

# Study of wear phenomena of some metal sample under lubricated condition

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## Abstract:-

In this work some metal samples made from pure copper and Brass alloy were prepared and machined as a half bushes with a diameter of 1.6 cm and length of 1.5 cm .Rockwell method was used to measured the hardness of samples before running . These samples were placed in wear system testing under lubricated condition (Iraqi Oil).Different normal loads were applied to copper and brass samples at different sliding time ,weight loss was measured for all sample by weighed the sample before and after running and the difference between them represent the weight loss. Different figures were plotted between weight loss and wear parameters.

## 1- Introduction:-

The natural wear process take place which results in the removed of wear material from surface [1].The increasing of complexity and cost of engine maintenance, together with a demand for improved safety of operation, has resulted in greater emphases being placed on research into modes of wear occurring in oil lubricated machinery and on monitoring methods to improve wear detection [2]. Most of the machine parts suffer from fraction and wear at the interactions, this fraction and wear affected the efficiency of machine and cause changes the mating parts [3].

Wear is one of the three most commonly encomtered industrial problems leading the replacement of component and assemblies engineering, the other being fatigue and corrosion .wear as a part of the tribology science is now receiving considerably more attention although still behind fatigue and corrosion in research effort [4].

## 2. Theoretical parts

### 2.1 Wear principle:-

Six variable controls the process of wear and by changing them, the amount of wear in any particulate case can be changed [5].Theses variable are:-

- The part which suffer wear such as hardness.
- The rubbing material which causes the wear.
- Material particle come between these surfaces.

- The load.
- The movement and sliding distance.
- The environment.

## **2.2 The mechanism of wear:-**

The first step removing a metal particle may be digging into the metal surface local loading because of intimate contact on an atomic scale. The second step a corrosion of the surface product such as an oxide or sulphide, usually quickly removed from the metal surface by the wearing agent [6, 7]. In addition the effect of temperature on the section of stagnant zone one wear depends on surface temperature distribution metal with a high melting point tends to have wearing properties.

## **2.3 Wear rate measurements:-**

The most common method of studying wear consists of the examination of the sliding surface before and after the test, any difference in the material can be attributed to wear [8]. Several methods of wear rate measurements such as mechanical method, optical method, and weighing method which was used in this work.

In This method the specimen is weighed before and after running, and the weight loss calculated as a difference between initial weight and the weight of sample after running.

## **2.4 Lubrication:-**

Most lubricants are introduced in to sliding system with the aim of reducing the amount of interaction between the contacting surfaces. Thus a lubricant may be used to reduce the amount of wear, or the degree of surface adhesion. Sometimes the prime task of the lubricant is to reduce the interfacial temperature, which produces some harmful change. For example local melting in one of the contacting surfaces materials [10].

## **3. Experimental Part**

### **3.1 Wear testing system:-**

Wear testing system which was used in this work consist from electrical motor with reducing speed pulleys, rotating hard shaft supported by two ball bearing immersed in oil container (made from Perspex),and half bush holder for testing samples with loading system[11].

### **3.2 wear sample preparation:-**

The samples wear made from copper and Brass alloy (59%Cu+40%Zn+1%Impurities)with a diameter of 1.6 cm and length of 1.5 cm machined as a half bush.

### **3.3 Procedure work:-**

The hardness was measured for all samples wear as shown in the table (3-1) which shows the different factors which were change during the work.

Table (3-1): The procedure of experimental work.

Sample	Sliding Time (min)	Load (N)	Initial Parameters
Cu	2	4,6,9	W <sub>1</sub> =20g Hardness=40±2HRC
	4	4,6,9	
	6	4,6,9	
	8	4,6,9	
	10	4,6,9	
Brass	2	4,6,9	W <sub>1</sub> =18.5g Hardness=37±2HRC
	4	4,6,9	
	6	4,6,9	
	8	4,6,9	
	10	4,6,9	

#### **4. The Results and Dissuasion:-**

Figures (4-1),(4-2)and(4-3) represents the weight loss of copper and Brass as a function of sliding time under different normal loads 4,6and 9 N . In all samples the weight loss increased gradually under different parameters until reaching a steady state condition, especially for brass under tests. In the beginning of the sliding , the removal of some materials from the specimens was due to wear, arises when junctions weld together become broken by relative motion in the steady state condition the action of lubricant minimize the friction force by separate the meeting surfaces , and to work Harding of the surface after four minutes.

Figures (4-4), (4-5) and (4-6) illustrates samples weight loss as a function of normal loads with different sliding time.

In general trend of an increased in weight loss with applied normal load were clearly demonstrated for normal load less than 4N , the weight loss is limited for copper sample but not shown this behaviour for brass sample.

Increasing the normal loads the weight loss increased slightly, due to the plastic deformation of the surface.

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## **دراسة ظاهرة البلى لبعض النماذج المعدنية تحت شرط التزييت**

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### **الخلاصة :-**

في هذا البحث تم تحضير بعض النماذج المعدنية من النحاس النقي وسبيكة البراص هذه النماذج شغلت كأصاف دوائر بقطر 1.6 cm وبطول 1.5cm . استخدمت طريقة روكويل لقياس صلادة العينات قبل التشغيل. تم وضع النماذج بمنظومة فحص البلى وتم تسليط حمل عمودي بقيم مختلفة على نماذج النحاس والبراص . كما تم حساب الوزن المفقود للعينات وذلك بقياس وزن العينات قبل وبعد التشغيل والفرق بينهما يمثل الوزن المفقود اثناء عملية التشغيل . تم رسم عدد من الاشكال البيانية تبين كدالة لمختلف عوامل البلى .