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MET 330

Dr. Ayala

September 23, 2021

HW #1.3

Devon Moore: Looking through the solved problems for Bernoulli's equation I learned how to change the standard form of the equation using algebra to solve for the unknown variable. I also learned it Is important to place the reference point at a spot that has the most known values and solve for the point that is unknown. The slides also explained the importance of substituting unknown variables such as velocity, in the first example, for a relationship that is known. The example problems also show when it is acceptable to drop variables that are not needed such as velocity in a large tank that is assumed to be still or pressure when it is atmospheric for both points. The slides also explained where and how to find parameters for known pipes in the appendix of the textbook. How to find the power of a pump was also explained in the slides, showing how to solve for h_A and plug that value in to a formula with volumetric flow rate and specific weight of the fluid. Pump efficiency was also introduced to determine the power of a pump that is not 100% efficient which is more realistic.

David Buonconsiglio: So far in this course, I have learned that it is possible to solve things without calculus, and that if you get the equations right, that excel can be your best friend. I also learned that variables can be dropped as needed according to the information available, and the data required, such as in Bernoulli's equation when solving for a system. This does have to be done with caution, as you don't want to drop a necessary variable, and you must make sure the data for the reference point is valid. Picking a reference point is extremely important in solving these systems, as are drawings that let you see the system in question. I particularly enjoyed the shopping center set-up that was given to us, and how we can pick and choose our equations based on need. The majority of the data we will need is either given in the problem, or found in the book in the appendixes, and if not, it is available on-line with a little google-fu. I am looking forward to the next steps and what I will learn going forward. This class has been an eye-opening experience, especially in trying to figure out how to use Bernoulli's equation in the problems in the homework. I hope to maintain my high level of readiness and attain an A in this course.

Richard Harrell: During this class so far, I have learn that Solving Problems in are not just knowing the equations "plug and Chug". This mean that I can you use basic Algebra to simplify Bernoulli's Equation to solver for the unknown. This means I can drop variables that are not needed. An example of this would be dropping Velocity when the is no motion and the pressure is Atmospheric at all points. Also learned that when solving a system problem I should not start every equation the same. Instead I should start solving at the lowest point with the most known Values.

Traveon Williams:

79.

Oil with a specific gravity of 0.90 is flowing downward through the venturi meter shown in the figure. If the manometer deflection h is 28 in, calculate the volume flow rate of oil

Formulae: $Q=Av$ ft^3/s

$A_B v_B = A_A v_A$

$$\frac{\pi D_B^2}{4} v_B = \frac{\pi D_A^2}{4} A$$

$$v_B = (\frac{D_A}{D_B})^2 v_A$$

$P_A + \gamma_o z_A = P_B + \gamma_o *(z_B - h) + \gamma_{Hg} *h$

$P_A - P_B = \gamma_o (z_B - z_A - h) + \gamma_{Hg}\, h$

$\gamma = sg*\gamma_{water}$

$$\frac{P_A}{\gamma_o} + \frac{v_A^2}{2g} + z_A = \frac{P_B}{\gamma_o} + \frac{v_B^2}{2g} + z_B \rightarrow \frac{P_A - P_B + \gamma_o(z_A - z_B)}{\gamma_o} = \frac{v_A^2 - v_B^2}{2g}$$

$$inch\ to\ foot = \frac{1\ ft}{12\ inches}$$

Data:	γ_{water}	62.4 lb_f/ft^3
	g	32.2 ft/s^2

Solve:	h	2.333333 ft
	γ_o	56.16 lb_f/ft^3
	γHg	844.896 lb_f/ft^3

$$v_B = (\frac{4}{2})^2 \rightarrow 4v_A$$

$P_A - P_B = 56.16\,(z_B - z_A - 2.333) + 844.896*2.333$

56.16*2.333	131.04
844.869*2.33	1971.424
1971-131	1840.384

$P_A - P_B = 56.16\,(z_B - z_A) + 1840.38$

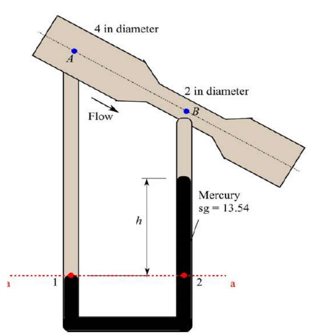
$$\frac{[(56.16(z_B - z_A) + 1840.38] + 56.16(z_A - z_B)}{56.16} = \frac{(4v_A)^2 - v_A^2}{2*32.2}$$

$$\frac{1840.38}{56.16} = \frac{15v_A^2}{64.4} \rightarrow 1840.38*64.4 = 56.16*15v_A^2$$

1840.38*64.4	118520.5
56.16*15	842.4

$118520.5 = 842.4v_A^2$

v_A^2	140.6938
v_A	11.86144 ft/s



$$Q = \left(\frac{\pi D_A^2}{4}\right) * v_A \rightarrow Q = \left(\frac{\pi \left(\frac{4}{12}\right)^2}{4}\right) * 11.86$$

Q 1.03498 ft^3/s

$Q=1.035\ ft^3/s$

89.

Oil with a specific weight of 55.0 lb/ft^3 flows from A to B through the system shown in the figure. Calculate the volume flow rate of the oil

Given: γ_o 55 lb/ft^3

Schedule 40 pipe

z_A-z_B -24 in

Formulae: $$\frac{P_A}{\gamma_o}+\frac{v_A^2}{2g}+z_A=\frac{P_B}{\gamma_o}+\frac{v_B^2}{2g}+z_B$$

$$\frac{P_A}{\gamma_o}+\frac{v_A^2}{2g}+z_A=\frac{P_B}{\gamma_o}+\frac{v_B^2}{2g}+z_B \rightarrow \frac{16v_A^2-v_A^2}{2g}=\frac{P_A-P_B}{\gamma_o}+(z_A-z_B)$$

$Q=A_A v_A$

$A_A v_A = A_B v_B$

$$A=\frac{\pi D^2}{4}$$

Data:

g	32.2	ft/s^2	
D_A	4	inches	0.333333 ft
D_B	2	inches	
γ_{water}	62.4	lb/ft^3	

Solve:

A_A 12.56637 in^2

A_B 3.141593 in^2

$12.7v_A$=$3.6v_B$

v_B 4 v_A 16

$$\frac{16v_A^2-v_A^2}{2g}=\frac{P_A-P_B}{\gamma_o}+(z_A-z_B) \rightarrow v_A^2=\left(\frac{2g}{15}\right)\left[\frac{P_A-P_B}{\gamma_o}+(z_A-z_B)\right]$$

$$v_A=\sqrt{\left(\left(\frac{2g}{15}\right)\left[\frac{P_A-P_B}{\gamma_o}+(z_A-z_B)\right]\right)}$$

p_1=p_A+$\gamma_o h_1$

h_1 1.166667 1.17 ft

$\gamma_o h_1$ 64.35

p_1=p_A+64.35 lb/ft^2

p_2=p_1

p_2=p_A+64.35 lb/ft^2

p_3=p_2-$\gamma_{water} h_2$

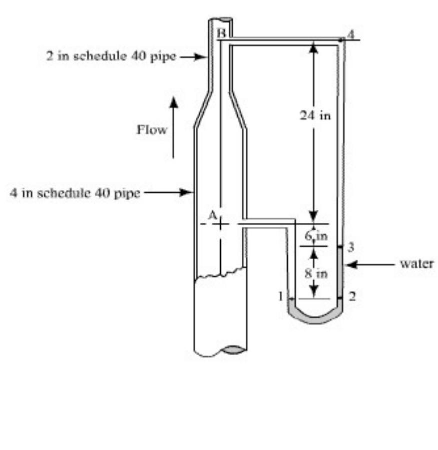
h_2 0.666667

$\gamma_{water} h_2$ 41.808 lb/ft^2

64.35-41.808 22.542

p_3=p_A+22.54 lb/ft^2

p_B=p_3-$\gamma_o h_3$



h_2 0.666667

$\gamma_{water}h_2$ 41.808 lb/ft^2

64.35-41.808 22.542

$p_3=p_A+22.54\ lb/ft^2$

$p_B=p_3-\gamma_o h_3$

h_3 2.5

$\gamma_o h_3$ 137.5

$p_B=p_A+22.54-137.5$ -114.96

$p_B=p_A-114.96\ lb/ft^2$

$$v_A = \sqrt{((\frac{64.4}{15})[\frac{114.96}{55}+(0-2))}$$

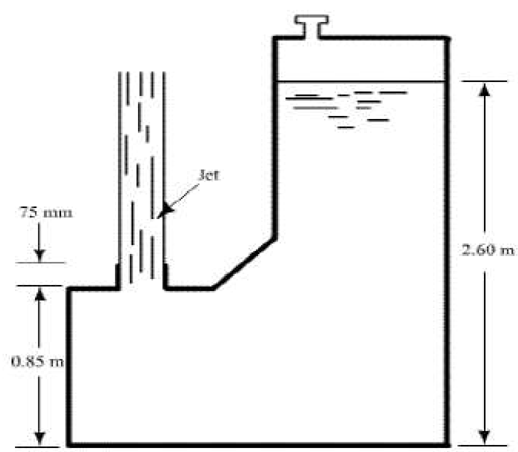
v_A	4.293333	Q=Av	
	2.090182	Q=0.086*0.621	
	0.090182	Q	0.053406 ft^3/s
	0.621369 ft/s	Q=0.053 ft^3/s	

$$A_A = \frac{\pi 0.33^2}{4}$$

A_A 0.08553 ft^2

91.

To what height will the jet of fluid for the conditions shown in the figure?



Given:		
	h	2.6 m
	h_1	0.85 m
	h_2	0.075 m

Formulae: $h_j=h-(h_1+h_2)$

Solve:			
	h_j	1.675	m