RADIATION EFFECTS IN COMBUSTION CHAMBERS OF COAL-FIRED BOILERS WITH A FIXED BED

A. Bıyıkoğlu and M. Sivrioğlu
Mechanical Engineering Department
Gazi University, 06570 Ankara, Turkey

ABSTRACT. Steady state combustion has been investigated for the simulation of reactive turbulent flow within the combustion chamber of a small-scale coal-fired boiler with a fixed bed. For this purpose, the one-dimensional code, CLAYER developed for determining the thermo-chemical field of coal combustion in a fixed bed, the zero-dimensional code, CREK used in determining the thermo-chemical field of reactive turbulent flows and the two-dimensional code, TEACH used in determining the hydro-dynamical flow field in the combustion chamber, are combined and modified. The Unreacted Shrinking Core Model is used for coal combustion. The turbulent reactive flow in combustion chamber is analyzed using k-ε turbulence, four-flux radiation and combustion models including chemical equilibrium and kinetics calculations. The comparison of the existing experimental data with the emission calculations at the exit of combustion chamber has resulted in an agreement with an acceptable degree. The effects of radiative heat transfer on temperature distribution and concentrations of combustion products are analyzed.