THE INFLUENCE OF PROCESSING PARAMETERS ON FLUID FLOW IN CONTINUOUS CASTING OF MOULD WITH VERTICAL ELECTROMAGNETIC BRAKE

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Abstract: Some traditional kinds of the electromagnetic brake (EMBr) such as EMBr Ruler and FC-Mould are widely used in the continuous casting process, which generally have the patterns of level magnetic poles in the wide side of the mould. However, these magnetic poles are fixed in a certain height level of the mould, which generally could not fit the intermittently change of the depth and angle of submerged entry nozzle (SEN) during the casting process. That will reduce the effect of EMBr and even bring some negative effect such as impeding bubble floating.

In this papers, a new pattern of EMBr was proposed, which magnetic poles are vertically installed on the narrow sides of the mould from the meniscus to the impinge point of melt from the outlet of SEN, it is named as vertical EMBr (V-EMBr). The remarkable characteristic of V-EMBr is that their control effect is not affected by the change of melt surface level, the outlet position and angle of SEN. Moreover, the covered region of V-EMBr is the key region of initial solidifying shell in the mould, which generally brings subsurface defects in slab owing to the bubbles and inclusions are captured by initial solidifying shell.

The numerical simulation and physical experiment on the control of fluid flow, bubbles and inclusions under V-EMBr was investigated according to casting speed, immersion depth of nozzle and magnetic flux density. The results show that the impinging velocity of melts from SEN on the narrow sides of mold is obviously reduced. Meanwhile, the free surface velocity and turbulence energy are also obviously decreased, so that it is helpful to reduce the capture of the non-metal inclusions and bubbles by the initial solidifying shell and the meniscus near the narrow side of the mould. The magnetic flux density of 0.3~0.4T with the V-EMBr is enough to control the fluctuation of meniscus and the impinging of melt from SEN to the narrow sides of mould. It prove the V-EMBr could control the fluctuation of free surface and the impinging on the narrow sides of mold with the reasonable magnetic field parameters, and it especially can satisfy the change of immersion depth and outlet angle of the SEN during a long time continuous casting process.