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Electrical/Electronics Engineering

ENC 214

1) Relative Density = 0.8

Inlet Diameter $d_1 = 150\text{mm} = 150 \times 10^{-3}\text{m}$

Throat Diameter $d_2 = 75\text{mm} = 75 \times 10^{-3}\text{m}$

$Q_{act} = 40\text{L/sec} = 0.04\text{m}^3/\text{sec}$

$C_d = 0.96$

$Z_2 - Z_1 = 150\text{mm} = 0.15\text{m}$

$A_1 = \frac{\pi d_1^2}{4} = \frac{\pi \times (150 \times 10^{-3})^2}{4}$

$= 0.0177\text{m}^2$

$A_2 = \frac{\pi d_2^2}{4} = \frac{\pi \times (75 \times 10^{-3})^2}{4} = 4.419 \times 10^{-3}\text{m}^2$

$= 4.419 \times 10^{-3}\text{m}^2$

$Q = C_d A_1 A_2 \sqrt{2gh}$

$\sqrt{C A_1^2 - A_2^2}$

$Q \sqrt{A_1^2 - A_2^2} = C_d A_1 A_2 \sqrt{2gh}$

$\sqrt{2gh} = \frac{Q \sqrt{C A_1^2 - A_2^2}}{C_d A_1 A_2}$

$\sqrt{2gh} = \frac{Q \sqrt{C A_1^2 - A_2^2}}{C_d A_1 A_2}$

$2gh = \left(\frac{Q \sqrt{C A_1^2 - A_2^2}}{C_d A_1 A_2} \right)^2$

$h = \frac{(0.04 \sqrt{0.0177})^2 - (4.419 \times 10^{-3})^2}{0.96 \times 0.0177 \times 4.419 \times 10^{-3}}$

2.9.81

2. Inlet d, $D_1 = 300 \text{ mm} = 300 \times 10^{-3} \text{ m}$, $A_1 = 0.0707 \text{ m}^2$
 Throat d, $D_2 = 150 \text{ mm} = 150 \times 10^{-3} \text{ m}$, $A_2 = 0.0177 \text{ m}^2$

S.p of mercury = 13.6

S.p of oil = 0.9

C.d = 0.98

Differential manometer = 250 mm = 0.25 m

$$h \left[\frac{S.p}{S.p} - 1 \right]$$

$$h = \left[\frac{13.6}{0.8} - 1 \right] y$$

$$h = (14.11) \times 0.25$$

$$h = 3.528 \text{ m}$$

$$Q = C_d A_1 A_2 \sqrt{2gh}$$

$$Q = 0.98 \times 0.7069 \times 0.0177 \times \sqrt{2 \times 9.81 \times 3.528}$$

$$Q = \frac{0.0102}{0.0689}$$

$$Q = 0.149 \text{ m}^3/\text{s}$$

$$3.528 = \left(\frac{P_1}{\rho} - \frac{P_2}{\rho} \right) - \left(\frac{P_2}{\rho} + Z_2 \right)$$

$$3.528 + \left(Z_2 - Z_1 \right) = \left(\frac{P_1}{\rho} + \frac{P_2}{\rho} \right)$$

Recall, $\bar{z}_2 - \bar{z}_1 = 300 \text{ mm} = 0.3 \text{ m}$

$$3.528 + 0.3 = \left(\frac{P_1 - P_2}{w} \right)$$

$$P_1 - P_2 = 3.828 \times w$$

Recall, $w = 9.81 \times 0.9$

$$P_1 - P_2 = 3.828 \times 9.81 \times 0.7$$

$$P_1 - P_2 = 33.79 \text{ KN/m}^2$$

$$25.0 \times (11.41) =$$

$$285.25 \text{ N}$$

$$P_{\text{total}} = 285.25 \text{ N}$$

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$$850 \times 2 \times 12 \times P_{\text{total}} \times 11.0 \times 0.9 \times 1.8 \times 10^{-3} \times 18 \times 10^{-3} =$$

$$P_{\text{total}} \times 10.0 = 285.25 \text{ N}$$

$$5019.0 = 285.25$$

$$P_{\text{total}} = 285.25 \text{ N}$$

$$2 \times 10^3 \times P_{\text{total}} = 0$$

$$\left(\frac{25}{w} + \frac{29}{w} \right) = \left(\frac{29}{w} + \frac{25}{w} \right) = 852.8$$