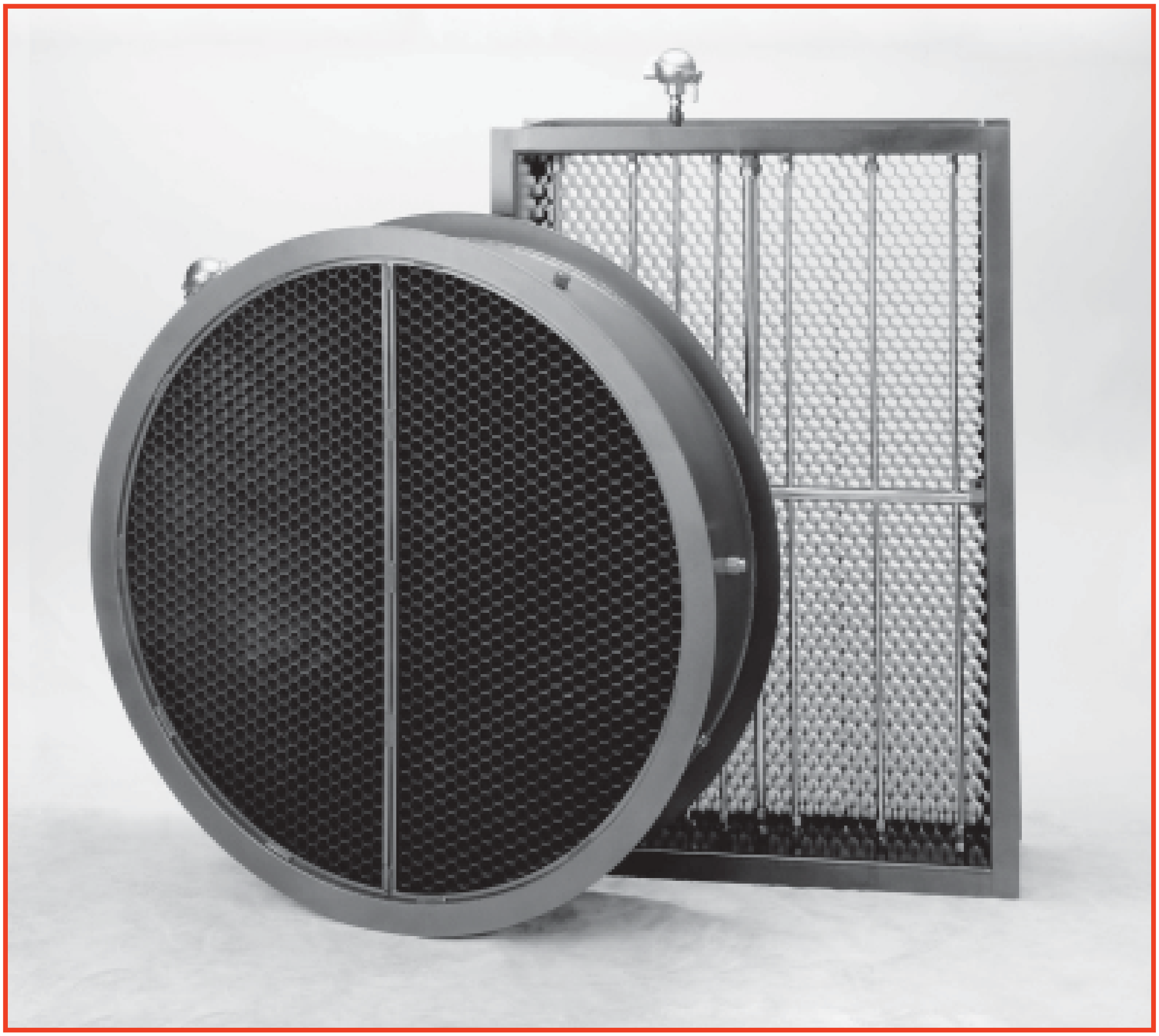
CA Station

Combustion Airflow Measurement Station



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TAEHUNG M&C Corporation

CA Station

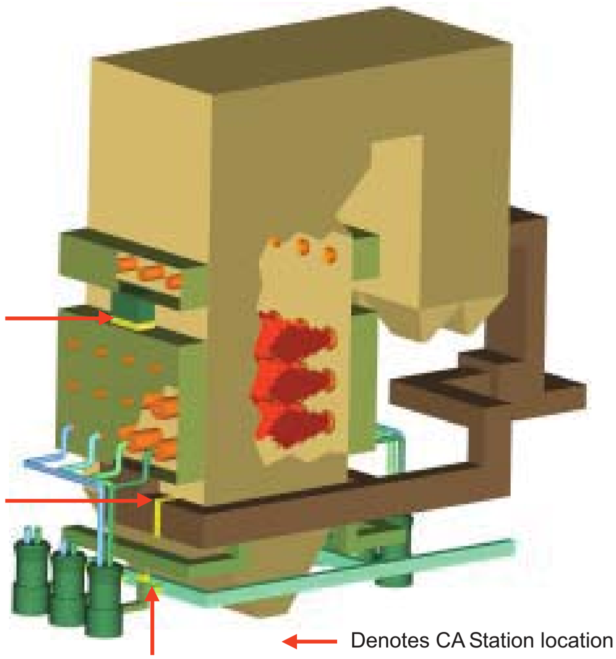
The Need for Combustion Airflow Measurement

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 stoichiometric ratios and facilitate more complete, stable combustion. Usable measurements cannot be obtained from existing devices such as venturis, foils, jamb tubes, etc., or instrumentation such as thermal anemometers due to limited available straight duct runs, low flow rates, proximity to modulating control dampers, broad turndown range, and high concentrations of airborne particulate (flyash).

AMC Power's ruggedly constructed Combustion Air (CA) Station, with both integral airflow processing cell and Fechheimer-Pitot measurement technology, is engineered to meet the challenging operating conditions of the typical power plant while providing mass flow measurement of PA, SA, and OFA within an accuracy of ±2-3% of actual airflow.

While the main functions of primary air are to first dry and then pneumatically convey the pulverized coal from the mill to the individual burners, it also determines coal particle velocity at the burner exit, influencing the flame position relative to the burner tip and impacting flame stability, both key factors in achieving optimized burner performance. Accurate PA measurement obtained with a CA Station can contribute to reducing NO_x and CO, improving flame stability, avoidance of coal pipe layout, minimizing LOI/UBC, reducing waterwall corrosion, and increasing combustion efficiency.

The CA Station is also ideally suited to measure SA entering each burner level of a partitioned windbox, SA being taken out of a windbox to supply multiple OFA ports, at the ducted inlet of FD fans, and bulk SA entering each windbox of a corner fired unit.



How It Works

Log-Tchebycheff Sensor Location. A high concentration of total and static pressure sensors positioned according to the log-Tchebycheff rule sense the multiple and varying flow components that constitute the airstream's velocity profile. The log-Tchebycheff's perimeter weighted sensor pattern is utilized to minimize the positive error (measurements greater than actual) caused by the failure to account for slower velocities at the duct wall when using traditional equal area sensor locations. Spacing of total pressure sensors is per the table below. Since the static pressure across the station is relatively uniform, a lesser number of static pressure sensors are utilized to minimize unrecovered pressure drop.

Duct / Station Configuration	Quantity of Sensing Points
Rectangular	25 or more points, maximum 6" or 8" apart, depending on duct size.
Circular	12 to 30 points, along 2 or 3 diameters.

Fechheimer Pitot Flow Measurement. The CA Station operates on the Fechheimer-Pitot derivative of the multi-point, self-averaging Pitot principle to measure the total and static pressure components of airflow. Total pressure sensing ports with patented (U.S. Patent No. 4,559,835) chamfered entrances, and Fechheimer pairs of offset static pressure sensing ports combine to minimize the effect of directional airflow. When located downstream of honeycomb airflow processing cell, the Fechheimer Pitot method is extremely effective at accurately measuring airflow in limited straight duct runs.

Airflow Processing. To assure extremely high levels of measuring accuracy (3% of actual flow) under extreme conditions caused by turbulent, rotating, and multi-directional airflows normally present near fan inlets, discharge ducts, and directly downstream from duct elbows, transitions, etc., the CA Station uses open, parallel cell, honeycomb panels to "process" the air into straightened flow just prior to the total pressure measurement plane. These honeycomb panels sharply reduce the need for long, straight runs of duct before and after the station to obtain accurate flow measurement.

Negligible Airflow Resistance. The CA Station airflow measuring station is designed to function while producing a minimum of resistance to airflow, due to the unique honeycomb air straightener-equalizer section having a free area of 96.6%. The unique, non-restrictive characteristic of the CA Station is seen in the Resistance vs. Airflow Velocity graph below. The values indicated are total resistance and do not include any allowances for static regain (a potential 20% reduction to the values).

Combustion Airflow Measurement Station

Construction Features

Specifications

Configurations.
Rectangular, Circular, and Custom

Accuracy.
2-3% of actual flow

Operating Temperatures.
Continuous operation to 800ºF

Connection Fittings.
1/2" FPT, Type 316 stainless steel

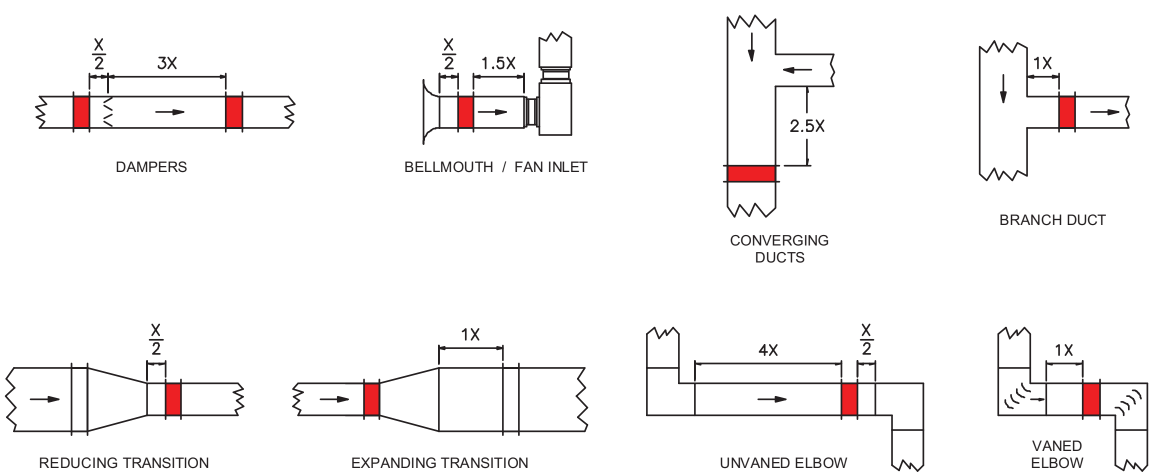
Static and Total Pressure Sensing Manifolds.
Type 316 stainless steel, welded construction

Airflow Straightener.
1" hexagonal, parallel cell straightener, 3" deep,
24 ga. (.024") thick carbon steel

Casing and Flanges.
3/16" carbon steel, continuous welded seams
Casing depth is 12"

Special Construction Options.
Sensing Manifold Cleanouts
Inlet Bell Mouth
Multi-point Temperature Measurement
Alternate Materials of Construction
Integral Control Damper

Minimum Installation Requirements



AMC Power's Product Families of Air & Coal Flow Measurement Systems

Pf-FLO™ – Pulverized Fuel Flow Management

The Pf-FLO™ system performs continuous and accurate fuel flow measurement in pulverized coal fired combustion applications, providing boiler operators with the real-time data needed to balance coal mass distribution between burners. Balanced fuel improves combustion efficiency and lowers emissions while reducing in-furnace slagging, coal layout, fuel slagging, and coal pipe fires.

IBAM™ – Individual Burner Airflow Measurement

The IBAM™ – Individual Burner Airflow Measurement probe is ideally suited for new or retrofit applications where a reduction in plant emissions and improvement in efficiency can be obtained through accurate measurement of burner secondary airflow. The IBAM™ probe has been designed to accurately measure in the particulate laden, high operating temperature conditions found in burner air passages.

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.

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

AMC 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. AMC Power offers complete engineering and testing to analyze air and coal delivery systems. AMC Power's field testing services use 3D airflow traversing and Pf-*FLO* coal flow measurement systems for the highest possible accuracy. To ensure cost effective and accurate solutions, AMC Power has full scale physical flow modeling capability and in house Computational Fluid Dynamics (CFD). CFD analysis is used to analyze flow profiles and design/redesign ductwork to improve overall performance. 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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