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CPA 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. So why should the industry switch now?

Over the last several years, some 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) is now on the verge of being published.

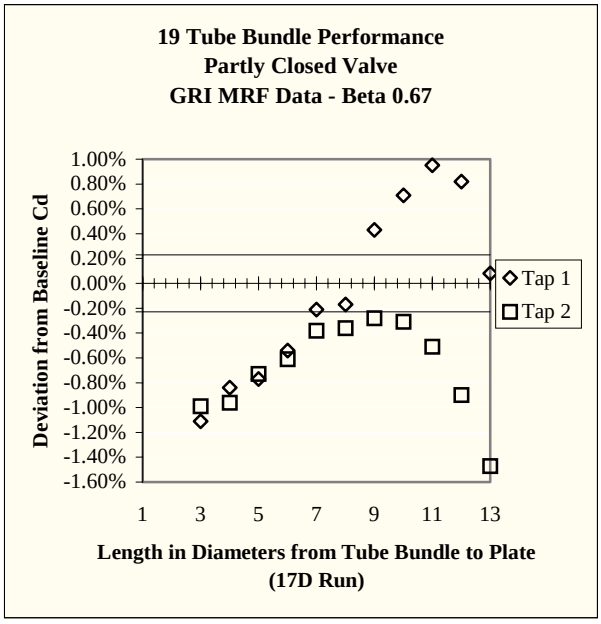
One of the significant changes is in the specification of meter run length. In the old standard, two options were given. These options were the choice whether to use straightening vanes or not. For each case, minimum meter run lengths were given, depending on Beta Ratio. **The new standard significantly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

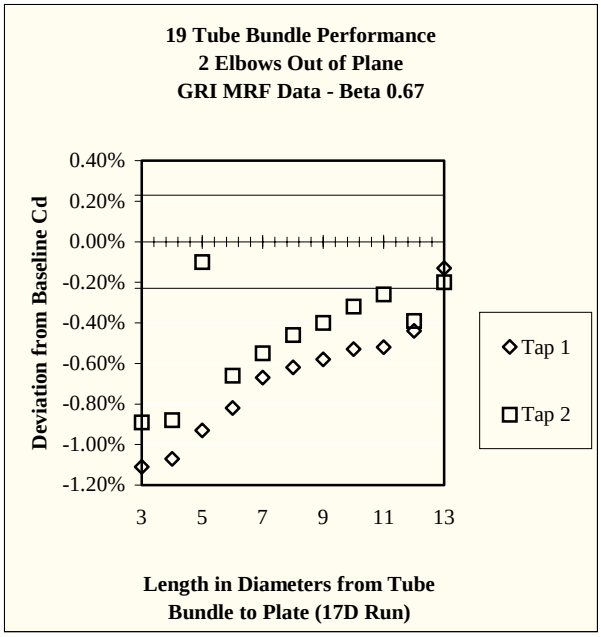
A third option was also added. If another type of flow conditioner is used, performance tests can be done to determine where in the run the flow conditioner can be used. Tube bundles were tested against this criteria.

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 swing 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 doing something which is not conducive to good measurement***.**

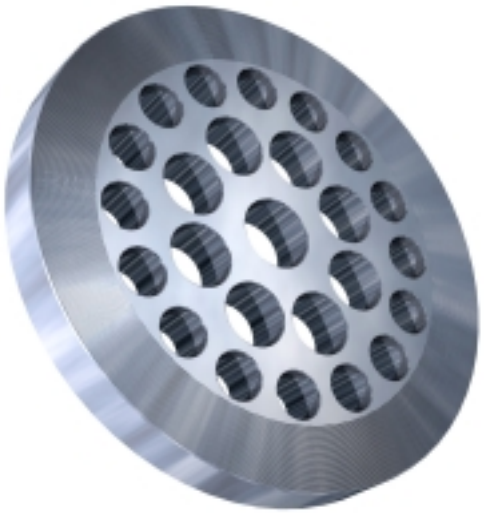
It appears that the tube bundle is locking in the flow profile, making it take much more straight pipe to settle back to a fully developed profile. There is a lot of research on this subject, which is not presented here. Much of this has been completed by GRI at the Southwest Research Institute and is available by contacting GRI.



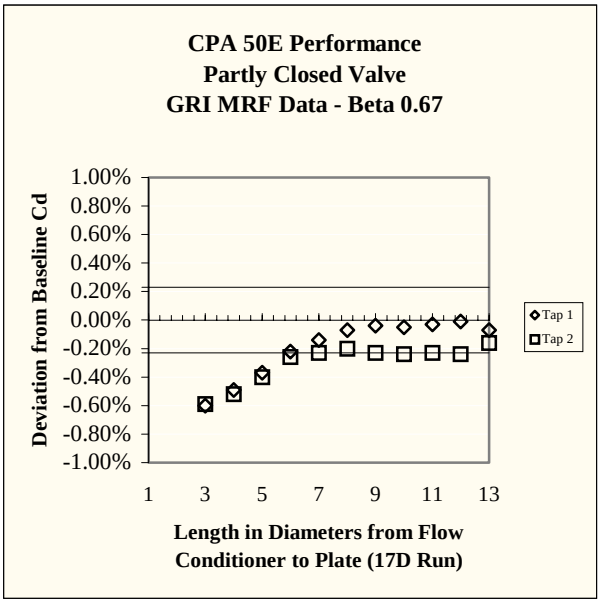


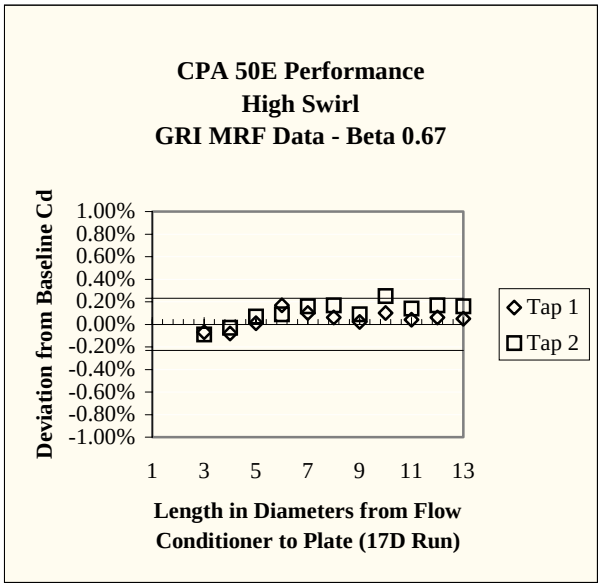
So what course of action of should meter designers and operators take?

There are flow conditioners on the market that actually do what we all thought tube bundles should do (but don't). 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 next year
- You have a high *lost and unaccounted for* and would like to reduce it
- Your customers complain about your measurement

Yes, the new standard will allow you to grandfather your existing meters, but that doesn't really solve anything. The fundamental reason that the standard is changing is that a tube bundle is not a very good flow conditioner.

For more information on how the CPA 50E Flow Conditioner can improve your orifice measurement, contact Canada Pipeline Accessories at 1-888-FIX FLOW

Visit our web site at www.cpacl.com

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