Gas Flow Troubleshooting

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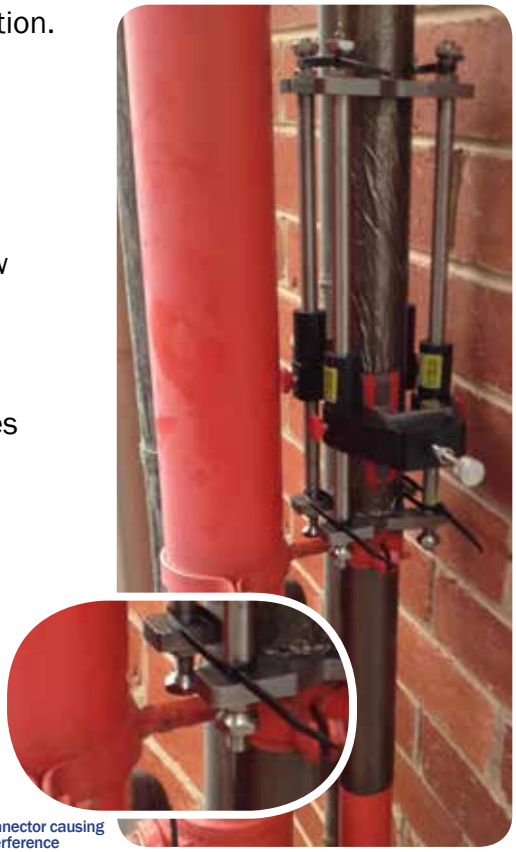
In the Field with the GE Panametrics TransPort PT878GC Ultrasonic Gas Flow Meter

TechRentals rented out a Panametrics PT878GC to a customer intending to audit compressed air flow at their facility. The set up involved 50 mm metal pipe with a known pressure of 7 bar. The customer reported intermittent results and errors when implementing tests, and requested assistance.

The PT878GC employs the transit-time principle for data collection. This means the time interval of an ultrasonic signal travelling upstream is compared to that of an ultrasonic signal travelling downstream. With no flow present these values are the same, however with a moving gas, the downstream signal will travel faster than the upstream signal. Gas velocity is then calculated through analysis of the measured transit times, from which flow can be determined.



Connector causing interference

This unobtrusive method of measurement means there is no obstruction to internal flow, and no need to physically alter pipes to gain access.

TechRentals team member Graeme Murphy went out on-site to inspect the set-up. Upon visual inspection, the customer appeared to have installed the apparatus correctly, with proper damping where the transducers were applied to the pipe, and along the pipe itself, extending out past where the bracket was mounted.

Damping with either mats or tape is crucial with ultrasonic signal testing; particularly with metal piping. Due to the significant difference in acoustic impedance between the pipe wall and the gas, only a very small fraction of the signal is ever transmitted through the gas. The rest of the signal stays within the pipe, and can be reflected strongly to distort return signals at the transducers. These phenomenon are referred to as pipe signals, and the behaviour is much like an echo bouncing back to the source. Damping the outer pipe surface minimises the effects of pipe signals by reducing their amplitude, so that interference doesn't overly compromise any return signal readings at the transducers.

Graeme then further investigated by implementing proper test procedure and viewing the results. It was soon found that errors were indeed frequent, and only intermittent performance was attainable. A physical inspection of the unit mounting and pipes then followed, and it was discovered that when touching a small strip of metal used for spacing of the pipe in question to an adjacent pipe, a steady reading was possible. This implied that the pipe was not properly deadened although the damping appeared to be more than sufficient.

The small strip of metal was not thought to be close enough to directly influence the transducer signals, and it was assumed that the damping all around it would negate any overt contributions. But as the physical examination suggested otherwise, corrective measures were implemented.

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It was determined that the connector would be damped and the entire apparatus would be mounted further away from the connector. Running the test protocol with the new set up yielded steady, error free results, and the customer was able to successfully audit the compressed air flow in the pipe.

Had the errors persisted, or circumstances restricted relocating the apparatus, diagnostic testing may have become necessary. In-depth analysis of the output signals could be used to determine whether the metal connector was augmenting reflected pipe signals and distorting return readings at the transducer, and/or if it was shielding a section of un-damped pipe that was allowing pipe signals to propagate more effectively. But as the issue was resolved, Graeme saw no need for further troubleshooting.

For more information, or to discuss your own application, please contact the team at TechRentals.

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