Application Guide Series

Primary Airflow in Coal-Fired Power

Benefits

- *Fuel cost savings*
- *Optimize PA temperature*
- *Improve process stability*
- *Reduce operator interventions*
- *Increase equipment capacity*
- *Ensure safe operation*
- *Prevent coal pipe fires and mill puffs*

Applications

- *Raymond Bowl Mills*
- *MPS and EL Mills*
- *Atrita Mills and more...*

Process Equipment

- *Coal pulverizer systems*
- *Hot and tempering air ducts*
- *Barometric damper inlets*
- *PA Fans*
- *Rotary (Ljungström) and tubular air preheaters*

Air Monitor
Precision Airflow Measurement

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Why is Primary Airflow Monitoring Important for Process Control in Power Plants?

Primary airflow monitoring is crucial for process control in power plants for several reasons. Accurate measurement of primary airflow helps optimize mill operation and burner performance, which are essential for efficient combustion and reducing emissions. Primary air plays a vital role in drying coal and conveying pulverized coal to the burners, which directly impacts flame stability and the position of the flame relative to the burner tip. Accurate primary airflow is key to achieving optimized burner performance and minimizing issues such as slagging, coal layout, pipe fires, and burner pluggage.

Moreover, precise airflow measurement allows for better control of stoichiometric ratios, facilitating more complete and stable combustion. This, in turn, helps lower NOx formation and tube erosion, contributing to overall plant efficiency and environmental compliance. Advanced measurement devices and systems, such as Fechheimer-Pitot Combustion Air (CA) stations and VOLU-probe/SS arrays, are designed to operate effectively even in challenging conditions with limited straight duct runs and high particulate environments. These systems ensure continuous and accurate airflow measurement, which is essential for maintaining optimal combustion conditions and improving plant performance.

What are Common Challenges When Measuring Primary Airflow?

Measuring primary airflow in ductwork systems, particularly in power plants, presents several common challenges. One common issue for retro-fitting flow measurement is the limited availability of straight duct runs, which impact accurate airflow measurement in most devices. Ductwork often includes control dampers and convergence points of hot and tempering air, complicating the placement and effectiveness of measurement devices due to velocity and temperature profile statification.

Another challenge is the presence of high concentrations of airborne particulate matter, such as fly ash, which can interfere with traditional measurement devices like annubars, venturis, foils, and thermal anemometers. These devices struggle to provide usable measurements due to low flow rates, broad turndown ranges, and the particulate-laden environment. The presence of fly ash and high velocity designs found in some mills lead to erosion of stainless steel probes.

Additionally, the need for precise measurement to optimize mill operation and burner performance adds to the complexity. Excessive primary air can lead to high NOx formation and tube erosion, while insufficient primary air can cause issues like slagging, coal layout, pipe fires, and burner pluggage.

To address these challenges, advanced measurement systems like Fechheimer-Pitot Combustion Air (CA) stations and VOLU-probe/SS arrays are used. These systems are designed to operate effectively in environments with limited straight duct runs and high particulate concentrations, ensuring accurate and continuous airflow measurement. To reduce erosion that occurs in some high velocity mills, Air Monitor offers tungsten carbide coated VOLU-probes greatly extending the life of the probes.

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How Does Air Monitor Provide Solutions?

A key solution to common challenges in coal-fired power plants is the use of Fechheimer-Pitot Combustion Air (CA) stations and VOLU-probe/SS arrays. These devices have proved successful for over 50 years to provide accurate airflow measurements even in environments with limited straight duct runs and high particulate concentrations. The CA stations and VOLU-probe/SS arrays can be strategically placed in the ductwork to measure total primary air or separate hot and tempering air, depending on the specific application requirements.

Another important solution is the implementation of the Combustion Airflow Management System (CAMS). The CAMS helps manage airflow measurement and maintain accuracy through an AUTO-purge III system that keeps the sensing ports and signal lines clear of accumulating fly ash. The system incorporates multi-variable functionality, compensating for all temperature and absolute pressure variations. The CAMS provides true density compensated mass flow output accuracy within 2% of actual airflow over a 10:1 turndown range.

Air Monitor utilizes integrated bell mouth CA stations with extended casing for applications where tempering air is not ducted but enters via a barometric opening. Air Monitor can also provide a multiblade control damper to replace the barometric damper improving control of the the tempering airflow. This setup creates the necessary minimum run of straight ductwork needed for accurate measurement.

Overall, these solutions help optimize mill operation and burner performance, reduce emissions, and improve plant efficiency by providing precise and continuous airflow measurement in challenging conditions.

Field tested components and engineering solutions for over 50 years

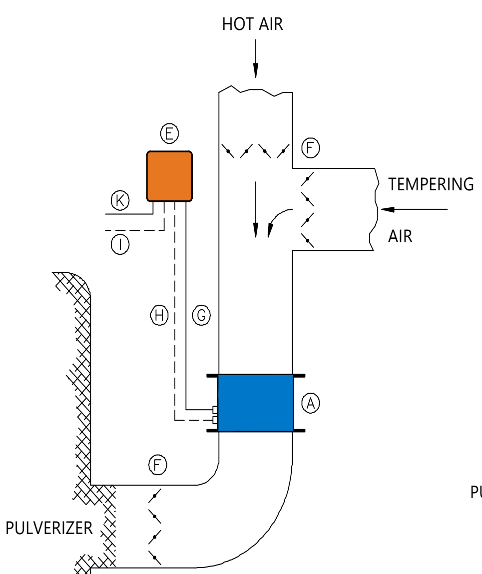

Figure 1

- Ⓐ CA Station w/Temperature Probe
- Ⓔ CAMS™ Purge and Transmitter
- Ⓕ Opposed Blade Damper
- Ⓖ T.P. and S.P. Signal Tubing
- Ⓗ Temperature Extension Wire
- Ⓘ 4-20mADC Flow Signal to DCS (lbs/hr)
- Ⓚ 100 psi Instrument Air

Figure 1: Total Primary Air (Hot & Tempering)

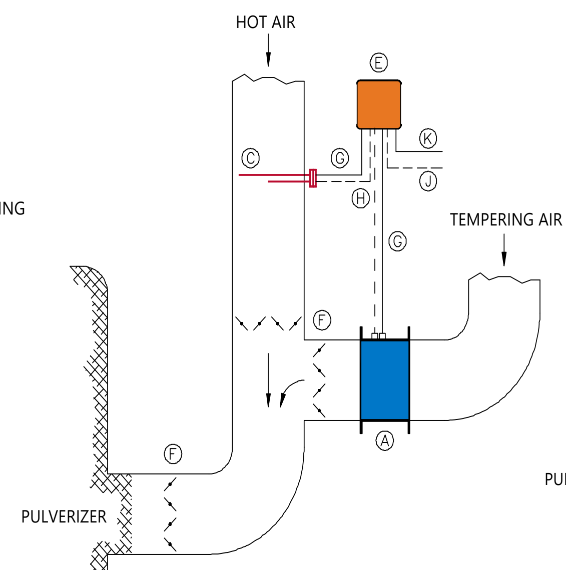

Figure 2

- Ⓐ CA Station w/Temperature Probe
- Ⓒ VOLU-probe/SS Array w/Temperature Probe
- Ⓔ CAMS Purge and Transmitter
- Ⓕ Opposed Blade Damper
- Ⓖ T.P. and S.P. Signal Tubing
- Ⓗ Temperature Extension Wire
- Ⓙ 4-20mADC Flow Signal to DCS (lbs/hr)
- Ⓚ 100 psi Instrument Air

Figure 2: Individual Hot and Tempering Primary Airflow Measurements, Pressurized Mill

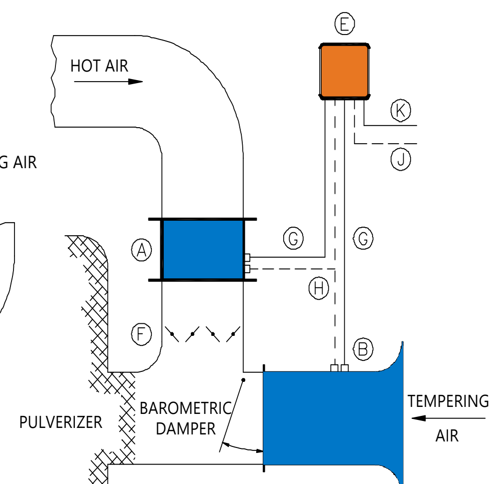

Figure 3

- Ⓐ CA Station w/Temperature Probe
- Ⓑ CA Station w/Bellmouth
- Ⓔ CAMS Purge and Transmitter
- Ⓕ Opposed Blade Damper
- Ⓖ T.P. and S.P. Signal Tubing
- Ⓗ Temperature Extension Wire
- Ⓙ 4-20mADC Flow Signal to DCS (lbs/hr)
- Ⓚ 100 psi Instrument Air

Figure 3: Individual Hot and Tempering Primary Airflow Measurements, Suction Mill