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-Plus™* 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.

$$V_t = \frac{(E_f - E_p) \times V_s}{(P_a / P_f) - (P_a / P_o)}$$

V_t = The minimum tank volume in gallons

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

V_s = The system volume in gallons

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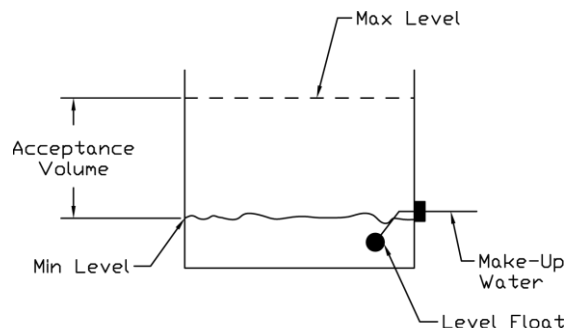
Attic Tank

The numerator of the formula, $(E_f - E_p) \times V_s$ 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.