ADEXA Predict, not just response

Importance of lot release in semiconductor industry and manufacturing

If I arrive on-time or early to the airport but there is a problem with the airplane and delay in the scheduled takeoff time, does it get me to my destination on time? Clearly the answer is No! Would it better for me to stay in the comfort of my home and go when I know the plane is ready to take off?

Or even better, find another flight to my destination so that I get there on time. By going to the airport at the “wrong time” and waiting I am only increasing “WIP” or waiting time and I am also contributing to airport congestion which adds to the traffic and boarding of other flights possibly causing others to miss their flights.

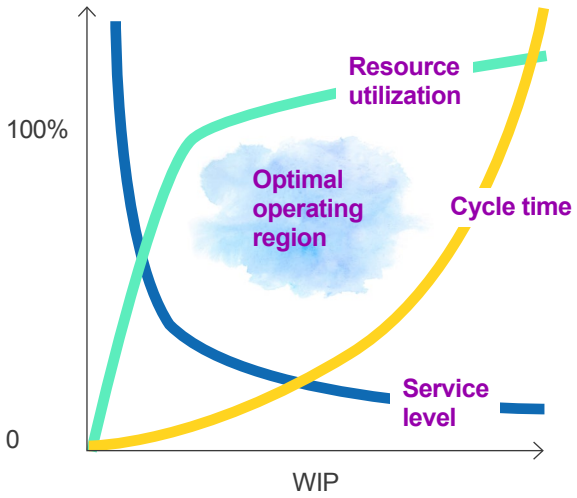
Such problems can be avoided by an intelligent planner or, release strategy, that can figure out exactly what the right time is for me to leave home given the traffic situation, the speed of cars, the parking time and time it takes to go through security.

This kind of predictive planning is ideal for releasing lots in a semiconductor manufacturing line where depending on the mix of products, availability of resources and masks as well as WIP, it can decide which lots should be released and which ones should be held back so that we meet the following three objectives optimally:

Cycle time Equipment utilization Delivery performance

The following diagram shows the relationship between these three parameters and how they change with WIP increase. In a high mix environment, increase in WIP does not necessarily imply additional wait times or delay in delivery because of multiple routes and balance of allocation of jobs by the system.

This is indicated in the diagram as the optimal region of operation where the desired objectives can be achieved.



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In environments where there is a high mix of products, such as foundries, we can increase the number of lots released without increasing their waiting time by ensuring that they are balanced across different bottleneck equipment such as lithography equipment.

Given the complexity of such environments where each process has 400-600 steps using hundreds of equipment requiring anything from 10 minutes to 10 hours with highly sensitive set up times (implanters) or batching requirements (ovens), one has to intelligently look ahead and look behind to ensure proper balance of lots re-entering the process and or entering the process with different priorities.

Unfortunately, sequencing engines with simplistic rules have been given too much attention in order to solve such a complex problem. Through years of R&D, we have concluded that unless a proper release strategy is deployed, sequencing would not be of much value. It is a reactive engine not a preventive one. But more importantly, in the presence of an adequate release strategy, sequencing can be a liability in the sense that it would try to resolve issues locally not being aware of the potential issues it might be causing 50 steps later!

Can you imagine being at the gate, and the airline personnel try to sequence your entry into the plane when the plane is not even at the gate or being fixed!

One other myth is the use of simulation tools to plan fabs! Simulation tools look nice and show movement. It is like a video game, we all enjoy watching it.

However, they DO NOT PROVIDE a strategy. They only show you where the problem might lie ahead without telling you how to avoid it. How could they? They do not look ahead; by definition simulation is one sequence at a time!

As in our opening example, a good release strategy is aware of the *right mix* of products in the fab as well as the work load of each equipment, now and future, and is constantly trying to balance what needs to go next such that the bottlenecks, as they are changing, will be fully utilized and at the same time keeping in mind which lots need to be ready and when for on-time delivery.

In fact, our research shows that in the presence of a good release strategy, a simple FIFO is the best sequence for the resources. In the context of our airport example, if you left your home at the right time, as you approach your gate, without much waiting, you will show your boarding pass and get into your seat for takeoff. No need to be sequenced!

Let's make **accurate** plans together!

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