

Improving Factory Productivity through Agile WIP Scheduling and Dispatching in 300mm Wafer Manufacturing

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Background: With the semiconductor manufacturing advancing to 300mm, factory automation has played an increasingly important role in factory productivity and manufacturing efficiency improvement. It is a known fact that multiple process generations typically exist in the same manufacturing facility. In addition, Technology development and manufacturing co-exist in the same factory with diverse product and technology mix. In order to run an efficient factory, a sophisticated WIP (Work In Process) scheduling and dispatching system is required to optimize the tool utilization and factory throughput.

Paper focus: Intel's agile WIP scheduling and dispatching system is built on a next generation Manufacturing Engineering System (MES300) and Real Time Dispatcher (RTD) in 300mm manufacturing. This paper will focus on key elements of the WIP scheduling and dispatching system architecture and implementations. In addition, results will be presented to demonstrate that this system significantly augments the operation efficiency and improves the overall factory throughput.

A brief outline of what will be discussed in this paper:

Architecture/system design & implementation: This system is built on multi-tier architecture (i.e., business logic, data access and presentation layers). The system provides a customized Configuration UI allowing the factory users to dynamically configure the WIP process parameters and priority in their modules so that the lot selections for their tool process can be optimized based on their operational needs. The agile scheduling and dispatching model presented in this paper comprehends many variables and parameters including hot box priority, lot rework, experiment lots, upstream and downstream WIP availability, etc. in enabling optimized WIP prioritization. The advanced MES300 system provides a common and extensible factory object model to eliminate data duplication and can be accessed from external applications via well defined interfaces. MES300 works with RTD to integrate system configuration and factory floor execution user interface conveniently to align with business!

processes. The WIP scheduling and dispatching system works in conjunction with Equipments Station Controllers and Automated Material Handling Systems (AMHS) to enable fully optimized WIP selection, transport and delivery to process tools promptly. The automated WIP scheduling and dispatching system is a dynamic system that can be continually tailored to the needs of the user, resulting in more significant productivity improvements throughout the Factory.

Results: The dynamic WIP scheduling and dispatching capability has been employed in all Intel's advanced 300mm factories, and it has dramatically reduced factory manual processing overhead and optimized factory output. Details on both labor reductions and factory throughput improvements will be presented.

Future work/challenges: In lights of the continually changing product mixes and technology evolutions, the automated scheduling and dispatching system is considered an integral part of Intel 300mm manufacturing. This paper will highlight the roadmap to develop more advanced WIP scheduling and dispatching technologies in Intel's 300mm manufacturing in the 3-5 year horizon.