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18/ENG07/1035
ENG 214

FLUID MECHANICS

1 $w = 0.8$

$d_1 = 150mm = 0.15m$

$d_2 = 75m = 0.075m$

$Q = 10l/s = 4 \times 10^{-5} m^3/s$

$C_d = 0.96$

$A_1 = \frac{\pi \times 0.15^2}{4} = 1.767 \times 10^{-2} m^2$

$A_{n2} = \frac{\pi \times 0.025^2}{4} = 4.918 \times 10^{-3} m^2$

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

$4.0 \times 10^{-2} = \frac{0.96 \times 1.767 \times 10^{-3} \times 4.918 \times 10^{-3} \times \sqrt{2 \times 9.8 h}}{\sqrt{(1.96 \times 10^{-2})^2 - (4.918 \times 10^{-3})^2}}$

$4.0 \times 10^{-2} = \frac{0.96 \times 7.826 \times 10^{-5} \times \sqrt{19.6h}}{\sqrt{(1.767 \times 10^{-2})^2 - (4.918 \times 10^{-3})^2}}$

$4.0 \times 10^{-2} = 0.96 \times 4.56 \times 10^{-3} \times 4.428 \times 10^{-3}$

$\sqrt{h} = \frac{4.0 \times 10^{-2}}{4.38 \times 10^{-3} \times 4.428}$

$h = \left[\frac{4.0 \times 10^{-2}}{4.38 \times 10^{-3} \times 4.428}\right]^2$

$h = 4.25m$

Recall

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

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

$4.25 = \left(\frac{P_1 - P_2}{w}\right) + (0 - 0.16)$

$4.25 + 0.15 = \frac{P_1 - P_2}{w}$

$4.4 \times 0.8 \times 1000 \times 9.81 = 34.5$

2 $d = 0.3m$

$d_2 = 0.16m$

guage reading $= 0.25m$

$Z_2 = 0.3m$

$A_1 = \frac{\pi \times 0.3^2}{4} = 0.07m^2$

$A_2 = \pi \times 0.16 = 0.86$

$Q = 0.198 m^3/s$

find the pressure diff

$h = \left(\frac{P_1}{w} + Z\right) - \left(\frac{P_2}{w} + Z_2\right)$

$3.53 = \left(\frac{P_1}{w} + \frac{P_2}{w}\right) + (Z_1 - Z_2)$

$= 33.8 KN/m^2$