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Abstract:

„Thermal conductivity temperature dependence of selected moulding sands”.

Casting technology of metals and their alloys uses many techniques, these are for instance: gravity casting into permanent or semi-permanent moulds, pressure die casting, casting into rotating moulds, semi-solid casting, squeeze casting, etc. The oldest one and commonly used up-to-day is the method of gravity casting into ceramic moulds, mostly made from sands with silica quartz matrix. These moulds are bonded mainly with natural binders, e.g. bentonite, synthetic resins or water glass. Today computer programs give possibility of numerical analyses of the technological processes. The numerical algorithms require introducing the proper boundary conditions, e.g. the temperature relationships of the mould material thermophysical properties, mainly the thermal conductivity, heat capacity and mass density.

A special attention should be focused on thermal conductivity of the wet mould during the first period of heating caused by cooling and solidifying casting, connected with water evaporation and the transport of water vapour into the mould body.

The research made during the project showed that in this period the thermal conductivity value of the mould material is approximately twice of the value of the dry mould. There is no doubt, it has a significant influence on shaping structure and properties of the surface layer of the solidifying casting. Comparing results of the physical experiments with numerical simulation clearly showed, that only introducing equations of temperature dependencies of the sand mould thermal properties allowed obtaining high degree consistency between design and experiment values.