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18/ENG06/028
ENG 214
Fluid mechanics

1 $V_1 = 5ms^{-1}$ $V_2 = 2ms^{-1}$
P Hg smaller end = 2.5m
$h_f = \frac{(0.85(V_1^2 - V_2^2)^2)}{2g}$ $L = 2.0m$
Phat lower end
$L = Z_1 - Z_2 = 2y$

$$\frac{P_1}{w} + \frac{V_1^2}{2g} + Z_1 = \frac{P_2}{w} + \frac{V_2^2}{2g} + Z_2 + h_f$$

$$\frac{P_2}{w} = \frac{P_1}{w} + \frac{1}{2g}(V_1^2 + V_2^2) + (Z_1 - Z_2)h_f$$

$$= 2.3 + \frac{5^2 - 2^2}{2 \times 9.81} + \frac{2(0.35(5-2)^2}{2 \times 9.81}$$

$$= 2.5 + 1.07 + 2 - 0.16$$

Pressure @ 10 m end 5.90%

2 Inlet diameter = 200m
Infront diameter = 100m
$P_1 = 17.658$
$T = 300m$ of mercury $\rho = 0.98$
$A_1 = \frac{\pi d^2}{4} = \frac{\left(\frac{20}{100}\right)^2 \times 3.140}{4} = 0.0314m$

$A_2 = \frac{\pi d^2}{4} = \frac{\left(\frac{10}{100}\right)^2 \times 3.142}{4} = 7.838 \times 10^{-3} m$

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

$$\frac{P_2}{w} = 0.3 \times 13.6 = 4.08 \text{ of } H_2O$$

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

$$h = 4.08018 m$$

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

$$Q = 0.98 \times \frac{0.0314 \times 7.853 \times 10^{-3}}{\sqrt{(0.0314)^2 - (7.85310^{-8})^2}} \times \sqrt{2 \times 9.8 \times 9.08018}$$

$$Q = \frac{0.000241}{0.0304} \times 8.947$$

$$Q = 0.0768 m^3/s$$

3 $\Delta_1 = 15cm$ $\Delta_2 = 30cm$

500m of mecury = 0.5m $Q = ?$

$S.G = 0.9$ $Cd = 0.64$

$$A_1 = \frac{\pi d^2}{4} = \frac{(15/100)^2 \times 3.14}{4} = 0.0176 mq$$

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

$h = \pi\left(\frac{13.6}{0.8} - 1\right)$

$h = 0.5\left[\frac{13.6}{0.9} - 2\right]$

$= 7.05\,m$

$Q = \frac{Cd - A_1A_2}{\sqrt{A_1A_2}} \times \sqrt{2g \cdot G}$

$Q = \frac{0.64 \times 0.0176(0.070) \times \sqrt{2 \cdot 9.81 \times 7.05}}{\sqrt{(0.0706)^2 - (0.070)^2}}$

$Q = \frac{9.35 \times 0^{-3}}{40.112}$

4 $A = \pi \cdot A \times 13 = 13m$

170mm of mecury (0.17m)

SG of mecury = (63.6)

SG of sea water = (1.026 $v =]$

$h = \sqrt{\left(\frac{SH}{J} - 1\right)}$

$h = 0.17\left[\frac{13.6}{1.026} - \#1\right]$

$h = 0\ 2.083m$

$V = \sqrt{2gh}$

$V = \sqrt{2 \times 9.81 \times 2.0083}$

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

5 $0.65\,m^3/mm$ 1700upm 15Nmq

15bar $10cm^3$ pav