

SmartLine Multivariable Transmitter Improves Efficiency and Emissions in Boiler or Boiler Operation

Solution Note

Multivariable transmitter is typically applied to airflow measurement for tighter combustion controls in furnaces and boilers to improve energy efficiency and emission control

Background

Safe and efficient operation of boilers and furnaces are essential to any process manufacturer. While maintaining the optimum energy efficiency is a priority process manufacturers also need to be in compliance with the regulations governing emissions. Several factors affect the energy efficiency of the boiler including heat loss due to moisture in the air, fuel, flue gas temperature, surface radiation and convection. Heat loss due to incomplete combustion is a major cause of reduced boiler efficiency. The combustion control system is one of the key factors that affect energy efficiency as well as emissions.

Challenge

Accurate, reliable and failsafe measurement of combustion airflow has long been an important element of any combustion control system. The air to fuel ratio directly affects both the efficiency and safety of boiler operation. Stoichiometric or “perfect” combustion combines the exact proportions of fuel and oxygen to achieve complete conversion of the carbon and/or hydrogen in the fuel. The ideal amount of air varies with the type of fuel, the boiler load, and the equipment design. Too much air, an ‘air-rich’ environment, results in energy lost up the stack.



SmartLine Multivariable Transmitters help improve energy efficiency and emission control in boiler operations.

FEATURES & BENEFITS

- Accurate and failsafe mass flow measurement
- Easy retrofit for existing legacy devices
- Minimize process intrusions, number of instruments and leakage
- Up to 30% reduced maintenance cost
- Up to 70% reduced inventory across field instruments Tighter flow measurements and combustion control
- Reduced emissions
- Tighter flow measurements and combustion control
- Improved boiler efficiency

Insufficient air results in loss of heat generation due to incomplete fuel combustion, and creates a safety hazard. Just the right mass of excess air is required to ensure that complete combustion occurs within the combustion chamber and to compensate for any delays in fuel-air ratio control action during load changes. Most air flow measurement technologies in use today do not measure mass flow directly. Therefore, we must “compensate” a volumetric flow measurement, either by direct or inferred measurement, for those process conditions that affect the fluid density and mass flowrate. Any deviation in line pressure or static pressure from design conditions can also cause an error in the final flow rate measurement. A 0.25 psi change can induce an error of over 1% in the flowing density and the resulting airflow rate. Correction for these temperature and pressure effects is required to ensure accurate, mass-based measurement of combustion airflow.

Even if compensation is done in the host system through individual measurement of line pressure and process temperature, the mass flow compensation in control systems does not account for variations associated with flow elements and flow profile. Only static compensation is used to arrive at the mass flow measurement.

Emission Control

Compliance with environmental regulations, particularly NOx control, has become increasingly important. Exceeding allowable limits can have significant operational and legal implications. Improving NOx control falls into two categories — initial prevention and post-combustion flue gas treatment. In many cases, the key to a successful NOx reduction program is control of excess air. Most boilers operate at 18% - 30% excess air at full load depending on fuel type. Reducing excess air without increasing operating risk is the key. Flue gas monitoring of O2 and CO are commonly used, but tighter combustion control by improving the accuracy of the air flow measurement can aid tremendously in achieving this goal.

Solution

The Honeywell SmartLine Multivariable Transmitter provides an ideal solution for the above challenge.

The SMV800 with built in dynamic compensation algorithms for variety of flow elements including pitot tubes helps customers measure dynamically compensated mass flow for air application.

In addition, multivariable technology eliminates the need for individual measurements there by reducing the number of instruments and maintenance costs by a third. Minimizing the number of instruments minimizes process intrusions and so process leaks.

Since the SmartLine Multivariable Transmitter is an extension of the SmartLine platform, the overall inventory costs for the existing SmartLine user is reduced by up to 70%.

SmartLine Multivariable Transmitter is an ideal retrofit for your existing solution for traditional flow measurements in view of the following reasons:

- Since SmartLine Multivariable Transmitter supports a variety of flow elements and associated engineering standards after proper evaluation you can reuse the existing flow elements such as pitot tube or anubar with SmartLine Multivariable Transmitters.
- In view of universal temperature input facility, any process temperature sensor can be connected to the SmartLine multivariable offering although RTD with high accuracy is most desirable.

There is no need to invest in additional configuration and maintenance tools since SmartLine Multivariable Transmitters support open protocols and standards such as HART7 and DTM based configuration.

Benefits

Industry leading performance with all the benefits of smart transmitter technology that help improve accuracy of flow measurements, enhance efficiency, and reduce emissions.

Best accuracy for measurement and calculated parameters up to 0.6% for mass flow; up to 0.2°C for process temperature; up to 0.04% of span for DP and 0.0375% for line pressure measurements.

Failsafe flow measurement for improved availability due to higher galvanic isolation for temperature inputs SMV800 helps minimize plant trips and/or loss of measurement due to ground loops sometimes encountered with temperature sensors and transmitters.

Modularity: an innovative modular design reduces complexity along the entire lifecycle by providing flexibility for post-start up modifications, reducing maintenance and inventory costs through spare parts and through simplifying module replacements and upgrades.

System integration: all SmartLine Multivariable Transmitters come with DE/HART communication protocols, are fully compatible, and integrate with Honeywell's Experion control system and with all other control systems with open protocols.

Other potential applications in boilers and furnaces: SmartLine Multivariable Transmitters can be applied for mass flow compensation for other applications, including fuel gas, natural gas or fuel oil flow in oil or gas fired furnaces and boilers and steam flow, feed water flow measurements in boilers. SmartLine Multivariable Transmitters together with the host system can also perform pressure compensation of boiler drum level to quickly and efficiently compensate for variations in drum level measurement caused by "shrink" and "swell".



Field-proven SmartLine SMV800 Multivariable Transmitters feature piezo resistive technology.

SmartLine Transmitter Family

The SmartLine Pressure, Temperature, Level and Multivariable Transmitters deliver total value across the entire plant lifecycle, from construction to operations to maintenance.

Smart Performance: SmartLine accuracy, stability and response time result in tighter process control, improving product yield and quality.

Smart Design: SmartLine's innovative modular design reduces complexity by allowing quick on-field replacement of parts without taking transmitters out of process and thereby reducing downtime, maintenance costs and spares inventory. SmartLine's universal terminals reduce costly wiring errors, troubleshooting and re-work by allowing loop wiring to be reversed. Rich advanced display and local configuration capabilities enable field operators to more efficiently perform tasks, solve problems and avoid errors with no need for a handheld device.

Smart User Experience: Smart messaging, maintenance and safety features as well as unique integration with Honeywell's Experion® control system reduce design and operator errors and enable faster intervention to avoid process upsets.

SmartLine Support Services

This product comes with worldwide, premium Technical Assistance Center (TAC) support services, which are part of the Total Care Field Instrumentation Services. The TAC services, along with the services provided by the local distributor, are designed to help customers improve and extend the usage of their field instrumentation, providing a safer, more reliable and more efficient operation.

Honeywell's Total Care Services bring 30 years of experience in terminals and the expertise of over 1,000 contracted customers around the world. Backed by the Honeywell Operating System, our support teams deliver greater in-depth domain and product expertise. We'll provide the right solution to critical issues—the first time—for a safer, more reliable and more efficient operation.

For More Information

To learn more about how Honeywell's SmartLine Multivariable Transmitters can improve plan operations, visit our website www.honeywellprocess.com/smartline or contact your Honeywell Account Manager, Distributor or System Integrator.

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