Interpreting Compressible Fluid Calibration Results:

Ultrasonic, Coriolis, Turbine and Differential Meters

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Over the years CEESI has published a number of similar papers where flow measurement experience is applied to the analysis of calibration results. Meter technologies include ultrasonic, Coriolis, turbine and a variety of differential producing elements. A typical analysis involves a mix of calibrations: 1) a large quantity of data from one meter, or a few meters, and 2) a smaller quantity of data from many meters. This paper is a summary of the important findings and compares and contrasts the meter technologies.

By definition a compressible fluid will exhibit variable density. The variation in density results in the potential for changes in meter performance. The CEESI database quantifies typical density effects in differential, turbine and Coriolis meters and the apparent lack of density effects in ultrasonic meters. With sufficient data the proper correlating parameter for a meter can be selected. Potential gas meter correlating parameters include Reynolds number, Mach number, flowrate or velocity.

The rangeability of different meters varies based on fundamental technology and flowing density. It is best quantified based on the variation of random effects over the flowrate range and non-linearity of the calibration data. The newest AGA standards divide the meter range based on random effects and linearity. The CEESI database enables direct rangeability comparisons between meter technologies and flowing density.

A periodic topic of discussion concerns how often a meter needs to be recalibrated. The CEESI database includes some recalibration data that allows for a recalibration interval to be selected based on uncertainty growth.