

8th International Conference on Physical and Numerical Simulation of Materials Processing (ICPNS)

14–17 October 2016

Seattle, Washington | Hosted by Purdue University

SESSION 2: SOLIDIFICATION AND CASTING, SALON B

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SATURDAY, OCTOBER 15, 2016

Mould corner radius-related flow and thermal states in bloom continuous casting with a swirling flow nozzle

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ABSTRACT

Based on a mathematical model coupling fluid flow, heat transfer, and solidification, the metallurgical behavior of the bloom continuous casting mould with different corner radius have been evaluated and compared with using the swirling flow nozzle (SFN). Compared to the straight nozzle, the SFN generated a strong swirling flow along with the upper and lower recirculation region in the mould, and created an active bulk flow below the meniscus, which can move the hot spot upward to improve the melting of mould powder and promote superheat dissipation of the molten steel. Most importantly, with the adoption of the SFN, the simulation results show that the temperature distribution in the mould together with the thickness of solidified shell at the cross-section will be more even with the increase of the mould corner radius, and the level fluctuation conditions at the free surface can also be improved.

KEYWORDS: mould, continuous casting, swirling flow, solidification, corner radius