Keynote Speech (III)

Optimization of Process Tool Operation for Future Semiconductor Manufacturing

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***Abstract*—**Cluster tools are widely used for most wafer fabrication processes. A cluster tool consists of several sing-wafer processing chambers, a wafer handling robot, and loadlocks for loading and unloading wafer cassettes. Wafers go through chambers and return after completing all process steps at the chambers while there is no intermediate waiting place for wafers, except robot arms. Cluster tools have many different architectures and scheduling requirements. Therefore, tool operation is rather complicated. Wafer delays within chambers as well as cycle time can be significantly improved by proper scheduling. There are numerous works on tool scheduling optimization. We briefly review tool architectures, scheduling requirements, modeling as discrete event systems, fundamental principles, and scheduling rules and optimization. We also explain future fab requirements and scheduling challenges. We also present how such principles and methods can be generalized to discrete event systems such as Petri nets and max-plus linear systems.