

MEASURING SECONDARY AIRFLOW (Airfoil Replacement)

Problem

The objective in the power industry today is twofold; to lower emissions and increase the plant's performance. Precise control of combustion airflow and fuel rates ensures proper stoichiometric ratios yielding more complete, stable combustion which ultimately has a positive effect on emissions and performance.

In fossil fuel plants designed over the past 40+ years airfoils or venturis have been the standard method for measurement of total secondary airflow. The signal obtained from these airflow measuring devices is used to control and maintain proper air to fuel ratios.

Although both airfoils and venturis have provided adequate airflow measurement in the past, today's emissions standards and performance concerns have prompted plant engineering to seek a more cost effective and accurate means of measurement.

Venturis and airfoils have known limitations: 1) significant nonrecoverable pressure loss means wasted energy or reduced fan capacity, 2) as turndown requirements increase for low NOx retrofits, accuracy decreases, 3) five to eight straight lengths of duct runs are needed at the point of installation to obtain true accuracy and repeatability, 4) the DP outputs are not linear, thus a single "K" factor cannot correct over a broad operating range, and 5) low signal to noise ratios are generated, producing unstable signal outputs.

Therefore, airflow measuring instrumentation capable of overcoming the above concerns is needed.

Solution

AMC Power's Application Engineering Department was called upon by a Utility located in Georgia to design an airflow measuring system to replace several airfoils within their 500MW coal fired boiler, thus reducing the energy required to operate their FD fans.

Airfoils in three locations and an air dam were replaced; two airfoils within the 12' x 15' secondary air ducts, one airfoil within the 6' x 6' duct providing hot air to the mills and one air dam within the 5' x 5' tempering air duct.

Fan curves revealed the nonrecoverable pressure loss resulting from the airfoils and air damper totalled 3+ IN w.c., wasting over 300 HP per fan.

An array of ten 12' VOLU-probe/2SS Pitot-Fechheimer probes were placed in

each of the secondary air ducts, an array of five 6' VOLU-probe/2SS's were placed within the hot air duct, and an array of four 5' VOLU-probe/2SS's were placed within the tempering air duct. The averaged total and static pressure signals from each VOLU-probe array are routed through its own AUTO-purge Panel to ensure system integrity against particulate buildup, then on to a DPT-*plus* Ultra Low Span, Density Compensating (DP) Transmitter. The 4-20mADC (lbs/hr) signals are forwarded to the DCS.

Results

The installed system achieved not only measuring to within 3% of actual flow with turndowns of 4:1, it also saved over \$50,000 per year in operating costs due to eliminating the nonrecoverable pressure loss found with the airfoils. Pay back was less than two years.

