Solution grade: 100 (original grade was 87.5)

I may not have realized that the solution was in terms of diameters, not radii. Having the solutions in terms of diameters is acceptable, but was not noted very clearly. The answers might be a little bit off from what I had and what most groups had (mdot coolant was a tad low, optimal UA was a little high) but it will work.

Report grade: 80 (original grade was 70)

-5 for not discussing how you obtained numbers (i.e. Nu) for the solution.

* While there is enough discussion to determine what you did for the coolant, there’s hardly any discussion about what you did with the solution other than figuring out q.

-5 for stating that cost is a constraint.

* While the goal of the project is to minimize cost, there was no real budget given and therefore cost is not an actual constraint. The constraints were more technical in nature, such as the inlet and outlet temperatures, pipe material, radii, etc.

-10 for not specifying whether the equation used for the log mean temperature difference equation shown is for a parallel or counterflow design.

* You used these equations correctly in your Matlab code and so this was taken off from the report section, not approach. Need to be more specific.
* In general, while equations were laid out clearly, the approach section lacked details that would have helped to figure out whether the coolant or the solution was being discussed, whether you were using an approach for parallel or counterflow, or even what the differences were between parallel or counterflow. Also, numbers were plugged into the part talking about equations you used, but it was not described how these numbers were obtained. In light of this, -10 points was considered to be fair.

Additionally, you did not have any details regarding the best heat exchanger in your report (i.e. what ID did you get? How much did it cost?)

Bureau

Approach grade: 85 (unchanged from original grade)

-10 for not verifying that the Nu correlation is valid for solution with the Re numbers observed

* The correlation used is for a Re of ~> 10,000. For some of the radii used, the solution will not have a Re that meets this criterion. Some groups may have argued the point that they recognized this and chose to use it anyway due to it being close/a good approximation, in which case points were not taken off. However, use of this correlation at least needed written justification.

-5 for the answer to the question of what to improve.

* Many students gave the answer of changing the tubing material, however 5 points were taken off from all of them because you can’t necessarily do this, depending on the actual conditions of the plant. These exact conditions were not given to you! This is a very real situation that comes up in industry as well, as different engineering groups within companies frequently argue about what kind of material can be selected to make a design as robust as possible and what kinds of material should be used to make things cheaper. The answer we were going for had more to do with the principles that were introduced in class, namely that fins may be added to improve heat transfer or induce turbulence in the solution to get a much higher heat transfer coefficient, and therefore a much shorter length. Keep in mind, the solution does not have a very high Re! Also, the coolant used (air at 1 atm) is a particularly bad choice, and so changing it was an acceptable answer. Other creative answers were also accepted if they were adequate.