



Improve Fired Heater Efficiency and HSE

Reduce emissions, increase safety,
and lower energy costs with
improved fired heater efficiency.

Industry Facts You Need to Know

REDUCE YOUR ENERGY INTENSITY

- ➔ Fired heaters account for **37%** of the U.S. manufacturing energy end use

(Source: Dept. of Energy/Mfg. Energy Consumption Survey)

- ➔ **30% to 50%** percent of an operating budget is typically spent on energy

(Source: Energy Star Guide)

IMPROVE FUEL EFFICIENCY AND EMISSIONS

- ➔ A **2%** reduction in O₂ (from **4%** down to **2%**) can result in up to **24%** in fuel savings

(Source: API RP 535)

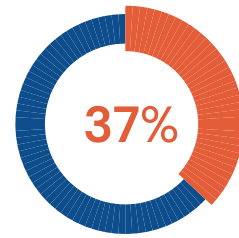
- ➔ A **2%** O₂ increase can result in a **25%-30%** increase in NO_x emissions

(Source: API RP 535)

IMPROVE YOUR BOTTOM LINE

- ➔ Moving from a traditional pressure- or volume-based fuel gas control scheme to a mass-based one, could result in more than **\$250K** Net Present Value (NPV) savings depending on heater duty

(Source: API RP 556 Sub-committee)



The U.S. Department of Energy reports fired heaters constitute 37% of manufacturing energy end use.



Positively Impact Your Energy, Emissions, and Safety

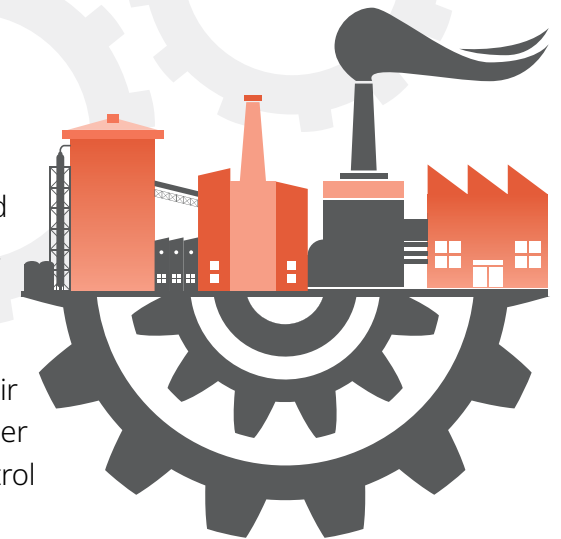
Utilize Emerson solutions to stabilize control of your fired equipment and reduce emissions, improve safety, and reduce energy costs.

The control strategy of fired equipment impacts energy, emissions, and safety. By measuring the concentration of oxygen in the flue gas of the stack, which serves as an indicator of both safety and efficiency of the heater, you can greatly improve the performance of your fired equipment.

When natural gas is used as the fuel source for combustion, the composition of these gases can change making the heating value of the gas variable. Air requirements for combustion also vary, leading to unstable or insufficient combustion.

In most fired heaters, the outlet temperature of the heater is cascaded to a volumetric flow controller or a pressure controller for the fuel gas. Neither of these options respond efficiently to a change in the heating value or energy content of the fuel.

Therefore, as a safety margin, heaters are operated with high excess air which leads to increased energy costs and emissions. To improve heater efficiency and safety, reducing control variability with mass-based control and better measurements can contribute to a more stabilized control and operation with less excess air.



APPLICATION CHALLENGES

Reducing energy intensity and achieving your company's ESG targets is your goal. We can help you with these major challenges, so you can better control your fired heater for optimal operation and improved profitability.

Reduce energy consumption and emissions

Operate with less excess air for maximum efficiency

Prevent safety trips caused by rich fuel conditions

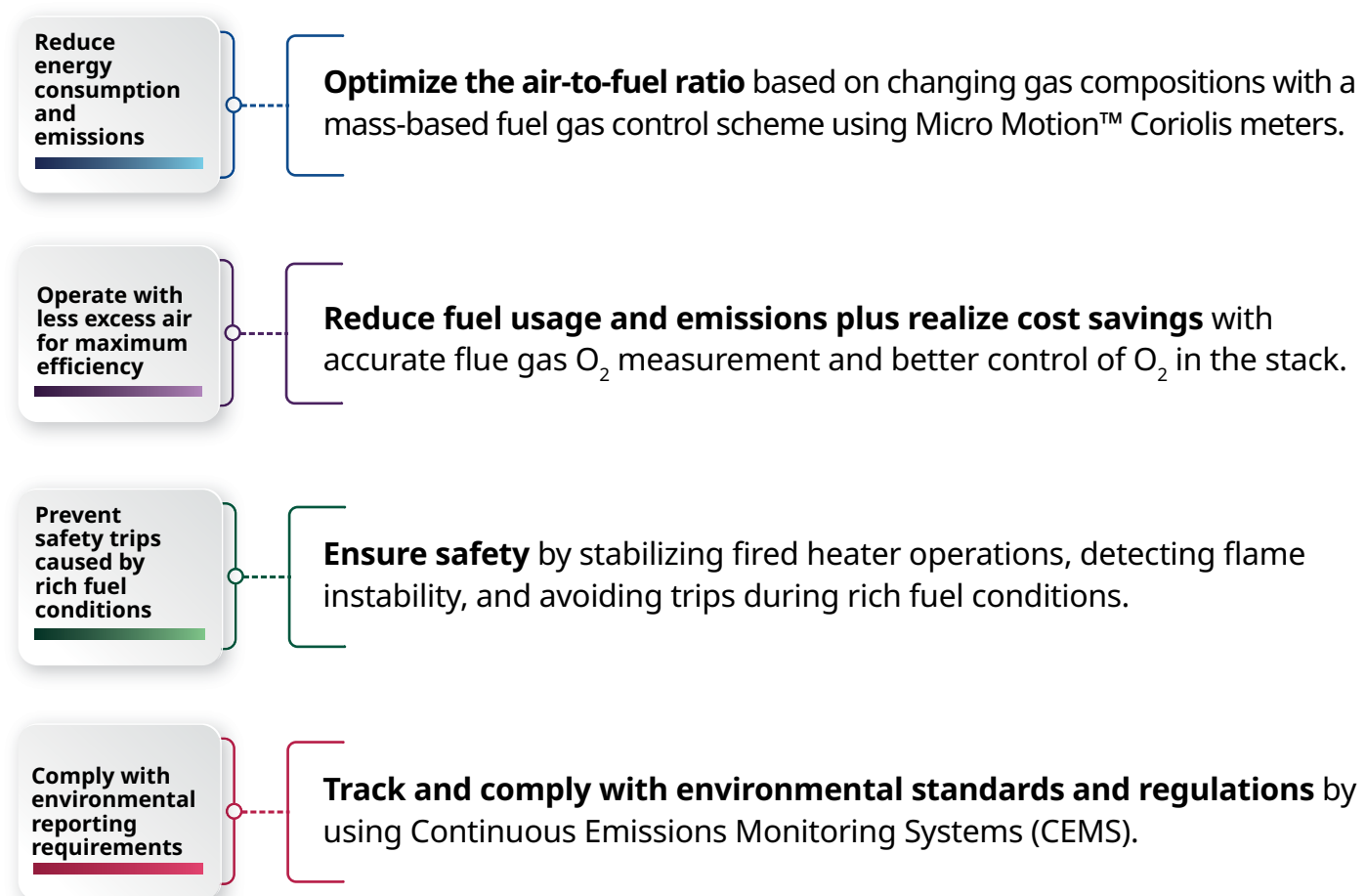
Comply with environmental reporting requirements

The Value of Emerson's Comprehensive Solutions



Emerson can help you improve fired heater performance. A mass-based fuel gas measurement control scheme can result in significant savings in energy costs, reductions in emissions, and safety improvements.

With Emerson's solutions you can:



Improved measurement and control strategies are critical to driving your operation to maximum efficiency and safety.

Product Solutions

Emerson is a collaborative partner. Our team works along with you to help improve fired heater combustion control and reduce energy costs and emissions.

On the next few pages, see how our product solutions have helped customers meet their goals of:

- Reducing energy costs and lowering emissions
- Ensuring safety while avoiding unplanned shutdowns
- Tracking emissions and regulatory reporting compliance

Let's start a conversation on how our team can work with you.



REDUCE ENERGY COSTS AND LOWER EMISSIONS



ENSURE SAFETY WHILE AVOIDING UNPLANNED SHUTDOWNS



TRACK EMISSIONS AND REGULATORY REPORTING COMPLIANCE



GOAL: REDUCE ENERGY COSTS AND LOWER EMISSIONS

Issues

Solutions

Featured Products

Fluctuations in fuel gas composition makes it difficult to maintain an optimal fuel to air ratio resulting in poor efficiency and increased emissions

Use mass-based fuel gas control and compositional analysis



Micro Motion Coriolis Meters -

- stabilizes combustion control with lower Btu content variability by controlling fuel gas on a mass-basis
- typical NPV savings of \$250K by moving from a volumetric to mass-based control scheme



Micro Motion SGM Gas Specific Gravity Meter -

- quickly detects variations in fuel gas composition to optimize fuel to air ratio control and improve combustion efficiency
- provides inferred fuel gas composition analysis, Btu, and Wobbe index calculations

Balancing excess oxygen in the flue gas to maximize efficiency, reduce emissions, and prevent unsafe fuel rich conditions

Implement reliable excess oxygen measurement of the flue gas



Rosemount™ OCX8800 Oxygen and Combustibles Analyzer -

- provides a continuous, accurate measurement of the oxygen remaining in flue gases coming from any combustion process
- combustibles sensor alerts to the presence of excess combustibles leading to more efficient combustion control and increased safety
- reduce maintenance with auto calibration capabilities of the transmitter



Rosemount 6888 In Situ Oxygen Analyzer -

- provides accurate measurement of excess oxygen which is critical for combustion optimization and control
- in-situ installation reduces response times for improved control of dynamic systems
- reduce maintenance with auto calibration capabilities of the transmitter

Inadequate measurement and control of heater air flow reduces combustion efficiency and increases emissions

Leverage the best available technology to measure air flow to the fired heater



Rosemount 3051SFA Annubar™ Flow Meter -

- enables accurate flow measurement for challenging installations like air ducts and stack flow measurements
- increase energy efficiency and reduce NOx emissions by operating with less excess air and tightening air flow control
- for stack measurement, a Pitot traverse technique determines meter factor correction improving accuracy for control and emissions reporting



Rosemount 3051SFC Compact Conditioning Orifice Plate Flow Meter -

- increase energy efficiency and reduce NOx emissions with improved air flow measurement and control for smaller fired heaters with smaller diameter air lines



GOAL: ENSURE SAFETY WHILE AVOIDING UNPLANNED SHUTDOWNS

Issues Solutions Featured Products

Ensuring fired heater safety and prevention of heater tube damage often requires SIL-rated complex redundant measurements

Use fit-for-purpose, SIL-rated flowmeters with built in redundancy to reduce installation complexity and cost



Rosemount 8800 Vortex Flow Meter -
- reduces spurious trips on heater pass measurements and maintenance caused by impulse line challenges
- the all-welded non-clogging single, dual and quad configurations provide reliable flow readings with lower installation costs by a single drop in assembly
- the first and only quad solution provides integrated process measurement plus 2oo3 voting redundancy, suitable for SIL-3 applications



Rosemount 9295 Process Flow Meter -
- meets challenging installation requirements with conditioning orifice technology in a ready-to-install spool that requires no additional straight runs
- meets SIS requirements on heater pass measurement with multiple independent transmitters on the same spool section and reduced installation costs
- an all-welded design eliminates leak points with rugged isolation valves that improve process safety



Rosemount 3144P Temperature Transmitter -
- provides the highest accuracy transmitter and measurement redundancy for heater outlet and stack temperature control
- hot backup redundant measurement reduces shutdowns

Undetected flame instability could lead to a flame-out resulting in hazardous unburned fuel left in the firebox and uncontrolled combustion resulting in a safety incident or equipment damage

Leverage flame instability detection technology to prevent dangerous flame-out conditions



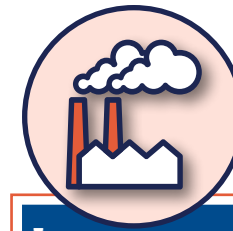
Rosemount 3051S Series Pressure Transmitters -
- combining the highest safety-rated pressure transmitter in the industry with Process Intelligence Diagnostic ensures burner safety and prevents unnecessary trips by providing early detection of burner flame instability
- statistical process monitoring technology measures and analyzes draft air pressure process noise by sampling at 22 times per second

Reduce response time and keep people safe by detecting fires that may occur near combustion equipment

Implement flame detection technology near potential fire sources



Rosemount 975MR Multi-Spectrum Infrared Flame Detector -
- provides the best possible combination of detection speed, performance, and false alarm immunity
- these detectors can be brought back to specialized fire alarm panels for the activation of suppression systems or tied back to the local DCS or Emergency Shutdown (ESD) system for shut down of machinery



GOAL: TRACK EMISSIONS AND REGULATING REPORTING COMPLIANCE

Issues Solutions Featured Products

Ensuring compliance with environmental regulations and reporting

Leverage turnkey continuous emissions monitoring systems (CEMS) and gas analysis solutions



Rosemount CT5100 Continuous Gas Analyzer -
- provides all CEMS measurements when using hot/wet sampling systems
- leverages quantum cascade laser (QCL) and tunable diode laser (TDL) technology with up to six laser measuring cells that can handle sample gas temperatures up to 190°C (375°F), making them well suited for hot/wet sampling systems



Rosemount X-STREAM Enhanced XECLD Continuous Gas Analyzer - provides all CEMS measurements when using a traditional cold/dry sampling systems. Includes technologies such as Non-Dispersive Infrared (NDIR)/Non-Dispersive Ultraviolet (NDUV) for CO and CO₂, Chemiluminescence for NO_x, Paramagnetic for O₂, and Electrochemical for cells and sensors

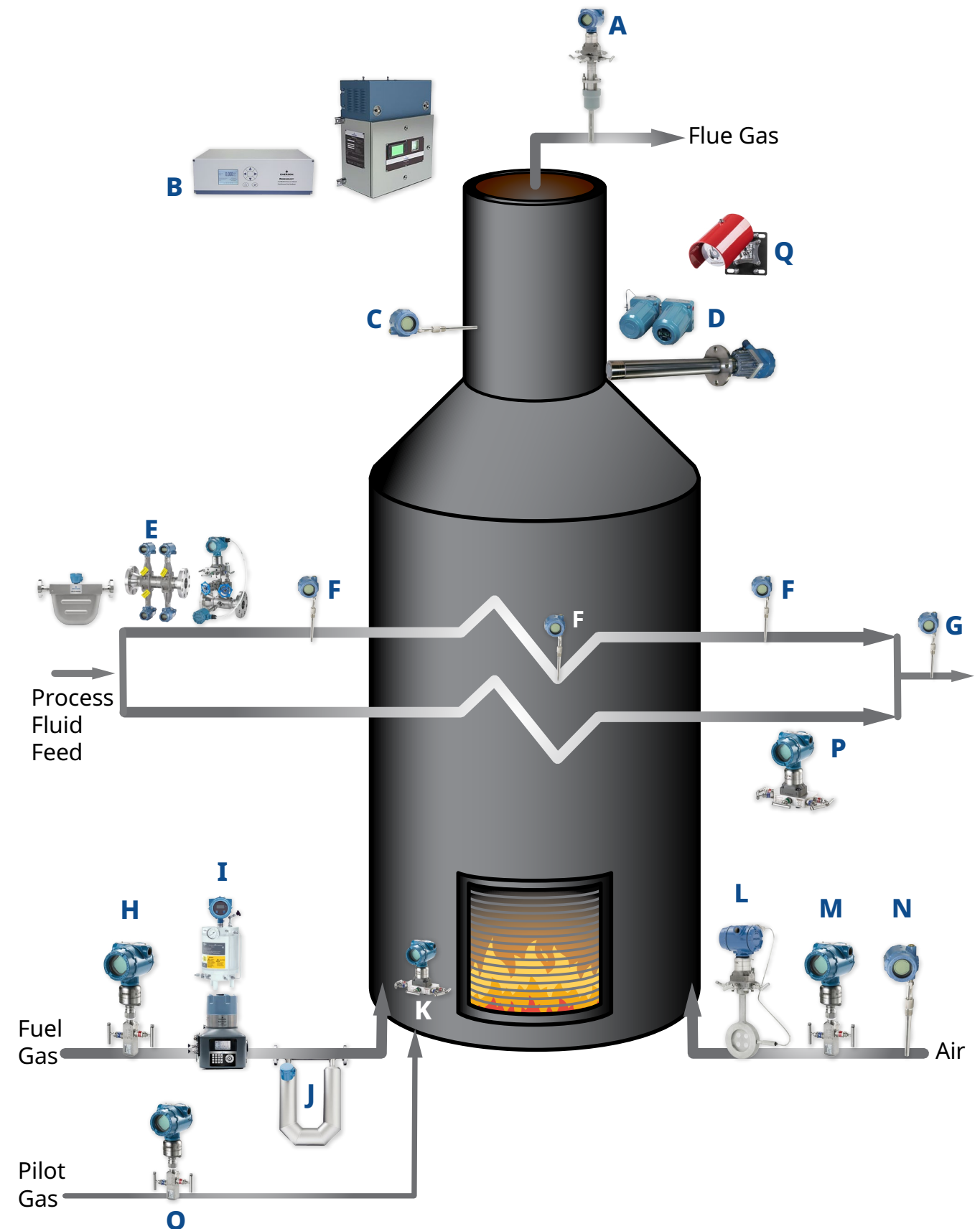


Rosemount 370XA Gas Chromatograph and Rosemount 770XA Gas Chromatograph- compact field installed gas chromatograph solutions that provide accurate real-time gas compositional analysis and Btu calculations of fuel and natural gas for control and emissions reporting calculations



Emerson has the portfolio breadth and industry experience to help you leverage automation technologies. If you're having unplanned fired heater trips caused by variations in fuel gas composition or looking to lower emissions and energy costs, **Emerson is uniquely qualified to help you improve fired-heater combustion control and reduce energy costs and emissions.**

- A** - Flue gas flow measurement
- B** - Continuous emissions monitoring
- C** - Stack temperature monitoring
- D** - Oxygen and COe measurements
- E** - Process fluid feed measurements
- F** - Temperature pass measurements
- G** - Temperature cascade control
- H** - Fuel gas pressure measurement
- I** - Fuel gas composition and Btu measurement
- J** - Mass flow control for fuel gas
- K** - Flame stability monitoring
- L** - Air flow measurement
- M** - Air flow pressure compensation
- N** - Air flow temperature compensation
- O** - Pilot gas pressure measurement
- P** - Flow pass pressure measurement
- Q** - Multi-spectrum infrared flame detector



Please contact your Emerson sales representative to discuss solutions to meet your goals.

Measurement Instrumentation

The broadest range of measurement and analytical technologies for the chemical industry.

To learn more about Emerson's solutions for the chemical industry



00803-0400-2323
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