

Numerical and Experimental Studies on the Characteristic of the Air Distribution in the Wind-Box of a Circulating Fluidized Bed Boiler

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Abstract : The wind-box is one of the important components of a Circulating Fluidized Bed (CFB) boiler. The uniformity of air flow in the wind-box of is very important for highly efficient operation of the CFB boiler. Non-uniform air flow distribution within the wind-box can reduce the boiler's thermal efficiency, leading to higher energy consumptions. An effective measure to solve this problem is to install an air flow distributing device in the wind-box. In order to validate the effectiveness of the air flow distributing device, visual and velocity distribution uniformity experiments have been carried out under five different test conditions by using a 1:64 scale model of a 220t/hr CFB boiler. It has been shown that the z component of flow velocity remains almost the same at control cross-sections of the wind-box, with a maximum variation of less than 10%. Moreover, the same methodology has been carried out to a full-scale 220t/hr CFB boiler. The hot test results depict that the thermal efficiency of the boiler has increased from 85.71% to 88.34% when tested with an air flow distributing device in place, which is equivalent to a saving of 5,000 tons of coal per year. The economic benefits of this energy-saving technology have been shown to be very significant, which clearly demonstrates that the technology is worth applying and popularizing.

Keywords : circulating fluidized bed, CFB, wind-box, air flow distributing device, visual experiment, velocity distribution uniformity experiment, hot test

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