Application Guide Series

Secondary Airflow in Power Plants

Benefits

- *Reduced fan power consumption*
- *Improved combustion efficiency & safety*
- *Lower NOx/SOx emissions*
- *Enhanced reliability*

Applications

- *Coal-fired Power Plants*
- *Gas/oil-fired power plants*
- *Utility boiler operations*
- *Retrofit projects for NOx reduction*

Process Equipment

- *Forced draft (FD) fans*
- *Air pre-heaters*
- *Secondary air ducts*
- *Combustion airflow management systems*

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

Accurate measurement of bulk secondary airflow is essential in the power industry to achieve modern performance and emission goals. Secondary air contributes directly to the combustion process, affecting both efficiency and emissions. Optimizing combustion air-to-fuel ratios ensures a safe operation, improved fuel efficiency, and reduced environmental impact. Many coal, gas, and oil-fired plants are forced to idle at low loads waiting for peak demand periods to ramp up. The need for precise, repeatable airflow measurement over a very broad flow range has increased across power generation facilities.

What are Common Challenges When Measuring Secondary Airflow?

Operators face several critical challenges when measuring secondary airflow using traditional technologies like airfoils, venturis, or thermal flow meters:

- **Poor accuracy through load turndown**: Measurement accuracy and signal stability degrade at reduced boiler loads, precisely when reliable airflow data is most critical for safe and efficient combustion control.
- **Insufficient straight duct runs**: Most airflow technologies require long, unobstructed duct runs to achieve rated accuracy. In large ducts and retrofit applications, these straight-run requirements do not exist; ducting is limited by facility space requirements and cost. The lack of straight duct run produces non-uniform and distorted flow profiles making accurate measurement difficult.
- **Maintenance burden and fouling risk**: Accumulation of fly ash and other contaminants affect all flow measurement technologies, degrading accuracy and requiring regular cleaning to maintain performance accuracy and reliable airflow measurement signals.
- **High pressure loss and energy waste**: Traditional devices such as venturis and airfoils introduce significant non-recoverable pressure losses, increasing fan energy consumption and reducing available boiler capacity.

These challenges highlight the inherent limitations of airfoils, venturis, and thermal flow measurement technologies, making clear the need for a purpose-built solution capable of delivering accurate, reliable performance in large ducts with highly distorted flow and wide operating ranges.

Traditional measurement devices such as venturis and airfoils, once standard in coal- and gas-fired power plants, now struggle to meet these evolving demands. Their significant pressure loss, sensitivity to flow disturbances, and limited accuracy especially at low loads hinder plant operation. More capable technologies—particularly multipoint Pitot probe arrays—provide accurate, efficient, and maintenance-friendly solutions with high turndown capability.

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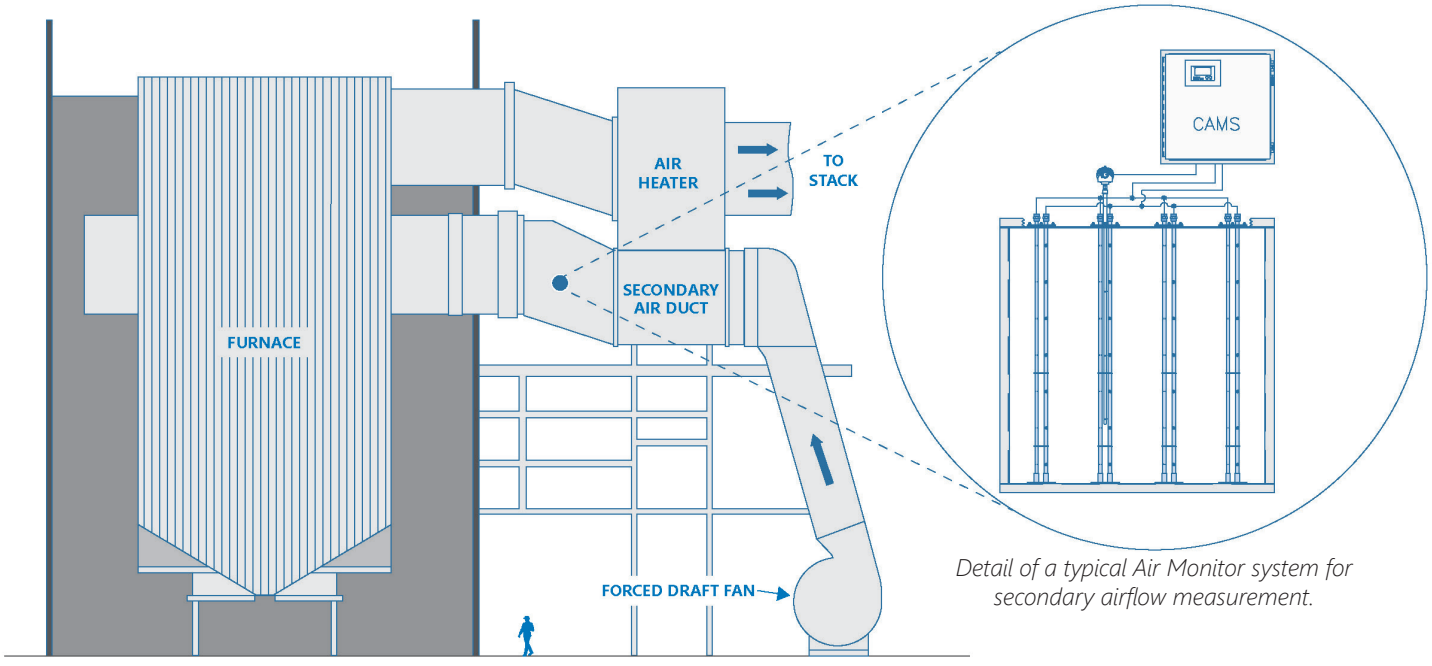
How Does Air Monitor Solve Secondary Airflow Challenges?

Air Monitor's multipoint airflow measurement solutions are purpose-built to overcome the limitations of airfoils, venturis, and thermal flow measurement technologies.

- Maintains accuracy through wide load turndown. Air Monitor multipoint Pitot VOLU-probe and Combustion Airflow (CA) arrays combined with the Combustion Airflow Management System (CAMS) provide stable, accurate and repeatable airflow measurements over 10:1 turndown. The high accuracy sensing and AUTO-zero technology of the CAMS ensure drift-free, reliable combustion control when precise airflow data is most critical, even at the lowest load condition.
- Performs accurately without long straight duct runs. Unlike traditional and thermal technologies that depend on perfectly uniform flow conditions, Air Monitor VOLU-probes and CA Stations are designed to operate in large ducts with limited straight runs and highly distorted flow profiles. Accurate averaging of airflow is achieved with the highest density of sensing points and Air Monitor's proprietary technology that actively compensates for pitch, yaw, and profile asymmetry commonly caused by duct transitions, elbows, and multiple fan configurations.
- Reduces maintenance burden and fouling impact. Air Monitor solutions are engineered for dirty, high-particulate environments common in utility boilers. The CAMS integrated self-cleaning AUTO-purge keep sensing points free and clear of fly ash and other contaminants, preserving measurement accuracy while minimizing manual maintenance and improving long-term reliability.
- Minimizes pressure loss and energy waste. With a negligible permanent pressure drop, Air Monitor VOLU-probes and CA Station measurement systems avoid the non-recoverable losses associated with venturis and airfoils. This maximizes available fan capacity, reduces fan power consumption, and supports higher overall boiler efficiency without sacrificing measurement performance.

By addressing accuracy, installation constraints, maintenance demands, and energy efficiency simultaneously, Air Monitor provides a modern airflow measurement solution engineered specifically for large secondary air ducts, challenging flow conditions, and the wide operating ranges required in today's utility boiler operations.

Field tested components and engineering solutions for over 50 years



Detail of a typical Air Monitor system for secondary airflow measurement.

Secondary air duct downstream of the air heater with limited straight run—challenging condition typical of industrial boilers.