Flow Measurements in a Continuous Steel Casting Model Using low Temperature Liquid Metal

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Model experiments with low melting point liquid metals are used to evaluate the flow structure and its related transport processes in metallurgical applications in melt flows. Water model experiments are less important, in particular, in case of strong temperature gradients, two-phase flows or flows exposed to electromagnetic fields. Here we present the Mini-LIMMCAST experimental facility to illustrate the continuous steel casting process using a GaInSn room-temperature liquid metal alloy. The parameters of the facility and the dimensions of the test sections will be given and possibilities to evaluate the flow in the mold will be discussed.

The effect which the magnetic field has on the flow structure turned out to be complex. The flow measurements do not show a general braking effect which would be expected as an overall damping of the flow velocity and its resulting fluctuations in the mold. Not only different magnetic field intensities had a big influence on the flow field, but also the variation of the electromagnetic field position had a striking impact on the resulting flow structures. The flow intensity in the upper part of the mold is also significantly influenced by the movement on the free surface of the metal. During continuous casting, this movement of the free surface is an important parameter to indicate the quality of steel. The experiments provide a substantial database for the validation of respective numerical simulations.

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