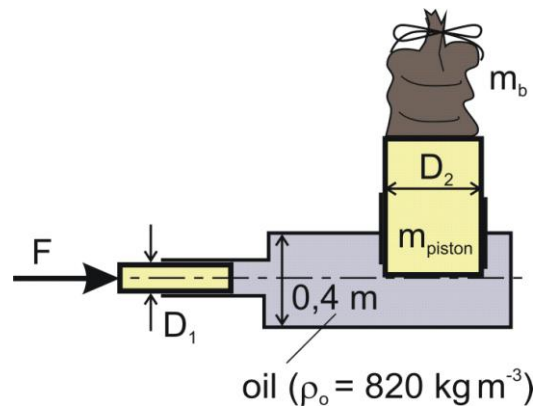


3rd exercise

Hydrostatics: Pascal's law and its application, buoyancy force, immersion of floating body, effective distribution of horizontal beams

3.1.

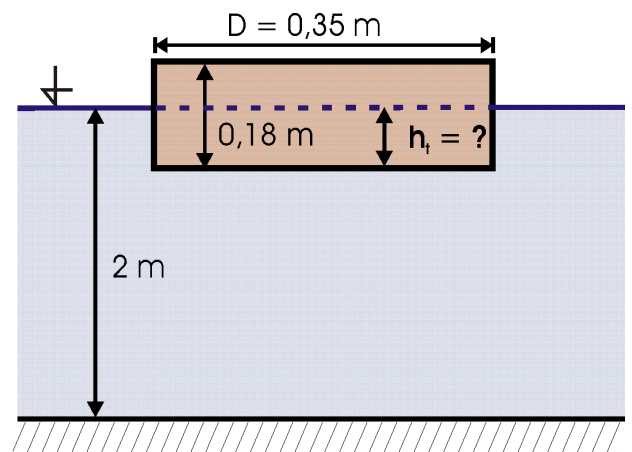
A burden having a mass $m_b = 140$ kg is to be lifted using a jacking equipment filled with oil. Determine a needed force ($F=?$). Diameters of pistons are $D_1 = 20$ [mm]; $D_2 = 78,5$ [mm], mass of piston $m_{\text{piston}} = 1,2$ kg. Consider a) theoretical effectiveness of equipment $\eta = 1,0$, b) real effectiveness $\eta \approx 0,97$.



(Result: $F = 90N$)

3.2.

A cylindrical tank floats in a container with water. Its mass $m = 13$ kg. Find out which part of the tank is submerged (immersion $h_t = ?$ [m]). Density of water $\rho = 1000$ kg.m⁻³.



(Result: $h_t = 0,135$ m)

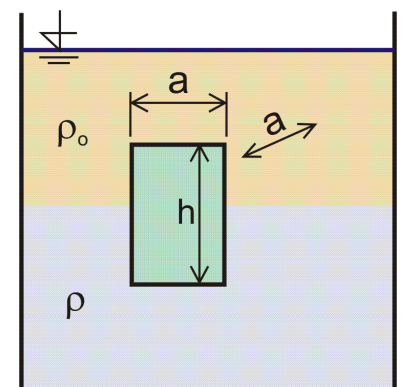
3.3.

A prism with a base $a \times a$ floats in a container filled with water and oil. It is submerged in $0,6 \cdot h$ in water and in $0,4 \cdot h$ in oil. Determine density of the prism.

$a = 15$ cm

$h = 20$ cm

$\rho_o = 900$ kgm⁻³



(Result: $\rho_t = 960$ kgm⁻³)

3.4.

Distribute 2 horizontal beams ($z_i = ?$ [m]) along the height of a vertical slide gate. The beams are to be distributed in such a way that both beams will be loaded by the same force. Height of water $h_h = 2$ m.

(Result: $z_1 = 0,943$ m; $z_2 = 1,724$ m)

