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18/ENG06/015
MECHANICAL ENGINEERING
FLUID MECHANICS
ENG 214

1.) $V_1 = 8ms^{-1}$

$V_2 = 2ms^{-1}$

P.H at smaller end = 2.5m

$$h_f = \frac{(0.33\,(v^1 - v^2))^2}{2g}$$

$L = 20m$

P.H at larger end =

$$L = z_1 - z_2 = 2g \quad \left| \; P_1/\omega + \frac{v_1^2}{2g} + z1 = P_2/\omega + \frac{v^2}{2g} = hf \right.$$

$$\frac{P_L}{\omega} = \frac{P_1}{\omega} + 1/2g\,(v_1^2 + v_2^2) + z_1 - z_2)\,hf$$

$$= 2.5 + \frac{8^2 - 2^2}{2\times 9.81} + 2 - \frac{(0.35\,(8-2))^2}{2\times 9.81}$$

$$= 2.5 + 1.0772 - 0.16055$$

$P_2 = 8.409$ bar //

Pressure at lower end $\therefore$ 8.409 bar

2.) Inlet diameter = 20cm

outlet diameter = 10cm

$P_1 = 17.698m$

4 = 30cm

(0.3m of mercury)

300m of mercury

$Cd = 0.98$

$$A_1 = \frac{\pi d^2}{4} = \frac{(\frac{20}{100})^2 \times 3.14}{4}$$

$= 0.0314m^2$

$$A_2 = \pi d^2/4 = \frac{(\frac{10}{100})^2 \times 3.14}{4}$$

$= 7.853 \times 10^{-3}$ //

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$P_1 = 17.658$

$= \frac{17.658}{1000} = 1.7658 \times 10^{-3}\ N/m$

$P_1/\omega = \frac{1.7658 \times 10^{-3}}{9.81} = 1.8 \times 10^{-4}\ m$

$P_2/\omega = 0.3 \times 13.6 = -4.08$ of H_2O

$h = P_1/\omega - P_2/\omega = 1.8 \times 10^{-4} - (-4.08)$

$h = 4.08018\ m$

$Q = Cd \frac{A_1 A_2}{\sqrt{A_1^2 A_2^2}} \times \sqrt{2gh}$

$Q = 0.98 \times \frac{0.0314 \times 7.858 \times 10^{-3}}{\sqrt{(0.0314^2) - (7.853 \times 10^{-3})^2}} \times \sqrt{2 \times 9.81 \times 4.08018\ m}$

$Q = \frac{0.000241}{0.0304} \times 8.947$ ≈ 0.

$Q = 0.0709\ m^3/s$

$D_1 = 18cm$

$D_2 = 30cm$

500m of mercury = 0.5m

S.G = 0.9 Cd = 0.64

a = ?

$A_1 = \frac{\pi d^2}{4} = \frac{(18/100)^2 \times 3.14}{4} = 0.0176m^2$

$A_2 = \frac{\pi d^2}{4} = \frac{(30/100)^2 \times 3.14}{4} = 0.0706m^2$

$h = [13.6/0.4 - 1]$

$h = 0.8[13.6/0.9 - 1]$

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$= 7.05m$

$$Q = Cd \frac{A_1 A_2}{\sqrt{A_1^2 A_2^2}} \times \sqrt{2gh}$$

$$Q = \frac{0.64 \times 0.0176 \times 0.0706}{\sqrt{(0.0706)^2 - (0.0706)^2}} \times \sqrt{2 \times 9.81 \times 7.05}$$

$$Q = \frac{35 \times 10^{-3}}{40.12}$$

$$Q = 2.33 \times 10^{-3} m^3 s^{-1}$$

4) $A \times 13 = 13m$

170mm of mercury (0.17m)

S.G of mercury (13.6)

S.G of Sea water 1.026

V = ?

$$h = g\left[\frac{\text{S.G of m}}{\text{S.G of water}} - 1\right]$$

$$h = = 0.17\left[\frac{13.6}{1.026} - \right]$$

$$h = 2.083m$$

$$V = \sqrt{2gh}$$

$$V = \sqrt{2 \times 9.81 \times 2.083}$$

$$V = 6.39 ms^{-1}$$

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