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Numerical investigation of the effect of dual turbulent intensity on pulverized coal swirl burner

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A numerical simulation was performed for dual swirl pulverized coal combustion (DSPCC) flame to analyze an effect of turbulent intensity on flame structure and NOx production by means of large eddy simulation (LES) technique. It is well known that swirl burners have an advantage in flame stabilization and NOx reduction by increasing residence time of fuels in an internal recirculation zone. The simulation results are compared to the experimental data performed by Sung, et al. The simulation result shows a good agreement with the experiment and detailed analysis is discussed in this work. Fig. 1 shows the axial velocity distributions of the experiment and the simulation. The red line of Fig. 1 (b) means zero velocity. The simulation predicts the heart-shaped inner recirculation zone well even though the volume is slightly different. Fig. 2 presents the predicted instantaneous results of temperature and NOx mole fraction. Most chemical reactions are taking place in upstream region by injected methane and released gases. And then, NOx appears through the reactions of thermal and fuel NOx process. The simulations are performed for three cases and the flame structure and production characteristics of NOx will be discussed in detail.

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