

The Bellows Bottom Line

Practical advice on expansion joints

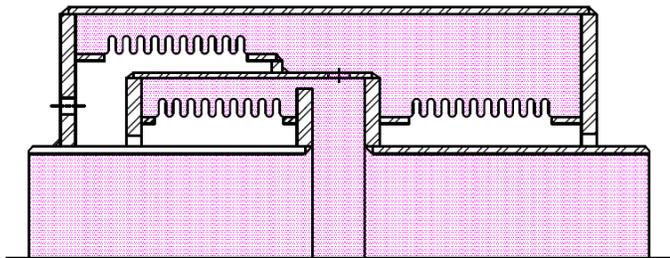
by Greg Perkins

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This month - **How an In-Line Externally Pressurized Pressure-Balanced Works** *A 'no-pressure thrust' axial expansion joint*

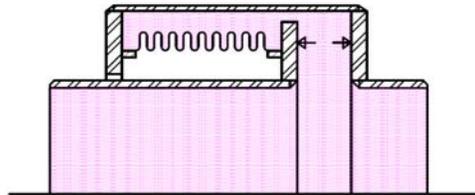
Whoa, what's up with all the bellows?

When you first look at a cross-section of an in-line pressure balanced externally pressurized expansion joint, it can look intimidatingly complicated. It is not. And to save me key strokes, let's call it a 'PB' from now on.



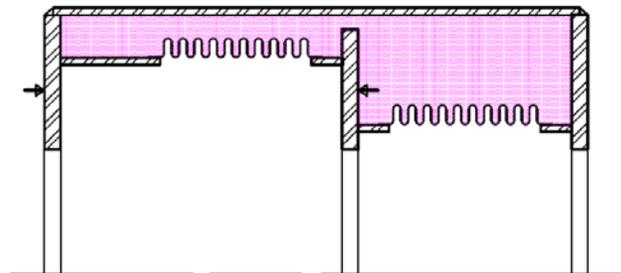
The externally pressurized in-line pressure balanced expansion joint (PB)

The PB allows axial movement without imposing a pressure thrust on the piping system. To better understand how it does that, let's break it down into its two major components – first, a regular externally pressurized expansion joint (see December 2010 article) which exerts a pressure thrust force on piping.



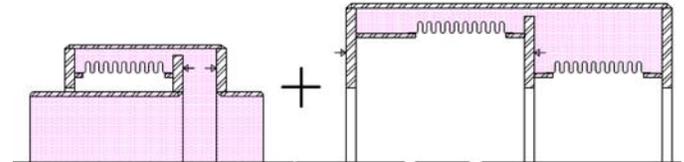
Externally pressurized expansion joints have a pressure thrust force

To counteract that force we need something that 'clamps' around each pipe end and matches that force yet still allows it to flex. The second component – a balancing cartridge, does just that.



Pressure balancing cartridge component of the PB

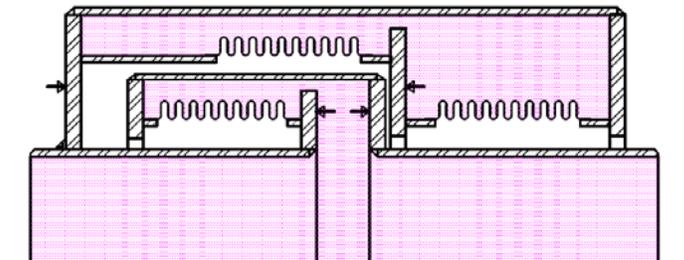
This 'balancing' cartridge, when pressurized, wants to exert a compressive force on anything it clamps around. The center ring will move to the left under pressure compressing the larger diameter bellows.



Regular expansion joint plus a balancing cartridge

When the two are added together it is easier to visualize how the forces of each one cancel each other out.

As the piping system pressure changes, so does the counter-acting force of the balancing cartridge. The expansion joint assembly is able to compress or extend without having a pressure thrust force. The only force the piping system feels is the spring rate of the bellows.



Visual example of the PB components off-setting pressure thrust forces

The first PB cross-section shown in this article is how these joints are actually built; note the holes so that pressure flows into the balancing cartridge.

The Bottom Line

Not as complicated as it first seems – just a regular expansion joint with a balancing cartridge added. These PB's are used when low loads are needed on vessels, equipment, or main anchors.



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