Design and Fabrication of Machine for Test in Abrasive Wearing According To ASTM G65 Standard

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Abstract- *In this work the design and construction of a "dry sand/rubber wheel apparatus" according to the ASTM G 65 Standard has been carried out and fabricated, in order to determine the abrasive wear of different materials. Wear damage which entails the loss of material is perhaps the simplest situation to describe quantitatively. The lost by attrition can be determined by measuring the change of mass or dimensions of the test specimen. ASTM G 65 Standard is widely used by industry to assist the selection of materials for the service in abrasive wear environment. The measurements of mass change by this method is usually quick and the materials cost can be low.*

Keywords- ASTM G65, Abrasive Wear, Machine Design, Fabrication, Dry Sand – Rubber Wheel Apparatus

I. INTRODUCTION

The wear damage in machine parts is important damage carries to replace machine parts causing a lost in the valuable time of productions. Therefore it is necessary to have a study related with the tribology. Laboratory modelings of tribological behaviors are very importance, because facilitates the correct selection of the materials to use in frictional constraints and contributes to materials saving and increment its durability. With this perception of necessities required in the industry, have been developed methods able to perform reproducible tests in any place. Due to this, organizations like ASTM, DIN, ISO, among others, have standardized these techniques,achieving with this, the general knowledge of the conditions of operation of the machines, of their dimensions and of all the operation parameters during the realization of the rehearsals. ASTM G 65 standard for abrasive wear test is widely used by industry to assist in selecting materials for abrasive wear service. This test involves loading a specimen against a rotating rubber-rimmed wheel while a flow of abrasive sand is directed at the contact zone. Choices of loads and sliding distances are detailed in the test method. Then is performed the design and fabrication of a machine type "dry sand - rubber disk" for test in abrasive wearing according to the ASTM G 65 Standard.

II. WORKING PRINCIPLE

It is Standard Test Method for Measuring Abrasion Using the Dry Sand/Rubber Wheel Apparatus. It is performed by loading a rectangular test sample against a rotating rubber wheel and depositing sand of controlled grit size, composition, and flow rate between them. The wheel is rotated in the direction of the flow of sand radially. The mass of the test sample is recorded before and after conducting a test and the difference between the two values is the resultant mass loss due to dry sand abrasion. One type of instrument used to get the quantities abrasion rate and normalized abrasion rate, is the abrasion scrub tester. This instrument is made up of a mechanical arm, and programmable electronics. The machine draws the mechanical arm with attached rubber wheel over the surface of the material that is being tested. The operator sets a pre-programmed number of passes for a repeatable and controlled result.

III. DESIGN AND FABRICATION

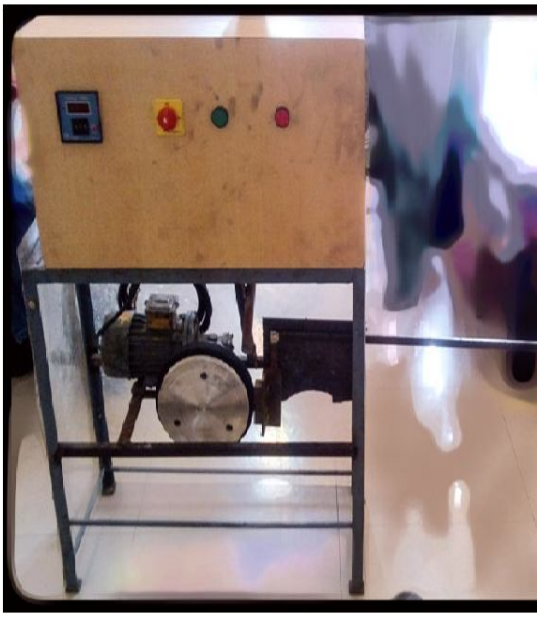

Figure 1: Abrasive wear test rig

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IV. CALCULATIONS AND RESULTS



Tested copper metal **Tested aluminium metal**
Tested mild steel

These figers shows the tested copper and aluminium and mild steel. The wear in the materials is show in the figures.

Abrasion factor = Wear loss in mild steel material /Wear loss in the specimen

If abrasion factor is less than (<1) one. The specimen is considered as soft material. If abrasion factor is greater than (>1) one. The specimen is considered as hard material.

$$\text{Abrasion factor for Aluminum} = \frac{\text{(Wear loss in mild steel)}}{\text{(Wear loss in aluminum)}}$$

$$= \frac{1.46}{2.44}$$

$$= 0.598$$

$$\text{Abrasion factor for copper} = \frac{\text{(Wear loss in mild steel)}}{\text{(Wear loss in copper)}}$$

$$= \frac{1.46}{3.9}$$

$$= 0.374$$

VI. APPLCATIONS

The standard abrasive Rubber/Wheel tests were carried out. To understand the wear mechanism, few of SEM observations have been performed on the worn surface. This test measures the weight or volume loss in a very controlled environment and simulates what is commonly referred to as Low Stress Abrasion or Scratching Abrasion. Selection of materials for the components. Ranking of materials according to rate of wear.

VII. CONCLUSION

The abrasive wear test rig helps us in ranking the material in terms of abrasion resistance. It can be seen after conducting test on the equipment that it is a low stress abrasion test because the abrasion is very slow. In this project we have taken Mild steel as reference material and tested other two materials which are Copper and Aluminum. After keeping time, feed rate and speed of motor as constant we have calculated the loss of materials in gms. We come to a conclusion that the maximum wear happens in copper. Also we compare the abrasion rate of both Aluminum and Copper. We see that the abrasion rate for both materials is less than one. Hence we can conclude that both the materials, Aluminum and Copper are soft materials. And we can also say that Copper is a better material than Aluminum in terms of abrasive resistance. Hence we conclude that this test can help in finding the abrasive resistance of different materials and rank them. And also we can find out that the materials to be tested are soft or hard.

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