How do you manage fuel usage and emissions in your fired heaters, boilers, furnaces, dryers, turbines, etc.?

"Energy accounts for 1/3 of the total cost of a typical chemical plant. Reducing the energy needed to make a pound of product is a matter of competitive survival."

William R Prindle, From Shop Floor to Top Floor: Better Business Practices in Energy Efficiency, ICF International

What if...

- You could run your plant safely with less excess air, even considering fuel variations?
- You could reduce your emissions?
- You could check your fuel and air meters without interrupting the combustion process?

How much are you spending to produce your product?

You are under constant pressure to minimize fuel usage. At the same time, you are facing increasing environmental regulations and pressures to try to reduce SO_x and NO_x emissions. There is nothing you would like more than to increase your efficiency in all of your combustion processes, lower your emissions, and reduce shutdowns, all the while ensuring that you aren't introducing any safety risks.

Controlling the fuel to air ratio during combustion can be a challenge when the fuel (natural gas or refinery fuel gas) changes in composition. Providing too much air reduces efficiency as the excess air absorbs some of the heat or combustion. Providing too much fuel means some of it is not completely burned, which results in reduced efficiency and increased carbon monoxide and hydrocarbon emissions.

In order to control the target fuel to air ratio, it is important to reduce the effect of the variability in fuel composition.

Utility managers we talk to tell us about challenges like these:

"Fuel variability forces us to run at low efficiencies."

You're asked to maintain the correct fuel to air ratio, but you either don't have any visibility to changes in composition of the hydrocarbon stream, or you are using a gas chromatograph that doesn't tell you about composition changes quickly enough to react.

"The environmental regulations aren't getting any easier."

Greenhouse gas emissions are getting more attention around the world, putting pressure on you to minimize all emissions.

"I need a simple way to check my meters to make sure I can still trust their outputs."

When you get a reading for fuel or air flow, you want to have a simple way to make sure those readings are correct without having to interrupt service.

Micro Motion®

EMERSON™
Process Management

COMBUSTION CONTROL

Reduce Energy Footprint

The fuel to air ratio is a critical control point in your process. Many people don't have any visibility to changes in gas composition, or if they do, it takes too long to get information from a gas chromatograph (GC) to react to changes. Because of this lack of information, excess air is used to prevent unburned fuel or hot spots due to high energy content fuel. Operating with too much excess air reduces combustion efficiency significantly.

Using a Micro Motion® 3098 Gas Specific Gravity Meter virtually eliminates the maintenance costs associated with a GC and allows for updates in seconds. The meter can output molecular weight (within 0.1%) and use AGA-5 calculations to output energy content. This can be used with the existing flowmeter for better control, or the fuel flow accuracy can also be improved with a Micro Motion flowmeter to get even better measurement.

Because the energy content of methane, ethane, propane, etc. have much less variation on a per mass basis than a per standard volume basis, if you assume a constant composition for the fuel gas, it should be done on a mass basis (see Figure 1). Many of our customers have successfully installed a Rosemount Vortex meter for the air measurement (+/-0.65%) and a Micro Motion ELITE® Coriolis flowmeter (+/-0.25%) to measure the mass of fuel gas with assumed energy content. Even with drastic changes in fuel composition where the energy content might vary by more than 20% on a volume basis, the energy content by mass is within 4%. Controlling the fuel to air ratio on mass can drastically improve combustion efficiency.

A refinery using fuel gas with 25-50% hydrogen content was able to increase steam capacity from 80% to nearly 100% by using a control system cascade loop for fuel to air ratio on a mass basis using a Micro Motion Coriolis flowmeter. They were also able to avoid hot spots and excess NO_x emissions.

REDUCE IMPACT OF FEEDSTOCK VARIABILITY

With faster visibility to changes in molecular weight (related to energy content), feed rates can be changed to maintain better control of fuel to air ratio. Another alternative is to use a flow metering technology that is inherently more immune to changes in composition than traditional volumetric flow meters. This means changing composition of feeds will have less impact, allowing for more efficient operation.

Component	Case 1	Case 2
Methane	30%	47%
Ethane	12%	15%
Propane	6%	7%
Butane	2%	6%
Hydrogen	50%	25%
BTU/lb	25587	23639
BTU/scf	869	1181
kJ/kg	59489	54959
kJ/Nm^3	32356	43973

Figure 1. Example of two different compositions of fuel gas with energy content that varies by +/-18% by volume, but only +/-4% by mass

REDUCE EMISSIONS

With better knowledge of energy content, you can control your fuel to air ratio to optimize efficiency and reduce NO_x, SO_x, and CO_2 emissions.

METER VERIFICATION

With Emerson's Smart Meter Verification, you can satisfy EPA and ISO requirements and check the health of the sensor and transmitter within minutes without interrupting the process, giving you confidence to know your meters are still functioning properly.

www.MicroMotion.com/Gas

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