Study on Defects of Aluminum Slabs due to Temperature Variations by DC Casting Processes

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ABSTRACT

During the continuous casting process of aluminum slab, there are many factors influencing the casting quality, such as the pour temperature, cooling water flow rate and casting speed. Due to these factors, the defects such as butt curl, serious cracking or even breaking will occur during processes. In this study, the forecasting system was established to simulate the heat transfer and butt curl phenomenon of the aluminum continuous casting. The finite element method (FEM) commercial software named as ANSYS Workbench CFX was used to predict the release of latent heat during the liquid aluminum solidification and calculate the average coefficient of thermal conductivity. The results of CFX were used as initial boundary conditions of thermal analysis and the method of birth and death are adopted to analyze slabs defects of aluminum 7075 alloys with different casting speeds. The results of FEM simulations indicate that the increase of casting speed will slow the decrease of temperature at center of slabs along the casting direction, and also reduce the butt curl and slab bow phenomenon. But on the contrary, the faster casting speed will produce bigger slab swell. The slab defects match with the actual phenomenon. Finally, the results show that simulated deformations consistent with the actual phenomena. Meanwhile, the predicted system would offer industries a good tool to reduce the manufacturing costs.

Keywords : aluminum slabs, DC casting, butt bow

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