AIR MIXER DRASTICALLY REDUCES TEMPERATURE STRATIFICATION IN PULVERIZER DUCTWORK

ATCO POWER'S 750 MW pulverized coal-fired Sheerness station, in Hanna, Alberta, was experiencing temperature stratification in its pulverizer inlet ductwork. Temperature deviations of up to 62 F were measured. In addition to reducing drying efficiency downstream, such imbalances can lead to safety issues. The temperature stratification was a result of merging two flow streams.

Incoming flow from the air heater provides the thermal energy for drying the coal as well as transporting the it to the boiler. The inlet air temperature is controlled using a tempering stream of ambient air,

To resolve the stratification problem, ATCO installed an air mixer device designed and patented by Airflow Sciences Corporation (ASC), Livonia, Mich. A computational fluid dynamics (CFD) model was used to optimize the mixer design for the plant's specific duct system geometry. A key consideration was to generate the mixing with minimal system pressure drop.

After installing the mixer device, the temperature deviation was reduced to 13 F. Results are shown in Table 1. It should be noted that the difference in average temperature is due to changes in operation of the pulverizer. The additional pressure loss caused by the mixer was barely measurable, at 0.1 inches of water.

"We were looking for a device that would provide an even temperature distribution to a temperature compensated airfoil in order to provide more reliable airflow control to our Pulverizers," said Kevin Burgemeister, Sheerness plant engineer. The air mixing device from ASC provided the temperature profile we were seeking while the simple construction and ease of installation made this a cost effective solution.

The techniques described can be applied to any situation where flow streams of differing temperature and/or chemical content need to be combined and mixed in an efficient manner. The design parameters of the mixing device may be optimized using CFD or, to reduce cost, it can be estimated. The resultant improvement in mixing can improve efficiency, increase throughput and reduce safety concerns.
Circle 206

TABLE 1
FLOW TEMPERATURE STRATIFICATION BEFORE AND AFTER MIXING DEVICE INSTALLATION

Pulverizer Inlet Measurement	Before	After
Average Temperature	534 F	573 F
Minimum Temperature	512 F	568 F
Maximum Temperature	574 F	581 F
Maximum ΔT	62 F	13 F