November 2008

CANADA PIPELINE ACCESSORIES

Tech Note: Why Not Tube Bundles?

Tube bundle straightening vanes have been around for a long time. Users of orifice and turbine meters have come to trust them to reduce measurement uncertainty and to allow their installations to meet standards such as AGA-3 and AGA-8. Tube bundles were originally designed to eliminate swirl, and they do a pretty good job at that.

Over the last several years, industry groups have been sponsoring research into the design of orifice meters. Things such as meter run length, upstream piping disturbances, allowable beta ratio, and meter tube roughness have been studied. This work is now complete and a major revision to the orifice meter standard (AGA-3 also referred to as API 14.3) was published in April 2000.

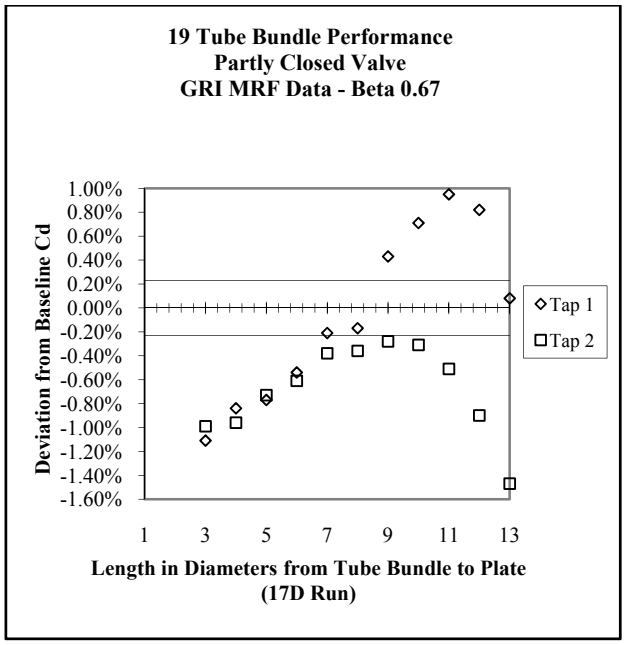
One of the significant changes was in the specification of meter run length. In the old standard, two options were given. These options were the choice whether to use straightening vanes or not. For each case, minimum meter run lengths were given, depending on Beta Ratio. **The new standard significantly lengthens the requirements for these two options, and significantly tightened the specifications for the straightening vanes.**

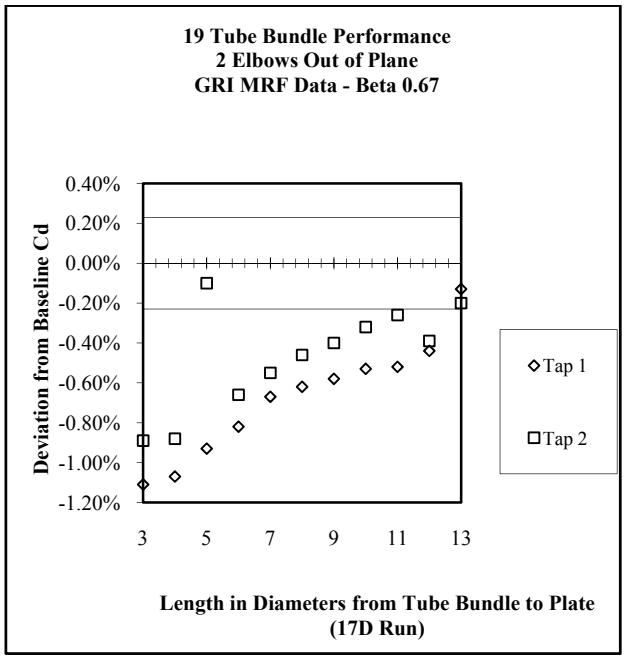
A third option was also added. If another type of flow conditioner is used, performance tests can be done to determine where in the run the flow conditioner can be used.

These figures are an example of the results of this testing in a standard 17D meter tube. Note that in the conditions highlighted, there is a change of over 2% depending on where the tube bundle is placed in the run, and as much as 1% difference between two tap holes.

The tube bundle is resulting in flow behavior that isn't conductive to good measurement.

It appears that the tube bundle is locking in the flow profile, requiring a longer length of straight pipe to settle back to a fully developed profile.





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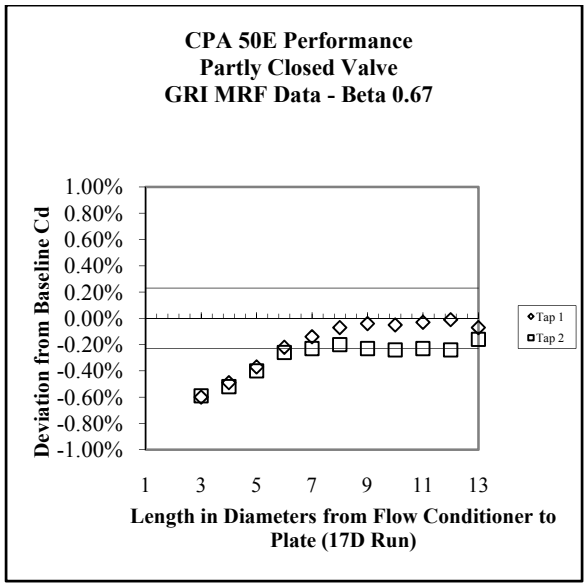
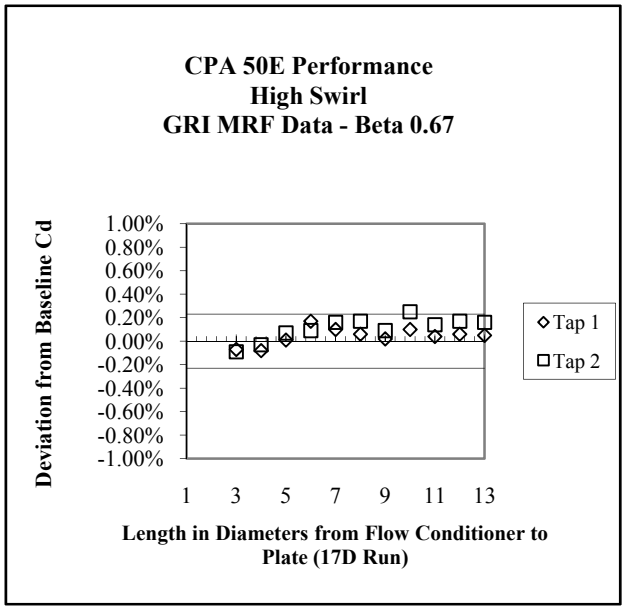
So what course of action of should meter designers and operators take?

There are flow conditioners on the market that actually do what tube bundles were supposed to. The CPA 50E flow conditioner (shown below) easily fits in a meter run where the tube bundle was formerly located. Results show that the measurement uncertainty is significantly reduced.

For example, the same test conducted for the tube bundle was conducted for the CPA 50E. The results are shown below. This is only a small sample of the data that has been gathered. The rest is available from API.





You should consider the CPA 50E if:

- You want to improve your orifice performance, especially at meters with high beta ratios.
- You don't want to retrofit it the following year.
- You have a high *lost and unaccounted for* and would like to reduce it.
- Your customers complain about your measurement.