PROPOSAL AND CREATION OF WEAR TESTING APPARATUS

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Abstract- **Wear is related to interactions between surfaces and specifically the purging and malformation of material on a surface as a result of mechanical action of the opposite surface. This study was used to design and to invent or produce the wear testing machine. This equipment is used to study the metallurgy properties of the materials. Machine was fabricated with well selected materials and consider the factor of safety. Design and calculations were carried out according to the design procedure. The performance of new to invent or produce machine is compared with the grade wear testing machine. The sense of wear is generally build on the loss of material, but it should be emphasized that damage due to material displacement on a given body (observed using microscopy), with no net change in weight or volume, also constitutes wear.**

I. INTRODUCTION

Tack on disk wear tester is the bulk popular tribometer for probe wear as well as frictional deportment of a materials under govern of rolling, slipping, or a combination of both. The discs (wheels) are permanent to two collateral shafts and pressed opposed to each other under abiding contact load. Driven by a motor through a train of gear, the classical are spin along with the shafts. The spinning speed can be controlled, so that when the linear speeds of two wheels are equal at the contact point (V1=V2), a pure rolling contact is achieved. When V1 and V2 are different and both wheels are spinning, a combined rolling-slipping can be discern. Whilst when one of the sample is permanent, and the other is spinning, then wear is a pure slip. In this case, the permanent sample can be a chunk, so that a name of hunk on wheel is used. Mordant atom may be annex to the touching area, attain a three body mordant wear testing.

II. LITRATURE REVIEW

There are 3 kinds of steps based on the height and width of step:

2.1 An mordant wear check
2.2. Rolling slipping wear check
2.3. A staples on disk wear check

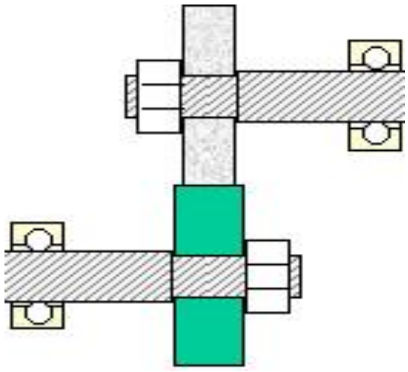

Fig-1: An abrasive wear tester

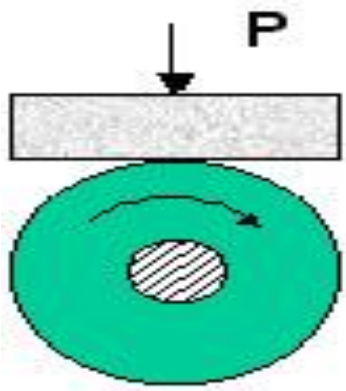

Fig-2: Rolling sliding wear tester

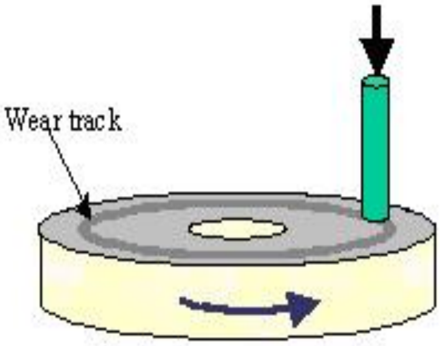

Fig-3: Pin on disk wear tester

III. TRANSFERAL SYSTEM

The rotary locomotion of the motor is transmitted to the operative element to provide an operative working or supplemental stirring. When the required stirring is rotary; the transferal takes place through tackle that transfer Rotary locomotion from one shaft to another. Transmission of the stirring from the extrinsic source to the operative element can take place through Mechanical elements such as belts, Gears, chains etc.

Mechanical transferal and its elements: -

3.1 Belt Transferal

3.2 Gear Transferal

3.3 Chain Transferal

3.1. Gear transferal system:

Coherence of capacity transferral in belt and rope operate is less. The power may be dispatch from one rod another by means of mating gears with high transferral coherence and a gear drive is also provide when the between driver and retainer is very little.

IV. DESIGN OF LEVER:

Length L =600mm

Applied load P=500N

Bearing pressure $\boldsymbol{p_b}$=5N/$\boldsymbol{mm^2}$

Tensile stress =745mpa

Yield stress =470 MPA

Solution:-

Load*distance = effort*distance

F*$\boldsymbol{L_1}$=P*$\boldsymbol{L_2}$

500*300 =P*300

P=500N

Reaction at the fulcrum pin at F

$\boldsymbol{R_F} = \sqrt{\boldsymbol{P^2}+\boldsymbol{W^2}}$

$\boldsymbol{R_F} = \sqrt{\boldsymbol{500^2}+\boldsymbol{500^2}}$

$\boldsymbol{R_F}$=707.106N

Design of hub pin:-

d =diameter of the hub pin

l = length of the hub pin

$\boldsymbol{R_F}$ **=d*l***$\boldsymbol{P_B}$

707.106 =d*1.25d*5

d = 11mm

l = 1.25*d

l =1.25*11

l =13.75

Let us now shear stress induced in the hub pin is less than the given value

707.106 = 2*($\boldsymbol{\pi \div 4}$)*$\boldsymbol{d^2}$*l

Shear stress =3.98MPa

Diameter of boss at hub

D_{bf} =2*d

D_{bf} =2*11

D_{bf}=22mm

Bending instant at the fulcrum

M =F*L

M = 500*300

M =σ150000N-mm

Section modulus Z:-

$$Z= \frac{\frac{1}{12}*L(D^2-d^2)}{d/2} \qquad Z = \frac{\frac{1}{12}*14(22^2-17^2)}{\frac{22}{2}}$$

Z=608.25mm^3

Bending stress = $\frac{M}{Z}$

$\sigma_b = \frac{150*10^3}{608.25}$

= 246.609MPA

Design for pin at A:-

Diameter of the pin d_1

Length of the pin l_1

Consider bearing of the pin at effort

500 = d_1*l_1*p_d

500 = 1.25*$d_1 * d_1 * 5$

d_1 =8.9mm

d_1 =9mm

l_1 = 1.25*d_1

l_1 = 1.25*9

Let us now check the shear stress induced in the pin at B

500 = $2 * \frac{\pi}{4} * d_1 2$*l

Shear stress = $\frac{5000}{2*\frac{\pi}{4}*9^2}$

Shear stress = 3.929N/mm^2

Design of lever:-

t = thickness of the lever

b= width of the lever

Taking distance from the centre of the fulcrum to y-y as 50mm

Maximum bending moment

=500*300

=150000N-mm

Section modulus Z:-

$Z = \frac{1}{6} * t * b^2$

$Z = \frac{1}{6} * t * 9 * t^2$ (b=2t)

Z= .67t^3

Maximum bending stress:-

FOS = 2.5 Maximum bending stress = $\frac{M}{Z}$

$298 = \frac{150000}{.67*t^3}$

t = 9.09mm

t = 10mm

Width

b=2*t

b= 2*10

b= 20mm

Lever specification:-

Length L=600mm

Thickness t= 10mm

Width b= 20mm

Diameter of the pin $d_1 = 9mm$

Diameter of the hole d=11mm

V. CONCLUSION

From the tests carried on different materials i.e., Aluminium, Mild steel and Cast iron the following conclusions were drawn:

- The wear rate (73.57E-6 N/s) was found high for cast iron because of its brittleness.

The wear rate was high when the abrasive media used was coarse (GFN 24).

- The wear rate was high when grinding wheel was used as the lining material.
- For olivine sand of GFN 42, wear rate of all material tend to slow down at higher loads, since finer grains particles tends to slip through the mating surface without participating in wear.
- When grinding disc was used with Aluminium specimen for all grain shape sands it was found that the wear decreases for higher loads. This was due to the aluminium particles getting embedded on the wheel.
- Temperature gradient was found to be the highest for Aluminium because of high thermal conductivity (k=204W/mK) compared to cast iron (k=52W/mK) and mild steel (k=54W/mK)i

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