

Tribology Testing

Ball-on-Disk or Pin-on-Disk Method

Tribology is the science and technology of interacting surfaces in relative motion. It is truly interdisciplinary and embodies the subjects of physics, chemistry, materials science and mechanical engineering.

Tribology embraces the study and application of friction, wear and lubrication.

The word "tribology" finds its origin in Greek language, "τριβος", which means rubbing or attrition.

Measuring Principle

FRICTION

To the first order approximation and within certain limits, but good for a large field of engineering:

Friction force is proportional to normal load

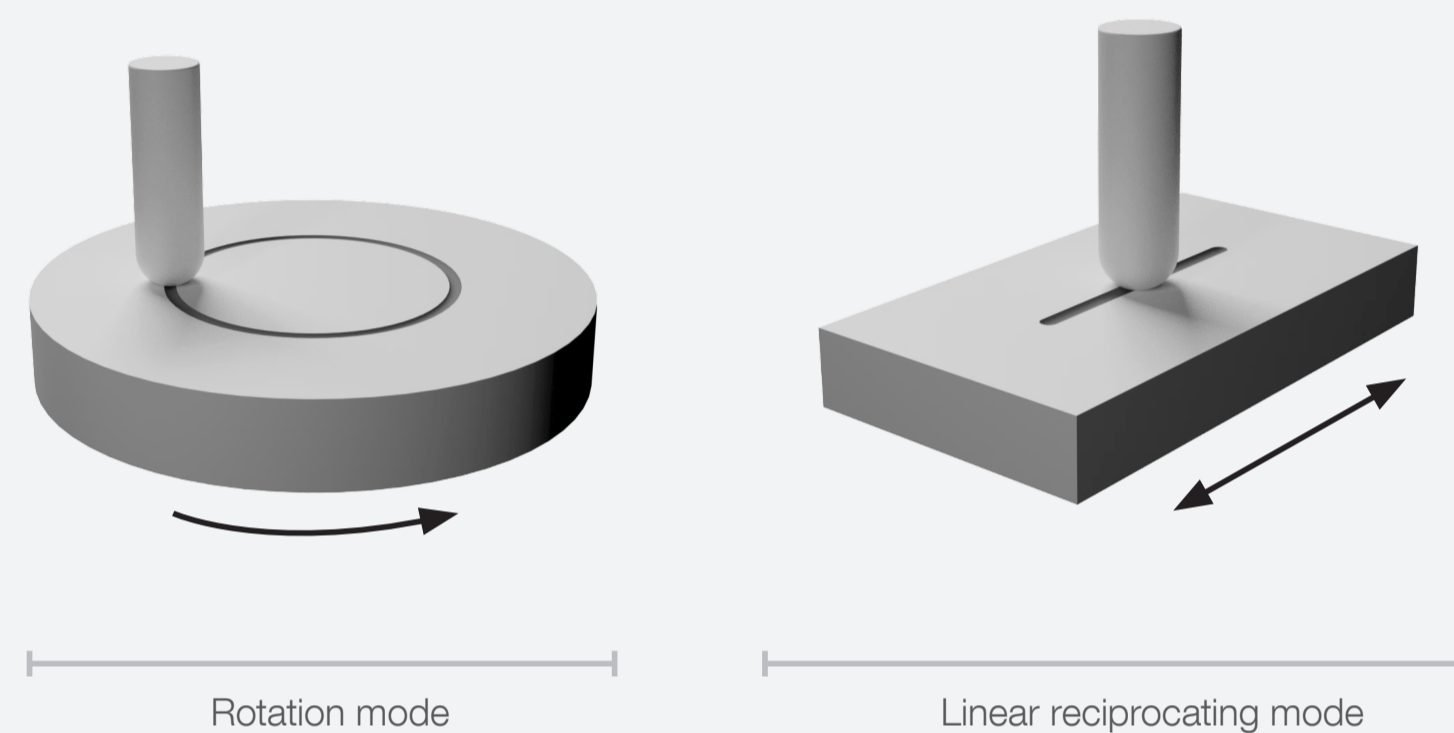
Friction force is independent of apparent area of contact

Friction force is independent of sliding velocity

Coefficient of friction (Amontons' law) :

$$\mu = F_t / F_n$$

μ : coefficient of friction, F_n : normal force, F_t : tangential force



WEAR

Disk wear volume = Cross section area * wear track circumference

Ball wear volume = Volume of the worn cap

Wear rate:

$$K = V / (F_n * L)$$

K : wear rate, V : wear volume, F_n : normal force, L : sliding distance

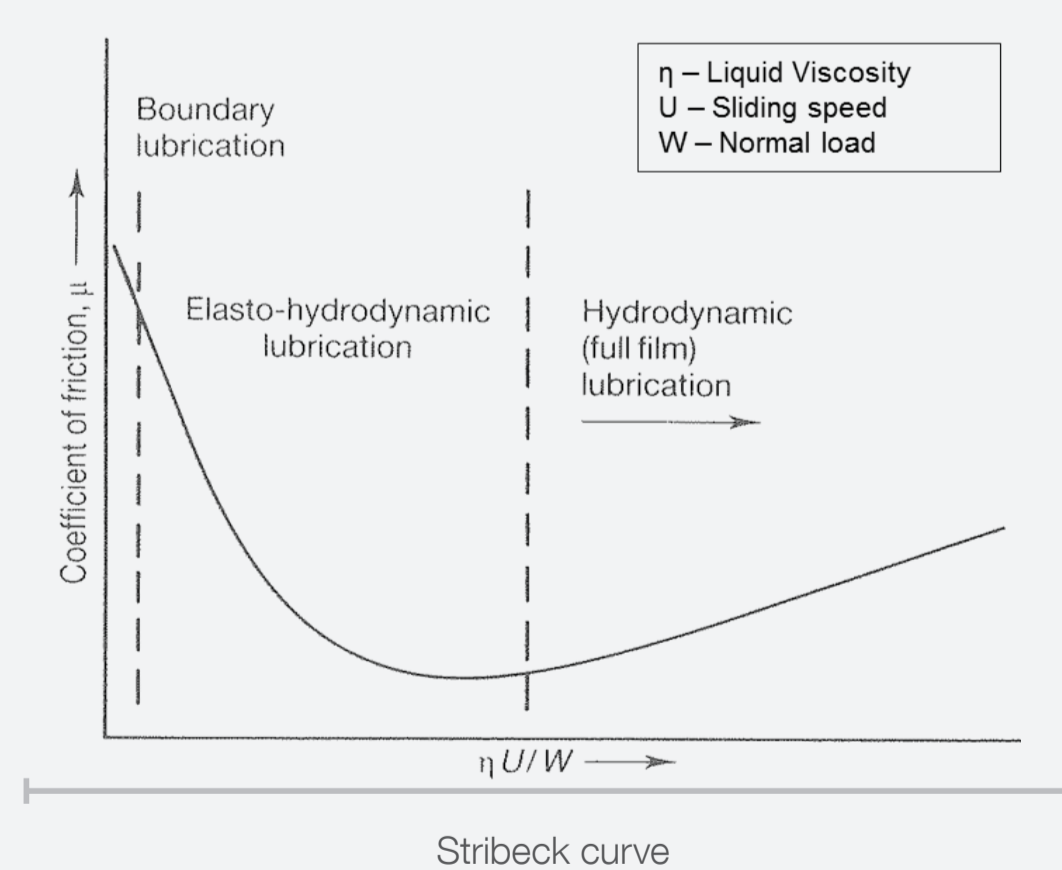


LUBRICATION

Boundary: direct contact occurs between asperities – lubricant acts as an adsorbed molecular film on the surfaces

Elasto-Hydrodynamic: contacting surfaces are non-conforming and local pressures in contact zone can be high

Hydrodynamic: sliding surfaces are separated by relatively thick film of lubricant; normal load is supported by pressure within the film



International Standards

ASTM G99 - Standard Test Method for Wear Testing with a Pin-on-Disk Apparatus

ASTM G133 - Standard Test Method for Linearly Reciprocating Ball-on-Flat Sliding Wear