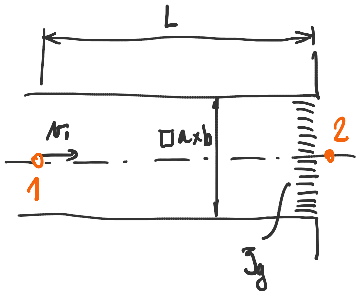
Voluntary homework - Ventilation duct

2022. április 28., csütörtök 14:38



$L = 12\,m$ $\quad a = 0.3\,m$

$\rho = 1.2\,\frac{kg}{m^3}$ $\quad b = 0.5\,m$

$\nu = 15 \cdot 10^{-6}\,\frac{m^2}{s}$ $\quad \zeta_g = 0.6$

$v_1 = 8\,\frac{m}{s}$ $\quad k = 0.5\,mm$

p_1 ? overpres.

BE 1-2

$$p_1 + \rho\frac{v_1^2}{2} + \rho g z_1 = p_2 + \rho\frac{v_2^2}{2} + \rho g z_2 + \Delta p'$$

($v_1 = v_2$, $p_2 = p_0$, $z_2 = z_1$)

$$\Delta p' = \Delta p'_{fr} + \Delta p'_{gin} = \lambda\frac{L}{D}\rho\frac{v^2}{2} + \zeta_g\rho\frac{v^2}{2}$$

hydraulic diameter: $D_h = 4\frac{A}{P} = 4\frac{ab}{2(a+b)} = 0.375\,m$

P ~ wetted perimeter

$$Re = \frac{vD}{\nu} = 200'000$$

$$\frac{D}{k} = 750$$

$\Big\}\ \lambda = 0.023$

$$p_1 - p_0 = \Delta p' = \rho\frac{v^2}{2}\left(\lambda\frac{L}{D_h} + \zeta_g\right) = 51.3\,Pa$$