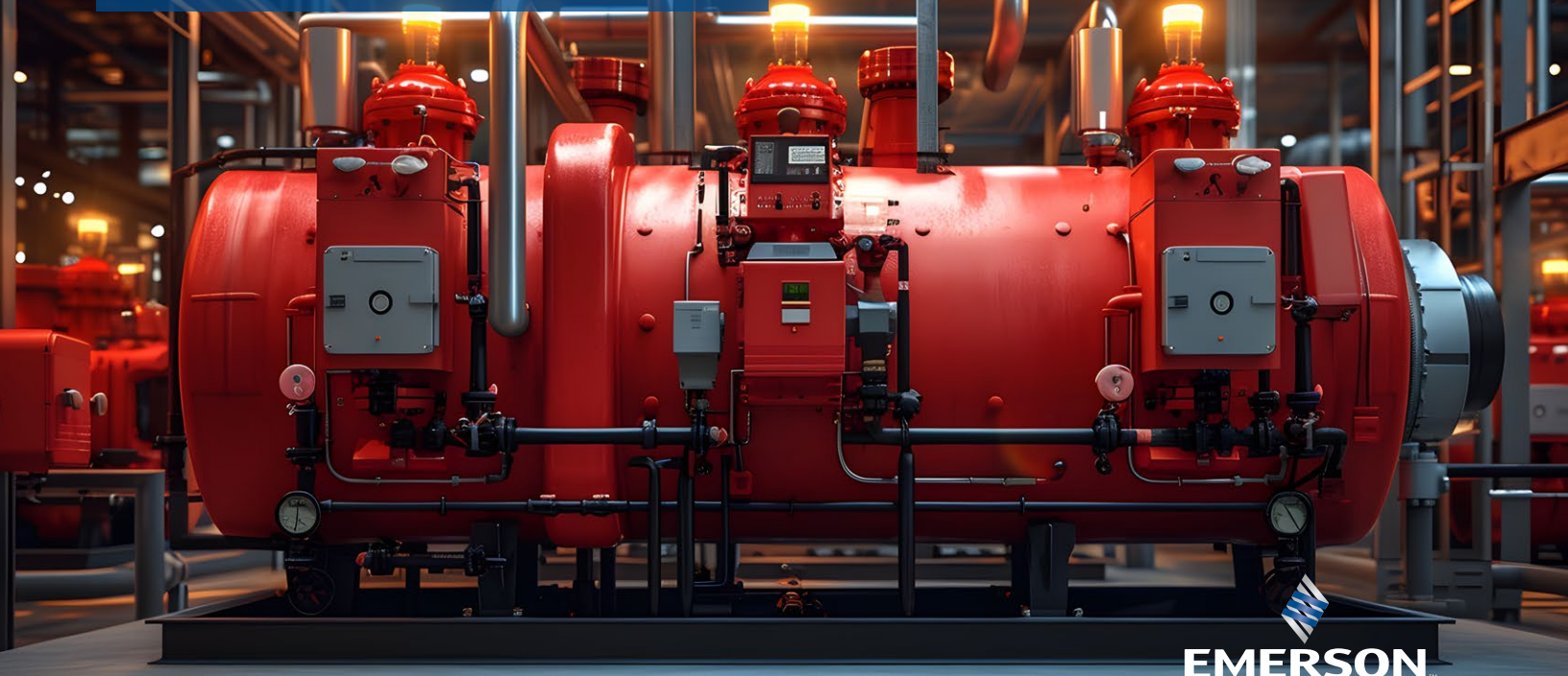




# Improve Boiler and Steam Distribution Efficiency

Realize large savings in fuel usage and emissions reductions by improving your boiler and steam system performance.





# Industry Facts You Need to Know

## IMPROVE YOUR BOTTOM LINE

- ➔ Steam generation accounts for 40% to 50% of a chemical plant's entire energy budget, so efficiency gains will significantly improve sustainability and profitability

*(Source: United States Department of Energy)*

- ➔ U.S. Department of Energy estimates the overall potential for energy savings in the U.S. chemical industry at 12.4% of the fuels used to generate steam

*(Source: United States Department of Energy)*

## IMPROVE FUEL EFFICIENCY AND EMISSIONS

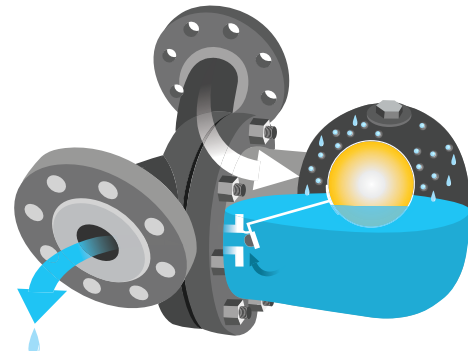
- ➔ U.S. Department of Energy suggests 15% to 30% of steam traps that are 3-5 years old are malfunctioning and 10% will likely fail in any given year

- ➔ A malfunctioning trap can easily waste \$10,000 worth of energy over a year

*(Source: United States Department of Energy)*



*The U.S. Department of Energy reports steam generation accounts for 40-50% of a chemical plant's entire energy budget.*



*Monitoring the health of industrial steam traps can help increase efficiency and energy.*

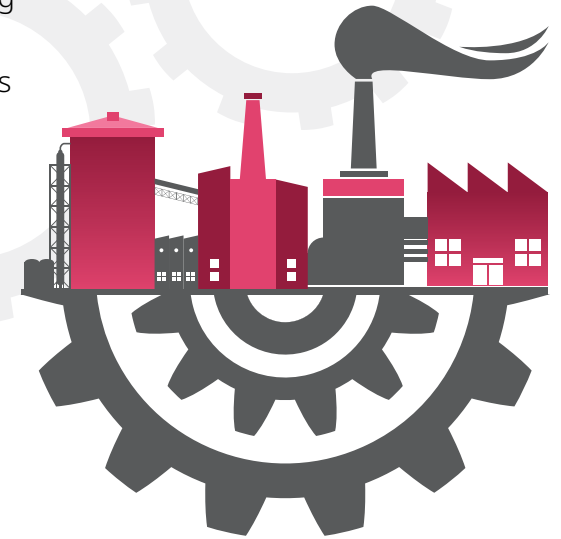


# Positively Impact Your Bottom Line by Optimizing Combustion and Steam System Efficiency

**Creating steam is an expensive and energy-intensive process. Evaluating boiler performance offers many areas of potential improvement. Boiler efficiency gains will significantly improve sustainability and profitability.**

Emerson provides solutions to help you improve boiler control, which is key to achieving a safe operation, increasing reliability and optimizing performance with respect to load-change response, fuel cost and emissions. The quality of measurement instruments and steam traps is the foundation for building optimal control.

Complex steam distribution systems to plant processes create numerous opportunities to save energy. Reducing steam distribution losses starts with improved measurements to establish usage baselines, but lack of or poor measurements create a mass imbalance in the steam network making it a challenge to improve efficiency and minimize losses.



## APPLICATION CHALLENGES

**Reducing energy costs and emissions is your goal.**

We can help you with these challenges, so you can better manage your boiler and steam production and improve your bottom line:

Reduce energy usage and steam waste

Optimize steam usage

Operate with less excess air and lower emissions

Comply with environmental standards



# The Value of Emerson's Comprehensive Solutions

Emerson can help you improve boiler and steam production performance with our comprehensive set of technologies. Emerson's measurement instruments and steam trap monitoring is the foundation for building optimal control while reducing emissions and wasted energy.

With Emerson's solutions you can:

Reduce energy usage and steam waste

**Stabilize fuel gas** to operate more safely and efficiently with Micro Motion™ Coriolis meters.

**Monitor condensate and water usage** using Flexim Non-Intrusive Ultrasonic flow measurement.

**Improve combustion efficiency** by measuring remaining oxygen and combustibles in the flue gas with Rosemount™ Oxygen and Combustibles Transmitters.

**Attain optimal efficiency** by monitoring steam temperature and accurately controlling boiler drum level.

**Improve safety with pressure measurements** to monitor gas supply, get early detection of flame instability, and monitor steam pressure.

**Maintain boiler water quality** to prevent corrosion and scaling, and identify leaks with pH and conductivity monitoring.

**Reduce wasted energy** by identifying faulty steam traps using the Rosemount 708 Acoustic Transmitter with Plantweb Insight™ Steam Trap monitoring software.

Optimize steam usage

**Optimize steam consumption** with DP Flow, and Vortex flow meters.

Operate with less excess air and lower emissions

**Improve combustion efficiency** using Rosemount oxygen and COe Analyzers.

Comply with environmental standards

**Monitor flue gas flow for emissions reporting** and measure large steam lines with Rosemount Annubar™ Flow Meters.  
Use CEMS technology to monitor for **environmental compliance**.

*The quality of measurement instruments and steam traps is the foundation for building optimal boiler control.*



# Product Solutions

Emerson is a collaborative partner. Our team works along with you to meet your boiler performance and steam production goals.

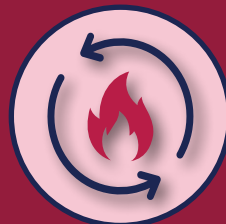
On the next few pages, see how our product solutions have helped customers meet their goals of:

- Reducing fuel costs and lowering emissions
- Improving heat and energy balance while eliminating waste
- Reducing maintenance and unplanned shutdowns
- Ensuring safety and environmental compliance

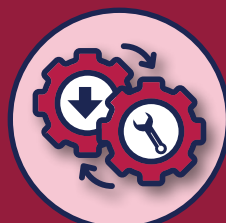
Let's start a conversation on how our team can work with you.



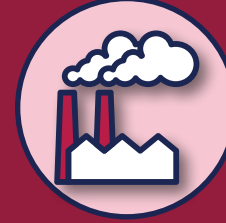
REDUCE FUEL COSTS AND LOWER EMISSIONS



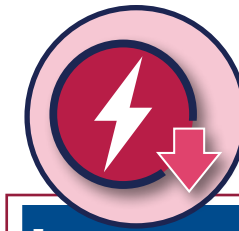
IMPROVE HEAT & ENERGY BALANCE WHILE ELIMINATING WASTE







REDUCE MAINTENANCE & UNPLANNED SHUTDOWNS

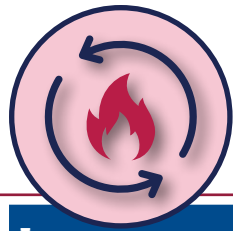


ENSURE SAFETY AND ENVIRONMENTAL COMPLIANCE



## GOAL: REDUCE FUEL COSTS AND LOWER EMISSIONS

Issues	Solutions	Featured Products
Fluctuations in fuel gas composition makes it difficult to maintain optimal fuel to air ratio resulting in poor efficiency and increased emissions	Use mass-based fuel gas control	 <p><b>Micro Motion Coriolis Meters -</b></p> <ul style="list-style-type: none"> <li>- stabilizes combustion control with lower Btu content variability by controlling fuel gas on a mass-basis</li> <li>- typical NPV savings of \$250K by moving from a volumetric to mass-based control scheme</li> </ul>
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	 <p><b>Rosemount OCX8800 Oxygen and Combustibles Analyzer -</b></p> <ul style="list-style-type: none"> <li>- provides a continuous, accurate measurement of the oxygen remaining in flue gases coming from any combustion process</li> <li>- combustibles sensor alerts to the presence of excess combustibles leading to more efficient combustion control and increased safety</li> <li>- reduce maintenance with auto calibration capabilities of the transmitter</li> </ul>
		 <p><b>Rosemount 6888 In Situ Oxygen Analyzer -</b></p> <ul style="list-style-type: none"> <li>- provides accurate measurement of excess oxygen which is critical for combustion optimization and control</li> <li>- in-situ installation reduces response times for improved control of dynamic systems</li> <li>- reduce maintenance with auto calibration capabilities of the transmitter</li> </ul>
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 boiler	 <p><b>Rosemount 3051SFA Annubar Flow Meter -</b></p> <ul style="list-style-type: none"> <li>- enables accurate flow measurement for challenging installations like air ducts and stack flow measurements</li> <li>- increase energy efficiency and reduce NOx emissions by operating with less excess air and tightening air flow control</li> <li>- for stack measurement, a Pitot traverse technique determines meter factor correction improving accuracy for control and emissions reporting</li> </ul>



## GOAL: IMPROVE HEAT AND ENERGY BALANCE WHILE ELIMINATING WASTE

Issues	Solutions	Featured Products
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Inaccurate or inadequate steam consumption monitoring in the plant

Use best-in-class multivariable steam flow measurement



- Rosemount 8800 Vortex Flow Meter -**
- increases energy efficiency by more accurately monitoring steam usage
  - MultiVariable capability with integral temperature sensor and external pressure transmitter input for P&T compensation
  - all-welded non-clogging design provides reliable flow readings without the need for impulse lines



- Rosemount 3051SFC Compact Conditioning Orifice Plate Flow Meter-**
- increase energy efficiency by more accurately monitoring steam usage
  - MultiVariable capability for improved P&T compensation and compact design with minimal straight runs and wireless options makes adding additional measurement points easy

Poor condensate heat recovery reduces energy efficiency

Accurately monitor condensate return flow to maximize heat recovery and reuse



- Flexim FLUXUS® F721 Non-Intrusive Ultrasonic Liquid Flow Meter -**
- non-intrusive meter for measuring condensate return and boiler feedwater flow
  - immune to water hammer effects and reduces energy cost with bidirectional flow to detect leaking valves

Inadequate steam temperature monitoring prevents identification of wasted heat

Leverage non-intrusive temperature monitoring to easily add monitoring points



- Rosemount X-well™ Technology -**
- accurately measure the process temperature with no pipe penetrations
  - easily add steam temperature measurements for improved monitoring of thermal efficiency
  - improve your repeatability and accuracy with ambient temperature compensation

Leaking steam traps are wasting energy

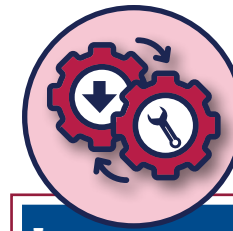
Implement wireless steam trap monitoring measurement and software



- Plantweb Insight Steam Trap Application -**
- dashboards display which steam traps are working correctly and which are in failure mode
  - the software estimates lost energy and resulting costs at any time
  - maintenance personnel can easily identify which steam traps need attention and plan repair activities



- Rosemount 708 Wireless Acoustic Transmitter -**
- monitors steam traps to lower the high cost of steam usage and losses due to malfunctioning traps
  - detects leaking, cold, and blow through conditions
  - real-time monitoring eliminates the need for a yearly steam audit and provides immediate notifications



## GOAL: REDUCE MAINTENANCE AND UNPLANNED SHUTDOWNS

Issues	Solutions	Featured Products
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Traditional level technologies often require wet legs with potentially unreliable heat-tracing. An unexpected freeze could cause a disruption to the boiler level measurement resulting in an unplanned outage

Eliminate the use of wet-legs and heat tracing and instead use guided-wave radar which can eliminate the risk that an unexpected freeze will disrupt the level measurement causing a costly unplanned outage



- Rosemount 5300 Level Transmitter - Guided Wave Radar -**
- boilers will trip if the drum level gets too high to avoid sending water into the steam line
  - they will also trip if it gets too low as this could cause the boiler to run dry resulting in damage
  - Rosemount guided wave radar with dynamic vapor compensation automatically compensates for changing process conditions which can also deliver tighter level control than what is achieved using traditional level technologies

Poor boiler water quality is causing scale build-up and corrosion resulting in increased maintenance

Monitor boiler water quality with improved conductivity and pH/ORP sensors



- Rosemount 400 Contacting Conductivity Sensor -**
- conductivity measurement is essential for maintaining water quality in boiler feedwater
  - helps prevent scale formation, control impurity buildup, optimize boiler efficiency, and ensure the longevity of equipment
  - can also be used to detect heat exchanger leaks that can contaminate the boiler feedwater and damage the boiler



- Rosemount 3900 General Purpose pH/ORP Sensor -**
- ensure boiler feedwater meets pH and water chemistry requirements
  - ORP measurement in boiler feedwater is a valuable tool for assessing the chemical conditions that impact corrosion, water treatment effectiveness, and system efficiency

Unreliable pressure and temperature devices are increasing maintenance costs

Take advantage of devices with the latest advanced diagnostics to improve reliability

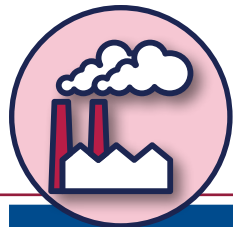


- Rosemount 3144P Temperature Transmitter -**
- provides the highest accuracy transmitter and measurement redundancy for boiler feedwater and steam ensuring accurate temperature compensation and reduced mass and energy balance errors
  - hot backup diagnostics provide a redundant measurement to reduce shutdowns



- Rosemount 3051S Series Pressure Transmitter -**
- accurately measure fuel gas header and steam pressures with the highest reliability
  - detect plugged impulse lines with advanced diagnostics to reduce downtime
  - utilize the highest safety-rated pressure transmitter in the industry





**GOAL: ENSURE SAFETY AND ENVIRONMENTAL COMPLIANCE**

**Issues Solutions Featured Products**

**Issues**  
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

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



**Featured Products**  
**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

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

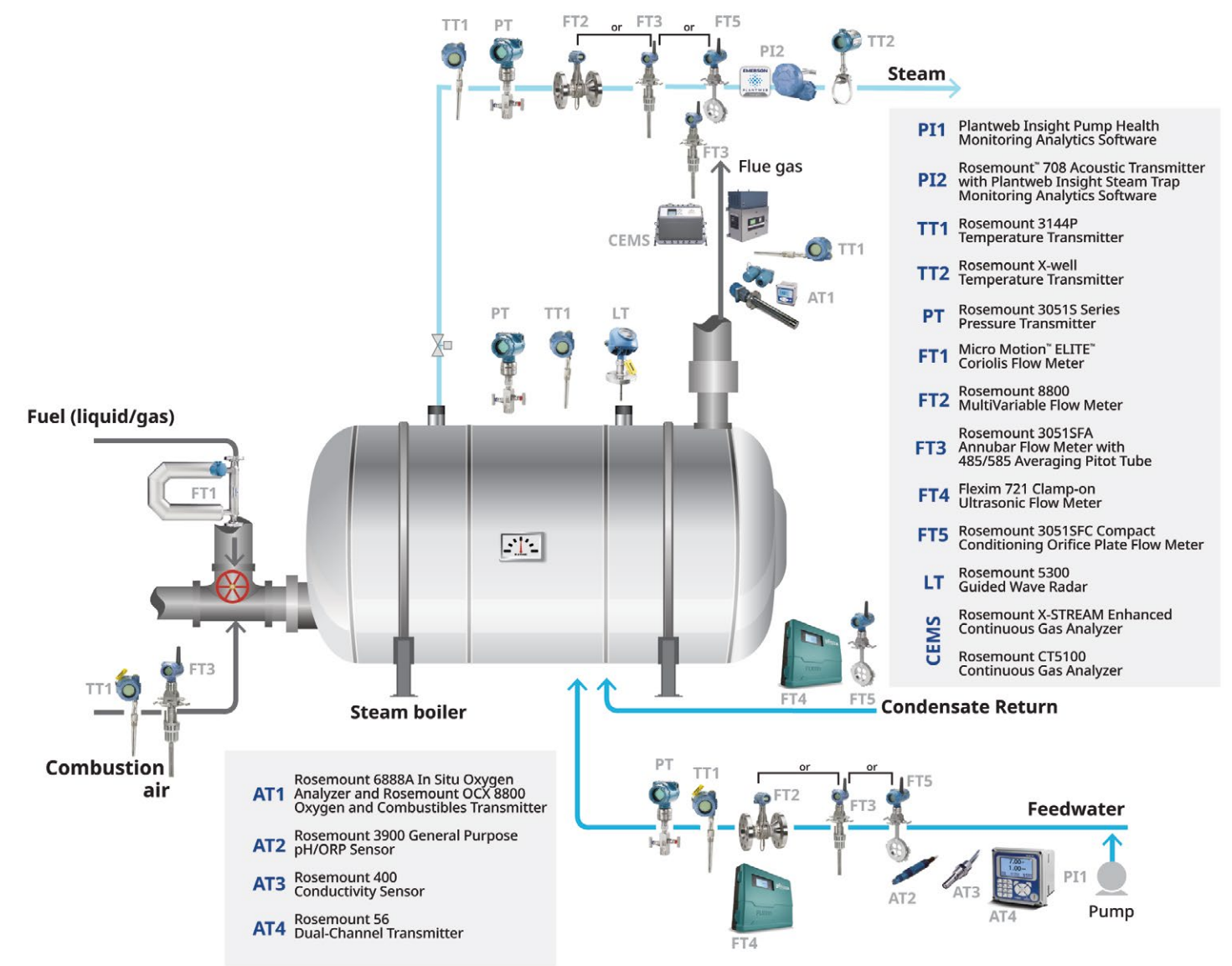


**Rosemount Continuous Gas Analyzer** -  
provides all CEMS measurements when using a traditional cold/dry sampling system. Includes technologies such as Non-Dispersive Infrared (NDIR)/Non-Dispersive Ultraviolet (NDUV) for CO and CO<sub>2</sub>, Chemiluminescence for NO<sub>x</sub>, Direct Absorption Laser for CO, CO<sub>2</sub>, NO<sub>x</sub>, SO<sub>2</sub>, CH<sub>4</sub>, and Paramagnetic for O<sub>2</sub>



Emerson's automation technologies can help address boiler and combustion process issues using a holistic improvement approach to deliver long-lasting reliability, lower costs, and optimal process performance.

**Emerson is uniquely qualified to help you positively impact your bottom line by optimizing combustion steam efficiency.**



**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

