

20929 Bridge Street, Southfield, MI 48033 4121 Brockton Drive SE, Grand Rapids, MI 49512 6200 Baron Drive, Bridgeport, MI 48722 6910 Treeline Drive, Suite A, Brecksville, OH 44141

Phone: (800) 589-6120 - Fax: (248) 354-3710 www.deppmann.com

October 3rd 2011 ~ Monday Morning Minutes:

Expansion and Compression Tanks – Part 1

by Josh Looper

I could entitle the next few weeks as: *TANKS-A-LOT*. (Sorry). Over the next few weeks, the Monday Morning Minutes blog will examine expansion and compression tank sizing. We will also tackle some more advanced issues in the selection and troubleshooting of closed system expansion tanks.

Tanks are often selected using software programs such as the Bell and Gossett ESP-PlusTM selection program. It is always valuable to understand what is going on behind the program so let's start with the formula behind the program and some basic terms.

$$V_{t} = \underline{(E_{f} - E_{p}) X V_{s}}_{(P_{a} / P_{f}) - (P_{a} / P_{o})}$$

Vt = The minimum tank volume in gallons

 $E_f - E_p$ = The expansion of the fluid minus the expansion of the pipe

Vs_= The system volume in gallons

 \mathbf{P}_{a} = The initial pressure in the tank before any fluid is introduced (Absolute PSIA)

 P_f = The cold fill pressure in the tank before heating or cooling (Absolute PSIA)

 P_0 = The final or maximum pressure your design requires in the tank after heating (Absolute PSIA)

The numerator of the formula, $(E_f - E_p) X V_s$ is called the Tank Acceptance Volume. Back when the original gravity flow hydronic systems were designed, there was an open expansion tank normally located in the attic. As the boiler fired, the water would expand and the level in the tank would rise. The starting pressure was atmospheric and so was the ending pressure since the tank was open. So the tank volume equaled the acceptance volume.

Today it is rare to use an open expansion tank. Today we use compression or expansion tanks. The terms are sometimes used interchangeably but in theory a compression tank is a closed tank with no physical separation between the fluid and the air in the tank. As the fluid volume increases, the air in the tank is compressed. An expansion tank, in today's world, is a closed tank with a membrane or physical separation in the tank. The tank starts with no fluid in the tank and the fluid expands into the tank as the fluid volume increases.

Next week we examine the calculation of the items in the formula.

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