

Finite element modelling of solidification phenomena

Abstract

The process of solidification process is complex in nature and the simulation of such process is required in industry before it is actually undertaken. Finite element method is used to simulate the heat transfer process accompanying the solidification process. The metal and the mould along with the air gap formation is accounted in the heat transfer simulation. Distortion of the casting is caused due to non-uniform shrinkage associated with the process. Residual stresses are induced in the final castings. Simulation of the shrinkage and the thermal stresses are also carried out using finite element methods. The material behaviour is considered as visco-plastic. The simulations are compared with available experimental data and the comparison is found to be good. Special considerations regarding the simulation of solidification process are also brought out.

Keywords — Casting, finite element method, heat transfer, solidification, thermal stress