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As we learned in class, Bernoulli's equation is used for almost everything in fluids. As we worked through the problems, we saw that Bernoulli's could be changed around to help find what was needed, and that most equations are actually hidden inside the equation. For example, in the first problem, dealt with pressure in a pipe varying with the diameter of the pipe. This is what brought to reality that Volume could be changed for the Q & A components in place. This was a huge learning moment for us doing the homework.

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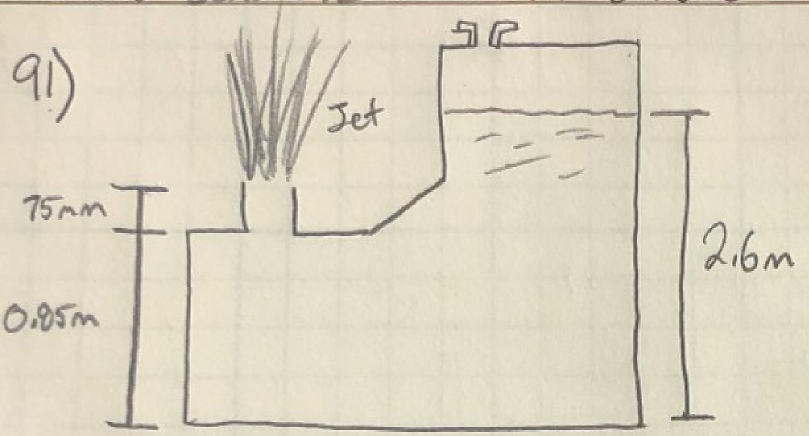

$h_1 = 0.075\ m$

$h_2 = 0.85\ m$

$h = 2.6\ m$

$h_j = h - (h_1 + h_2)$

$h_j = 2.6m - (0.075m + 0.85m)$

$\boxed{h_j = 1.675m}$

Ch6. problem 79

$$\frac{\pi D_B^2}{4} V_B = \frac{\pi D_A^2}{4} V_A$$

$$V_B = \left(\frac{D_A}{D_B}\right)^2 V_A$$

$D_A = 4\,in$ $\quad$ $D_B = 2\,in$

$$V_B = \left(\frac{4}{2}\right)^2 V_A = 4V_A$$

$P_1 = P_2$

$$\gamma_o = Sg \times \gamma$$
$$.9 \times 62.4 = 56.16\,lb/ft^3$$
$$\gamma_{HG} = Sg_{Hg} \times \gamma = 13.54 \times 62.4 = 844.896\,lb/ft^3$$

$$h = 28\left(\frac{1}{12}\right)$$
$$P_A - P_B = 56.16\left(z_B - z_A - 28\left(\frac{1}{12}\right)\right) + 844.896 \times 28 \times \frac{1}{12}$$
$$P_A - P_B = 56.16(z_B - z_A) + 1640.38$$
$$\frac{P_A}{\gamma_o} + \frac{V_A^2}{2g} + z_A = \frac{P_B}{\gamma_o} + \frac{V_B^2}{2g} + z_B$$
$$\frac{[56.16(z_B - z_A) + 1640.38] + 56.16(z_A - z_B)}{56.16} = 11.86\,ft/s$$

$Q = A_A V_A$

$$Q = \left(\frac{\pi \times \left(\frac{4}{12}\right)^2}{4}\right) 11.86 = \boxed{1.035\,ft^3/s}$$

Chapter 6 Problem 6.82

Given;

Specific weight of oil, $\gamma_{oil} = 55\ lb/ft^3$

Diameter of pipe at A, $D_A = 4\ in$

Diameter of pipe at B, $D_B = 2\ in$

Solution,

Pressure at point 1

$P_1 = P_A + \gamma_o h_1$

$P_1 = P_A + (55)(1.17)$

$= P_A + 64.35 \ lb/ft^2$

$P_2 = P_1$

$= P_A + 64.35 \ lb/ft^2$

$P_3 = P_2 - \gamma_w h_2$

$P_3 = P_A + 64.35 - (62.4)(0.67)$

$P_A + 22.54 \ lb/ft^2$

$P_B = P_A + 22.54 - (55)(2.5)$

$= P_A - 114.96 \ lb/ft^2$

$V_A = \sqrt{\left(\frac{2 \times 32.2}{15}\right)\left(\frac{114.96}{55} + (0.2)\right)}$

$= 0.621 \ ft/s$

$A_A = \frac{\pi D_A^2}{4}$

$A = \frac{\pi (0.33)^2}{4}$

$= 0.086 ft^2$

$Q = AV$

$Q = 0.086 \times 0.621$

$= 0.053 \ ft^3/s$

$\therefore$ Volume flow Rate of Oil

is $Q = 0.053 \ ft^3/s$