

# Experimental Study of Wear Properties on Aluminum Silicon Alloy

Shaik Chand ,Shaik Zeeshan Ahmed, Mohammed Ghouse, Assistant Professor Attalique Rabbani

Student of Department of Mechanical Engineering  
ISL Engineering College ,Hyderabad,AP, India

**Abstract** –At present there are many properties of Aluminum Silicon alloy which contain light weight less coefficient of thermal expansion and more weight ratio which is suitable for many industries in past decade it is more accepted in automobile industries as it is useful in cost saving and its Si alloy plays an important role in this study the wear behavior of Al-Si is being studied Aluminum of 86% weight with silicon of 14% of weight,Aluminum of 82% of weight with silicon of 18% weight,Aluminum of 78% weight with silicon of 22% weight were synthesized by casting method.the wear behavior was studied by using pin on disc wear testing machine.the mechanical properties of the alloy has increased.

**Keywords**–Al-Si alloys, casting, pin on disc wear testing machin

## I. INTRODUCTION

Aluminum alloys are distinguished according to their major alloying element. Silicon is the main alloying element . It give good casting properties to the alloy by decreasing its viscosity. It reduces melting temperature of the alloy, decreases shrinkage during solidification. Also it is very inexpensive for a raw material silicon has low density (2.34 g/cm<sup>3</sup>), which can be a advantage by reducing component's total weight. Si has very low solubility in Al; therefore it precipitates as pure silicon, hard and hence helps in improving abrasion resistance. Al-Si alloys form an hyper eutectic at 14 wt% silica at a temperature of 623°C,also an hyper eutectic at 18wt% silicon at a temperature of 720°C,and also a hyper eutectic at 22wt% silicon at a temperature of 860°C Depending on Silicon weight percentage, the Aluminium-Silicon alloy systems can be divided into 3 major categories:

- Hypo eutectic ( <12 weight % Silicon )
- Eutectic ( 12-13 weight % Silicon )
- Hyper eutectic ( 14-25 weight % Silicon )

## II. LITERATURE REVIEW

Aluminum alloys, are gaining vast industrial significance because of their undischarged combination of physical, mechanical, and wear resistance properties over its base alloys. They have high specific strength, high wear and abrasion resistance, better high temperature strength, high stiffness, improved damping capacity and low thermal expansion coefficient. Aluminum alloy with 11.5 wt%

SiC particle reinforced composite offers same mechanical properties but higher thermal conductivity and specific

heat than cast iron. As a result, frictional heating is found to be substantially less in these alloys than that of cast irons. This contributes to their use in engineering and automobile sectors excessively, where wear and tear are the very major problems. Some of the components are pistons, connecting rods and cylinder heads for automobile and impellers, turbine blade, agitators, vortex finder, pump inlet. in mining and marine sectors .

## III. EXPERIMENTAL PROCEDURE

### 1. Dimensioning

Rectangular samples were cut from different block using the lathe machine. The dimensions of the cut samples were 10mm length and 30mm in height.

### 2. Polishing

One of the sample was polished on one side to reveal the micro structure. Mechanical polishing was done using emery papers in the sequence of 1/0, 2/0, 3/0, and 4/0. After mechanically polishing the sample, cloth polishing using a 6 micrometer diamond slurry was done. After obtaining a mirror finish polishing of the sample, the sample was etched and used.

### 3. Wear test

Pin on disc wear test machine for the wear testing. The disc which rotates is made of high carbon, quenched and tempered steel of diameter 120 mm and hardness of 70 HRC. The Al-14%Si samples were held stationary and the normal load is applied via a lever mechanism. The tests were done by keeping sliding speed constant. No lubricant is used as test is carried out in dry conditions. The samples were weighed at regular intervals to measure weight loss. It was under careful examination that the specimens wearing in the test are continuously cleaned with woolen cloth so as to avoid the snaring of wear

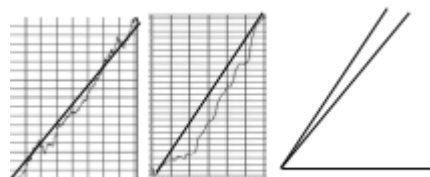
debris and to achieve uniformity in experiential procedure. Stereo microscope was used to analyses the crack morphology of the worn surfaces of sample. Same wear testing is done for Al-18% sample and also for Al-22% sample.



#### 4. Applications

- Building & construction of highway, marine, automotive.
- Aircraft, transportation application.
- Power train system.

#### 5. Graph



WEAR RATE A OF ALLOY

### IV. CONCLUSION

The increase in slope of “Wear Vs Time” plot from the 30N load test to 80N load test, signifies the fact that wear rate increases with increase in applied load. The weight loss rate is initially high, but this rate gradually decreases as time increases. This is due to the change in mechanism of wear. Hardness increases as Aging Time increases due to Precipitation of GP Zones or metastable phases. When aging temperature is high, there could be reduction in hardness. In such a case hardness peak would be obtained

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