

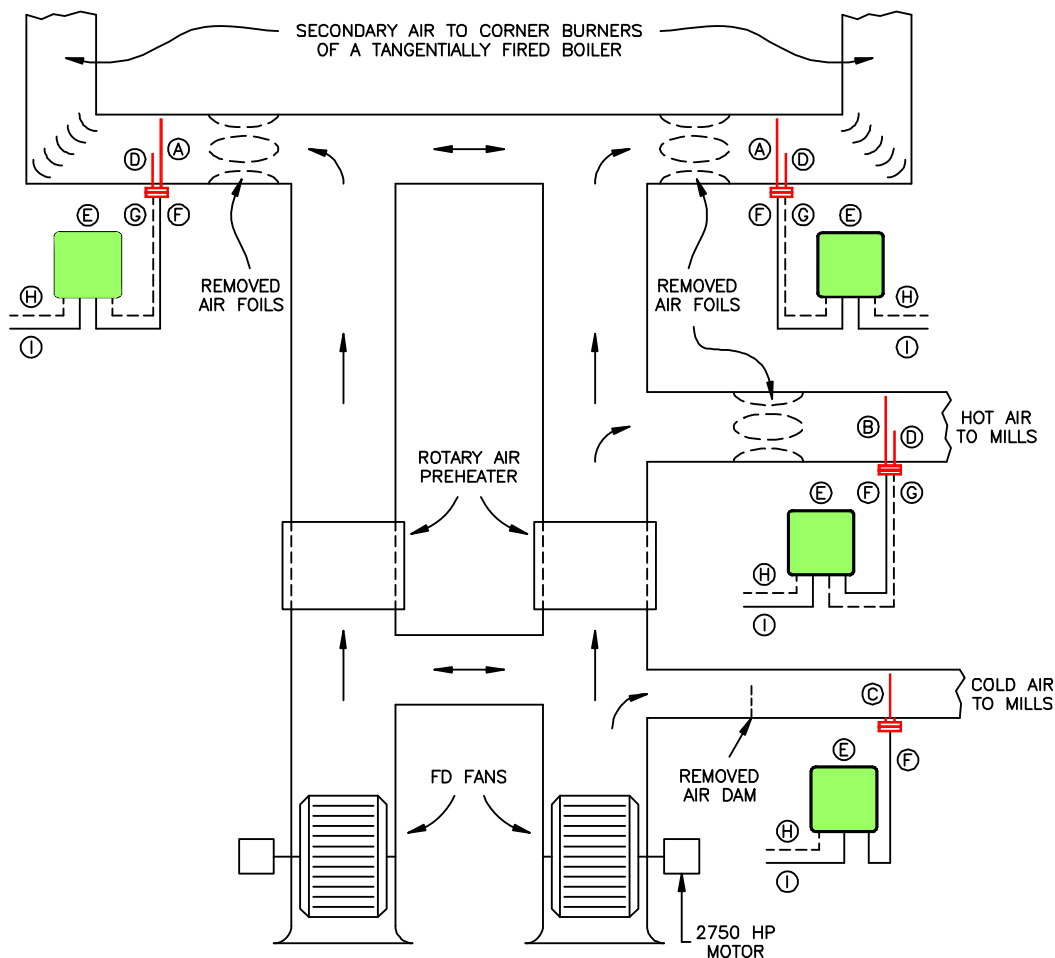
MEASURING BULK SECONDARY AIRFLOW

The Challenge

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.

Traditional coal fired power plant design utilized airfoils or venturis for measurement of bulk primary and secondary airflows for the purpose of maintaining the correct boiler air to fuel ratio at varying load conditions. Although airfoils and venturis have provided adequate airflow measurement in the past, achieving current emission reduction mandates and performance objectives require a more accurate and cost effective means of airflow measurement.

Venturis and airfoils have known limitations: 1) Significant non-recoverable pressure loss that wastes power and can limit generated output; 2) Decreased accuracy and noisy signals at high turndown operating conditions associated with low NO_x retrofits; 3) The need for five to eight straight lengths of duct run at the point of installation to obtain true accuracy and repeatability, 4) Cannot achieve a linear mass flow output over a broad operating range with a single K-factor.



The Solution

Air Monitor Power's Application Engineering Department was called upon by a Georgia utility to design and provide airflow measuring systems to replace three airfoils and one air dam within their 500MW, coal fueled, T-fired boiler. The project objective was to gain needed FD capacity, with the cost justification expected to come from a reduction in energy required to operate the FD fans.

Airfoils in three locations and an air dam were removed – one airfoil in each of the 12' x 15' bulk secondary air ducts, one airfoil in the 6' x 6' hot primary air duct serving the mills, and the air dam in the 5' x 5' tempering air duct. Fan curve data indicated the total non-recoverable pressure loss caused by the airfoils and air dam was slightly more than 3" w.c., wasting nearly 300 HP per fan.

An array of Fechheimer-Pitot VOLU-probe/SS were installed in each of the four measurement locations: Ten probes 12' in length in each of the two secondary air duct, five probes 6' in length within the hot PA duct, and four probes 5' in length in the tempering air duct. For each array the VOLU-probe/SS total and static pressure signal connections were manifolded together and routed to their own Combustion Airflow Management System (CAMS) enclosure. Within the CAMS enclosure the pressure signals plus airflow temperature are converted by the CAMM into a density compensated lbs/hr mass flow output to the DCS.

The CAMM also manages the AUTO-purge™ system used to keep the VOLU-probe/SS sensing ports and signal lines clear of accumulating fly ash. The purge cycle can be configured to operate on a programmable interval or initiated via a dry contact from the DCS. During the purge cycle the CAMM maintains a locked signal output to the DCS while providing a dry contact

Result

notification of purge cycle start and finish. FD fan operating costs were reduced nearly \$50,000 per year, resulting in a 21-month payback for the project. As a result of the installed VOLU-probe/SS arrays measurement accuracy was greatly improved, to within 3% of actual airflow over the 4:1 range of turndown.