

MEASURING NATURAL GAS IN BOILER AND FURNACE APPLICATIONS

Optimization of a combustion process can result in significant savings in fuel costs. Proper control of the air/fuel ratio to a burner results in the highest possible efficiency - the maximum steam output (or heat generated) for the least fuel consumption. Accurate flow measurement (and the resulting improved control) of the natural gas and combustion air is critical to achieve peak efficiency. A wide variety of flow measurement technologies are used including orifice plates/DP transmitters, vortex, turbine, variable area and thermal mass flow meters. The critical factors in selecting the best flow meter for combustion applications are mass measurement, accuracy, repeatability, turndown, installation, safety and reliability. Let's review these areas in more detail:

1. Mass Measurement

Combustion is a chemical reaction; therefore, controlling the air/fuel ratio based on mass is essential. The Fox Thermal mass flow meter provides a direct mass measurement in Standard Cubic Feet per Minute (SCFM) or Pounds Per Hour (lbs/hr). Alternatively, differential pressure type devices (i.e. orifice plate with differential pressure transmitter), vortex, turbine and variable area meters provide only a volumetric flow measurement. With these devices, changes in process pressure or temperature will result in significant measurement error. It is possible to obtain an inferential mass flow measurement by compensating the volumetric flow with pressure and temperature measurement in a flow computer. However, this combination of instruments is expensive to purchase, install and maintain. A direct mass measurement with a Fox Thermal mass flow meter is your best solution.

2. Accuracy, Repeatability, Turndown

The topic of turndown is combined with the discussion of accuracy and repeatability for an obvious reason. If the flow meter is only accurate over part of the measurement range, your ability to optimize combustion over the entire operating range of the boiler will not be possible. A flow meter with wide turndown provides accurate and repeatable measurement over the entire operating range of the boiler. Fox Thermal flow meters are based on thermal mass flow technology that is highly sensitive to gas flow resulting in a turndown up to 1000:1; 100:1 typical. The platinum sensor achieves long-term stability because platinum is one of the most stable materials on earth. Fox Thermal delivers accurate and repeatable flow measurement over the full boiler operating range.

3. Installation

Although typically overlooked when assessing the cost versus performance benefits of one flow technology with another, the effort required to install a flow meter can have a significant impact on the "total installed cost" of a device. Installation of most flow meter technologies typically requires cutting out a section of pipe and installing flanges and possibly support brackets. Alternatively, use of a Fox Thermal insertion style flow meter is easy and less costly. The insertion flow meter probe is inserted into the pipe and secured in place with a Fox Thermal supplied compression fitting. The pressure rating is 300-500 psig (depending on model). Additionally, there are no moving parts and pressure drop is extremely low. All Fox Thermal models available with insertion probes.

Another issue related to installation concerns upstream and downstream straight pipe requirements.

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Most technologies, including insertion flow meters require 10 to 15 diameters of straight pipe upstream of the sensor and 5 to 10 diameters downstream. However, for situations where long, straight pipe runs are not available, Fox Thermal offers inline styles with flow conditioners or the option to add the FC10 flow conditioner to an insertion style flow meter to provide a solution. Flow conditioners eliminate the need for long upstream and downstream straight pipe runs.

4. Safety and Reliability

	Product Certifications															
	ISO	FM	FMc	CRN	ASME IX	CE/EMC	LVD	PED	ATEX	IECEX	NA-MUR	NACE	EPA	BSEE	MA Prod.	AB32
FT1	●	●	●	N/A	●	●	●	●	●	●	●	●	●		●	●
FT2A	●	●	●	●	●	●	●	●			●	●	●		●	●
FT3	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
FT4A	●	●	●	N/A	●	●	●	●	●	●	●	●	●			●
FT4X	●	●	●	N/A	●	●	●	●	●	●	●	●	●		●	●

For more information on product approvals, please see the model datasheet.

5. Natural Gas Composition Variances

The NAESB lists a "standard" natural gas composition, but the reality of natural gas composition is that it can be widely different from one source to another; even in the same state. It's important that the flow meter is calibrated to measure the actual gas composition found in the process, but this makes finding a flow meter tricky. If the composition of the gas changes over time, but the calibration of the flow meter remains locked to an outdated composition, the errors in reading could be significant.

Fox Thermal has developed the Gas-SelectX® gas selection feature to allow the flexibility needed for these difficult applications. With Gas-SelectX®, the user can choose from a list of pure gases or program a custom gas mix in the field with the push of a button. Gas sampling done at regular intervals will show if changes in the gas composition have occurred and the flow meter can be updated with the new gas composition on the spot; no need to send it back to the factory for a re-calibration!

The Fox Thermal mass flow meter is your best choice in boiler, kiln and furnace applications for measuring natural gas and combustion air. Call or email us today to see how we can help with your natural gas flow measurement needs!