運用資料探勘技術建構半導體封裝業之品質改善系統

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摘　要

在半導體封裝產業中，製程的良率一直是同業競爭中的關鍵因素，有鑑於此，本研究乃針對提高製程良率而建置一套品質改善系統。個案將以液晶顯示器驅動積體電路之捲帶式封裝製程為研究主體，透過改善關鍵製程來提高良率，以減少因為未將製程參數最佳化所產生的瑕疵。

首先，我們將蒐集來的失效產品資料經由群集演算法探勘獲得瑕疵種類分群的數量，然後決定出各群的定義，並導入資料倉儲中。接著再採用適合分類之演算法，如決策樹、類神經網路、羅吉斯迴歸、貝氏分類與關聯規則等，利用多準則決策從中評估與比較以挑選出最佳的演算法來進行關鍵變數之分析。

由本研究的結果，顯示出不良產品的關鍵因素並探討出問題解決對策，以提供品質管制工程人員做為製程參數最佳化之參考。經導入本品質改善系統後，大大地提昇了整體產品良率、減少了重工/停機次數與縮短了產品生產週期，因此對半導體封裝業而言，本研究是提昇競爭力以因應瞬息萬變市場的有利工具。

關鍵字：資料探勘、資料倉儲、群集、決策樹、類神經網路、羅吉斯回歸、貝式、關聯法則、線上分析處理、捲帶式封裝、多準則決策

Using Data Mining Technology to Construct a Quality Improvement System for Semiconductor Packaging Industry

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Abstract

Yield enhancements are always the key factor among competitors in the semiconductor packaging industry. In view of this, this paper attempts to construct a quality improvement system to increase process yield. Case study focuses mainly on the tape carrier package process of liquid crystal display driver IC by improving key process for the increase of yield rate. The parameter settings should be taken into account to avoid that the defects happen due to process parameters not being optimized.

First, we collect large amounts of data of defective products and use clustering algorithm to obtain the amount of defective categories. Next, the definitions of these clusters are determined and loaded into the data warehouse. Then, the suitable classification algorithms, decision tree, neural network, logistic regression, Bayesian, and association rule, are used for evaluation and comparison with multiple criteria decision making to select a better algorithm for the analysis of key variables.

From the result of this research, major causes of defective products are investigated and countermeasures of the problems will provide know-how for the optimization of process parameters to quality control engineers. After the proposed quality improvement system is applied, the benefits are obtained to improve product yield reduction of rework/holding lot frequency and product cycle time. Therefore, to semiconductor packaging industry, this study provides a most beneficial tool to improve competitiveness for responding to the ever changing marketplace.

Keywords: Data mining; Data warehouse; Clustering; Decision tree; Neural network; Logistic regression; Bayesian; Association rule; OLAP; TCP; Multiple criteria decision making

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