Optimal Analysis of A390 Aluminum Automobile Piston Casting

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ABSTRACT

The goal of this study was to understand the solidification and flow phenomena of A390 aluminum alloy automobile piston casting, under the computer-aided designing simulation by the computer-aided engineering (CAE) software. The CAE simulation was also determined to get the optimal casting design of piston, and the real castings were done to estimate the reliability of CAE simulation. The experimental results indicate that the non-pressurized gating system with cylindrical runner can effectively control the ingate velocity and reduce the turbulence of flow when compared to the other designs. Besides, the better ingate should be arranged at the side of piston skirt. The top riser set on the piston casting had the best feeding result. The design of chill on the piston casting with and without riser whether it is top or side, the feeding of shrinkage could not be successful and the defects also occurred inside the piston casting. The yield was changed from 78 percents to 91 percents by way of optimization design and simulation of riser on the piston casting, and the simulation results also revealed the non-pressurized gating system with the cylindrical runner and top riser design has the better yield then the other system design. Finally, the casting design of the A390 aluminum alloy automobile piston casting would be certainly evaluated by the CAE software.

Keywords : A390 Aluminum Alloys ; Solidification ; Flow ; Gating ; Computer-aided Engineering (CAE)

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