GABARITO SEM CONSULTA

1ª Questão:

$\rho_r = 0{,}88$ **e** $\mu = 6{,}5\times10^{-4}\,\text{Pa}\times\text{s}$

INI 32-200

$$\rho = 0{,}88\times1000 = 880\frac{\text{kg}}{\text{m}^3} \Rightarrow \nu = \frac{\mu}{\rho} = \frac{6{,}5\times10^{-4}}{880}$$

$$\nu = 7{,}39\times10^{-7}\,\frac{\text{m}^2}{\text{s}} = 0{,}739\frac{\text{mm}^2}{\text{s}}$$

Portanto, não há necessidade de correção das curvas do fabricante.

a) N_B = ? $\quad \phi_r = 190\text{mm} \Rightarrow p_2 = p_{atm} = 0$ e $K_2 = 350000\frac{\text{s}^2}{\text{m}^5}$

$$H_{est} = K_1 = (12-2) + \left(\frac{0 - 0{,}2\times0{,}2\times10^4\times9{,}8}{880\times9{,}8}\right) = 10 - 2{,}27$$

$$H_{est} = K_1 \approx 7{,}73\text{m}$$

$$\text{CCI} \Rightarrow H_s = 7{,}73 + 350000\times Q^2$$

$Q(m^3/h)$	0	5	10	15	20
H_s(m)	7,73	8,41	10,4	13,81	35,6

Através do gráfico dado, temos:

$$Q_t \approx 16{,}75\frac{\text{m}^3}{\text{h}} \quad H_{Bt} \approx 15\text{m} \text{ e } \eta_B \approx 52\%$$

$$N_B = \frac{880\times9{,}8\times15\times\left(16{,}75/3600\right)}{0{,}52} \therefore N_B \approx 1157{,}5\text{W}$$

b)

$$H_{est} = K_1 = (12-1) + \frac{1\times10^4\times9{,}8}{880\times9{,}8} \therefore H_{est} = K_1 = 21{,}4\text{m}$$

$$H_s = 21{,}4 + 460.000\times Q^2$$

$Q(m^3/h)$	0	5	10	15	20
H_s(m)	21,4	22,3	25	29,4	35,6

Através do gráfico $Q_{Tas} = 17\frac{m^3}{h}; H_{BTas} = 31{,}9m$

$$\frac{H_{Bas}}{\eta_{Bas}} = \frac{H_{B1}}{\eta_{B1}} + \frac{H_{B2}}{\eta_{B2}}$$
$$\frac{31{,}9}{\eta_{Bas}} = \frac{19{,}7}{0{,}55} + \frac{12{,}2}{0{,}48} \Rightarrow \eta_{Bas} = 52{,}1\%$$

2ª Questão:

$$H_e = H_s + h_s$$
$$z_e + \frac{p_e}{\gamma} + \frac{\alpha_e \times v_e^{\,2}}{2 \times g} = z_s + \frac{p_s}{\gamma} + \frac{\alpha_s \times v_s^{\,2}}{2 \times g}$$
$$v_e = \frac{4 \times 3 \times 10^{-3}}{\pi \times \left(4{,}08 \times 10^{-2}\right)^2} = 2{,}3\frac{m}{s}; v_s = \frac{4 \times 3 \times 10^{-3}}{\pi \times \left(3{,}54 \times 10^{-2}\right)^2} = 3{,}05\frac{m}{s}$$

Considerando $\alpha_{s=}\ \alpha_e = 1{,}0$

$$\frac{p_e - p_s}{\gamma} + \frac{v_e^{\,2} \times v_s^{\,2}}{2 \times g} = h_s \therefore h_s = \frac{5{,}1 \times 10^{-3}}{10^3 \times 9{,}8} + \frac{2{,}3^2 - 3{,}05^2}{19{,}6}$$
$$h_s \approx 0{,}316m \Rightarrow 0{,}316 = K_s \times \frac{3{,}05^2}{19{,}6} \Rightarrow K_s = 0{,}666$$

3ª Questão:

$$\mu = 0{,}0581Pa \times s; L = 50m$$
$$D_{int} = 0{,}0525m; \sum 27{,}2m$$
$$Re = 1482; v = 2\frac{m}{s}$$
$$H_P = ?$$
$$f = \frac{64}{Re} = \frac{64}{1482}$$
$$H_P = \frac{64}{1482} \times \frac{(50 + 27{,}2)}{0{,}0525} \times \frac{2^2}{19{,}6} = 12{,}96m \approx 13m$$

4ª Questão:

$$H_0 = H_1 + H_{p0\to 1}$$

P.H.R→ eixo da tubulação.

$$3 + \frac{p_0}{\gamma} = \frac{2 \times v_1^{\,2}}{2 \times 9{,}8} + 12{,}96$$

$$3 + \frac{p_0}{\gamma} = \frac{2 \times 2^2}{2 \times 9{,}8} + 12{,}96 \therefore \frac{p_0}{\gamma} = 10{,}368\text{m}$$

$$1482 = \frac{\rho \times 2 \times 0{,}0525}{0{,}0581} \Rightarrow \rho = 820{,}04 \frac{\text{kg}}{\text{m}^3}$$

$$p_0 = 833226\text{Pa}$$