The Application of Taguchi Method in Accurate Ceramic Mold Casting Process—Shoes Die Casting for Example

高境宏、林朝源

E-mail: 9423575@mail.dyu.edu.tw

ABSTRACT

Because of the fact that the processing cost of mold is increasing and the life cycle of the new product development is ever shortening, the application of the accurate ceramic mold casting to the development of the relevant metal mold seems to attract more and more attention. The accurate ceramic mold casting can not only shorten the mold forming cycle time but also cut down production cost to a great extent, which will extensibly uplift the market competitive. The thesis is mainly devoted to the finding of the factors and their combination affecting the mold forming via the Taguchi method and the operation criterion for high quality. And then, basing on the findings, we hope to upgrade the mold strength so as to get them spread within the scope of 25+0.2 kn/m² and 25-0.2 kn/m², and to avoid the corruption of mold through the insufficiency of the mold strength, which will lead to rework, cost up and losing of productivity. According to our experiment, we have found if we do make some adjustments to the relevant control factors, we may obtain the optimization result. They are A1-Pouring Temperature (1690~1720 °C), B3-Zircon Flour (50%), C3-Zircon Sand (35%), D3-Mulgrain Sand (15%), E1-Ethyl Silicate (20.5kg), F3-Burning Temperature (1150°C), G3-Mold Sand (28.3 kg), H2-Na2SO4 (4.1 kg).

Keywords: Accurate Ceramic Mold Casting, Taguchi Method, Shoes Die Casting

Table of Contents

目錄 封面內頁 簽名頁 授權書..............................iii 中文摘要............................................iv ABSTRACT............................................v 誌謝...............................................vi 目錄...............................................vii 圖目錄..............................................x 表目錄..............................................xi 第一章 緒論 ........................................1 1.1 研究背景與動機..................................1 1.2 研究目的........................................2 1.3 研究方法........................................3 1.4 研究範圍........................................3 1.5 研究流程與步驟..................................4 第二章 文獻探討 ....................................6 2.1 田口品質工法相關文獻............................6 2.2 陶模製程在模具上之相關文獻......................7 2.3 模具介紹........................................9 2.3.1 國內模具產業概況..............................9 2.3.2 國內模具產業之發展方向及重點...................11 2.4 蕭氏鑄造法(Shaw Process)之製程..................14 2.4.1 蕭氏精密鑄造技術..............................14 2.4.2 蕭氏模使用材料................................15 2.4.3 蕭氏模製造原理及程序..........................15 2.4.4 蕭氏模鑄造方法................................16 2.5 精密陶模鑄造法應用於鞋模具之鑄造...............18 2.5.1 分型製作 .....................................21 2.5.2 陶/砂模製作 ..................................23 2.5.3 熔煉澆注 .....................................27 2.5.4 鋸切澆冒口/鑄件整型...........................32 第三章 研究方法.....................................34 3.1 田口式品質工法簡介.............................34 3.2 品質損失函數 ...................................38 3.3 直交表 .........................................44 3.4 參數設計.......................................49 3.4.1 實驗設計法 ...................................49 3.4.2 信號雜音比 ......,............................51 3.4.3 參數設計的步驟 ...............................53 3.5 允差設計 .......................................55 3.6 變異分析 .......................................55 第四章 實證結果.....................................58 4.1 選擇回應值 .....................................58 4.2 設定控制因子 ...................................60 4.3 設計實驗.......................................62 4.4 實驗結果 .......................................65 4.5 最佳設計組合 ...................................71 4.6 變異數分析與確認實驗 ...........................74 4.6.1 變異數分析....................................74 4.6.2 確認實驗......................................80 4.6.3 實際改善成效..................................82 第五章 結論與建議 ..................................83 5.1 結論 ...........................................83 5.2 建議 ...........................................83 參考文獻 ...........................................85

REFERENCES