Computer-aided Simulation Analysis of Vacuum Die Casting for AG40A Zinc Alloy

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ABSTRACT

The AG40A zinc alloy has better mechanical strength and low cost due to its fine microstructure and smooth surface, therefore it is widely used in zinc die-casting industry. But, AG40A zinc alloy die-castings often reveal defects like envelopment of gas, shrinkage and cold shut, thus its application is limited. This research was mainly focused on the simulation of whether the vacuum-aided extraction is conducted on the resolution of those defects in the AG40A zinc alloy sanitary die-casting by FLOW-3D software. In addition, the effects of die casting process parameters including casting pressure, pouring temperature and mold temperature on the defects of AG40A zinc alloy were studied.

The FLOW-3D ’s filling and solidification simulations of AG40A zinc alloy were conducted to predict the envelopment of gas, turbulence and cold shut location in this research. The process conditions imposed on the AG40A zinc alloy sanitary die-castings consisted of whether vacuum-aided extraction on the die, three different mold temperatures, three different pouring temperatures and three different casting pressures. The density and porosity of AG40A zinc alloy sanitary die-castings measured by Archimedes principle were compared to the results of computer simulation.

The results show that with vacuum-aided extraction on the die, not only the envelopment of gas of die-castings can be effectively reduced, but also solidification shrinkage of castings can be avoided, but, the turbulence and cold shut defects cannot be effectively improved. Moreover, under the condition of vacuum-aided extraction on the die, the porosity of AG40A zinc alloy sanitary die-castings can be reduced with increasing the mold temperature and the pouring temperature.

Keywords : AG40A zinc alloy、Computer-aided simulation analysis、Vacuum-aided die casting、Archimedes principle

Table of Contents

第一章　前言.....1
第二章　文獻探討
2.1 壓鑄法.....2
2.2 真空壓鑄技術.....3
2.3 真空系統.....5
2.4 鑄件孔洞率.....7
2.5 AG40A鋅合金.....8
第三章　實驗方法及步驟
3.1 研究目的.....16
3.2 實驗設備與材料.....16
3.3 實驗方法.....17
3.3.1 電腦輔助模擬分析.....17
3.3.2 壓鑄參數設定.....18
3.3.3 實際鑄件孔洞率量測.....18
第四章　結果與討論
4.1 充填模擬之捲氣位置.....27
4.1.1 澆注溫度的影響.....27
4.1.2 模具溫度的影響.....29
4.1.3 鑄造壓力的影響.....31
4.2 充填模擬之紊流情形.....33
4.2.1 澆注溫度的影響.....33
4.2.2 模具溫度的影響.....35
4.2.3 鑄造壓力的影響.....37
4.3 充填模擬之流痕缺陷.....40
4.3.1 澆注溫度的影響.....40

4.3.2 模具溫度的影響.....42
4.3.3 鑄造壓力的影響.....43
4.4 凝固模擬之縮孔分布.....45
4.4.1 有無真空輔助壓鑄的影響.....45
4.4.2 鑄造壓力的影響.....45
4.5 最佳製程條件之比較.....46
4.5.1 無真空輔助壓鑄.....46
4.5.2 有真空輔助壓鑄.....50
4.5.3 孔洞率比較.....53
第五章　結論.....84
參考文獻.....86

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