Panametrics
a Baker Hughes business

Application note

Verifying fixed meter performance with a portable clamp-on

Benefits:

- Verification without process shutdown
- Easy to set up and install
- High reliability
- Numerous diagnostics to assess the performance

Summary

Panametrics' service team called to investigate and verify the operation of four wetted DigitalFlow* GM868 ultrasonic gas flow meters installed as part of the gas injection metering system.

An oil company operating in the Berkine Basin region in the Sahara Desert drilled 100 wells, with a combined production capacity reaching about 285,000 barrels of oil per day. At each of those wells, gas was re-injected to maintain pressure. An orifice plate metering system was installed at each well to control the injected gas flow (with pipe sizes 3 to 6 inches and pressure around 300 bar). It was decided to install ultrasonic flow meters to measure flow at the outlet of the plant for wet gas because wet gas causes maintenance problems to orifice plate meters. In addition, for larger pipes and for very high pressure (350 bar) in these conditions, ultrasonic measurement is more cost effective.

Application

Pipe size:	4” and 10"
P:	Between 300 and 350 barg (4350 and 5076 psig)
T:	Ambient
Fluid:	Gas and wet gas

Challenge

The Panametrics service team was called to investigate and verify the operation of four wetted DigitalFlow* GM868 ultrasonic gas flow meters installed as part of the gas injection metering system. The four meters each had the same configuration, mounted on a 10-inch nominal pipe in the horizontal plane. However, the meters never worked well because they were never commissioned and it was not known who installed and programmed the meters in order to validate the performance.

The team entered the general operating parameters into the flow meters and the electronics cleared all fault conditions and indicated a flow. The instrumentation manager confirmed that the compensation of the gas pressure and temperature would be done on the DCS and only actual flow (m3/H or ACM/H) was needed on the analog output. After restarting, the GM868 was interrogated and all parameters were found acceptable.

Flow measurements were important to maintain the good operation of the wells. However, six months later the customer had data showing a 20% difference between flow measured with ultrasonic meters and those measured by the orifice plate. The ultrasonic meters measured the total gas leaving the plant for injection into the reservoir. At each gas injection well there was a flow computer with an orifice plate. Adding data together there was a 20% difference between the total of the individual orifice meters and the total of the ultrasonic meters.

The instrumentation manager wanted to know if it would be possible for a portable clamp-on gas meter to measure the gas at the plant on the 10-inch line, and then measure the gas at the 4-inch lines at each well site to understand where the differences were between the gas injection export meters (GMs) and the total of all the orifice plates. The difficult application (heavy wall thickness, wet gas and very high pressure) would present a challenge for any portable clamp-on.

Solution

The meter delivered positive outcomes to the operator for data reconciliation. The actual volumetric flow rates were successfully compared with a clamp-on meter and were found to be in agreement within approximately 5%, which was acceptable due to process instability. The PT878GC performed excellently with 1 MHz C-RL transducers by validating both the actual flow rates and fluid sound speed. It was then deduced that the difference in standardized volumetric flow rate was caused by the incorrect application of compressibility in high pressure natural gas.

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