Semiconductor Practice

Mahindra Satyam

Intelligent Scheduling and Dispatch Solutions

Overview

The semiconductor manufacturing industry is a rapidly growing industry. As the use of electronics pervades more into everyday life in the form of computers, cell-phones etc., there is immense pressure on the semiconductor manufacturers to increase product variety and reduce delivery times. Due to rapid development, the industry is moving towards fully automated manufacturing systems. High volumes and increasing product variety make 'built-on-demand' a complex proposition. The manufacturing plant must be flexible and have an effective planning and scheduling system to manage the complexity.

Semiconductor manufacturing involves a series of iterative processes that aim to achieve the exact precision over a period of chip manufacturing. Ensuring that these processes are completed in time to fill customer orders is a major challenge; one that has even mystified developers of sophisticated production-scheduling applications.

Majority of scheduling bottlenecks are encountered in the photolithography and diffusion areas of any Semiconductor Fab. Photolithography removes the bulk of a substrate by marking it with a photomask and light sensitive chemicals called the photoresist. The substrate is then treated with chemicals engraving the exposure pattern under the photoresist. The need to ensure all processes are completed within a certain amount of time, adds to the scheduling challenge. Limited with certain amount of time to get movement from one process to the next, and that's a hard scheduling problem.

As the wafers are released into the fabrication line there is immense decisive need to decide how they flow through the factory, how they're queued up, and which lots get priority overcoming the quite complex scenarios.

Rapid Solution for Optimal Production and Scheduling

The problem of developing an optimal production schedule in the horizon of a week to a day for a semiconductor manufacturing system is an extremely hard problem due to:

- Large number of process steps for each wafer
- Stochastic nature of the yields and process
- Re-entrant flows
- Large number of jobs
- Large number of machines/tools
- Sequence dependent changeover times

Though production performance and optimization remains top priority for many FABs, it is easier said than done due to the complex nature of modern FABs. One primary means of achieving this is centered on the development of models that intelligently optimizes available resources and production performance. The new model should also allow flexibility to accommodate rapid changes and deal with seemingly conflicting objectives.

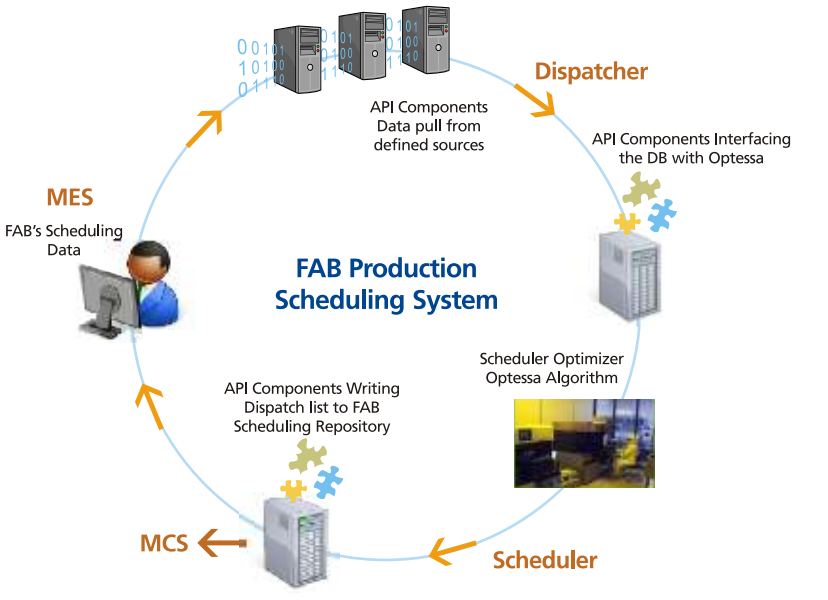
Mahindra Satyam along with alliance partner Optessa has developed robust architecture for sequencing and scheduling the semiconductor FABs using advance modern stochastic search technique to rapidly find a near optimal solution, even for large problems.

The primary objective is to provide the FAB Managers and station controllers with an intelligent scheduler, assisting in improving process area performance and to optimize WIP flow through various sections of the Chip Manufacturing FAB by expanding the analysis beyond the current WIP queue considering upstream and downstream flow across the entire tool group or sector.

The solution can generate a schedule that optimizes a cost function, after considering all rules and constraints. The computational engine at the core of adopted algorithm optimizes the entire solution by a multi-pass iterative process involving millions of evaluations. This advanced engine surpasses conventional techniques resulting in a flexible model that ensures minimal cost and delay with maximum resource utilization.

The solution considers the following requirements/complexities in semiconductor manufacturing scheduling:

- Rescheduling
- Re-entrant Flows
- Non Uniform Load
- Setup Times
- Downtimes
- Rework
- Rejection of Lots
- Hot Lots
- Matching of Tools
- Auxiliary Resources
- Test/Monitor Wafers
- Send Ahead Wafers
- Handling Sample Lots
- Processing Time-Windows
- Utilization of resources
- Integration with MES
- Manual Overrides
- Rules/Constraints for Scheduling



Benefits

The solution has the following advantages over existing legacy systems:

- Helps in generating schedules that optimize a cost function, after considering all rules and constraints. The cost function value provides a quantitative and qualitative insight into the generated schedule.
- The computational engine & core scheduler algorithm will optimizes the entire solution by a multi-pass iterative process involving millions of evaluations. This is a superior approach to solution methodologies found in existing systems. The result will be a high quality schedule that maximizes resource utilizations, minimizes changeovers and delays, and reduces costs.
- Another benefit of the solution is that it is fully configurable/ parametric, and there is no hard-wiring to a specific environment or machine configuration, this has the real time capacity to offer direct effect on:
  - Providing real-time response to production plan updates
  - Alleviates bottlenecks
  - Lowers overall cycle-time
  - Reduces cycle-time variability
  - Increases production yield and throughput
  - Provides consistent dispatching across all tools upstream and downstream

About Mahindra Satyam

Mahindra Satyam is a leading global business and information technology services company that leverages deep industry and functional expertise, leading technology practices, and an advanced, global delivery model to help clients transform their highest-value business processes and improve their business performance.

The company's professionals excel in enterprise solutions, supply chain management, client relationship management, business intelligence, business process quality, engineering and product lifecycle management, and infrastructure services, among other key capabilities.

Mahindra Satyam is part of the multi-billion Mahindra Group, a global industrial federation of companies and one of the top 10 business houses based in India. The Group's interests span automotive products, aviation, components, farm equipment, financial services, hospitality, information technology, logistics, real estate and retail.

Mahindra Satyam development and delivery centers in the US, Canada, Brazil, the UK, Hungary, Egypt, UAE, India, China, Malaysia, Singapore, and Australia serve numerous clients, including many Fortune 500 organizations.

Global Presence

Contact

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