

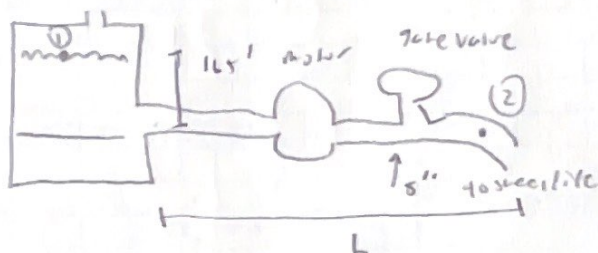
7.30

given

Water: 60°F motor = 37 hp $\rho = .6651 \frac{\text{ft}^3}{\text{s}}$
appendix $Q = 1000 \frac{\text{gal}}{\text{min}}$ ft^3/s

$$\gamma = 62.2 \frac{\text{lb}}{\text{ft}^3}, \quad \beta = 1.93 \frac{\text{slug}}{\text{ft}^3}$$

$$V = 9.15 \times 10^{-1} \frac{\text{ft}^2}{\text{s}}$$



$$Q = 1000 \frac{\text{gal}}{\text{min}} \left(.002228 \frac{\text{ft}^3}{\text{s}} \right) = 2.228 \frac{\text{ft}^3}{\text{s}}$$

$$V_2 = \frac{Q}{A_2} = \frac{2.228}{.6651} = 3.35 \frac{\text{ft}}{\text{s}}$$

$$\frac{V_2^2}{2g} = \frac{(3.35)^2}{(2)(32.2)} = .174' \quad h_2 = (z_1 - z_2) - \frac{V_2^2}{2g}$$

$$\text{Power} = \gamma Q H = \frac{(37 \text{ hp}) \left(550 \frac{\text{ft} \cdot \text{lb}}{\text{s}} \right)}{(2.228) (62.2) \frac{\text{lb}}{\text{ft}^3}} = 147'$$

$$(16.5 - 147) = .174' = 17.83'$$

7.42

given:



$$30 \text{ psig} = P_1$$

$$P_{loss} = 15.5 \frac{10^{-4} \text{ ft}}{16} = h_L$$

$$Q = 40 \frac{\text{gal}}{\text{min}} \left(1.00227 \frac{\text{m}^3}{\text{s}} \right) = .05912 \frac{\text{m}^3}{\text{s}}$$

$$\times 262.2$$

$$\text{find } h_L$$

$$h_L = (z_1 - z_2) - \frac{V_2^2}{2g}$$

$$h_L = \frac{30}{62.2} + 212 + 146.5 + 15.5$$

$$h_L = (427.86) (62.2) (.00912)$$

$$15.5 = 212 - \frac{V_2^2 - V_1^2}{2g}$$

$$-146.5 = - \frac{V_2^2 - V_1^2}{2g}$$

$$= 146.5$$

$$P_4 = (2325 \frac{10^{-4} \text{ ft}}{\text{s}}) \left(\frac{141}{550 \frac{10^{-4} \text{ ft}}{\text{s}}} \right)$$

$$= 4.2 \text{ hL}$$