Comparison of Test Methods for Measuring Flow Stability

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The technical quality of water flow facilities is defined by the quality of the pumps and valves, methods of creating a stable flow and the design of the pipeline layout and is directly reflected in the flow stability. However, using existing methods it is difficult to differentiate between the actual flow fluctuations and the flow meter's noise. The test results can be affected by the working principle, the sample rate and the response time of the flow meter used.

A turbine flow meter, a Coriolis flow meter, an electromagnetic flow meter, a clamp-on ultrasonic flow meter, a Laser Doppler Anemometry (LDA) system and two types of pressure sensors were installed in series in the hot water flow facility of the PTB Berlin. A constant flow and a regular fluctuant flow were measured, and the flow change was monitored by these different meters at the same time.

The comparison of the test results reveal that of the flow meters the turbine flow meter has the highest actual sample rate and the fastest response time; however its response time is still about 0.1s slower, when compared to the two types of pressure sensors. A good correlation was found between the results of the turbine meter and the Coriolis meter, demonstrating that the test results reflect the real flow fluctuation of the facility. An additional advantage of the use of the two types of pressure sensors is the ability to detect high frequency flow fluctuations.