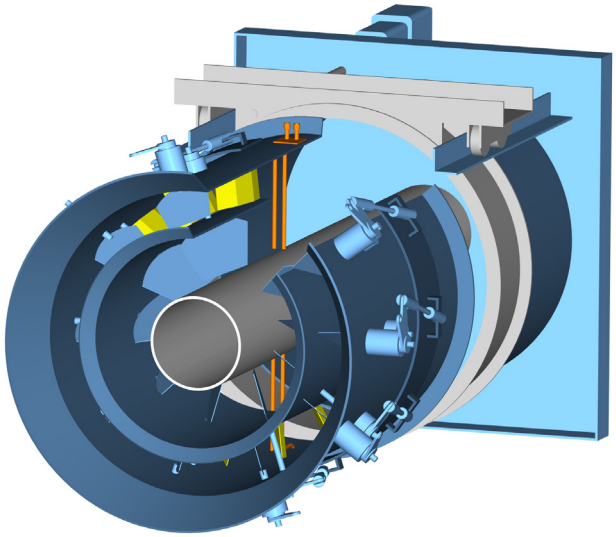
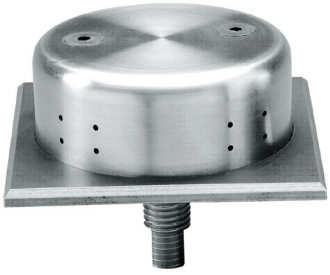
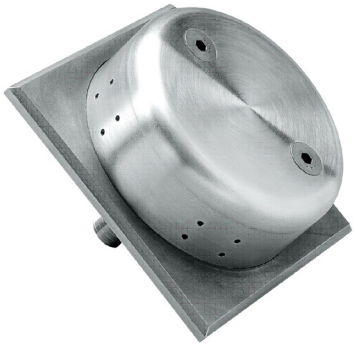
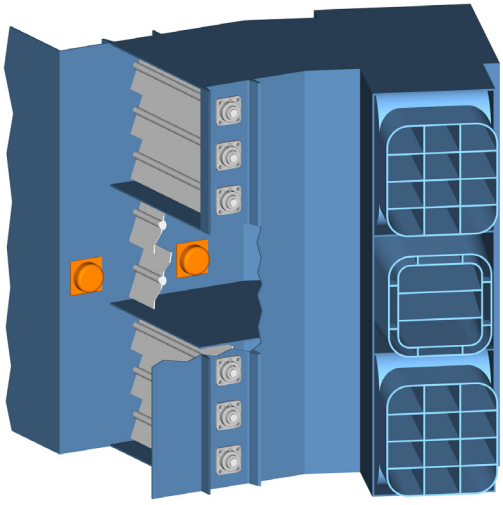
IBAM™

Individual Burner Airflow Measurement









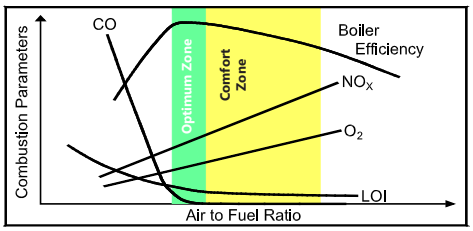
Proven solutions for the power industry

Air Monitor
Precision Airflow Measurement
An ONICON Brand

IBAM

The Need for Burner Airflow Measurement

The objectives in the power industry today are twofold; to lower emissions, and increase plant performance. Precise measurement of combustion airflow and fuel rates positively contributes to achieving those objectives by providing the information needed to optimize burner stoichiometric ratios and facilitate more complete, stable combustion. As indicated by the following chart, optimization of the key combustion parameters of NO_x, O_2, LOI, CO, and boiler efficiency only occurs within a narrow range of air-to-fuel ratios.

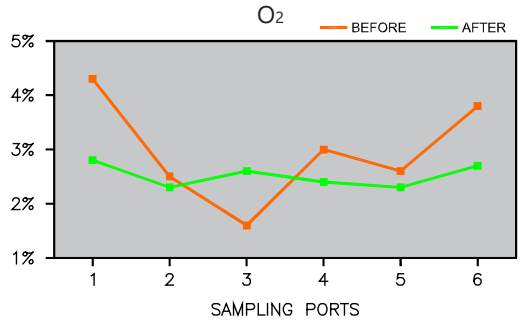


Traditional coal fired power plants lacked any means to measure and control airflow into individual burners. New burner designs prompted by Clean Air Act attainment levels for NO_x reduction are typically comprised of inner and outer airflow barrels to introduce secondary air (SA) to the flame ball, adjustable swirl angles blades in each barrel, a combination of fixed and/or adjustable inlet sleeve/disk dampers, and in most installations the burners are equipped with actuators to facilitate DCS controlled modulation of burner SA airflow corresponding to varying fuel loads. Unfortunately some low NO_x burners come equipped with a non-calibrated airflow sensing device and most others lack any means to determine how much SA is entering the burner, resulting in the need for extensive burner tuning targeted at meeting the manufacturer's NO_x and CO emissions guarantees but not repeatable or maintainable long term over varying load conditions.

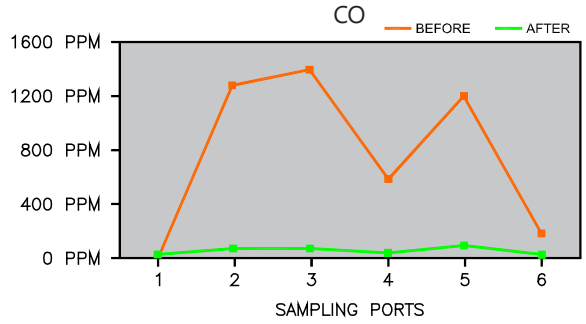
Just as there are variances in fuel distribution to each burner, multiple burners served by a common or partitioned wind box can have substantial burner-to-burner imbalances in SA. Accurate and repeatable measurement of individual burner SA requires Air Monitor Power's IBAMs, airflow probes that are economically feasible to retrofit into existing burners and yet able to accommodate a variety of design challenges – the absence of any undisturbed cross section of airflow passage; an installation location typically downstream of a modulating inlet sleeve, disk or damper; a broad range of boiler operating conditions; the presence of fly ash particulate and 1200ºF operating temperatures; and for wall fired burners the broad range of airflow pitch and yaw vectors produced by the adjustable swirl angle blades.

Performance Benefits

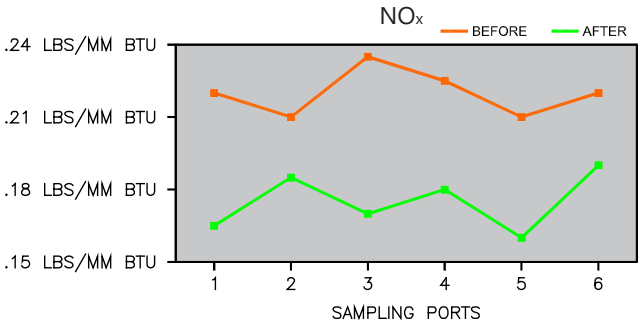
Substantial reductions in NO_x levels are obtained when the IBAM's accurate SA measurement is integrated into DCS burner control to dynamically maintain burner-to-burner airflow balance or a bias strategy corresponding to the varying fuel loads. The addition of an airflow system for coal usage permits control of SA to achieve individual burner stoichiometry objectives, safely lowering overall NO_x and excess O_2 while simultaneously reducing areas of high CO that otherwise produce undesirable slagging and water wall corrosion.



- ***Provides*** burner-to-burner relative secondary air measurement to within 5% accuracy.
- ***Facilitates*** control of individual burner stoichiometry and air-to-fuel ratio.
- ***Increases*** the manageable range of burner turndown.
- ***Reduces*** unburned carbon in flyash.
- ***Permits*** burner-to-burner balancing of secondary airflow, intentional burner airflow biasing, or burner plus OFA combustion staging.



- ***Reduces*** CO and the potential for corrosion in the lower furnace.
- ***Reduces*** NO_x through furnace operation with less excess air.
- ***Reduces*** burner throat slagging.
- ***Safely*** reduces excess O_2.



Individual Burner Airflow Measurement

Construction Features

IBAM SAP/TFA
For Corner Fired Applications

- Type 316 stainless steel pressure sensing chamber.
- Reverse Fechheimer pressure sensing ports.
- Bolted construction permits disassembly for long-term maintenance.

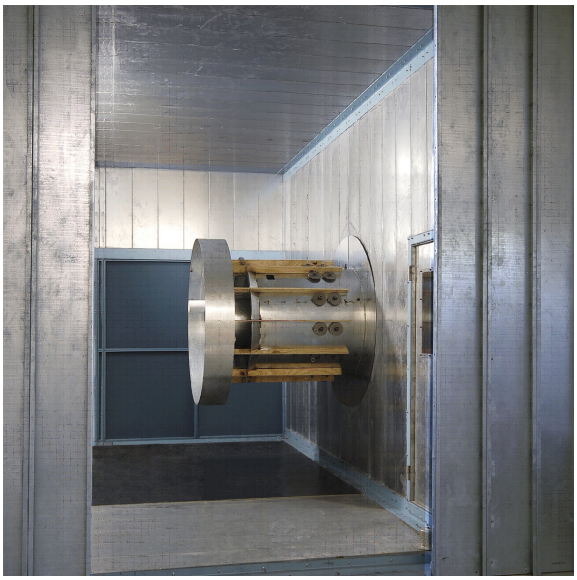
IBAM Probe
For Wall Fired Applications

- Offset Fechheimer static pressure sensors.
- Chamfered total pressure sensors.
- All welded Type 316 stainless steel.
- Optional Inconel, 310SS, and Tungsten Carbide coated.

Design & Testing

Air Monitor Power IBAMs have been applied to virtually every OEM and after-market burner design; each one custom engineered to reflect the user's unique burner or OFA port, and windbox configurtaion. Based upon the Fechheimer-Pitot measurement technology, the IBAM design process draws from a broad array of construction options: Quantity and pattern of individual total pressure (TP) and static pressure (SP) sensing holes, CW and/or CCW rotation of the individual TP and SP sensing probes; rotation of the entire IBAM assembly, special high temperature materials and abrasion resistant Tungsten Carbide coatings. Wind box configuration and burner symmetry guide the quantity of IBAMs needed to obtain desired accuracy and repeatability.

Each IBAM design is extensively tested and characterized in Air Monitor Power's large scale test duct using a full size mock up of the wall fired burner or corner fired control damper, with testing conducted over a broad matrix of customer specific sleeve damper or inlet disk positions, swirl angle settings, and boiler operating conditions. The result is a multi-order polynomial equation, with one or two variables, to accurately correlate the TP and SP signals from the IBAMs plus damper or disk position into mass flow with an accuracy of ±5%.



Test Duct Wind box with Burner Mock-up

CAMS

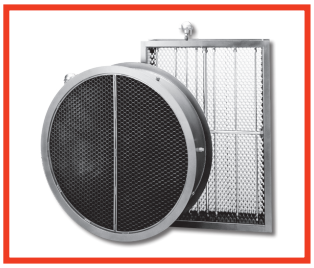
The Air Monitor Power CAMS™ – Combustion Airflow Management System is designed to fulfill the need for a reliable and accurate means of flow measurement in combustion airflow applications.

Combined into a single engineered package are the CAMM™ – Combustion Airflow Management Module containing the microprocessor based instrumentation to measure the airflow and manage the purge cycle, and AUTO-purge to protect against any degradation in performance of the duct mounted measurement device(s) due to the presence of airborne particulate.

Air Monitor Power's Product Families of Air Flow Measurement Systems

VOLU-probe/SS™ Stainless Steel Airflow Traverse Probes.

Multi-point, self-averaging, Pitot-Fechheimer airflow traverse probes with integral airflow direction correcting design. Constructed of Type 316 stainless steel and available in externally and internally mounted versions for harsh, corrosive or high temperature applications such as fume hood, laboratory exhaust, pharmaceutical, and clean room production and dirty industrial process applications.



CA™ – Combustion Airflow Measuring Station & VOLU-probe/SS™ Traverse Probes.

Air Monitor Power's duct mounted airflow measurement devices have been designed to accurately and repeatedly measure air mass flow in power plants. The Combustion Air (CA) Station™ includes honeycomb air straightener to accurately measure in shorter straight duct runs than any other flow measurement device. The VOLU-probe/SS™ delivers accurate airflow measurement performance in the form of an insertion probe. Both devices feature Type 316 stainless steel flow sensing arrays.

VELTRON DPT-plus – Microprocessor Based Transmitter

The The VELTRON DPT-plus transmitter is furnished with an automatic zeroing circuit capable of electronically adjusting the transmitter zero at predetermined time intervals while simultaneously holding the transmitter output signal. The automatic zeroing circuit eliminates all output signal drift due to thermal, electronic or mechanical effects, as well as the need for initial or periodic transmitter zeroing.

CAMS™ – Combustion Airflow Management Systems.

The CAMS™ – Combustion Airflow Management System has been designed to reliably and accurately measure airflow in combustion airflow applications. The CAMS™ contains the microprocessor based instrumentation to measure the airflow and manage the AUTO-purge. The AUTO-purge is a high pressure air blowback system that protects the duct mounted flow measurement device from any degradation in performance due to the presence of airborne particulate (flyash).

CEMS™ – Continuous Emissions Monitoring System

Air Monitor Power's CEMS™ – Continuous Emissions Monitoring Systems assist in complying with the Clean Air Act's stringent emission measurement standards and the requirements of 40 CFR 75. Air Monitor has assembled a cost effective integrated system consisting of in-stack flow measurement equipment and companion instrumentation to provide continuous, accurate, and reliable volumetric airflow monitoring of stacks and ducts of any size and configuration.

Engineering & Testing Services. Air Monitor Power offers complete engineering and testing to analyze air and coal delivery systems. Air Monitor Power's field testing services use 3D airflow traversing and flow measurement systems for the highest possible accuracy. To ensure cost effective and accurate solutions, Air Monitor Power has full scale model fabrication and certified wind tunnel testing is used to develop application specific products that will measure accurately where no standard flow measurement can.

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125-510-10 (03/20)