Experimental Procedure for Pin-on-disk wear testing

(Step by Step)

- Collect your sample and keep it in a cover by marking your group no. and date
- Polish the sample as explained in the experimental procedure upto 800 grit emery paper.
- Take initial dimensions and initial weight (W_1) after cleaning the sample and record the readings in laboratory copy (mandatory for all).
- Polish the counter disk using finer grit emery paper.
- Fix the sample in the pin-holder as explained and fix all other parameters (track diameter, p.m., load, duration).
- Run the instrument and record cumulative wear loss (in μm), time (in minute) and frictional force (F_r) readings from controller.
- Take sufficient readings at regular intervals (1 minute or 30 seconds).
- Remove the sample; take final weight, W_2 (after cleaning) and length after completion of the test.
- Data analysis and report preparation as described and discussed.

TRIBOLOGICAL STUDY OF DIFFERENT MATERIALS

Pin-on-disk testing

Theory

In material science, wear is erosion or sideways displacement of material from its "derivative" and original position on a solid surface performed by the action of another surface. Wear is related to interactions between surfaces and more specifically the removal and deformation of material on a surface as a result of mechanical action of the opposite surface. The need for relative motion between two surfaces and initial mechanical contact between asperities is an important distinction between mechanical wear compared to other processes with similar outcomes. The study of the processes of wear is part of the discipline of tribology. The complex nature of wear has delayed its investigations and resulted in isolated studies towards specific wear mechanisms or processes. Some commonly referred to wear mechanisms (or processes) include:

1. Adhesive wear
2. Abrasive wear
3. Surface fatigue
4. Fretting wear
5. Erosive wear

Experimental Procedure:

Dry sliding wear tests of the specimens are carried out in a pin-on-disk wear testing machine (Wear and Friction Monitor- TR-20LE, DUCOM, Bangalore, India). During wear test, the specimen-pin (cylindrical shape; 7 mm in diameter (approx..) and 20 mm in length) is held against an EN 31 steel disk (Hardness = 60 HRC, HV 695) rotating at 200 rpm under different normal loads (P). The tests are performed in an open air environment. The diameter of the circular path traversed by the pin (wear track diameter) is 100 mm that accounts for a sliding speed of 1.0 m s^{-1}. Before each test, the surface of the pin is polished with silicon carbide emery paper of 800 grit size. Each specimen-pin is subjected to a total test time of 10 min. The weight of the pin at the beginning and at the end of each test (after 10 min.) is measured in a high precision microbalance (CPA225D, Sartorius, Germany) to find out the weight loss. Accordingly, the overall wear rate is calculated in g m^{-2} m^{-1}. Furthermore, during

the test, cumulative wear (in 'μm') and frictional force (in 'N') data are recorded with time (in 'min'). The co-efficient of friction (μ) is calculated from frictional force (F_r) and normal load (P) using the relationship, $F_r = \mu P$. These data are used to generate cumulative wear loss vs. sliding distance and co-efficient of friction vs. sliding distance plots.

Sliding distance = πDNt;

Where, D-track dia. (0.1 m), N-r.p.m, t- time (30 min)

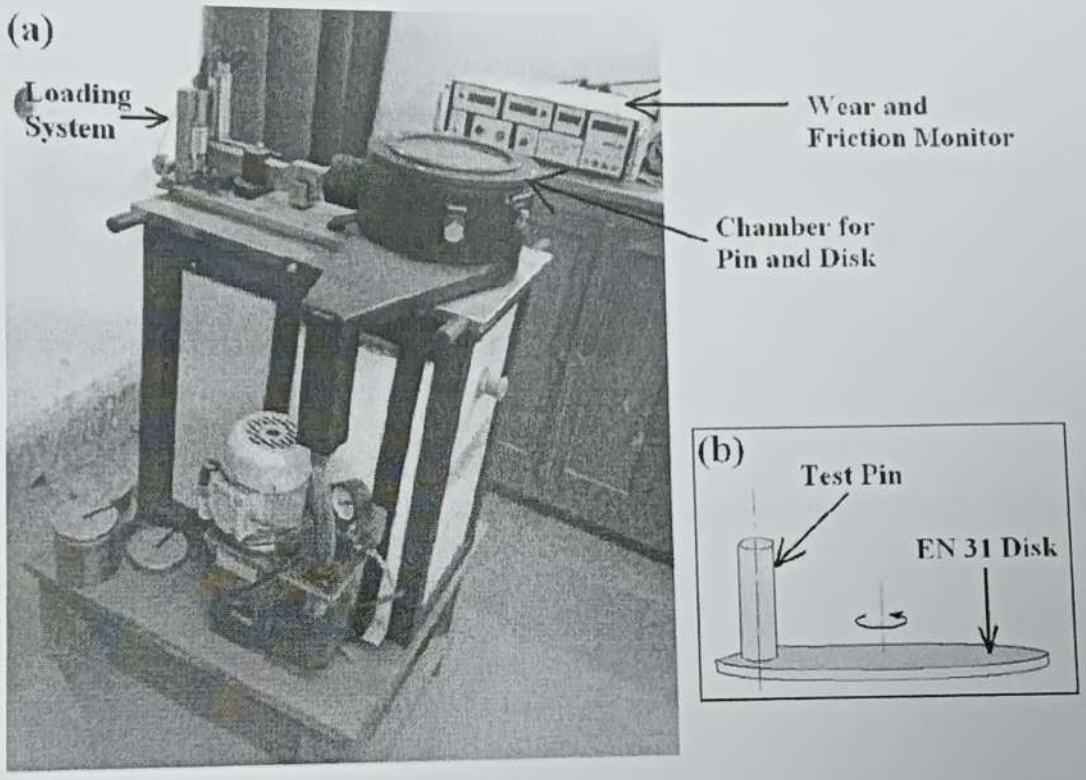

Fig. 1—Wear testing apparatus: (a) experimental setup and (b) schematic diagram of the pin-on-disk arrangement.

Results:

REPORT THE FOLLOWINGS:

PLEASE MAKE REPORT INDIVIDUALLY (REFRAIN FROM COPYING)

You may take help of computer for plotting only but insert (by typing)

(a) Name,

(b) Roll number

(c) Group number

(d) Experiment number and

(e) Date on it

(XEROX PLOTS ARE NOT ALLOWED)

Individually for each load

(a) Plot cumulative wear Vs. sliding distance graph (Individually for each load)

(b) Plot co-efficient of friction vs. sliding distance graph (Individually for each load)

(c) Calculate wear rate at each load (Individually for each load)

After completion of Experiment 1-3

(a) Plot cumulative wear Vs. sliding distance graph (combine all for three loads)

(b) Plot co-efficient of friction vs. sliding distance graph (combine all for three loads)

(c) Plot wear rate Vs. applied load graph (combine results for three loads)

Discussion:

Explain the individual (for each experiment) and final plots (after completion of Experiment 1-6).

Conclusion/summary:

Include for each experiment and after completion of Experiment 1-6.