



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

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) pipe. 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.

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.

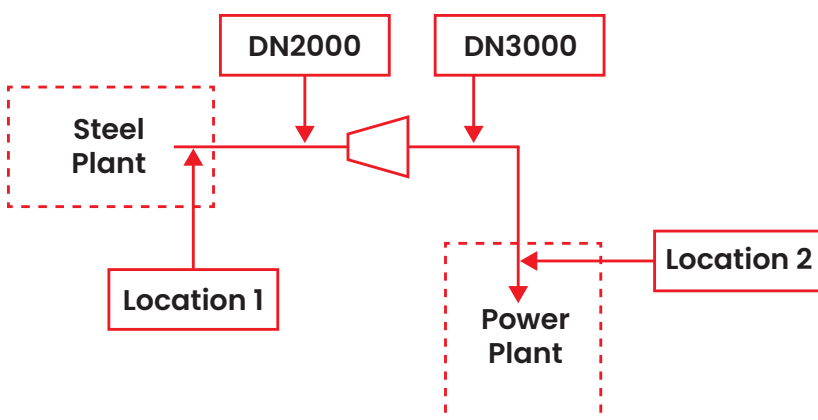


Fig. 1: Installation schematic

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.



Fig. 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.



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

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.



Fig. 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 on next page

Component	Name	Concentration Mole %
H ₂	Hydrogen	3,80
N ₂	Nitrogen	48,46
Ar (+O 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