FOX
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Application Guide:

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 flowmeters. The critical factors in selecting the best flowmeter 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 Model 10A Thermal Mass Flowmeter provides a direct mass measurement in Standard Cubic Feet per Minute (SCFM). 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 types of 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 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 flowmeter 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 flowmeter with wide turndown provides accurate and repeatable measurement over the entire operating range of the boiler. Fox Flowmeters are based on Thermal Mass Flow technology that is highly sensitive to gas flow resulting in a turndown up to 100:1. The platinum sensor achieves long-term stability because platinum is one of the most stable materials on earth. Fox 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 flowmeter can have a significant impact on the "total installed cost" of a device. Installation of most flowmeter technologies typically requires cutting out a section of pipe and installing flanges and possibly support brackets. Alternatively, use of an insertion style device, such as the Fox 10A Flowmeter is easy and less costly. The insertion flowmeter is installed by drilling a hole in the pipe and welding on a ¾" NPT coupling. The insertion flowmeter probe is inserted into the pipe and secured in place with a Fox supplied compression fitting. The pressure rating is 300 psig. Additionally, there are no moving parts and pressure drop is extremely low.

Another issue related to installation concerns upstream and downstream straight pipe requirements. Typically most technologies, including insertion flowmeters require 10 diameters of straight pipe upstream of the sensor and 5 downstream. However, for situations where 15 diameters of straight pipe are not available, Fox offers an in-line flowmeter that provides a solution. The inline flowmeter contains flow-conditioning plates that eliminate the need for upstream and downstream straight pipe runs.

4. Safety and Reliability

The Fox 10A Thermal Mass Flowmeter is delivered standard with an explosion-proof housing rated for Class I, Division 1, Groups B, C and D. The sensors all welded, all stainless steel construction was specifically designed for demanding industrial applications.

Cost Savings/Benefits Summary

The Fox Thermal Mass Flowmeter is your best choice in boiler and furnace applications for measuring natural gas and combustion air:

- A direct mass flow measurement in SCFM
- Accurate flow measurement over the entire operating range of the boiler
- Easy, cost effective installation
- Safe in explosive gas applications
- No moving parts and extremely low pressure drop

Free article: Fox would be happy to send you the article "Simple Techniques To Optimize Boiler Efficiency" by Randall L. Hayes, P.E. Please contact us.

Also ask us about flowmeters for compressed air applications.