Replace Bi-Directional Orifice Metering with Ultrasonic Meters

PRO Fact Sheet No. 304

Partner Reported Opportunities (PROs) for Reducing Methane Emissions

Applicable sector(s):

☐ Production ☐ Processing ■ Transmission and Distribution

Partners reporting this PRO: Columbia Gas Transmission

Other related PROs: Reduce Frequency of Replacing Modules in Turbine Meters

Compressors/Engines	☐
Dehydrators	☐
Pipelines	☐
Pneumatics/Controls	■
Tanks	☐
Valves	☐
Wells	☐
Other	☐

Technology/Practice Overview

Description

Bi-directional flow rate measurement is commonly done with the gas that is injected into and withdrawn from gas storage fields. For accurate flow measurement, the orifice plate (the component inside the pipeline) is removed, inspected, and replaced if the sharp edges on the orifice are worn smooth. Removing the orifice requires the valves on each side of the orifice meter run to be closed and the pipeline segment vented to the atmosphere. This orifice inspection may be required monthly during winter gas withdrawal.

A partner reported replacing orifice meters with ultrasonic meters, reducing methane emissions, operating costs, and maintenance costs, and increasing operating efficiency. Ultrasonic meters use high frequency sound pulses between two sensors across the pipeline, calibrated for the flow rate of the gas. Ultrasonic meters have no pressure drop, no flow blockage, no moving parts, and can be calibrated without venting gas.

Methane Savings: 20 Mcf per year

Costs

Capital Costs (including installation)

☐ <$1,000 ☐ $1,000 – $10,000 ■ >$10,000

Operating and Maintenance Costs (annual)

■ <$100 ☐ $100-$1,000 ☐ >$1,000

Payback (Years)

☐ 0–1 ■ 1–3 ☐ 3–10 ☐ >10

Benefits

Reducing methane emissions was an associated benefit of the project.

Operating Requirements

An electrical power supply and a minimum length of straight pipe, or straightening vanes, are needed to implement this technology.

Applicability

This technology is applicable to all flow measurements, but particularly for bi-directional flow metering.

Methane Emissions Reductions

Methane emissions reduction may be estimated using the *Pipeline Rules of Thumb* handbook, Fourth Edition, p. 270. One partner reported saving 119 Mcf of methane for 14 units, ranging in size from 6-inch to 10-inch. Orifice plates need to be inspected and changed more frequently when measuring “dirty” gas (i.e., direct from a reservoir, such as gas withdrawal from storage during peak demand periods), because the particulates will wear the sharp orifice plate edges smooth, distorting the accuracy of the measurement.

Economic Analysis

Basis for Costs and Savings

Methane emissions reductions of 20 Mcf per year are based on inspecting/changing 5, 8-inch orifice plates on a 900-psig system, 12 times per year. Assume block valves are located 11 pipe diameters up and downstream of the orifice for both bi-directional meters (storage) and also, for conservatism, in unidirectional meters (transmission, distribution).

Discussion

The primary benefit of this technology is labor cost savings, which could approach $5,000 per year. The capital and installation costs are based on retrofitting an ultrasonic meter on existing pipe at a cost of $10,000 to 20,000. The only operating cost is electrical power for meters that use 10 to 20 watts. The payback is based on labor savings, vented gas savings, and fuel gas savings (O&M).