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SIMULATION OF CONTINUOUS CASTING OF STEEL BY A MESHLESS TECHNIQUE

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ABSTRACT

This paper uses a recently developed upgrade [1] of the classical meshless Kansa method for solution of the transient convective-diffusive heat transport [2] in continuous casting of steel. The problem is characterised by a moving mushy domain between the solid and the liquid phase and a moving starting bottom block that emerges from the mould during the process. The solution of the thermal field with moving boundaries due to phase-change and due to the growing computational domain is based on the mixture continuum formulation. The growth of the domain and the movement of the starting block are described by activation of additional nodes and by the movement of the boundary nodes through the computational domain, respectively. The domain and boundary of interest are divided into overlapping influence areas. On each of them, the fields are represented by the multiquadrics radial basis function collocation on a related sub-set of nodes. Time-stepping is performed in an explicit way. Convection-dominated situation [3] is described by the characteristic based split [4]. The governing equation is solved in its strong form, i.e. no integrations are performed. The polygonisation is not present and the method is practically independent of the problem dimension. Realistic boundary conditions and temperature variation of material properties are included. A two-dimensional transient test case solution is shown at different times and its accuracy is verified by comparison with the reference finite grid finite volume method results.

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