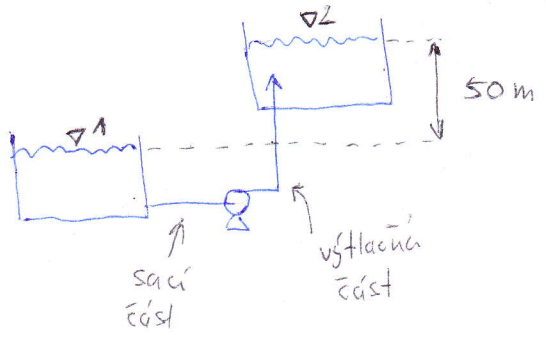
3-16



nové ocelové $\varepsilon_A = 0.2$ mm

$d = 0.1$ m

$e_{dis,sací} = 15.3$ J/kg

$L = 400$ m

$\sum \xi = 9.2$

$V = 1.3$ m/s

$\eta_{celk} = 0.76$, $P = ?$, $\dot{V} = ?$

$$\dot{V} = v \cdot S = v \cdot \frac{\pi d^2}{4} = 1.3 \cdot \frac{\pi \cdot 0.1^2}{4}$$

$$= 0.01021 \ m^3/s$$

Bernoulliho rovnice

$$\frac{v_1^2}{2} + \frac{p_1}{\rho} + h_1 g + e_č = \frac{v_2^2}{2} + \frac{p_2}{\rho} + h_2 g + e_{dis}$$

$e_{dis} = e_{dis,sací} + e_{dis,výtlačná}$

$t = 25°C$ - asi

$\rho = 997.02$ kg/m^3

$\eta = 0.8905 \cdot 10^{-3}$ Pa·s

$$e_{dis,výtlačná} = \left[\lambda \cdot \left(\frac{L}{d}\right) + \sum \xi\right] \cdot \frac{v^2}{2}$$

$$Re = \frac{v \cdot d \cdot \rho}{\eta} = \frac{1.3 \cdot 0.1 \cdot 997.02}{0.8905 \cdot 10^{-3}} = 145\,550$$

$$\lambda = \frac{0.25}{\left\{\log\left[\left(\frac{6.81}{Re}\right)^{0.9} + \frac{0.2/100}{3.7}\right]\right\}^2} = 0.02479$$

$$e_{dis,výtlačná} = \left(0.02479 \ \frac{400}{0.1} + 9.2\right) \frac{1.3^2}{2} = 91.56 \ J/kg$$

$v_1 = v_2 \doteq 0$

$p_1 = p_2 = p_{ATM}$

$h_1 = 0 \quad h_2 = 50$ m

} zjednodušení Bernoulliho rovnice

$$e_č = h_2 \cdot g + e_{dis} = 50 \cdot 9.81 + 15.3 + 91.56 = 597.36 \ J/kg$$

$$\dot{m} = \dot{V} \cdot \rho = 0.01021 \cdot 997.02 = 10.1796 \ kg/s$$

$$P_č = \frac{e_č \cdot \dot{m}}{\eta_{celk}} = \frac{597.36 \cdot 10.1796}{0.76} = 8001.14 \ W = \underline{8 \ kW}$$