



Ultrasonic Flow Meters for Custody Transfer of Natural Gas

- Calibrator accuracy provides >1000% Return On Investment
- 1% improvement in gas flow accountability
- Reduced uncertainty enables invoicing of an additional \$216,000 annually

Application

The company is a leading interstate pipeline operator of natural gas in the US. The ability to accurately measure the flow of gas in the pipeline is critical for custody transfer. In particular the measurement uncertainties count against the sellers favor and can therefore not be invoiced!

Challenge

In recent years the industry has switched to using more precise ultrasonic flow meters as the technology has matured and price levels come down. Ultrasonic sensors have no moving parts, do not suffer pressure loss and provide virtually maintenance-free operation.

However, an often overlooked fact is that, without an equally reliable temperature reading the actual gas volume through the pipeline cannot be correctly determined. If accuracy improvements from using the new ultrasonic flow meters were to be realized the company needed the right solution to verify the temperature sensor measurements. With an accuracy of $\pm 0.3\%$ from the ultrasonic flow meters it was determined that an uncertainty of less than 0.1°F (0.06°C) was required from the temperature calibrator for the RTD probe verification.

Historically lower priced temperature calibrators with a higher uncertainty had been used. Several calibrators had been tested and found lacking for the new requirements.



Solution

The company tested and decided to standardize on the Reference Temperature Calibrator type RTC-157 together with a reference probe. The RTC-157, with its active dual zone heating technology, was capable of measuring with an accuracy of $\pm 0.07^\circ\text{F}$ (0.04°C), sufficient for the verification.

The following conservative assumptions were applied for the calculation on savings and ROI:

- Pipeline diameter: 10 inch (0.254 m)
- Gas flow velocity: 50 ft/s (15.24 m/s)
- Static pressure: 1080 PSI (74.11 bar)
- Gas price: \$4.4/MMBTU (\$0.16/m³)
- Temperature: $\sim 69^\circ\text{F}$ (20.56°C)

With an improved temperature accuracy of 0.2°F (0.11°C) the error in the calculated flow volume per hour is reduced by 5.7 MMTBU (161 m³) corresponding to \$25.83 per hour or \$18,597 per month of previously unaccounted gas value.