Hello John,

I received back some comments from Ralf Emberger at ACAM that will hopefully answer some of the questions posed when we met you in July. Also we were wondering what the status is of Spire Metering designing with the ACAM device, and when you might be targeting a product for production?

Here the Q&A from my notes:

1. Quality of plastic spool-pieces?
Again, we are not the sensor experts, but from what we heard: the type of plastic is important, usually fiber-glass reinforced materials are used. Further, a crucial parameter is the thermal expansion coefficient for the material in question.

2. Aging effects -> reduction in amplitude -> error?
Spire asked for the consequences of amplitude reduction due to aging. The answer is, that the signal to noise ration (SNR) is getting worse by aging. The hit itself can be reliably be tracked thanks to the secure 1st hit detection. We don't have numbers how much worse the SNR gets, but we recommend to monitor "aging" by the pulse ratio and make own investigations.

3. Temperature compensation / changes in speed of sound
Spire asked how to do the compensation for the change of speed in sound in water over temperature. The answer is, that this is done externally to the GP22. The temperature is sensed with GP22 and then externally a correction is applied. For this, (publicly available) diagrams showing the dependency between the speed of sound in water over temperature can be used. I attach an Excel spreadsheet showing the dependency. The numbers were taken from the Internet (Wikipedia & Co.) and some Excel calculations were done, please use it as an indication.

4. Constant offset in Tup / Tdown
John explained a constant "offset" in the travel path of ToFUp and ToFDown and asked for its potential compensation. The simple answer is, that it doesn't matter with the time interval measurement, since we are doing ToFUp and ToFDown, calculating the difference levels it out (that was my answer on that day too). If he was referring to the fact, that via the sum of ToFUp and ToFDown some dependency to the temperature is given (and consequently it could be used to indirectly measure the temperature), the picture looks different: in calculating the sum of ToFUp and ToFDown this offset of course matters. Here the only way that makes sense is to do some basic calibration (optimally in the linear part of the speed of sound curve), i.e. take the sum value at several temperature points.

Please feel free to comment back or ask further questions, we are here to support you and your staff!

Best Regards,

Jim

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