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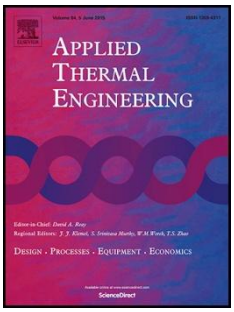

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Influence of combustion system retrofit on NO_x formation characteristics in a 300 MW tangentially fired furnace

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Highlights

►Higher temperature enhance NO_x formation process near the conventional burner.

►Lower temperature control NO_x formation in fuel rich stream of low NO_x burner.

►Operation of SOFA effectively reduce both of the rate and region of NO_x formation.

►Combustion systems retrofit slightly decrease the economic performance of boiler.

ABSTRACT: The NO_x emission in a 300 MW retrofitted tangentially fired pulverized coal (PC) boiler is numerically studied using fluid dynamic code. Good agreement between design/measured values and predicted results implies the accuracy of analysis in current study. The results showed that, the retrofit of combustion system not only change the total NO_x emission concentration of boiler exit, but also the scale of NO_x formation region in furnace. In conventional burner, peak temperature of flue gas is very close to burner, and thus greatly enhances NO_x formation process. In fuel rich stream of the low-NO_x burner, the optimum concentration of particle coal can not only reduce peak temperature in the vicinity of burner, but also produce more intermediate species to enhance NO_x conversion process. Although the conversion rates of HCN slightly increases in the fuel lean stream of low-NO_x burner due to relatively higher oxygen mass fraction in this stream, the peak value of fuel NO_x formation rate curve is still lower than that of conventional burner. Operation of separated over fire air could effectively reduce both of the rate and region of total NO_x formation in furnace. However, combustion systems retrofit slightly decrease economic performance of boiler and extend the ignition length of pulverized coal. Therefore, optimal design of combustion system is still necessary for better economic performance and stabilized combustion characteristic of the boiler. Present study provides guidance for optimization design of low-NO_x combustion system, combustion adjustment and safe operation of the boiler.

KEY WORDS: Coal combustion; NO_x emission; Bias burner; Separated over fire air

1. Introduction

The control and reduction of nitrogen oxides in industrial coal combustion installation attracted much attention all over the world due to their unfavorable impacts upon environment[1]. Electric utility industry, as one of the most important industry in energy consumption and pollution[2], is of great significance to NO_x emission reduction[3]. Tangentially fired pulverized coal (PC) boiler is widely used for electric utility industry because of good flame distribution and uniform heat flux to the furnace walls[4, 5]. Some significant improvements in reducing gas temperature deviation, low load steady combustion and lower NO_x emission have been made in recent years[6]. Among those improvements