摘要

隨著科技的日新月異，導線架在各個行業中的應用變得越來越重要。最初導線架主要應用於消費型電子產品，提供基本功能。然而，隨著時代的進步，電動車和再生能源領域的快速發展，對導線架的需求顯著增加。這些領域對導線架的性能和耐用性有了更高的要求，不僅要求導線架能夠處理更大的電流和更高的可靠性，同時也需要具有更好的導熱和抗腐蝕能力等。

本研究選擇 TO-263 封裝形式的導線架作為研究對象，目的是優化連續沖壓製程中的沖頭磨耗量參數。通過實驗設計法，我們詳細規劃並進行實驗，以找出降低沖頭磨耗的關鍵因子。在與工程師的進一步討論後，我們為各項影響因子設定了不同的水準進行實驗。這些實驗不僅找出影響沖頭磨耗的關鍵因子，還使我們能夠確定最佳的參數組合，從而顯著提高製程效率並減少沖頭的磨耗

本研究使用 Minitab 作為輔助，使用分析軟體規劃實驗設計，並對結果進行各項的運算，研究結果的最佳參數為沖頭材質為陶瓷，油量為 15mL，沖壓間隙選擇 0.02mm，使得在連續沖壓製程中，將沖頭的磨耗量降低。

最後透過更換沖頭材質，及增加沖壓間隙，來減少約 57%的磨耗量，沖頭的壽命因此得以延長，換算維護頻率可從每月一次維護下降為每兩個月一次。本案例公司每次維護花費時間，大約需要 12 至 16 個工時，因此一年大約可以減少 6 次維護，節省約 72 至 96 個工時，後續透過展開此方法到其他上百組的模具條件中，可獲得最大化效益。

關鍵字：導線架、沖壓製程、實驗設計法

ABSTRACT

As technology rapidly advances, the application of Lead Frame in various industries has become increasingly important. Initially, Lead Frame were primarily used in consumer electronics, providing basic functionalities. However, as time moves on, the rapid development of electric vehicles and renewable energy sectors has significantly increased the demand for Lead Frame. These sectors require higher performance and durability from Lead Frame, not only demanding the ability to handle larger currents and higher reliability but also better thermal conductivity and corrosion resistance.

This study focused on optimizing punch wear parameters in the continuous stamping process of TO-263 packaged lead frames. Using the design of experiments method and Minitab software, we conducted detailed experiments to identify key factors and determine the optimal parameters for reducing punch wear. Discussions with engineers led to setting different levels for each impact factor in the experiments.

The best parameters identified were: punch material as ceramic, oil volume at 15 mL, and a stamping gap of 0.02 mm. These parameters reduced punch wear by about 57%, extending punch life and reducing maintenance frequency from once a month to once every two months. This change saved the company approximately 72 to 96 working hours annually. This method will be expanded to other mold conditions to maximize benefits.

Keywords：Lead Frame、Stamping process、Design Of Experiment (DOE)