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1. It is generally considered that in engineering application problems, there are no perfectly frictionless surfaces. Therefore, explain these two types of friction.
2. Dry Friction b. Fluid Friction and give practical examples

Answers

Dry friction is the force that opposes one solid surface sliding across another solid surface. Dry friction always opposes the surfaces sliding relative to one another and can have the effect of either opposing motion or causing motion in bodies.

The most commonly used model for dry friction is coulomb friction.

Dry friction resists relative lateral motion of two solid surfaces in contact. The two regimes of dry friction are 'static friction' ([stiction](https://en.wikipedia.org/wiki/Stiction)) between non-moving surfaces, and *kinetic friction* (sometimes called sliding friction or dynamic friction) between moving surfaces.

Coulomb friction, named after [Charles-Augustin de Coulomb](https://en.wikipedia.org/wiki/Charles-Augustin_de_Coulomb), is an approximate model used to calculate the force of dry friction. It is governed by the model:

F f ≤ μ F n , {\displaystyle F\_{\mathrm {f} }\leq \mu F\_{\mathrm {n} },} 

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where,

Ff is the force of friction exerted by each surface on the other. It is parallel to the surface, in a direction opposite to the net applied force.

µ is the coefficient of friction, which is an empirical property of the contacting materials,

Fn is the normal force exerted by each surface on the other, directed perpendicular (normal) to the surface.

The Coulomb friction Ff may take any value from zero up to µFn , and the direction of the frictional force against a surface is opposite to the motion that surface would experience in the absence of friction. Thus, in the static case, the frictional force is exactly what it must be in order to prevent motion between the surfaces; it balances the net force tending to cause such motion. In this case, rather than providing an estimate of the actual frictional force, the Coulomb approximation provides a threshold value for this force, above which motion would commence. This maximum force is known as traction.

The force of friction is always exerted in a direction that opposes movement (for kinetic friction) or potential movement (for static friction) between the two surfaces. For example, a curling stone sliding along the ice experiences a kinetic force slowing it down. For an example of potential movement, the drive wheels of an accelerating car experience a frictional force pointing forward; if they did not, the wheels would spin, and the rubber would slide backwards along the pavement. Note that it is not the direction of movement of the vehicle they oppose, it is the direction of (potential) sliding between tire and road.

Example of dry friction application: Dry friction occurs between the tires and the road for this motorcycle. The dry friction force for a motorcycle is what allows it to accelerate.

Fluid Friction: Fluid friction occurs between fluid layers that are moving relative to each other. This internal resistance to flow is named viscosity. In everyday terms, the viscosity of a fluid is described as its “thickness”. All real fluids offer some resistance to shearing and therefore are viscous. It is helpful to use the concept of an inviscid fluid or an ideal fluid that offers no resistance to shearing and so is not viscous.

Fluid friction depends on some factors which are:

1. Nature of the fluid
2. Shape of the body
3. Amount of area faced by the body in the fluid
4. The viscosity of the fluid
5. The speed of the body
6. Explain the following types of machines
7. Wedges b. Square Threaded Screws c. Journal bearings

Wedges: A wedge is a triangular shaped tool, and is a portable inclined plane, and one of the six classical simple machines. It can be used to separate two objects or portions of an object, lift up an object, or hold an object in place. It functions by converting a force applied to its blunt end into forces perpendicular (normal) to its inclined surfaces. The mechanical advantage of a wedge is given by the ratio of the length of its slope to its width. Although a short wedge with a wide angle may do a job faster, it requires more force than a long wedge with a narrow angle.

The force is applied on a flat, broad surface. This energy is transported to the pointy, sharp end of the wedge; hence the force is transported.

The wedge simply transports energy and collects it to the pointy end, consequently breaking the item. In this way, much pressure is put on a thin area.



Square Threaded Screws: The square thread screw is a common screw thread form, used in high load applications such as leadscrews and jackscrews. It gets its name from the square cross-section of the thread. It is the lowest friction and most efficient thread screw, but it is difficult to fabricate.

The greatest advantage of square threads is that they have a much higher intrinsic efficiency than trapezoidal threads (Acme or metric trapezoidal). Due to the lack of a thread angle there is no radial pressure, or bursting pressure, on the nut. This also increases the nut life. The greatest disadvantage is the difficulty in machining such a thread. The single-point cutting tools or taps and dies used to cut the thread cannot have efficient rake and relief angles (because of the square form), which makes the cutting slow and difficult.



Journal Bearings: Journal (friction, radial or rotary) bearing: This is the most common type of plain bearing; it is simply a shaft rotating in a bearing. In locomotive and railroad car applications a journal bearing specifically referred to the plain bearing once used at the ends of the axles of railroad wheel sets, enclosed by journal boxes (axle boxes). Axle box bearings today are rolling-element bearings rather than plain bearings.

