Task 12: Fittings and Minor Losses for Channel Supply Line

Purpose: To provide a list of all fittings required for the pipe system that runs from the tank to the channel. Then, using the same pipe diameter and flow rate, calculate the new pressure above the water in the tank.

Drawings and Diagrams:

Sources:

* Mott, Robert L. and Untener, Joseph A. “Applied Fluid Mechanics”, 7th edition Pearson Education, Inc. (2015)
* [www.engineeringtoolbox.com](http://www.engineeringtoolbox.com)

Design Considerations:

The design considerations are the same as Task #3 with the exception of adding the following: “The air pressure above the water in the tank must be high enough to force the water downward and through the pipe at the correct flow rate while accounting for all minor losses in the pipe system, but not so high that the structural integrity of the tank is jeopardized. The entrance was assumed to be a square-edged inlet from the tank to the pipe.”

Data and Variables:

Same as Task #3 with the addition of:

Kent = Resistance Coefficient of Pipe Entrance from Tank (0.5)

Procedure:

Additions to Task #3

“The energy loss in the pipe was determined, …, roughness, dynamic viscosity, and the resistance coefficient of the pipe entrance.”

Calculations:

Summary:

The friction loss in the pipe had previously been considered in Task #3, so the only additional energy loss associated with the pipe system is the entrance of the water from the tank into the pipe. The pressure now required to satisfy the requirements of the system is 9.00 psig. This is an increase of approximately 1.6 psig (~21%) from the original calculation. This large of an increase is surprising based on the fact that the water has to enter the pipe in some way and it would not be expected to create that much of an impact.

Materials:

No additional materials are required for this task.

Analysis:

Based on the size of the tank, 9.00 psig is a very large amount pf pressure. As the water goes out of the tank and this pressure remains constant, the tank walls will be under a great deal of pressure from the air. Thus, it will be important to keep a constant flow of water into the tank to maintain this pressure on the tank at a lower value. Obviously, the design requires it to operate for one (1) hour without power, however, it would not be recommended to run the system without water flowing into the tank regularly.