

Analysis of Heat Transfer Conditions in the Sand and Metal Moulds and Their Effect on the Solidification of the Casting

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The article deals with heat transfer in the casting - mould system. There are characteristics of sand and metal mould. The sand mould is a dispersion system, respectively - a capillary-porous body. In sand mould are heat transfers shared by all three ways: conduction, convection and radiation. These individual elementary processes of heat transfer are only theoretical significance, as very often processes are taking place simultaneously in different intensities or interact. The maximum effects of these processes are in a certain temperature range. From temperature 200 °C dominates conduction heat transfer. Between of temperatures 200 to 600 °C is the effective convection heat transfer. At higher temperatures above 600 °C prevails radiation heat transfer. This is the consequence, why the sand mould has a lower value thermal accumulation than a metal mould. The metal mould as a result of its character and compactness has a high heat accumulation value. Therefore, in the metal mould cast solidifies faster than the in sand mould. Based on the Newton's and Fourier's laws, there were indicative calculated times of solidification cast of shape plate in the sand and metal moulds. Concurrently were made simulations calculations performed solidification of shaped plate through simulation software MAGMA 5. To obtain the corresponding results of simulation calculations, it is important to use the respective temperature-dependent of the thermo-physical variables, including temperature dependence heat transfer coefficient.

Keywords: Sand mould, Metal mould, Solidification, Heat transfer, Thermo-physical quantities.

Acknowledgement

This article is financially supported by Ministry of Education Youth and Sports of Czech Republic through the project SGS.

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