

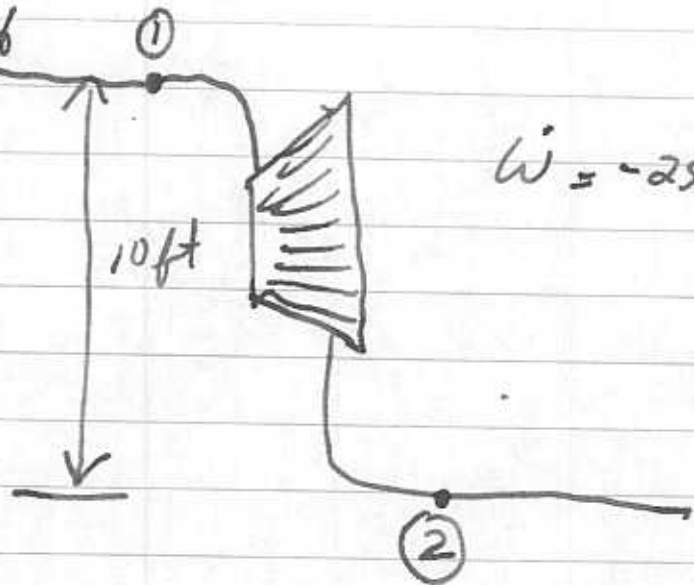
MYO 5.110 Water

$$P_1 = 60 \text{ psi} = 8640 \text{ psf}$$

$$\dot{V} = 150 \text{ ft}^3/\text{s}$$

$$d_1 = 3 \text{ ft}$$

Power Lost = ?



$$P_2 = -10 \text{ in Hg} \\ = -705 \text{ psf}$$

$$d_2 = 4 \text{ ft}$$

Extended Bernoulli Equation (Cons. of Energy)

$$\frac{P_2}{\gamma} + \frac{V_2^2}{2g} + z_2 = \frac{P_1}{\gamma} + \frac{V_1^2}{2g} + z_1 + h_s - h_L$$

$$h_L = \frac{W_{\text{lost}}}{\dot{m}g}$$

$$h_s = \frac{W_{\text{sh}}}{\dot{m}g}$$

$$V_1 = \frac{\dot{V}}{A_1} = 21.2 \text{ ft/s}$$

$$V_2 = \frac{\dot{V}}{A_2} = 11.9 \text{ ft/s}$$

$$h_s = \frac{(-2500 \text{ hp})(550 \frac{\text{ft}\cdot\text{lb}}{\text{s}}/\text{hp})}{\dot{m}g}$$

$$h_s = \frac{-1375000 \text{ ft}\cdot\text{lb/s}}{(1.94 \frac{\text{slugs}}{\text{ft}^3})(150 \frac{\text{ft}^3}{\text{s}})(32.2 \text{ ft/s}^2)}$$

MYO 5.110 continued

$$h_s = -146.7 \text{ ft}$$

$$\frac{P_2}{\gamma} + \frac{V_2^2}{2g} + z_2 = \frac{P_1}{\gamma} + \frac{V_1^2}{2g} + z_1 + h_s - h_L$$

$$\frac{-705 \text{ psf}}{62.4 \text{ lb/ft}^3} + \frac{(11.9 \text{ ft/s})^2}{2(32.2)} + 0 = \frac{9640 \text{ psf}}{62.4} + \frac{(21.2 \text{ ft/s})^2}{2(32.2)} - 146.7 \text{ ft} + 10 \text{ ft} - h_L$$

$$h_L = -17.8 \text{ ft}$$

$$h_L = \frac{\dot{W}_{\text{lost}}}{\dot{m}g} \Rightarrow \dot{W}_{\text{lost}} = 166789 \text{ ft}\cdot\text{lb/s}$$

$$\dot{W}_{\text{lost}} = 303 \text{ hp}$$