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Monday, December 21, 2020

Net Positive Suction Head (NPSH) Part 3 of 5 –NPSH Available

Monday Morning Minutes | by Norm Hall, December 21, 2020

The available cooling tower pump NPSH or net positive suction head is a function of the pan elevation, friction, and temperature. Sometimes the combination of these things will hurt you. Today, the R. L. Deppmann Monday Morning Minutes looks at calculating the available pressure at the pump.

This article will start by looking at the formula for calculating the available NPSH for an open or closed system during design. Then we will show you an easy method using the Bell & Gossett System Syzer calculator.

$$NPSHA = HA \pm HZ - HF - HVP$$

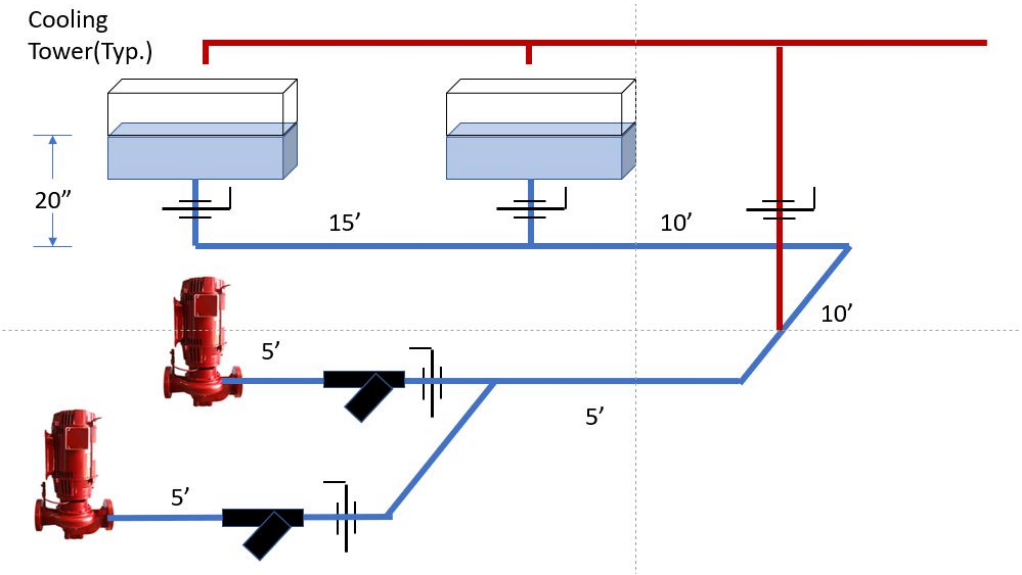
Net Positive Suction Head Available Formula

- **HA** is the available **absolute** pressure **in feet** at the tower or condensate water surface or, in a closed hydronic system, the expansion tank pressure.

- **HZ** is the elevation of the water surface or expansion tank above (+) or below (-) the pump suction **in feet.**
- **HF** is the piping and fitting friction loss **in feet** from the water surface or expansion tank to the pump suction.
- **HVP** is the absolute vapor pressure of the fluid **in feet** at the pump suction temperature.

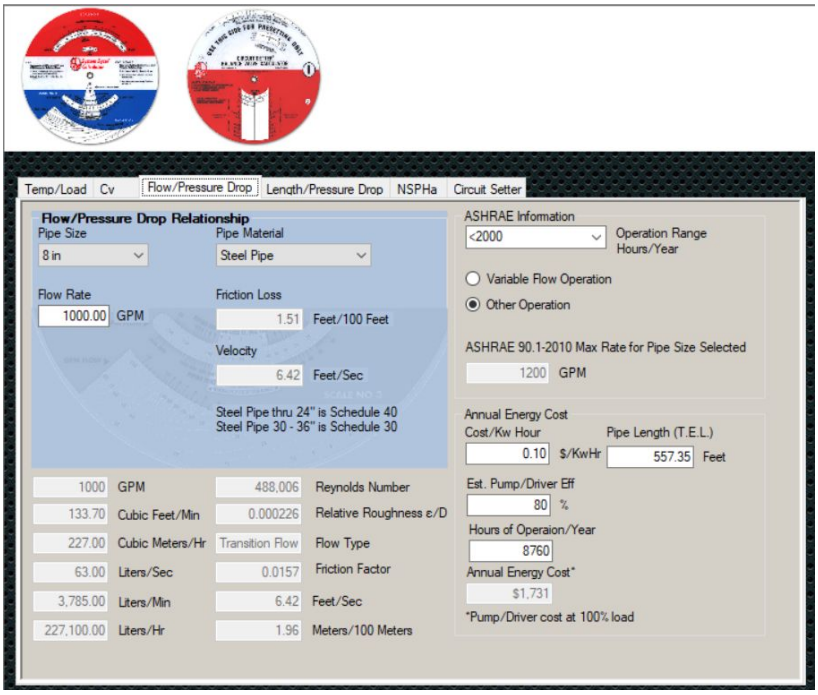
Bell & Gossett has a nice explanation of this in the article ***Determining NPSHA*****.**

Using the B&G System Syzer for NPSHA

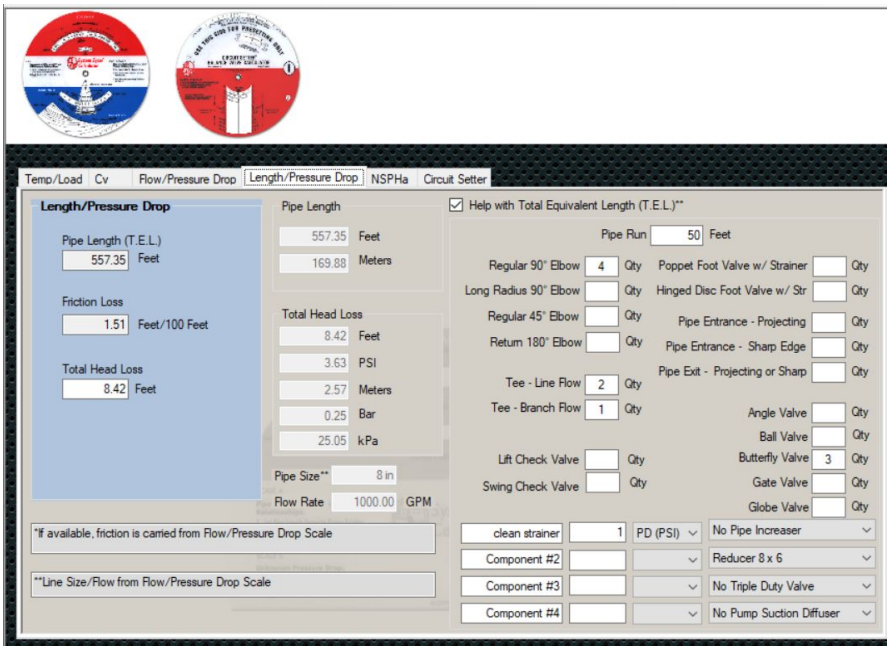


Look at the simple system piping example shown above. This example will use the 1000 GPM at 40' pump from part 2 of this series. The pump NPSH required with allowances and safety factors was 23 feet. Use the system syzer to determine the NPSHA.

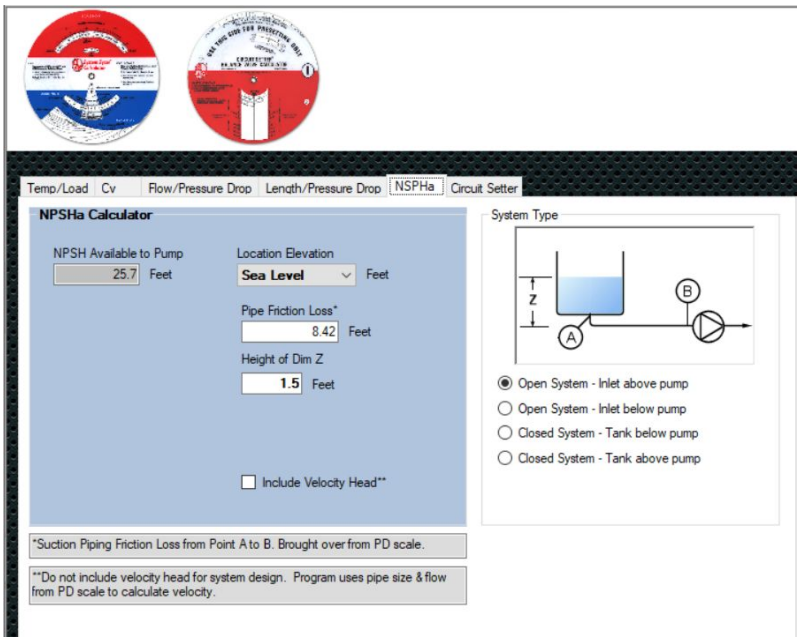
Step 1: Use your chosen pipe size and flow rate at the proper temperature and enter them under the **flow/pressure drop** tab.



Step 2: Enter the pipe lengths and fittings in the Length/Pressure Drop tab.



Step 3: Enter the elevation from the minimum tower basin water level to the centerline of the pump suction in NPSHa tab.



This pump selection required a modified NPSHR required of 23 feet. This pump installation has an available NPSH of 25.7 feet. This application will work fine.

It is VERY IMPORTANT for the engineer to spend the time to detail the suction piping and verify elevations. What would happen if the contractor used 8" pipe but reduced down to 6" for the valves and strainer at the pump suction? The friction loss would jump to 16 feet. The NPSHA drops to 18.2 feet. The pump would now be in trouble.

Check out the rest of the Net Positive Suction Head (NPSH) Series:

Part One – Terms and Definitions

Part Two – NPSH Safety factors