

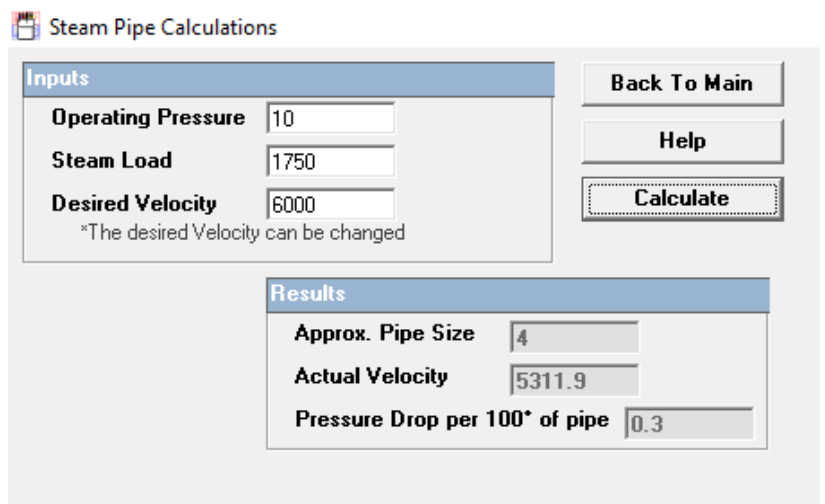
Monday, February 3, 2017

Steam Pipe Sizing: Steam Heat Exchangers Basics (Part 5)

Steam pipe sizing is easy with today’s sizing programs. What is behind the programs? This question and others like it are answered in the R L. Deppmann Monday Morning Minutes.

Steam pipe sizing is easy with today’s sizing programs. What is behind the programs? Whether the steam pipe is for a steam heat exchanger or just the main piping, this question and more are answered in the R L. Deppmann Monday Morning Minutes.

When selecting steam pipe sizes, the engineer or contractor is asked to fill in the capacity, the steam pressure, and the velocity required. The answer is a pipe size and a pressure drop per 100 feet of pipe. Let’s look at this required data. The capacity is simply the maximum flow rate in pounds per hour or PPH.



Inputs	
Operating Pressure	10
Steam Load	1750
Desired Velocity	6000
*The desired Velocity can be changed	

Results	
Approx. Pipe Size	4
Actual Velocity	5311.9
Pressure Drop per 100* of pipe	0.3

Steam Pressure and Pipe Sizing

The steam pressure is the expected MINIMUM steam pressure. The engineer is required to make sure that all equipment including the pipe can handle the MAXIMUM steam pressure the system will see. When selecting the pipe, make sure we look at the minimum pressure. Steam volume is greater at lower pressure.

For example, let’s assume the steam heating system is low pressure, which means it is 15 PSIG or less. The boiler may have a 15 PSIG pressure relief valve and it is possible that the pressure in the system could rise to almost 15 PSIG before the valve opened. The components must be able to withstand 15 PSIG.

Most 15 PSIG systems are not operated anywhere close to 15 PSIG. Let's assume for a moment that the system operates at 5 PSIG. Well, 5 PSIG steam has a volume of 20 Cu. Ft. /Lb. and 15 PSIG is less at 14 Cu. Ft. /Lb. If we sized the pipe on 15 PSIG, it will have a higher velocity and pressure drop when the actual steam has 33% more volume than expected. Size the pipe on the minimum pressure expected when operating at the design flow.

What Steam Velocity Should I Use For Pipe Sizing?

Many programs have an input cell for the velocity required but do not offer any guidance. Hoffman, a Bell and Gossett brand, offers the following suggestions. In building heating systems we recommend selecting the pipe on 4000 to 6000 feet per minute (FPM). This is a good range to keep pressure drop down as well as minimizing velocity noise in the pipe. In process applications, we use 8000 to 12000 FPM. This is normally in a plant where the velocity noise may not be such an issue. Pressure drop should always be checked.

Once the pipe size solution is offered by the program, the engineer will check the pressure drop per 100 feet to make sure it provides the correct pressure to the equipment. Let's look at an example: **PROBLEM:** What steam pipe size do I need for 4300 PPH of steam at 60 PSIG minimum pressure in a medical office building. **SOLUTION:** Since this is a medical office building we will shoot for a velocity of 4000 to 6000 FPM. Using the Hoffman selection program, we get the following solution.

The engineer selects a 4" steam pipe size with a velocity of 4700 FPM and a pressure drop of 0.7 PSIG per 100 feet.

Next week the R. L. Deppmann Monday Morning Minutes will look at sizing condensate pipe.

Inputs	
Operating Pressure	60
Steam Load	4300
Desired Velocity	6000
*The desired Velocity can be changed	

Results	
Approx. Pipe Size	4
Actual Velocity	4693.9
Pressure Drop per 100* of pipe	0.7

Buttons: Back To Main, Help, Calculate