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MET 330

Fluid Mechanics

Test 3 Reflection

Upon reviewing the solution for test 3 and comparing with my own work, I have identified a few areas of improvement along with mistakes. For part A of the test, one of the key components of the problem statement, was to identify all energy losses through the system from the entrance to the end of the "top branch / branch 1", while establishing how a pump power was to be determined for the system. One major component needed was to be able to identify all energy losses through the system. When comparing my answer to the solution, I was close to the overall hL of the solution throughout the system. Once the energy losses were calculated, the remainder of the problem was pretty simple, as I used methods identified and worked through within practice problems/examples. I knew hA of the system needed to be calculated and identified through Bernoulli's. As the problem statements was to find pump efficiency, PA also needed to be established with the use of hA(gamma)Q. These were all equations used throughout examples and class lectures. There were two portions of the system that had me wondering was "turbulence" and water within the 1" pipe run up to the closed valve. I would figure that turbulence would be present but was not too sure on how It would impact the system. Also how did the water react within the 1" pipe run? I imagine water was still present up to the 1" valve but did it provide any resistance at all within the system for the pump. As for the overall solution, I was about 1hp too high as the solution was at 6hp where I was at 7hp. I looked through the calculations to see where my error could have been but I'm not too sure, I appears everything was on par with the solution but maybe it was a rounding error. Overall part A of the test was fairly straight forward and nothing out the normal that wasn't not previously seen.

As I reviewed the solution for part B, this is where the fun started. I knew that I had to use what was known in part A with the energy losses throughout the system but was not too sure how pump head would then carry through in developing equations. I also knew that branch 2 energy losses had to be established. My approach was to use the energy losses up to the "tee" at point A and add on the remaining components within branch 2. At first, I relied too much on the example problems and tried to establish a pressure at point "A", as I thought it was needed. Once the pressure was calculated, I was unsure how that would be possible with the already added pump head value. I also thought that "Q" had to add up to be the 275 but I was also looking for that set Q value within each branch for conservation of mass to be accounted for. I continued through this route for branch 2 as we'll and I was just stumped on where to go from there as I was trying to establish the correct equations will finding set Q for each branch. I then scratched that approach of setting a pressure at "A" as it was confusing me more and I shifted then to just having my points at the tank/system end. I went through establishing energy losses in the system with the reference points that provided the most information. Originally when I setup my Bernoulli's equation and when everything canceled out I was thrown off. I just didn't understand how nothing but the energy losses, pump head and delta z was going to provided me information. I spent a lot of time just making sure if what I was doing was correct as I had always thought a pressure needed to be present. I then just said I'm going to go with I got and see what happens. I next laid out my energy losses across the system and started to organize everything to make sure I was accounting for each component. I knew that organization was going to be the key when laying out these equations. I knew Q is what was looking for, due to establishing conservation of mass and once I broke down each equation to establish "Q", I thought to myself, geezuz there's a lot of stuff here and just simplifying each equation was going to be a challenge. I knew I was looking for Q and thought I had removed it from the equation as a constant but

when reviewing the solution, I saw that my approach was off but kind of close, as I was trying to make something work with Bernoulli's PA/GammaQ. Regardless I spent a lot of time looking and reworking equation and energy losses until I thought I was on the correct track. Once I calculated for Q in each branch, I was led to the conservation of mass equation were adding both values per branch gave me a relatively close value of 285 compared to the original 275. At this point I thought I was on the correct track but I was worn out and mentally drained. I attempted to work the excel for iterations but this was my weakest point. I knew I had to work in the realm but I did not practice enough with it. Overall, once getting to the point of iteration, I just used the set "k" values of the gate valve in branch 2, to find the total energy losses as a guide to see the difference, but even then, I think I set something incorrectly.

Test 3 really tested my patience and problem-solving skills while applying them to new concepts. Overall, the "fluids mechanics" portion of the test wasn't not too bad, there was a hefty portion utilizing organization, math concepts and excel. The test really made someone think about how the pump effects the system and how to organize thoughts on what was happening per branch, while making one think "how is this all being effected?". The tasks for part A & B were simple putting things into a real word perspective of what engineers as a whole would need to account for throughout designs of various fluid systems. Applying the methods of calculating energy losses in a system from all test and identifying how a valve and pump effect a system, was something that I was not sure on how it impacts a system during normal daily operations. Such as in previous test material, the class/homework problems, were used to solve minor isolated areas of concerns for practice. Seeing that within the piping systems that even though they might look simple, there's a lot to take account for when working through how everything correlates with each other. Part A of the test was pretty straight forward and was something that is seen throughout many aspects. I had never really thought, how would a pump interact within various system configurations. Part B of the test was something new with utilizing iteration but the other concepts were pretty much on par with what has been previously work, just taken down a level further with the energy losses. Utilizing excel is also something that I would need A LOT more practice and help in, as it was my greatest weak point with the test.

Practicing these types of problems would help me progress more for identifying how more complex fluid systems would work. I do still continue to see where engineers would use the same concepts of identifying forces, energy losses and design requirements of multiple systems throughout the industry. Similar design aspects are seen throughout my current career as a Modeling and Simulation Engineer, as I work alongside with many other engineering concentration/professionals. Although I myself am not an engineer that focuses on fluid or mechanical movements, I still do interact with professionals within the field and understanding their concepts is beneficial. Though I'm not sure I would use these specific skills/methods in conducting calculations in my current field of work, I still do interact with many persons whom strictly work similar piping systems and design efforts on complex systems. Once again being able to identify key features for various systems is a skillset to be developed but one that would definitely carry onto all aspects of my career, as I deal with various customers for various project types. The use of the information tested upon I do believe would benefit me with understanding system requirements and needs for various customers within Newport News Shipbuilding. Working with various tradesmen and understanding specific concerns is something I must be accustomed to. Being able to understand areas of concern/focal points and what exactly is taking into to place with items such as energy loss/required, is important on various ship systems.

There were concepts that were tested and reviewed in this test/material that not only do carry onto my professional career but also into my lab portion of fluid mechanics. I believe one area I was most successful on would be the first half of the test, in regards to identifying components and energy losses needed for established power to the required pump. Once again as in previous test, I did reference the book and course lectures/notes for what I thought were the proper equations/methods but, being able to

use resources in not just a key factor. I have found out on this test just as test 1 & 2, that practice makes perfect.

As for conducting the test, I spent about 1 hour reviewing the text source for the pretest requirements. I spent about roughly 10-12 hours combined on the test. Roughly 3 hours was spent on part A. I then started part B with establishing equations and organizing my information on my spread sheet. I did take time between test to go back and review sources and also to address work/family obligations. This test just as previous test provided me good insight on how the fluid mechanics principles are being identified and addressed within my current employment. As I have been exposed to many types of engineering principles / areas of concentrations, fluid mechanics has been the most involved, that I have experienced thus far. I do have a new found respect for those whom tackle situations and problems on a daily basis professionally, as this semester has outlined for us some concepts that I had not ever taken into consideration.

WRITING RUBRIC

1.	Purpose	1.0/10.0
2.	Drawings	1.0/10.0
3.	Sources	1.0/10.0
4.	Design considerations	1.0/10.0
5.	Data and variables	1.0/10.0
6.	Procedure	1.0/10.0
7.	Calculations	1.0/10.0
8.	Summary	1.0/10.0
9.	Materials	1.0/10.0
10.	Analysis	5/10.0
	TOTAL	9.5/10.0

FINAL GRADE: **(90/2)*(4.5/5 + 3/7) = 58**

1. PUMP HEAD
    a. Initial setup – labeling, reference, points .9 out of 1
    b. Appropriate use of Bernoulli's to solve for hA 1 out of 1
    c. Compute all 11 energy losses .9 out of 1
    d. Compute pump power .8 out of 1
    e. Correct final results .9 out of 1

1. TOTAL FLOW RATE AFTER OPENING VALVE
    a. Setting up the equations (2 eq from Bernoulli) 1.5 out of 2
    b. Consider ALL energy losses in each branch 1 out of 1
    c. Setting up the iteration process 0 out of 1
    d. Solving the equations using excel 0 out of 1
    e. Tried all valve opening cases 0 out of 1
    f. Correct final results 0 out of 1