

# A Study on Technology of Vacuum-Assisted Die Casting for AG40A Zinc Alloy

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## ABSTRACT

The mechanical properties of Zinc alloy die casting can not be upgraded because of the internal holes which limit its application. To explore the scope of application of zinc alloy and improve its mechanical properties, constantly upgrading and developing the technology of zinc alloy die-casting are needed. In this study, a vacuum-assisted system coupled with improved mold in the process of zinc alloy die-casting is used. Analyze the results of experiments with different combinations of casting conditions-different pressure, mold temperature and pouring temperature under the conditions of the atmosphere and vacuum-assisted die-casting. Through this experiment, the best process parameters of vacuum-assisted AG40A zinc alloy die-casting can be obtained.

The experimental results showed that the die-casting process with vacuum-assisted system has a fewer average value of porosity percentage, a better compressive strength and a higher pressure value of leakage-resistant for leakage test than the conventional zinc die casting. In addition, compare the least porosity percentage as well as the maximum compressive strength of AG40A zinc alloy die castings obtained from the process parameter combinations, the mold temperature of the vacuum-assisted system is 150 , which is higher than the mold temperature 100 of the traditional system. Similarly, to acquire the same results above-mentioned, the pouring temperature of the vacuum-assisted system is 420 , which is higher than the pouring temperature 400 of the traditional system. However, there is not any change about the effect trend of casting pressure on the porosity percentage and compressive strength of AG40A zinc alloy die castings whether the vacuum-assisted system is applied or not. As for the castings examined by the leakage test, due to their crystal grains are near to be round and less stress concentration occurred, all the die-castings whether the vacuum-assisted system is applied or not did not reveal any leakage defect.

OM observation of the region near the fracture surface of handle of all castings shows that the vacuum-assisted process can reduce the porosity percentage and the pore size and the grain size as well. Therefore, the compressive strengths of castings for process with vacuum-assisted system are increased. The mold temperature which can result in the AG40A zinc alloy die casting with the smallest grains is 150 . In addition, the results show that the process with vacuum-assisted system indeed promotes the grain of castings to be smaller and increases their compressive strengths via SEM observations. The pouring temperature of the process with vacuum-assisted system which can result in the least porosity and smaller pores is 420 .

Keywords : AG40A zinc alloy, vacuum-assisted die casting, porosity, compressive strength, leakage test

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