APPLICATION NOTE

Chemical

Flow measurement of natural gas and oxygen for combustion control

- Flowmeters for a combustion control cabinet to monitor industrial gases
- Low-pressure natural gas flow measurement with integrated correction to standard conditions
- High accuracy mass flow measurement of oxygen to maintain combustion quality
- Comprehensive customer care package from technical advice to installation and after-sales service

1. Background

One of the leading global manufacturers of industrial gases and gas equipment runs several European sites of which one is located in Belgium. For a producer of Zamac alloys, the company engineered and built a combustion control cabinet to monitor and optimize furnace performance.

2. Measurement requirements

The furnace is natural gas fired. Natural gas supply and flow rate of oxygen are the most essential control variables in terms of combustion efficiency and quality. The industrial gas equipment supplier therefore needed to fit the cabinet with flowmeters able to accurately monitor the gas flow rates over a large measuring span. Installation space was limited.

Natural gas flow measurement posed a particular challenge as the operating pressure was low (0.3...0.45 barg / 4.35...6.5 psig) and fluctuating gas conditions required temperature and pressure compensated flow measurement. Given the small mounting space, installing several different sensors was not the best of options. This application called for a compact flow instrumentation with integrated temperature and pressure measurement as well as gas volume correction. Due to the low-pressure conditions, mechanical or other flowmeters that cause pressure loss by design could not be used. All requirements were specified in a request for quote (RFQ) process.

3. KROHNE solution

It was KROHNE's offering together with the technical advice provided during every step of the RFQ process that convinced the gas equipment manufacturer in the end. The decision was made to equip the combustion control cabinet with ultrasonic and Coriolis mass flowmeters.

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For low-pressure natural gas flow measurement, the OPTISONIC 7300 Biogas was selected. The all-in-one ultrasonic flowmeter combines flow, pressure and temperature measurement in a single device and also features integrated gas volume correction. In this way, it is able to provide the natural gas flow rate corrected to standard conditions. The flowmeter has proven itself in many low-pressure gas applications with biogas or methane. It was provided with cost-effective low-pressure flanges. As requested by the customer, the device causes virtually no pressure loss.

OPTISONIC 7300 Biogas for low-pressure natural gas flow measurement

The OPTIMASS 6400 Coriolis mass flowmeter was the preferred choice for flow measurement of oxygen. The twin bent tube flowmeter is designed for advanced gas applications with high accuracy requirements. The flowmeter was supplied ex works with cleaning for oxygen service. It is oxygen-approved – even up to 100 barg / 1450 psig if used with Hastelloy® tube material as confirmed by WHA Inc., NM/USA. 8 units of the flowmeter were mounted in parallel into the vertical pipes of the control cabinet, fitting well into the confined installation space. Like all KROHNE Coriolis mass flowmeters, the OPTIMASS 6400 is resistant to installation and process effects. "Crosstalk" was thus not an issue.

Combustion control cabinet with OPTIMASS 6400 Coriolis mass flowmeters for oxygen measurement

4. Customer benefits

The gas equipment supplier was very satisfied with the instrumentation recommended for the combustion control cabinets. The OPTIMASS 6400 helps the operator maintain a proper oxygen supply under varying conditions and within safe limits while the OPTISONIC 7300 Biogas provides reliable natural gas readings at low pressure conditions. High accuracy flow measurement is ensured and allows the end-user to properly control their natural gas and oxygen consumption so as to achieve the most favourable furnace efficiency and combustion performance.

The control cabinet manufacturer benefited from a very good price-performance ratio. In using the OPTISONIC 7300 Biogas for low-pressure natural gas flow measurement, the customer particularly saved on CAPEX and installation costs. There was no need to install three separate sensors for flow, temperature and pressure measurement plus external flow computer. This also reduced the complexity of the application.

KROHNE worked closely together with the customer along all essential process steps. As an experienced partner of the industrial gases industry, a tried and tested customer care approach was pursued – including technical support already during the preparation and processing phase of the RFQ process, flowmeter manufacturing according to customer specifications, installation at the customer's site and after-sales service.

5. Products used

OPTIMASS 6400

- Coriolis mass flowmeter for advanced gas applications
- High accuracy mass, density and volume flow measurement
- Oxygen-approved up to 100 barg / 1450 psig

OPTISONIC 7300 Biogas

- Ultrasonic flowmeter for low-pressure gas applications (incl. biogas, landfill and sewage gas)
- Integrated temperature and pressure measurement, gas volume correction and methane content measurement

Contact

Would you like further information about these or other applications?
Do you require technical advice for your application?
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