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# OPTIMISATION OF PULVERISED COAL COMBUSTION BY MEANS OF CFD/CTA MODELLING

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ABSTRACT

The objective of the work presented in this paper was to apply a method for handling two-phase reacting flow for prediction of pulverised coal combustion in large-scale boiler furnace and to assess the ability of the model to predict existing power plant data. The paper presents the principal steps and results of the numerical modelling of power boiler furnace with tangential disposition of the burners. The computational fluid dynamics/computational thermal analysis (CFD/CTA) approach is utilised for creation of a three-dimensional model of the boiler furnace, including the platen superheater in the upper part of the furnace. Standard k-e model is employed for description of the turbulent flow. Coal combustion is modelled by the mixture fraction/probability density function approach for the reaction chemistry, with equilibrium assumption applied for description of the system chemistry. Radiation heat transfer is computed by means of the simplified P-N model, based on the expansion of the radiation intensity into an orthogonal series of spherical harmonics. Some distinctive results regarding the examined boiler performance in capacity range between 65 and 95 % are presented graphically. Comparing the simulation predictions and available site measurements concerning temperature, heat flux and combustion efficiency, a conclusion can be drawn that the model produces realistic insight into the furnace processes. Qualitative agreement indicates reasonability of the calculations and validates the employed sub-models. After the validation and verification of the model it was used to check the combustion efficiency as a function of coal dust sieve characteristics, as well as the impact of burners modification with introduction of OFA ports to the appearance of incomplete combustion, including CO concentration, as well as to the NOx concentration.

KEYWORDS

CFD modelling, pulverised coal-fired boiler, thermal radiation, combustion, heat transfer, furnace

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