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CC Process optimization through combined digital twin and in-line measurement technology for a stainless-steel slab production

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The degree of digitalization in steel producing companies is increasing significantly, which consequently amplifies the importance of identifying significant process parameters and investigating the effect of parameter changes.

Digital simulation technology today makes it easily possible to carry out three-dimensional process simulation of the entire continuous casting process. State-of-art simulation tools provide quantitative insights into formation of flow, solidification, stress and distortion. Recent developments in modelling of electromagnetic stirring (EMS) and its impact on the flow behaviour as well as thermomechanical coupling with simulation of stress development, up to the slab's interaction with rolls and bulging effects, can be considered.

By integrating MAGMA CC's digital twin technology with mecorad's radar-based solutions, virtual experimentation is combined with real-time in-line measurements. Thus, information about quality, productivity and energy saving potential of process alternatives can be examined more precisely and beneficially.

Whereas many secondary parameters can be examined throughout the casting process, primary parameters of the product can only recently be obtained from inside the casting machine as early as the mold exit using the radar technology from mecorad. The WTL series delivers continuous real-time values of strand dimensions uninfluenced even by conditions in the secondary cooling zone, which allow a proactive, in-line intervention and optimization of the casting process. Combined with radar-based mold level control, deviations from optimum simulations become visible to the operator immediately.

In this manner, expensive and energy intensive experimental trials can be avoided and replaced with the digital twin technology of MAGMA CC in conjunction with in-line measurement from mecorad. Based on this knowledge, the optimized casting processes are both cost- and energy-efficient, as well as robust with respect to final product quality.

These findings have been validated on an industrial-scale continuous slab casting machine, demonstrating the effectiveness of combining digital twin technology with real-time radar-based measurement.

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