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KNOWLEDGE

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Using Micro Motion® Coriolis Meters for the Custody Transfer of Natural Gas

Prior to 1999, the natural gas industry in the Australian state of Victoria, which serves approximately 1.5 million customers, was entirely owned and operated by the Victorian state government. In 1999, the government privatized this industry, dividing it into four segments: production, transmission, distribution, and retail. GasNet was one of the key players to emerge in the transmission segment, which receives the natural gas from the producer's offshore rigs and sells it to local distributors. GasNet now owns and maintains an estimated 2,500 km (1,560 miles) of natural gas transmission pipeline, and moves around 220 x 10^{15} joules of gas every year.

As part of the privatization process, custody transfer meters had to be installed at the junction between the transmission and distribution industry segments. In all, GasNet needed to install over 120 new custody transfer meters.

Metering Technologies Considered for Custody Transfer

Of the 120 custody transfer meters, 36 were to be either Coriolis meters or rotary meters. The GasNet engineers were somewhat leery of rotary meters because of the possibility of jamming. And they already had some familiarity with Coriolis meters because of a previous successful application at a plant in Western Australia.

In order to be certain that Micro Motion® Coriolis meters were the best fit, GasNet had meters of several sizes tested at the Micro Motion factory in Boulder, Colorado; at the Colorado Engineering Experiment Station, Inc. (CEESI); and at Pigsar PTB in Dorsen, Germany. There are four categories of custody transfer meters established by the Victorian government, ranked A through D. Category-A meters allow the highest flow rates but have the most stringent accuracy requirements. Category-D meters restrict flow to the lowest rates but have the most relaxed accuracy requirements. GasNet chose Category C for this application, which translated into 1/4-inch to 3-inch line sizes at an uncertainty of ±1.5% on volume and ±2.0% on energy.

The factory in Boulder tested a 1/4-inch, a 1/2-inch, and a 1-inch meter on water. (A significant amount of work has been done to prove that calibration on water is transferable to gas.) CEESI tested those same meters on high-pressure air (730 psia), and Pigsar tested a 2-inch and a 3-inch meter on natural gas. The performance of the Micro Motion Coriolis meters was well within the accuracy specification of the application. The 1-inch meter tested at an overall accuracy of approximately ±0.30%. The 2-inch meter tested at an overall accuracy of approximately ±0.25%.

Based on the results of these tests and the engineers' confidence in Coriolis meters, GasNet chose to install Micro Motion Coriolis meters in these 36 custody transfer sites.

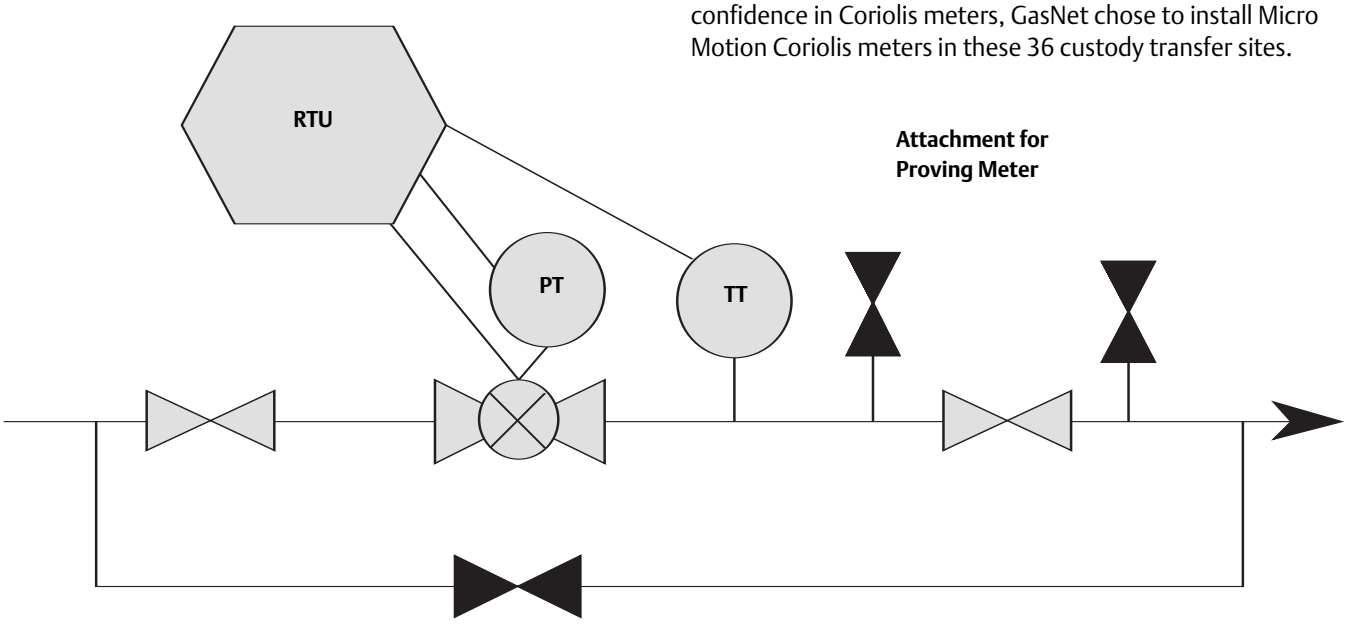

Figure 1. Site Configuration

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Proving the Custody Transfer Sites

For all of the custody transfer sites, GasNet needed to have a way to prove the accuracy of their installed meters to the satisfaction of government regulators. One of the ideas they considered was to install a second meter in every location, but the cost associated with that option was estimated at $200,000.

Instead, the solution GasNet settled on was to build each custody transfer site so that a portable proving meter could be attached and removed easily. Figure 1 shows a diagram of a typical proving site configuration. For their proving meter GasNet used a Micro Motion ELITE® meter, which was transported on a special skid and attached to custody transfer sites with 50 mm flexible hoses (see Figures 2 and 3).

Figure 2. Portable Proving Meter and Proving Caravan

This kit is used to prove GasNet's Coriolis sites and their sites in which turbine meters are installed as well (for a total of almost 100 custody transfer sites). A GasNet engineer drives out to a custody transfer site with the proving caravan and connects the portable Micro Motion meter to the line. Inside the caravan is a gas chromatograph, which is also connected to the process. Gas is allowed to flow through the portable meter long enough for it to stabilize, then the site is proved for about an hour.

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One of the reasons this technique works is because Micro Motion Coriolis meters do not require any upstream or downstream piping requirements — they measure accurately as long as the flow tubes are filled with gas. This installation flexibility allows GasNet to use a Micro Motion meter in a way that would be impossible for virtually any other type of meter, saving GasNet around $200,000 in equipment costs.

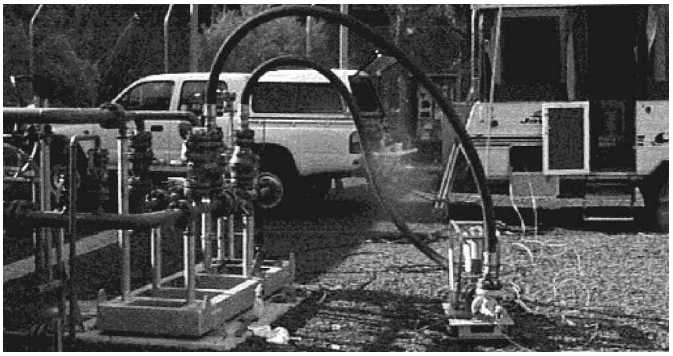

Figure 3. Portable Proving Meter

Summary

GasNet was able to meet all of its custody transfer accuracy and proving requirements without spending hundreds of thousands of dollars on redundant metering equipment. Since installing Micro Motion Coriolis meters in 36 of their custody transfer sites and using the portable Micro Motion meter for proving the majority of their sites, GasNet has seen a consistent, reliable accuracy within 0.5% at the most common flow rates. (This means their outflow accuracy is substantially better than what they receive from the gas producer, which achieves accuracy of only ±1.5% with an aged orifice plate meter.) Government regulators have been completely satisfied with GasNet's proving system and the performance of all of GasNet's Coriolis meters.

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