

Implementation in-situ auto polishing rate optimization for chemical mechanical planarization process in semiconductor fabrication industry

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Abstract

In CMOS technology semiconductor fabrication with typical 30,000 wafers per month capability, there are 300 to 1000 process steps, 200 to 300 product variations and 500 equipment. The processes are Lithography, Etching, Cleaning, Film Deposition, Ion Implantation and Chemical Mechanical Planarization (CMP). The focus is on CMP, which represents about 10% of the total processes in wafer fabrication. It is defined as a planarization process by polishing the wafers to certain thickness and eventually producing smooth surface for next process requirement. The challenges to this process are the product variations, the incoming lot and the correct thickness. As a result, lot queue is high due to waiting time on measurement results and adjusting recipe manually to get the right polishing time. The focus in this paper is to improve lot queue time at CMP, from ex-situ manual process adjustment into automated in-situ data integration of measurement and process adjustment. The study proposes an object oriented algorithm that integrates Manufacturing Execution Systems (MES) with process and measurement equipment by using Visual Basic language. The main goal is to control CMP process and to provide real time feedback data from measurement equipment to the CMP process. Based on data collected, the proposal has successfully reduced CMP waiting time by 13%.

Keywords

Chemical Mechanical Planarization, polishing time, thickness, Manufacturing Execution System

Biography

Samad Ramlan is a CIM Section Manager in Silterra Malaysia Sdn. Bhd. He earned B. (Hons.) in Electrical and Electronics from Universiti Tenaga Nasional, Malaysia. He leads System Integration section that is responsible on sustaining and developing Business Rules within MES scope in the company. Currently, he is pursuing his PhD in Manufacturing Engineering Faculty, Universiti Teknikal Malaysia Melaka, Malaysia.

Mohamed Ariff Shri Abdul Aziz is a CMP Principal Engineer in Silterra Malaysia Sdn. Bhd. He earned B. Eng. from Universiti Teknologi Malaysia, Malaysia. He is a key person in the CMP module and leads CMP process team.

Mohamad Zambri Mohd Darudin is a Director in Silterra Malaysia Sdn. Bhd. He earned B. Applied Science (Hons.) from Universiti Sains Malaysia, Malaysia. He has various working experience in multi-national companies such as Intel Corp., and STMicroelectronics prior to join Silterra. He leads Manufacturing, CIM and Industrial Engineering Department in Silterra. Currently, he is pursuing his PhD in Management from Universiti Utara Malaysia, Malaysia.

Muhammad Hafidz Fazli Md Fauadi is a senior lecturer at the Department of Robotic and Automation, Faculty of Manufacturing Engineering in Universiti Teknikal Malaysia Melaka, Malaysia. He earned B. IT. in Industrial Computing from Universiti Kebangsaan Malaysia, Malaysia, Masters Eng. in Mechanical Engineering from Universiti Teknologi Malaysia, Malaysia, and Doctor of Engineering from Waseda University, Japan. His research areas interest are Intelligent Manufacturing, CIM and Multi-Agent System

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