



APPLICATION REPORT

Iron, Steel & Metal

Mass flow measurement of hydrogen

- Process gas measurement in the production of graphite parts
- Excellent measurement accuracy at low operating density
- Reliable information on gas consumption for improved cost management



1. Background

The MERSEN Group (formerly Carbone Lorraine) is a global specialist for electrical power and advanced materials. These include carbon-based products or high-performance materials made of graphite, such as those used in applications with high thermal stress (e.g. high-temperature furnaces). The production site in Gennevilliers, France, has been producing graphite specialties for high-temperature processes for more than one hundred years.

2. Measurement requirements

Hydrogen is one of the most expensive industrial gases at MERSEN. It is used as a process gas in the production of graphite parts. At the Gennevilliers site there is another company that also uses hydrogen. Both companies also use the same infrastructure for gas supply.

MERSEN decided to determine the total gas consumption of the site so as to monitor the common gas costs. The company also wanted to measure its own hydrogen consumption in order to be able to charge the other company accordingly.

| Measurement requirements | Total consumption (of both companies) | Consumption of MERSEN |
|--------------------------|---------------------------------------|---------------------------------|
| Medium | Hydrogen | Hydrogen |
| Density | 1.07 kg/m ³ | 0.91 kg/m ³ |
| Pressure | 12 barg / 174 psig | 10...11 barg / 145...159.5 psig |
| Temperature | Ambient | Ambient |
| Flow rate (max.) | 30 kg/h / 66 lb/h | 10 kg/h / 22 lb/h |

In order to cover as large a flow range as possible, MERSEN previously used two variable area flowmeters, one for large flow rates and the other for small flow rates. The two different measurements as well as the slightly fluctuating pressure and ambient temperature, however, inevitably led to incorrect process information.



3. KROHNE solution

The OPTIMASS 6400 Coriolis mass flowmeter with nominal diameter DN15 (stainless steel version) was installed to measure the hydrogen consumption of both companies. KROHNE also recommended using the OPTIMASS 6400 in nominal size DN10 (also stainless steel version) for flow measurement of the hydrogen quantities consumed by MERSEN alone.

The OPTIMASS 6400 is the most suitable flowmeter for this gas application due to its V-shaped twin bent tube design. It is capable of measuring gases with a density below 1 kg/m^3 over a wide measuring range and with high accuracy. Its signal converter outputs the actual flow rate and transmits the total flow rate via analogue signal (4...20 mA) and pulse output or via digital outputs.



Hydrogen measurement at MERSEN with the OPTIMASS 6400 Coriolis mass flowmeter (DN10)

4. Customer benefits

The customer benefits from a stable hydrogen measurement under very low density conditions. Since the installation of the Coriolis mass flowmeters, the measurement has functioned independently of the operating conditions. It is accurate over the entire flow range.

MERSEN now has reliable information about the total amount of hydrogen delivered and can determine its own consumption much more precisely. In this way, the gas consumption of both companies can be determined beyond doubt and invoiced accordingly. The general consumption measurement corresponds to the hydrogen supplier's data.



Measurement of the total hydrogen consumption with the OPTIMASS 6400 Coriolis mass flowmeter (DN15)



Product used

OPTIMASS 6400

- Coriolis mass flowmeter for advanced process applications
- Twin bent tube design
- High accuracy mass, density and volume flow measurement ($\pm 0.35\%$ of MV for gases and up to $\pm 0.05\%$ of MV for liquids)
- Communication options: HART[®], FOUNDATION[™] Fieldbus, PROFIBUS[®] PA & DP, Modbus and PROFINET



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