Physical Modeling and Numerical Investigation of Fluid Flow and Solidification Behavior in a Slab Caster Mold using Hexa-furcated Nozzle

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Abstract

Slag entrapment from metal-slag interface during continuous casting operation has been a major area of concern for steelmakers globally. The presence of inactive regions in the upper region of the mold poses another challenge. Proper flow behavior of the molten metal coming out of the nozzle in the mold is required to overcome these challenges. Nozzle design greatly affects the flow pattern of the molten steel inside the mold. The present investigation is an attempt to study the flow and solidification behavior in a slab caster mold with the use of a novel designed hexa-furcated nozzle (HFN) using numerical investigation results. The casting speed and submerged entry nozzle (SEN) depth are varied to study the effect of these parameters on minimizing the inactive zones in the mold and the steel/slag interface fluctuations. The results show that the interface fluctuation increases at higher casting speed and lower SEN depth. The RTD analysis is also performed for different cases to investigate the flow behavior. The validation of the fluid flow and RTD curve inside the computational domain is carried out with the use of physical modeling.

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