Abstract Format

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Development of an Auto-Milling Control System to Improve Coal Power Plant Combustion Efficiencies

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Abstract

The desired coal fineness, milled for coal power plant combustion, would typically be in a design target range of 75 μm to 200 μm. The plant's combustion effectiveness and efficiencies are directly related to the coal particle sizes supplied to its burners. The speed and frequency of conveying information on particle sizes produced by the coal mills would enable operators to act on adjustments to the mill parameters such as roller arm position or classifier vane angles. Such detection and feedback capability is currently unavailable in coal power plants and a technology to carry out these task would bring about significant progress to coal mill operations and influence future mill designs.

TNBR, in a recent research project, designed and developed an auto-milling algorithm which enables information from particle size measurements to drive mechanical adjustments in the mill towards a target output fineness range. The auto-milling capability works in a closed loop system and removes the need for human interaction on milling adjustments. Coal particle size measurements are carried out using available particle imaging technology and fed into the TNBR algorithm for processing using a model predictive control strategy.

The auto-milling system has been proven to work both on a component level and in an integrated system to measure, analyse and provide a response through scaled roller arm movements. A response time of two seconds was recorded in the experiments from the detection of a particle size range to a change in roller arm position. The significance of the response is clear when compared to a time scale of days for the current practice of manual sampling and settings change in coal mills. The benefits of auto-milling could also be quantified through savings from thermal efficiency improves related to the combustion of within-design-range coal particles. A yearly fuel savings projection of RM5.6 mill is estimated from employing auto-milling for each mill in a 700 MWth coal power plant.