TUTORIAL – POWER SCREWS

Q1. Simplified drawing of a friction drive forging press having **30 ton load capacity**is shown in the figure below. Shaft is driven by an electric motor. Shaft can be moved on rotation axis by a mechanism, if left side disk contact to the center disc, upper die moves downward, if the right side disk contact to the center disk, upper dies moves upward. Power screw nut is fixed on press frame by bolts. Press frame is made by cast iron. (*gravitational acceleration can be assumed as g=10 m/s^2)*

According to the given data,

a) Determine the factor of safety of the system,

b) Determine the power of the motor.

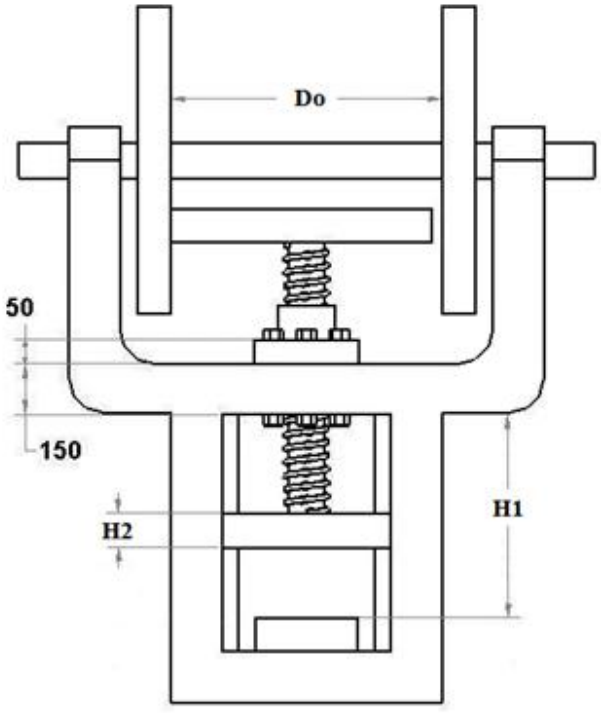
c) Determine the efficiency of the system

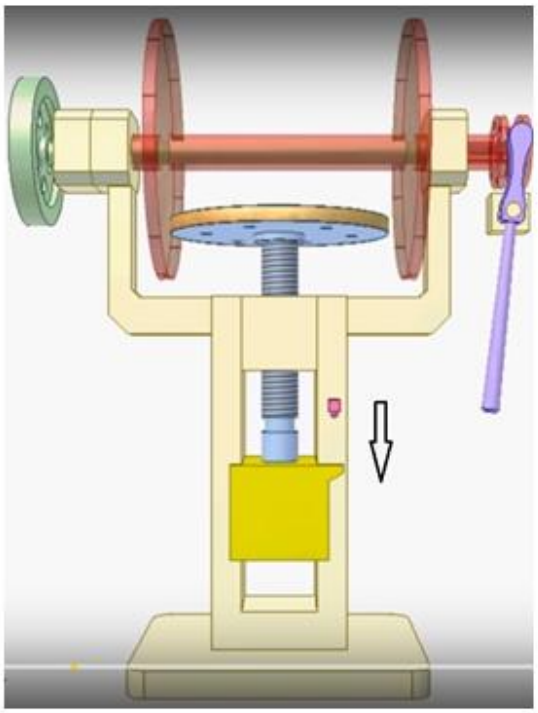
DATA

Power screw: Major diameter is 50mm (square-threaded)
Screw material: AISI 1050 Q&T steel (Sy=580 MPa)
Nut Material:AISI 1040 Q&T steel (Sy=415 MPa)

Nut height: 100 mm
Number of start: 2
Friction coefficient between screw and nut: 0.2
Pitch: 6 mm

Do: 800 mm
H1: 500 mm
H2: 70 mm
Rotational speed of the motor: 500 rpm





Q2. A single square threaded screw jack (as shown below) is given. According to given data;

- Calculate the design factor of safety under static loading condition based on **Distortion Energy Theorem (DET)** for all types of failures.
- Check the system for self-locking condition.
- Determine the required motor power to drive this mechanism.
- Calculate the efficiency of the system.

Major diameter of the screw: 30 mm Maximum load rising capacity: 15 kN. Number of start of the screw : 1 Coefficient of friction between the threads: 0.2 Pitch:6 mm Maximum extension of the screw from the base: 450 mm Height of the nut: 50 mm Materials of the screw and the nut: Steel, E=207GPa Mechanical properties of the screw: Sy=400MPa, Sut:480 MPa Mechanical properties of the nut: Sy=340MPa, Sut:400 MPa Load rising velocity: 0.8 m/min