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Combustion Improvements in Coal Fired Boilers Through Burner Balancing

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Abstract

Uneven coal flow distribution in pulverized coal-fired boilers adversely affects combustion efficiency and leads to increased unburned carbon in fly ash, increased CO_2 emissions, increased potential for fuel line pluggage and burner damage, probable furnace slagging, and irregular heat release within the combustion chamber. In addition, it is critical for low NO_x (Nitric Oxides) firing systems to precisely control air-to-fuel ratios in the burner zones where temperatures are sufficiently high to facilitate formation of NO_x.

Numerical simulations were performed by the project team to develop an on-line coal flow control technology for vertical spindle mills. The results of numerical investigations by Computational Fluid Dynamics (CFD) software suggested several design options for an on-line coal flow control technology among the burner lines. In this study, it is proposed to evaluate and improve these coal flow control designs suggested by the numerical simulations through experiments using a laboratory scale pulverizer model in the Center's Pneumatic Conveying Laboratory. Once a coal flow control mechanism is developed, parametric tests will be performed. The parametric tests will include air-to-fuel ratio, PA velocity, classifier vane angle and coal flow distribution at the inlet plane of the pulverizer.