Quality Prediction and Optimization with Simulation in Ingot Casting

HAHN Ingo

MAGMA Gießereitechnologie GmbH,
Czech Republic

Ingot casting production is increasingly concentrated on special alloys and products, which can only be produced by this process. Steel ingots are subsequently subject to further processing steps like forging or rolling. There is no doubt that proper quality control and cost savings throughout the whole production process are key factors for a competitive production. The quality of the as-cast ingot is the starting point for all the subsequent heat treatment and deformation steps - Most major quality problems in ingots originate from the casting process. The state-of-art tool to investigate and predict product quality is simulation. With casting process simulation, it is possible to team, solidify and cool a virtual ingot to predict e.g. shrinkage, centre-line porosity, segregation, inclusions, residual stresses and cracks that originate during casting.

This presentation shows examples for the prediction of ingot casting quality with simulation. A special focus is put on the application of autonomous optimization to improve the layout of the ingot casting process: The today-given availability of quick and reliable casting simulations enables to automatically carry out many simulations without interaction of the user. The casting process layout and parameters are varied by an optimization program in order to fulfil predefined targets, for example minimum shrinkage and at the same time a minimum head size.

With virtual optimization the very best casting process can be designed – It helps to provide an optimum cast product at reduced production costs.