CA Station
Combustion Airflow Measurement Station

Contact Power Specialties, Inc. at (816) 353-6550
or visit www.powerspecialties.com

Proven solutions for a tough industry
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 NOx and CO, improving flame stability, avoidance of coal pipe layout, minimizing LOI/UBC, reducing waterwall corrosion, and increasing combustion efficiency.

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.

<table>
<thead>
<tr>
<th>Duct / Station Configuration</th>
<th>Quantity of Sensing Points</th>
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<tbody>
<tr>
<td>Rectangular</td>
<td>25 or more points, maximum 6” or 8” apart, depending on duct size.</td>
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<tr>
<td>Circular</td>
<td>12 to 30 points, along 2 or 3 diameters.</td>
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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**

- 12” Depth
- Total Pressure Sensing Manifold
- Offset Fechheimer Static Pressure Sensing Probe
- Optional Manifold Cleanouts
- 90º Connection Flanges
- Welded 3/16” Carbon Steel Casing
- 24 ga. Carbon Steel Airflow Straightener

**Specifications**

**Configurations.**
Rectangular, Circular, and Custom

**Accuracy.**
2-3% of actual flow

**Operating Temperatures.**
Continuous operation to 800°F

**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**

- DAMPERS
- BELLMOUTH / FAN INLET
- CONVERGING DUCTS
- BRANCH DUCT
- REDUCING TRANSITION
- EXPANDING TRANSITION
- UNVANED ELBOW
- VANED ELBOW
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.

**VOLUM-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.

**CEMSTM – 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.