

The CAE Analyses of Riser Feedability for A356 Aluminum Alloy Casting

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ABSTRACT

The study of riser feeding is mainly focus on steel and cast iron, but their feeding principles are not suitable for A356 aluminium alloy. This research used the CAE software-AFSolid system to modify Caine's riser feeding rule and to measure the feeding distance of riser for A356 aluminium alloy. The flowing velocity of computer simulation result reveals the different effect of various gating ratio for gating system. The empirical model of feeding distances of risers for A356 aluminium alloy casting was also calculated by regression analysis method. In addition, this study also investigates the effects of thermal parameters on the soundness of A356 alloys casting by criteria hot spot, thermal gradient, cooling rate and solidification time. The practical castings poured by CO₂ sand mold and X-ray examination were performed to understand the validity of CAE results. The results of study show that the gating system with 1:4:4 gating ratio had a stable melt flow for A356 aluminium alloy. From the prediction of defects simulated by those criteria stated above, the hot spot will be in the riser if the casting can get adequate feeding. The greater thermal gradient and cooling rate can promote the feeding efficiency of castings and prevent the shrinkage of castings. As the solidification time of risers is longer than that of castings, the feeding will be sound. In addition, the difference between the Caine's riser feeding rule and the results of simulation shows that the sound range of riser's feeding should be modified. Through the examination of X-ray for inspecting the practical A356 step-castings and plate-castings also shows that the shrinkage positions are correspondent to the computer simulation.

Keywords : A356 aluminium alloy, computer-aided engineering, Caine's riser rule, feeding distance, soundness

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