Application note

Measuring the flow rate to detect leaks on a blast furnace gas transportation line

Advantages:

The GM868 was able to provide accurate, repeatable, drift-free measurement without causing a pressure drop in the system. The GM868 proved it could operate with little maintenance even under harsh conditions.

Application

A steel plant in Belgium uses two GM868 ultrasonic general-purpose gas flowmeters to detect leaks on a blast furnace gas transportation line. Flow readings are constantly compared against each other for differences that could indicate a leakage.

Installation

Blast furnace gas is transported from the steel plant to a power plant via a transportation line several miles long. The gas from the blast furnace is collected and sent to a power plant to be used as fuel.

The customer needed to monitor the flow to detect leakages; therefore, one GM868 was installed at the customer site on an 80 in. (2000 mm) pipe. The other meter was installed at the power plant on a 120 in. (3000 mm). The pipe expands from 80 to 120 in. approximately 0,62 m (1 km) before the power plant. See Figure 1 below for meter locations.

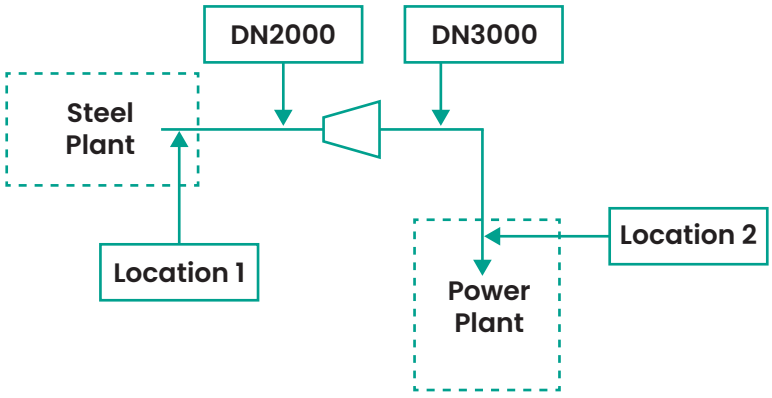

Figure 1: Installation schematic

The transducers for both meters were installed in a diametrical 45° setup in horizontal plan to avoid liquid collection in the nozzles to prevent transducer or insertion mechanism malfunctions (see Figure 2 below). The transducer heads were flush with the inside pipe wall to protect the transducer from small dust or liquid particles.

Figure 2. Customer installation site

Figure 3. below shows the ultrasonic signals taken on the 80 in. (2000 mm) pipe at a velocity of 118 ft/s (36 m/s). As shown the signal is clearly visible and the noise level is almost zero.

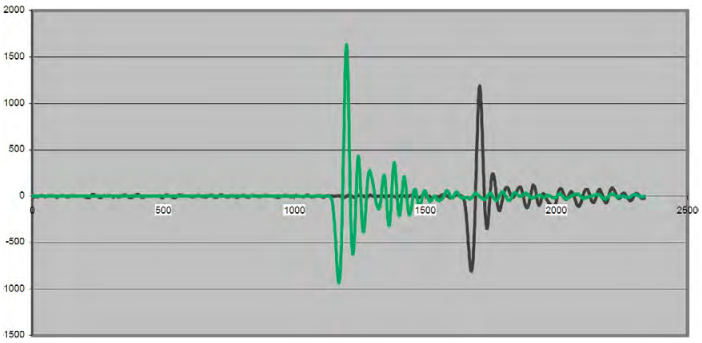

Figure 3. Ultrasonic signal from GM868 installed on 80 in. (2000 mm) pipe

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After almost one year of operation, the transducers were removed for evaluation. The meter was performing flawlessly even with a dirty tar-like buildup from the blast furnace gas on the transducers. Figure 4 shows an upstream transducer coated with dirty tar-like buildup.

Figure 4. Upstream transducer removed for inspection

Equipment

Measurements were taken using two GM868 single channel flowmeters with T5(50kHz) transducers and preamplifiers (PRE868-4-20). Transducers were installed using insertion mechanisms (IMA71) and ball valved for easy removal under operating conditions. A MODBUS communications card was used to transfer data to the customer's system.

Specifications

Pipe OD:	Meter 1: 80 in. (2000 mm) Meter 2: 120 in. (3000 mm)
Pipe ID:	Meter 1: 79 in. (1996 mm) Meter 2: 118 in. (2999 mm)
Wall thickness:	0.40 in. (10 mm)
Pipe material:	Carbon steel
Pressure:	0 to 8.7 psig (0 to 1.6 bar)
Temperature:	32 to 113°F (0 to 45°C)
Flow velocity:	0 to 48 ft/s (0 to 45 m/s)
Transducers:	T5 (50 kHz) transducers installed at a diametrical 45° setup
Gas composition:	See Table 1 below.

Component	Name	Concentration Mole %
H_2	Hydrogen	3,80
N_2	Nitrogen	48,46
Ar (+0_2)	Argon (+ Oxygen)	0,62
CO	Carbon monoxide	24,43
CO_2	Carbon dioxide	22,50
Contaminants	Dirty, wet	Low

Table 1. Blast furnace gas composition

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