Chapter 8[1]

Enhancing Competitive Advantages and Operational Excellence for High-Tech Industry through Data Mining and Digital Management

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Abstract: As global competition continues to intensity in high-tech industry such as the semiconductor industry, wafer fabs have been placing more importance on the increase of die yield and the reduction of costs. Because of automatic manufacturing and information integration technologies, a large amount of raw data has been increasingly accumulated from various sources. Mining potentially useful information from such large databases becomes very important for high-tech industry to enhance operational excellence and thus maintain competitive advantages. However, little research has been done on manufacturing data of high-tech industry. Due to the complex fabrication processes, the data integration, system design, and requirement for cooperation among domain experts, IT specialists, and statisticians, the development and deployment of data mining applications is difficult. This chapter aims to describe characteristics of various data mining empirical studies in semiconductor manufacturing, particularly defect diagnosis and yield enhancement. We analyze engineering data and manufacturing data in different cases and discuss specific needs for data preparation in light of different characteristics of these data. This study concludes with several critical success factors for the development and deployment of data mining applications in high-tech industry.

Key Words: Data mining, Semiconductor manufacturing, Failure diagnosis, Decision analysis, Decision trees, Artificial neural network, Wafer acceptance test, Wafer bin map.

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[1] Liao, T.W. and E. Triantaphyllou, (Eds.), **Recent Advances in Data Mining of Enterprise Data**, *World Scientific*, Singapore, pp. 367-412, 2007.