

Abrasive Wear Behavior of Silicon Polyethylene vinyl Acetate Copolymer

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Abstract. Abrasive wear behavior of silicon copolymer (Ethylene-Vinyl Acetate) was investigated using pin on disc wear testing machine. The abrasive wear test silicon copolymer was conducted by taking two variables viz. angular speed and normal load. The normal load varies from 5N to 15N with different angular speed (100, 150 and 200 rpm). The experimental data was obtained from 5N to 15N only, by using pin on disc wear testing machine. After the completion of experimental work, the results showed that the wear increases as the angular speed (RPM) and applied load. The most important conclusion of Silicon EVA is that wear in first minute is more as compared to the last minute while increasing the angular speed. Initially the wear of Silicon EVA with respect to angular speed increases linearly till 150 rpm but as the rpm increases beyond 150 to 200 rpm, the linear relationship tends to curve (Parabolic).

Keywords: Abrasive wear, silicon copolymer (Ethylene-Vinyl Acetate)

1. INTRODUCTION

Ethylene-Vinyl Acetate often described as being "five times stronger than steel on an equal weight basis". In particular, up to date aramid have been extensively used in personal protection, tires, equipment, shoes, building construction and marine application by virtue of their very strong tensile strength. This low performance moderate cost most common material used for variety of applications. EVA copolymer provides sufficient strength between 30° c to 50° c but are limited used between 60°c to 80 ° c and have low creep resistance under load.

This paper is mainly focused on several factors, which directly affects the working condition of silicon copolymer (Ethylene-Vinyl Acetate). The main objective of this paper to use pin-on-disc setup, which can check wear rate or loss of mass of the selected specimen at different normal loading condition (5N-15N) and angular speed (100, 150 & 150 rpm)

2. EXPERIMENTAL MATERIAL AND PROCEDURE

Silicon copolymer (Ethylene-Vinyl Acetate) was obtained in the form casted cylindrical ingots; the dimensions of the specimens are 1cm diameter with a length of 6.5 cm. To wear the surface of the specimen stone abrasive disc was used. The test procedure started by making 9 sets of Silicon EVA carrying 5 different specimens in each set. Before each test, the weight of the specimen was taken carefully using an Electronic balance with an accuracy of **0.001g**. After a travel time of **02 minutes** against the grinding disc, the sample was taken out carefully from the fixture. The debris's were removed from the valleys of the specimen with the help of cotton cloth so that the exact wear of materials can be measured. Once again the weight of the grinded test specimen was taken carefully using the above electronic balance and the difference in weight noted. This was continued for different times at different specimens. For every specimen there's a change in rpm but at different load and wear test was conducted using same procedure as discussed above. The effect of weight loss was taken for calculating the wear mass and wear rate.

3. RESULTS AND DISCUSSION

The results on weight loss have been presented as a function of applied load and angular speed. The wear rate has been evaluated in term of weight loss in the entire specimen investigated. The effect of load and speed (rpm) on the wear rate has been discussed. In addition, the effect of abrasive size on wear rate of fibers has also been discussed. All the calculations is investigated by weighting the specimen before grinding and after grinding and then the loss of weight after abrasion is considered as the wear rate. The wear rate increases gradually at different angular speed.

3.1 Effect of Speed (rpm) On Abrasive Wear of Silicon EVA at Constant Load

As the wear studies were conducted against the abrasive media (grinding disc). The selection of applied load and the position of the specimen for wear studies were taken as three different loads. Five reading of wear were taken

from three sets at different angular speed. The result shows that as the speed (rpm) increases the wear rate of the specimen increases for a same load.

The tests for wear rate are held at 3 sets of specimen at different rpm but at a constant applied load. These tests are done at

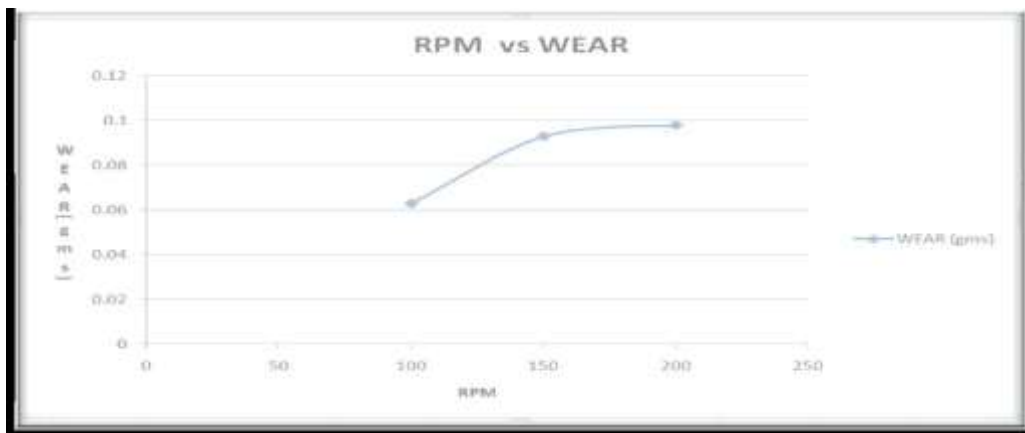
- i. 100RPM
- ii. 150RPM
- iii. 200RPM

After conducting total experiment regarding our investigation of abrasive behavior of Silicon EVA polymer

Following mean results has been obtained. These results are shown in tabular form below:

*** At 5N- RPM vs. WEAR**

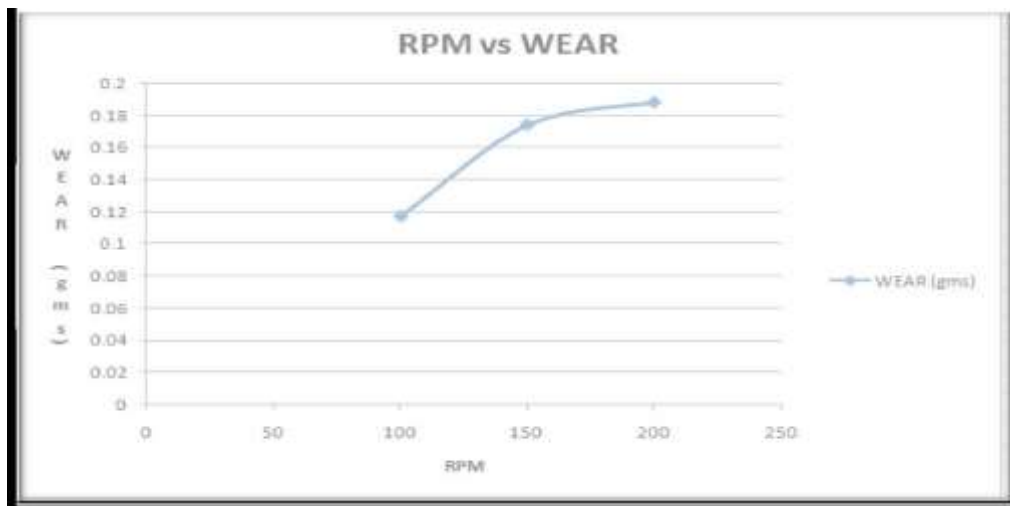
RPM	WEAR (gms)
100	0.063
150	0.093
200	0.098



Curve 1: Variation of wear rate of the work piece for 5N applied load

*** At 10 N- RPM vs. WEAR**

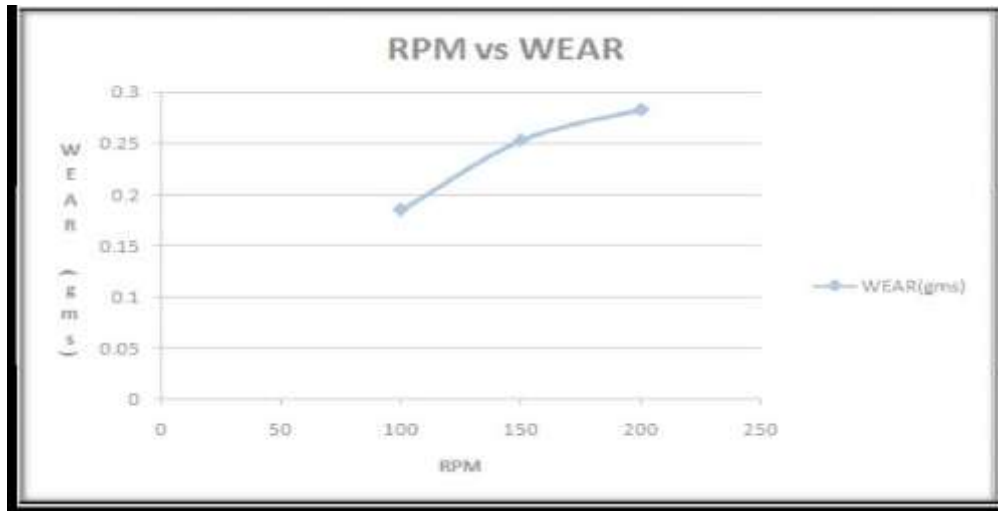
RPM	WEAR (gms)
100	0.117
150	0.174
200	0.188



Curve 2: Variation of wear rate of the work piece for 10N applied load

* At 15 N- RPM vs. WEAR

RPM	WEAR (gms)
100	0.185
150	0.253
200	0.283

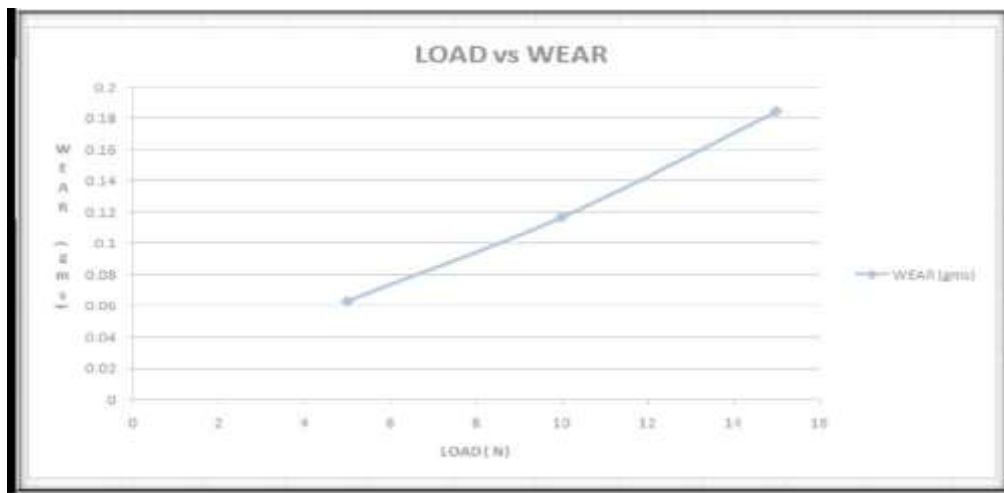


Curve 3: Variation of wear rate of the work piece for 15N applied load

3.2 Effect of Applied load On Abrasive Wear of Silicon EVA at Constant Angular Speed

LOAD vs. WEAR

LOAD (N)	WEAR (gms)
5	0.063
10	0.117
15	0.185



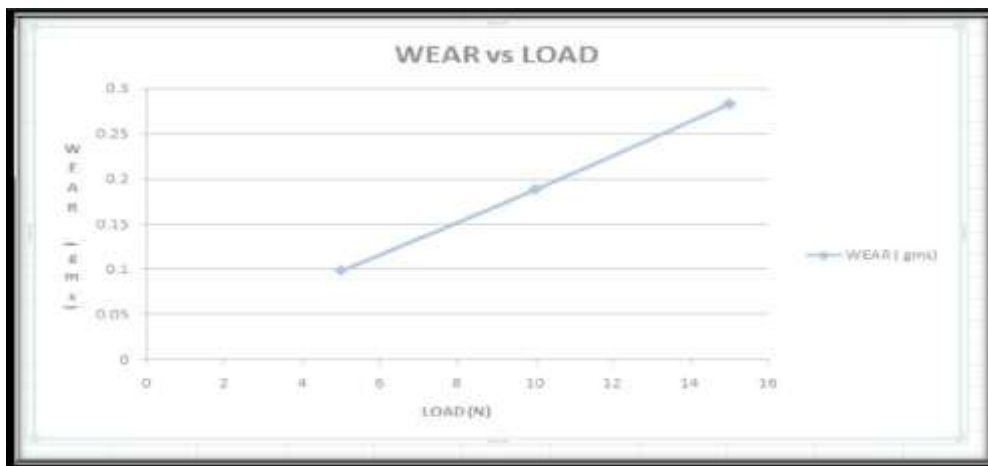
Curve 4: Variation of wear rate of the work piece for 100 rpm angular speed

LOAD (N)	WEAR (gms)
5	0.093
10	0.174
15	0.253



Curve 5: Variation of wear rate of the work piece for 150 rpm angular speed

LOAD (N)	WEAR (gms)
5	0.098
10	0.188
15	0.283



Curve 6: Variation of wear rate of the work piece for 200 rpm angular speed

The main findings of the investigation have been listed out. The suggestion for the future work have also been indicated. The specimen do not get fresh abrasive surface, due to this wear resistance increases. Following results are discussed below

3.3. RPM vs WEAR

Curve 1

This graph shows RPM vs WEAR at 5 N. The wear increases while RPM increases from 100 to 200. The graph is not linear in nature.

Curve 2

This graph shows RPM vs WEAR at 10 N. The wear increases while RPM increases. The graph is not linear in nature.

Curve3

This graph shows RPM vs WEAR at 15 N. The wear increases while RPM increases. The graph is not linear in nature. In this graph wear is more as compare to graph 1 and graph 2.

3.4. LOAD vs WEAR

Curve 4

This graph shows LOAD vs WEAR. The wear increases while load increases from 5 to 15N. The graph is linear in nature, this shows linear relationship between load and wear.

Curve 5

This graph shows LOAD vs WEAR. The wear increases while load increases from 5 to 15N. The graph is linear in nature, this shows linear relationship between load and wear.

Curve 6

This graph shows LOAD vs WEAR. The wear increases while load increases from 5 to 15N. The graph is linear in nature, this shows linear relationship between load and wear. In this graph wear is more as compare to curve 1 and curve 2.

4. CONCLUSIONS

Thus it can be concluded from the above discussion that:

1. There is a linear relationship between wear and applied load
2. The wear increases as the applied load increases. Wear is more at 15 N load as compare to 5 N and 10 N load.
3. The wear increases as the angular speed (RPM) increases.
4. The most important conclusion of Silicon EVA is that wear in first minute is more as compare to last minute while increasing the angular speed. Initially the wear of Silicon EVA with respect to angular speed increases linearly till 150 rpm but as the rpm increases beyond 150 to 200, the linear relationship tends to curve (parabolic)

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