

Remote Condition Monitoring of Daniel Ultrasonic Meter Extends Calibration Cycles and Minimizes Production Delays

RESULTS

- Saved \$235,000 per year in ultrasonic flow meter calibration costs
- Saved hundreds of man-hours and minimized production delays associated with meter recalibration
- Met DECC requirements for extending recalibration intervals
- Reduced safety and financial risks
- Increased customer confidence in ultrasonic flow meter performance



APPLICATION

Custody transfer measurement at a gas pipeline using ultrasonic flow meters at the main delivery point into the UK national transmission system. Gas is reduced in pressure and heated prior to exporting via the Transco or Interconnector UK metering facilities.

CUSTOMER

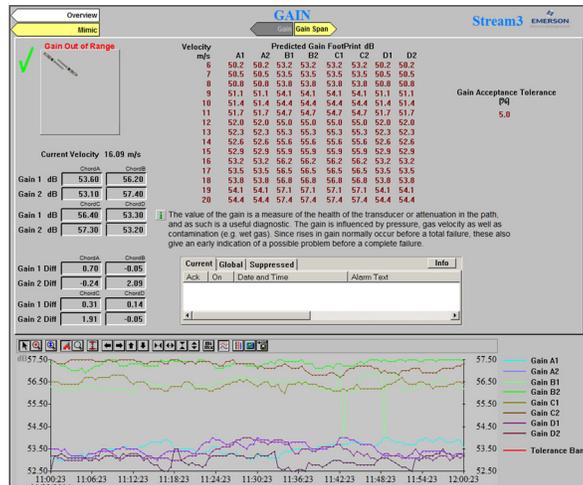
Gas pipeline operator in Europe's Southern North Sea.

CHALLENGE

The pipeline operator is required to verify meter performance as part of their custody transfer contractual agreements and to remain in compliance with government legislation. To demonstrate to their pipeline partners that they are operating within the agreed measurement uncertainties, the pipeline operator followed a calendar-based calibration approach to check the health of the ultrasonic meters used for measuring gas sales and custody transfer into the UK national transmission system.

The pipeline metering system has been in production since late 2001 and employs five identical 508 mm (20 in) Daniel ultrasonic meters. This system was the first UK delivery point to utilize ultrasonic technology. As this was a relatively new technology at the time, the initial recalibration period was set at 90 days. The meters were then removed from service and sent to one of the approved gas flow calibration centers in Europe. Consequently, operators were faced with

Daniel ultrasonic flow meter verification diagnostics with online CBM enabled estimated annual savings of \$235,000 and created a smarter measurement system that meets DECC requirements for extended calibration intervals.



Audit traceability is made easy with a two-year historical trending package that allows operators to retrospectively check control limit breaches.

the following challenges:

- Financial cost of the calibration averaging \$47,000 per meter certification, including costs associated with logistics and attendance at the calibration lab.
- Safety concerns around the removal and handling of large metering equipment.
- Planning and scheduling to ensure minimal downtime without any gas deferral. The typical turnaround time for meter recertification is approximately four weeks.
- Emissions Trading Scheme (ETS) legislation governing the venting and release of hydrocarbon gases.
- Availability of test slots, particularly for gas ultrasonic meters larger than 10 inches.
- Potential damage to the gas ultrasonic meters during removal, transportation or reinstallation.

Most systems in the UK have generally adopted a rule set whereby a new gas ultrasonic meter must be recalibrated as follows:

- After six months in service
- Again after an additional six months
- If the flow weighted mean shift between each calibration has been <0.3 % on subsequent recalibration, an extension to the calibration frequency to 12 months can be applied.

Over a span of 10 years, 53 calibrations were performed on the five Daniel ultrasonic meters with no indication of measurement accuracy shift exceeding 0.3%, the current trigger level for initiating a mismeasurement inquiry.

SOLUTION

It was recommended that the pipeline operator use Daniel online ultrasonic meter Condition-Based Monitoring (CBM) software. CBM is a smart and automated solution that puts the operator in control of their metering system, replacing calendar-based calibration and maintenance practices with condition-based monitoring where diagnostic data is used to influence and reduce calibration and maintenance costs.

Unlike conventional ultrasonic meter diagnostics software which logs intermittently and provides “snapshots” of meter performance, Daniel online ultrasonic meter CBM has allowed operators a continuous, automated health check for all **process, measurement and functional diagnostics** of multiple ultrasonic meters from one single location, eliminating the need for manual examination of log files and reducing man-hours involved in connecting, collecting,

and analyzing diagnostic data. CBM monitors each of these diagnostics in real time and compares them with configurable control limits to ensure meter functionality, process stability and system accuracy are within specification throughout the life of the ultrasonic meter.

CBM allows diagnostic parameters to be monitored and recorded on a 24/7/365 basis and logs the data in an auditable format. Each individual diagnostic check has operator entered control limits and alerts the user if a control limit has been breached. The alerts are easy to understand and act upon. No specialized training is required to interpret complex graphs or analyze trends. By using the continuous health monitoring that CBM offers, operators reduced inspection time in the field. In addition, embedded expert knowledge helped less experienced technicians interpret diagnostics to resolve problems more rapidly. Maintenance is no longer prescriptive but condition based.

Analysis of the CBM diagnostic data obtained from the metering systems at the gas pipeline has indicated the following:

- **Functional Checks:** No degradation in Daniel gas ultrasonic meter functionality since the data logging began.
- **Process Condition Checks:** The diagnostic data collected on start-up has demonstrated that the transfer of the meter calibration is valid. The process condition diagnostics showed no evidence of blockage, contamination or wall roughness changes over the period of data collection.
- **Measurement Integrity Checks:** Comparing the ultrasonic meter-calculated speed of sound (SOS) against the value according to the AGA 10 standard based on external measurement of pressure, temperature and gas composition indicated that all instruments performed well within their expected tolerances. The calculated SOS also gave confidence that the metering system has been performing as designed with a very low uncertainty, and the gas ultrasonic meter transducers have remained free from contamination.

CBM has provided the pipeline operator with a qualitative indication that the Daniel ultrasonic meter has not shown any drift in its operating characteristics, extending the interval between meter calibrations up to 12 months and reducing calibration costs by an average of \$235,000 per year.