of the present study is to investigate the wear behavior of Al 6061.

EXPERIMENTAL SETUP

Specimen selection and preparation

The specimen was prepared by using cast aluminium alloy (Al6061) having composition as : Al(95.85-98.56%), Si(0.4-0.8%), Fe(max. 0.7%), Cu(0.15-0.4%), Mn (max. 0.4%), Mg(0.8-1.2%), Cr(0.04-0.35%), Zn(max. 0.25%), Ti (max. 0.15%). A small sample of dimension (1.5cmX1.5cmX6cm) was taken and polished on top and bottom with emery paper to make the surface smoother.

Wear test machine

The wear characteristics of Al alloy is tested using pin on disk apparatus. The specimen is held strongly beside the rotating steel counter disk with the help of an applied load.

Wear test-pin on disc machine

Specification of load applied

This experiment was done for different normal load such as 5N, 10N, 15N, 20N, 25N.

EXPERIMENTAL PROCEDURE

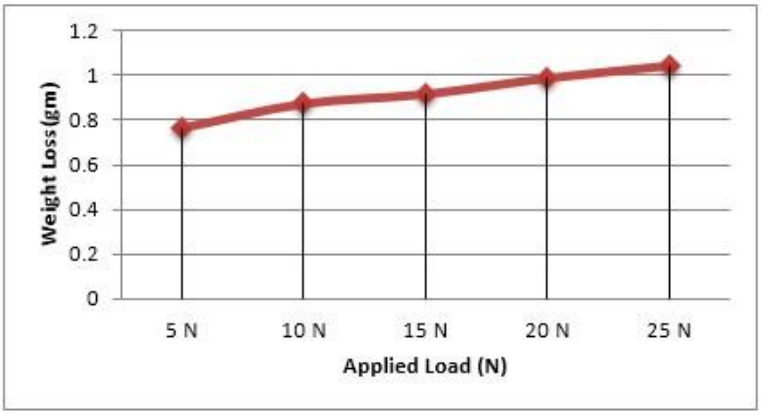
The wear characteristics of Al alloy is tested using pin on disk apparatus. First of all, weight of the specimen was taken accurately. The specimen was kept in horizontal position on the wear test machine for 360 secs with an applied load of 5N. The sample was taken out, cleaned with acetone, dried and weighed to find the weight loss due to wear. The amount of wear is determined by measuring appropriate linear dimension of both specimens

before and after test, or by weighing both specimens before and after test. The wear was calculated using weight loss method. This experiment continued for five different loads (10N, 15N, 20N and 25N) in the same position (horizontal). The procedures were repeated for vertical position also.

RESULTS & DISCUSSION

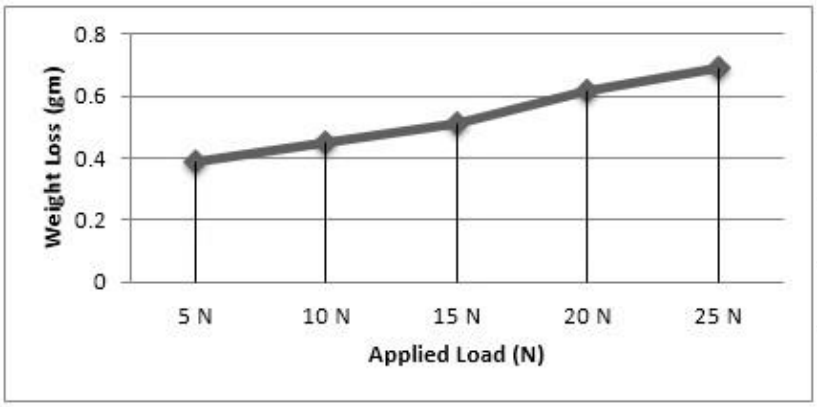
The following table shows the variation of wear rate with applied load for Al6061 when kept in two different positions (horizontal and vertical).

Weight loss in HORIZONTAL POSITION



Load (N)	Weight loss(gm)
5	0.763
10	0.872
15	0.915
20	0.987
25	1.043

Weight loss in VERTICAL POSITION



Load (N)	Weight loss(gm)
5	0.387
10	0.450
15	0.512
20	0.615
25	0.693

It can be observed from the above figure that as the applied load increases, the wear rate (weight loss) also increases. Also as the position changes from horizontal to vertical, the wear mass decreases due to change in orientation of forces.

CONCLUSIONS

Following conclusions have been drawn on the basis of this experiment.
a.) weight loss increases with increasing load.
b.) Wear is higher when specimen is kept horizontally for the same load.
c.) Wear is lower when specimen is kept vertically for the same load.

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