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NUMERICAL SIMULATION OF TWO-PHASE TURBULENT FLOWS OF ASH CIRCULATING IN FLUIDIZED BED

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In Estonia *ca* 95% of electricity is produced by oil-shale power plants. Circulating fluidized bed (CFB) technology is installed and launched in 2004 at Estonian Power Plant and at Baltic Power plant where oil shale is combusted. Since during oil shale combustion a lot of ash is formed, there is no need of using additional material (for example, sand) in the solid phase in the oil-shale CFB process. In CFB oil-shale ash is circulating.

The concentration of solid particles of ash and inert material in the combustion chamber of CFB is very high, and that gives a rise to some disadvantages. At the same time, the required temperature level in the combustion chamber is guaranteed by the circulation of solid particles. In this work numerical simulation of gas-solid particles' flow has been performed in the frame of a two-fluid model, namely the Eulerian approach for the dispersed phase, for conditions of CFB ranging from moderate to high mass ratios of the flow. An incorporated original model of closure of the transport equations of the dispersed phase permitted to account interparticle collisions which might be indispensable to proper numerical simulation of the process in the CFB under study.

There were performed two numerical simulations using different models: TBL (turbulent boundary layer) model and 2D RANS (two-dimensional Reynolds averaged Navier-Stokes) model, which qualitatively and quantitatively describes the real-time distribution of flow parameters in a real flow domain, i.e. model covers reasonable physical phenomena occurring in fluidized-bed conditions.

The results of this work would be helpful for improving the processes occurring in the combustion chamber of CFB.

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