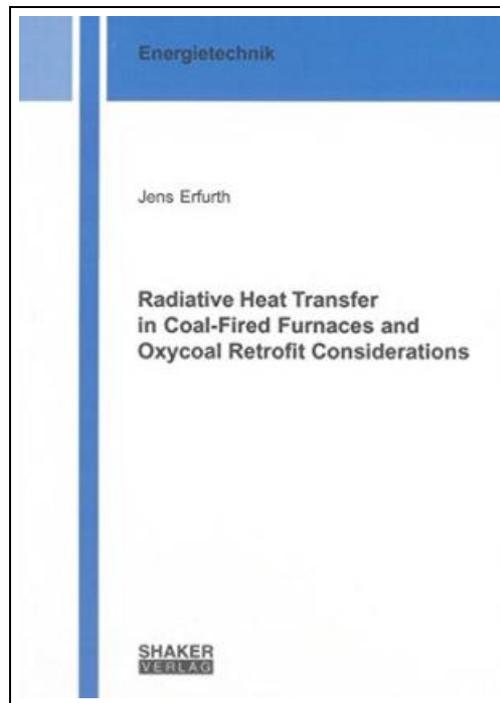


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RADIATIVE HEAT TRANSFER IN COAL-FIRED FURNACES AND OXYCOAL RETROFIT CONSIDERATIONS

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Shaker Verlag Feb 2012, 2012. Taschenbuch. Condition: Neu. Neuware - Oxycoal combustion is the combustion of coal using a mixture of oxygen and cooled recycled flue gas in place of air. In the last years it has gained interest as a means of CO₂ capture from stationary point sources. In particular, under emission mitigation regimes the retrofit of existing coal-fired power plants may help avoid 'stranded assets' through lower emissions and thus costs if certain technical criteria can be met. Among these is the need to keep total heat transfer in the boiler constant while not raising the furnace exit temperature. The altered gas composition in oxycoal combustion leads to changes in both convective and radiative heat transfer, of which the latter, while of overwhelming importance in the furnace, poses a particular challenge to modellers. This work is thus primarily concerned with the simulation of radiative heat transfer. After a short introduction to oxycoal combustion, a general discussion of Computational Fluid Dynamics (CFD) models for coal combustion is given. Emphasis is placed on the physics of molecular gas band radiation, respective modelling approaches and their application within a CFD context. Based on this analysis, it is concluded that for the purposes of this work, a nongrey CFD implementation of the Exponential Wide Band Model is most suitable. Then the results of CFD simulations of the furnace of a state-of-the-art coal-fired USC boiler with a thermal power of 1,210 MW are presented, which were carried out using the commercial software FLUENT® 6.3, combined with some User-Defined Functions. In addition to air combustion, the cases studied include variations of the burner oxygen concentration and the mode of flue gas recycling (wet and dry), the two additional parameters that present themselves in oxycoal combustion to meet the retrofit criteria. The same burner...



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