Contribution ID: **160** Type: **Oral Presentation**

Secondary Cooling Heat Transfer Measurements on a New Test Rig

Wednesday 8 October 2025 10:20 (20 minutes)

The accurate knowledge of the cooling heat-flux in continuous casting spray cooling is essential to exactly control the cooling conditions. Recent investigations on laboratory test rigs by other research groups showed that the cooling heat-flux depends on many parameters and can not sufficiently be described by simple relations between spray water/air density and heat-flux density. In addition to the flow rates, parameters like nozzle type and arrangement, casting speed, surface temperature and orientation as well as the surrounding roll and roll bearing geometries influence the cooling heat-flux. Only measurements on hot surfaces can provide the needed heat-transfer data for each individual cooling situation. A test rig for such measurements developed at PRIMETALS is presented. The test rig consists of a hot plate that can be moved in relation to water nozzles to simulate the strand moving with casting speed. Both nozzles and plate can be rotated to arbitrary angels with respect to gravity to simulate different orientations of the strand surface on a curved caster. Roll dummies can be mounted to analyze the influence of the rolls. The cooling heat flux is measured by applying an inverse modeling algorithm on the time signal of temperature sensors immersed in the hot plate. The design of the immersed sensor is optimized to minimize the inherent errors of the method in order to get accurate results. Process parameter studies are presented to show the influence of the parameters on the cooling effect of the nozzles.

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Session Classification: Cooling & Solidification Control

Track Classification: Steelmaking - Continuous casting, near-net shape casting and ingot casting