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Numerical Analysis for a 870MW Wall-fired Pulverized Coal Boiler: Comparison with Field Test and Simulation

Seok-Gi Ahn, Chung-Hwan Jeon
School of Mechanical Engineering/Pusan National University,
Busandaehak-ro 63beon-gil, Geumjeong-gu, Busan, Rep. of KOREA
seokgi0502@naver.com; chjeon@pusan.ac.kr

Extended Abstract

Pulverized coal-fired boilers have been used to generate power in Korea, contributing 39% of the total electricity in 2014. [1] Recently, the Korea South East Plant (KOSEP) constructed a wall-fired boiler with a capacity of 870MW on Dec. 2014. The boiler was designed to burn low rank coal (5,300 kcal/kg) and this uses a Low-NOx Burner and air staging system for reduction of NOx emission during coal combustion. This system can control emissions and combustion efficiency. For this reason, Kim et al. [2] investigate the effects of various combustion tuning parameters, such as coal burner swirl angle, over fire air (OFA) flow distribution etc. in the 870MW wall-fired boiler on site. The test results are about change of NOx and CO concentration at exit from the boiler depending on the parameters. Computation fluid dynamics (CFD) have been widely used to predict boiler performance. [3-5]. It's because CFD can provide a detailed boiler analysis such as distribution of temperature, velocity and species concentration in the boiler. So the objective of this study is a numerical investigation of the field test in the 870MW wall-fired boiler [2]. This study is investigated the effects of burner swirl angle and OFA flow distribution on the combustion and emission characteristics such as gas movement, coal particles trajectory, temperature, thermal absorption at water wall around a burner zone etc. The CFD results compare to the field test and analyse the combustion characteristics in the boiler. The commercial CFD code ANSYS FLUENT v16.1 is employed to simulate the CFD simulations. The fluid flow and coal particle combustion process are modelled using the Euler-Lagrange approach. The governing equations for the conservations of energy, mass, momentum and species are solved [6].

References

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