"Tool-level Data Analysis for Increased Efficiency and Process Control
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The demands of fabrication have generated the need to optimize the efficiency of process tools. There are now multiple modes to enhance the Overall Equipment Efficiency for process equpiement based on Advanced Equipment Control (AEC) and Advanced Process Control (APC). For instance in the case of process tools, data can be taken at rates up to (and even beyond) 10Hz with collect 100's of system variables. In addition, for plasma processes such as etch, there are optical sensors which can capture extensive process characteristics. The combination of both tool and process data is a powerful capability to fingerprint the process equipment. The immediate benefits include tool matching, process monitoring, reduced non-product wafer requirements, system fault detection and control. This AEC implementation based on tool-level data analysis utilizes multi-variate analysis to monitor the system health and help with start-up and trouble shooting. In addition, the fingerprinting can be used to optimize PM's to evolve to "Predictive Maintenance" and shorten recovery times. Various examples will be given using tool-level data for OEE improvement, non-product wafer reduction and scrap reduction. As for APC, it is now well proven that tool-level data from on-wafer features is useful for run-to-run control. Multiple examples include gate etch, recess etch, as well as CMP. Here production implementation of APC will be shown to enable Cp and Cpk improvements. With the use of tool-level data, it is now possible to achieve some of the requirements for process control for the sub 90nm generations.