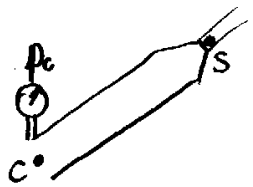
Pauta Auxiliar 6

P1

a)



$$B_C = \frac{v_C^2}{2g} + \frac{p_C}{\gamma} + z_C$$

$$B_S = \frac{v_S^2}{2g} + \cancel{\frac{p_S}{\gamma}}^{0} + z_S \qquad z_S = z_C + H$$

descarga a la atmósfera

$$B_C = B_S + \Delta_f \qquad \Delta_f = f_2 \frac{L_2}{D_2} \frac{v_2^2}{2g}$$

$$v_2 = v_C = \frac{Q_2}{\left(\frac{\pi D_2^2}{4}\right)} \qquad v_S = \frac{Q_2}{\left(\frac{\pi d^2}{4}\right)}$$

$$\Rightarrow \frac{1}{2g}\left(\frac{4Q_2}{\pi D_2^2}\right)^2 + \frac{p_C}{\gamma} + \cancel{z_C} = \frac{1}{2g}\left(\frac{4Q_2}{\pi d^2}\right)^2 + \cancel{z_C} + H + \frac{f_2 L_2}{D_2 2g}\left(\frac{4Q_2}{\pi D_2^2}\right)^2$$

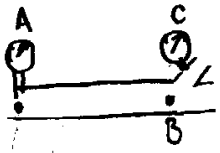
$$\frac{8Q_2^2}{g\pi^2 D_2^4} + \frac{p_C}{\gamma} = \frac{8Q_2^2}{g\pi^2 d^4} + H + \frac{f_2 L_2}{D_2 g}\frac{8Q_2^2}{\pi^2 D_2^4}$$

$$\frac{8Q_2^2}{g\pi^2}\left(\frac{1}{D_2^4} - \frac{1}{d^4} - \frac{f_2 L_2}{D_2^5}\right) = H - \frac{p_C}{\gamma}$$

$$\Rightarrow Q_2 = \sqrt{\frac{g\pi^2}{8}\frac{\left(H - p_C/\gamma\right)}{\left(\frac{1}{D_2^4} - \frac{1}{d^4} - f_2 L_2/D_2^5\right)}}$$

$$Q_2 = 19{,}2 \text{ lt/s}$$

b)



$$B_A = B_B + \Delta_{f(A-B)} - \Delta B_{Maq}$$

$$B_B = B_C = \frac{v_C^2}{2g} + \frac{p_C}{\gamma} + z_C$$

$$B_A = \frac{v_A^2}{2g} + \frac{p_A}{\gamma} + z_A \qquad z_A \approx z_C$$

$$\Rightarrow \frac{V_A^2}{2g} + \frac{p_A}{\gamma} + \cancel{z_A} = \frac{V_C^2}{2g} + \frac{p_C}{\gamma} + \cancel{z_C} + \frac{f_1 L_1}{D_1}\frac{V_1^2}{2g} - \Delta B_M$$

$$V_A = V_1 = \frac{Q_1}{\left(\frac{\pi D_1^2}{4}\right)} \qquad V_C = \frac{Q_2}{\left(\frac{\pi D_2^2}{4}\right)}$$

$$\Rightarrow \Delta B_M = \frac{8 Q_2^2}{g\pi^2 D_2^4} + \frac{p_C}{\gamma} + \frac{f_1 L_1}{D_1}\frac{8 Q_1^2}{g\pi^2 D_1^4} - \frac{p_A}{\gamma} - \frac{8 Q_1^2}{g\pi^2 D_1^4}$$

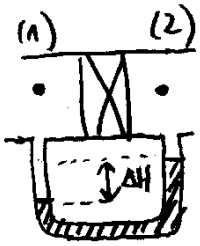
$$\Rightarrow \Delta B_M = -10{,}24\ [m]$$

corresponde a una turbina

$$\Delta B_M = \frac{P}{\gamma Q} \Rightarrow Pot = \gamma Q \Delta B_M = 3512{,}8\ [W]$$

c) Por continuidad del nodo

$$Q_1 = Q_2 + Q_3 \Rightarrow Q_3 = Q_1 - Q_2 = 15{,}8\ lt/s$$



por hidrostática

$$p_1 + \gamma \Delta H = p_2 + \gamma_m \Delta H$$

$$\Rightarrow p_1 - p_2 = \Delta H(\gamma_m - \gamma)$$

$$B_1 = B_2 + \Delta_S$$

$$B_1 = \frac{V_1^2}{2g} + \frac{p_1}{\gamma} + z_1 \qquad B_2 = \frac{V_2^2}{2g} + \frac{p_2}{\gamma} + z_1$$

$$V_1 = V_2,\ z_1 = z_2$$

$$\frac{p_1}{\gamma} = \frac{p_2}{\gamma} + \Delta_S$$

$$\Delta_S = \frac{p_1}{\gamma} - \frac{p_2}{\gamma} = \frac{p_1 - p_2}{\gamma} = \frac{\Delta H(\gamma_m - \gamma)}{\gamma} = 2{,}52\ [m]$$

$$\Delta_S = k\frac{V^2}{2g} = k\,\frac{8 Q_3^2}{g\pi^2 D_3^4}$$

$$\Rightarrow k = 62$$