

1. Sub

Inlet d: $P_1 = 300 \text{ mm} = 300 \times 10^{-3} \text{ m}$; $A_1 = 0.07069 \text{ m}^2$
 Throat d: $P_2 = 150 \text{ mm} = 150 \times 10^{-3} \text{ m}$; $A_2 = 0.0177 \text{ m}^2$
 Sp of mercury = 13.6
 Sp of oil = 0.9
 $C_d = 0.98$

Differential manometer = 250 mm = 0.25 m

$$h = \left[\frac{S_m}{S_o} - 1 \right] \cdot h = \left[\frac{13.6}{0.9} - 1 \right] y$$

$$h = (13.11) \times 0.25$$

$$h = 3.278 \text{ m}$$

$$Q = C_d A_1 A_2 \sqrt{2gh} = 0.98 \times 0.07069 \times 0.0177 \times \sqrt{2 \times 9.81 \times 3.278}$$

$$Q = \frac{\sqrt{(0.07069^2 - 0.0177^2)}}{0.0684} = 0.149 \text{ m}^3/\text{s}$$

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$$0.0684$$

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$$h = \left(\frac{P_1}{\rho} + z_1 \right) - \left(\frac{P_2}{\rho} + z_2 \right)$$

$$3.278 = \left(\frac{P_1}{\rho} - \frac{P_2}{\rho} \right) + (z_1 - z_2)$$

$$3.278 + (z_2 - z_1) = \left(\frac{P_1}{\rho} - \frac{P_2}{\rho} \right)$$

$$z_2 - z_1 = 300 \text{ mm} = 0.3 \text{ m}$$

$$(3.278 + 0.3) = \left(\frac{P_1 - P_2}{\rho} \right)$$

$$3.578 = \frac{P_1 - P_2}{\rho}$$

$$(3.578 \times 9.81 \times 0.9) = P_1 - P_2$$

$$P_1 - P_2 = 32.79 \text{ kN/m}^2$$

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sol

Relative density = 0.8

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

Throat $d = 76 \text{ mm} = 76 \times 10^{-3} \text{ m}$

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

$Z_2 - Z_1 = 160 \text{ mm} = 0.15 \text{ m}$

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

$$h = \frac{Q \sqrt{(A_1^2 - A_2^2)}}{C_d A_1 A_2}$$

$$h = \frac{0.04 \times \sqrt{(0.0177)^2 - (0.0117)^2}}{0.96 \times 0.0177 \times 0.0117} = 4.25 \text{ m}$$

$$2 \times 9.81$$

$$h = \frac{(9.855)^2}{2 \times 9.81} = 83.36 - 4.2489 \approx 4.25 \text{ m}$$

$$2 \times 9.81$$

Then:

$$h = \left(\frac{P_1}{\rho_1} + Z_1 \right) - \left(\frac{P_2}{\rho_2} + Z_2 \right)$$

$$h = \left(\frac{P_1}{\rho_1} - \frac{P_2}{\rho_2} \right) + (Z_1 - Z_2)$$

$$4.25 = \left(\frac{P_1 - P_2}{\rho} \right) + (Z_1 - Z_2)$$

$$4.25 + (Z_2 - Z_1) = \frac{P_1 - P_2}{\rho}$$

$$(4.25 + 0.15) = \frac{P_1 - P_2}{\rho}$$

$$\rho(4.25 + 0.15) = P_1 - P_2$$

$$\rho = 0.8 \times 9.81 \times 1000$$

$$P_1 - P_2 = 34531.2 \text{ N/m}^2 = 34.53 \text{ kN/m}^2$$

sol

Inlet d. P.

Throat d.

Shl. & m.

Sp. of

Different

$h = \left[\frac{5 \times 10^{-3}}{4} \right]^2$

$h = \frac{4419 \times 10^{-3}}{4}$

$h = 1104.75 \times 10^{-3}$

$h = 1.10475 \text{ m}$

$Q = C_d$

$h =$

3

2