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IMPROVEMENT OF THE CONJUGATE HEAT TRANSFER IN HIGH TEMPERATURE CHAMBER FURNACES FOR CERAMIC FIRING

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The firing of ceramic ware in chamber furnaces is transient multiphysical process, including turbulence combustion and fluid flow in the gas space, convective heat transfer, radiation heat transfer from the flue gases to the furnace wall and ceramic ware, surface to surface radiation between the solid surfaces and conduction heat transfer in combination with endothermic or exothermic processes in the ceramic body.

Models and conceptions for numerical analysis of the conjugate heat transfer in such furnaces in order to investigate the possibilities for improvement of their efficiency are developed. They are applied for analyses of the thermal processes in a chamber furnace for firing of technical ceramics. All mathematical models are validated on the base of information, obtained from in situ measurements of parameters of the real object. Non uniform thermal and fluid flow fields in the thermal aggregate cause problems in the furnace walls and in wastes at the ceramic ware. An impossibility of improving the furnace operation at the existing construction, topology and parameters of the burners is established.

A variant for reconstruction of the furnace is investigated numerically. It includes changes of the number, power and topology of the burners and the arrangement of the ceramic ware in the furnace space. Uniform temperature fields and reduction of the specific fuel consumption at the suggested configuration of the thermal aggregate are established. They are prerequisites for quality and economical firing of the ceramic ware.

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