

TITLE: ON-LINE MEASUREMENT OF PULVERIZED COAL

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Abstract

Coal-fired electric utilities consistently struggle with attempts to improve overall plant performance by achieving optimum combustion. While many techniques are employed, little has been done to optimize combustion at the individual burners. Distribution of windbox airflow and pulverized coal flow can vary greatly. There has been no effective method to measure coal and air, and the utility industry continues to accept these performance inadequacies.

In the age of deregulation and with increasing concerns over emissions, the utility industry continues to search for better methods of fuel and airflow measurement and control. This is especially true with the use of low NO_x burners, which require accurate airflow and fuel balance for optimum reduction of NO_x while simultaneously minimizing unburned carbon.

In 1997, a large Utility in Germany tested the use of a new coal flow measuring device which utilizes low frequency microwaves to accurately measure the absolute mass flow in coal pipes. When applied to coal outlets from a pulverizer, this device can accurately measure coal flow distribution from pipe-to-pipe. This device has successfully proven its ability to measure coal flow distribution with no maintenance drift problems. Based on the device's success on one mill, the Utility elected to equip all of the pipes on one boiler at this station. Secondary air (SA) is individually ducted to each burner on this boiler (unlike SA in the United States); the plant will control airflow to account for fuel imbalances on-line in an attempt to increase plant efficiency by reducing excess oxygen.

Introduction

In the United States, the Clean Air Act and deregulation prove to be driving forces in electric utility plant improvements. One of the more important factors that addresses both issues is fuel/air ratio, which, prior to the Clean Air Act and deregulation, was rarely scrutinized. Not only is the fuel/air ratio important to optimizing combustion efficiency, it is also critical to the performance of low NO_x burners and combustion modifications associated with low NO_x programs (e.g., staged combustion). Poor fuel/air ratio can also lead to problems such as slagging, and high unburned carbon in flyash which can impact ash sales.

Currently, the method for measuring coal flow into a boiler consists of volumetric and gravimetric coal feeders that measure the coal entering each coal pulverizer. From the pulverizer, the coal is delivered to multiple coal pipes, then, via the coal pipes; the pulverized coal is delivered to the individual burners.

Balancing of the coal flow distribution between burners has traditionally been attempted through clean or dirty air traversing and the installation of orifice plates. These types of manual traverses can only provide information at a single operating condition. Since it is widely accepted that the pipe-to-pipe coal distribution changes with load and time, manual traverses, even if accurate, can not be sufficient for balancing coal pipes to achieve optimum combustion.

While NO_x improvements are not as critical to the German utilities, which typically have SCRs in place to reduce NO_x, a deregulated environment is forcing that industry to look at efficiency upgrades. One large German Utility, which had previously determined via extractive sampling that their pipe-to-pipe coal imbalance was severe, decided to use a new technology for measuring pulverized fuel flow in an effort to reduce the overall excess air and thus improve efficiency. The new technology that was selected and proven to work was *Pf-FLO* by Promecon.