FabTime Cycle Time Management Newsletter

Volume 8, No. 7 August 2007

Information

Mission: To discuss issues relating to proactive wafer fab cycle time management

Publisher: FabTime Inc. FabTime sells cycle time management software for wafer fab managers. New features in this month include in the software this month include support for displaying data tables on home pages and a new alert type based on the number of rows returned by a home page chart.

Editor: Jennifer Robinson

Contributors: James Ignizio (Intel); Bob Kotcher (Western Digital); Professor Scott Mason (University of Arkansas)

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Welcome

Welcome to Volume 8, Number 7 of the FabTime Cycle Time Management Newsletter! We hope that this issue finds you all well, and enjoying the tail end of summer (for most of us, anyway). In this issue, we have a community announcement about a new electronic publication that we think will be of particular interest to subscribers of this newsletter. It's targeted to established fabs, rather than focusing only on the bleeding edge of technology. Our FabTime user tip of the month concerns exploiting the archive of past FabTime tips from inside the software. We have two subscriber responses to last month's issue - one about holding batch tools idle, and the other about cluster tools.

Our main article this month comes from our esteemed guest contributor (introduced last month), Professor Scott Mason of the University of Arkansas. Professor Mason is a national expert on dispatching, scheduling and manufacturing performance improvement for wafer fabs. This month, Professor Mason discusses scheduling and dispatching. He provides an overview of scheduling and dispatching terminology, discusses the state of the practice with respect to fab dispatching, briefly outlines FabTime's dispatching functionality, and then presents some case study results from across the industry describing the positive impact that effective dispatching can have on a fab. We hope that you find this article useful, and we welcome your feedback.

Thanks for reading!—Jennifer

FabTime

Tel: (408) 549-9932
Fax: (408) 549-9941
www.FabTime.com
Sales@FabTime.com

Community News/Announcements

New Digital Magazine Targeted to Mainstream Fabs

We would like to bring to your attention the following announcement, which is for a new digital magazine focused on manufacturing improvement for wafer fabs. What's different about this magazine from many others currently available is that it is being specially targeted to "mainstream" fabs, as opposed to more cutting edge 300mm and MEMS fabs. It is an excellent fit for many of the companies that are part of the Fab Owners Association, with which FEO will be partnering, and for many of the subscribers to this newsletter. You can find more details, including subscription information, below.

"In November 2007 Mazik Media, the publishers of Future Fab International (www.future-fab.com) will launch a new digital magazine dedicated to mainstream manufacturing: Fab Engineering and Operations (FEO). For over a decade the mainstream fabs in the semiconductor industry have been slowly falling off the media's radar screen as they have not kept pace with Moore's Law and the burgeoning technology race, and have instead evolved profitable business models away from the expensive R&D-driven business models of those adhering to the International Technology Roadmap for Semiconductors (ITRS). More and more companies are finding they do not need nano-scale technologies to develop products for the vast majority of applications, and in a consumer-dominated world, market cost has become the prime concern. For many companies there is no need for the expensive move to 300mm technologies ($2bn-plus), let alone the suggested 450mm, at least until the technologies become mature enough that more companies can build these megafabs. Last year over 85% of devices sold were manufactured on 200mm or older manufacturing lines, yet there is currently no dedicated media outlet for the concerns and issues of the companies populating this vast bulk marketplace. FEO has been designed to address the needs of mature manufacturing operations as they strive to perfect their strategies in an ever more cost-conscious world. There are many unique challenges faced by these manufacturers that have no outlet for discussion: equipment maintenance, cycle-time management, supply chain issues and even the sourcing of legacy equipment.

To ensure FEO covers the issues that affect the mainstream fabs, the magazine will adopt Future Fab International's unique editorial model – similar to the way a technical conference is built. The editorial will remain focused on issues affecting mainstream manufacturers, as individuals in that same space will guide this aspect of the magazine. FEO Magazine is collaborating with organizations that complement its aims and is pleased to announce partnerships with the Fab Owners Association (www.waferfabs.org) and the International Symposium on Semiconductor Manufacturing (www.issm.com).

FEO, like all business-to-business magazines, will be funded by companies that sell products and services into the mainstream manufacturing space, but unlike most magazines, FEO has been designed to serve as an extremely cost-effective marketing platform, and features an innovative way of creating attractive advertisements from basic materials – all for one price. The magazine is dedicated to stimulating collaboration and discussion from the manufacturers, while stimulating competition and expanding the marketplace for its support infrastructure. FEO will be a PDF-based digital magazine and the subscription is FREE.

For more information and to subscribe, please visit us at www.feoproject.com."

FabTime User Tip of the Month

Consult the Tips Archive

Do you find these tips of the month useful? Have you ever read one and thought: "Aha! I've been wondering how to do that."? If so, we're glad. But did you know that all of the tips of the month we've sent so far, some 40+ tips, are archived so that you can access them from inside the FabTime software? All you need to do to find the past tips is click "Help" from anywhere inside the software, and then click "Tips" in the resulting help system toolbar (red buttons, at the top of the screen). This brings you to a list of all of the past tips. You can click on any title to see that tip in detail. Or, just scroll down the page to read any that catch your eye. Some tips that have been especially popular include:

- Hide Legends on Home Page Charts
- Configure Goals to Use the New "(any)" Filter
- Create A Lot Comments Report
- Use the New Stripe Control to Add a Target Region to Charts
- Add a Custom Title to any FabTime Chart
- Display Personal Goals on Chart Pages
- Copy Chart Images to Other Applications
- Add a Chart from a Shared Home Page to your own Home Page

There are lots more, which you can find if you take a few minutes to browse the Help. If you are new to using FabTime, and weren't able to participate in the software training class, you might especially find the archived tips useful. Note that not all recent tips may be displayed at your site, depending on how recently your system administrator has installed FabTime patches.

If you have questions or suggestions for future tips of the month, send them to Jennifer.Robinson@FabTime.com or use the Feedback form inside FabTime. Thanks!

Subscriber Discussion Forum

Issue 8.06: Holding Batch Tools Idle (Subscriber Discussion Question)

James Ignizio (Intel) wrote: "I'll stick my neck out and attempt to respond to Walt Trybula's question (e.g., *If you hold a batch tool idle so as to run with a full batch might that make it a bottleneck?*). That response is listed below. First, however, it is important to note that there is disagreement as to the definition of a bottleneck (i.e., factory constraint, factory choke-point). Just some of the definitions I've encountered follow:

1. A bottleneck is a factory tool set having the highest ratio of utilization to availability (i.e., highest U/A ratio)

2. A bottleneck is a tool set that has the longest average number of lots waiting for processing (i.e., longest average queue length)

3. A bottleneck is a tool set that has the most narrow "gap," where that gap is defined as:

Gap = (A-U)/A

It should be noted that all these definitions fail to factor in variability – which is, to me, problematic. But, since most firms appear to use the first definition (i.e., highest U/A ratio), I'll try to respond to Walt's question using that definition as a basis for discussion.

To compute the U/A ratio you obviously have to compute U and A. But you must do that correctly by factoring in such matters as batch forming time, test wafer time, setup time, and so forth. If not, you have – in my opinion – failed to compute the correct U/A, and failed to identify the bottleneck (per the first definition). This can be explained via a numerical example.

Assume that you wish to determine the U/A ratio of a tool set in a fab that operates 168 hours a week. This particular tool set batches jobs and is up, running, and qualified 140 hours a week on average. Its *nominal* availability is thus:

Availability = 140/168 = 83.33 percent

Next assume that the tool set is BUSY (processing ***marketable*** lots) 110 hours a week on average and is BLOCKED (**see definition below**) on average 10 hours a week. The average hours per week that the tool set is utilized is defined as the sum of the BUSY and BLOCKED times, or 110 + 10 = 120 hours per week. Thus the U/A ratio of this tool set is:

U/A = 120/140 = 85.7 percent

If that ratio happens to be the highest (or is tied for highest) then, under the first definition the tool set would be a bottleneck.

But most firms do not seem to compute BUSY and BLOCKED times as defined below:

BUSY TIME = the average number of hours per week that the tool is engaged in processing ***marketable*** lots

BLOCKED TIME = the average number of hours per week that the tool set is:

a. Up, running, and qualified, ***AND***

b. A lot is in the queue in front of the tool set, ***BUT***

c. The lot is BLOCKED from processing because:

a. the tool set must wait for a full size batch to be formed, *or*

b. the tool set must wait for a setup, *or*

c. the tool set is engaged in processing a *non*-marketable lot (e.g., test wafer), *or*

d. any other factor (e.g., wait for operator, interrupt) is in play that blocks the tool set from processing the waiting lot

So, to answer Walt's question, I believe that a batching tool set could become a factory bottleneck (per the first definition) if its batch forming time increases its U/A ratio a sufficient amount. I've validated this assumption via numerous fab simulations so I feel relatively comfortable with this conclusion. [A more detailed discussion appears in THE *LITTLE RED BOOK OF MANUFACTURING* (Ignizio & Burke).]

Issue 8.06: Cluster Tools

Bob Kotcher (Western Digital) wrote in response to last month's article about cluster tools: "In answer to the question that you posed about how we model cluster tools, here at Western Digital's read-write head fab now, we model machines statically but we are planning to build simulation models of the more complex ones in the future.

I have a question related to that, though. When looking into this at my prior company, I asked a couple machine suppliers what prioritization algorithms they used for their robots, but they said that they couldn't reveal them, for proprietary reasons. Do you know if this is

always the case? Any suggestions? I guess one could just start by modeling the robot under FIFO, modifying as necessary to prevent deadlocks, and be pretty close. And if further accuracy is desired, tests and/or observation could help ascertain more closely what system the robot is using. I'm curious what your other readers think.

FabTime Response:

I'm afraid that we don't know the answer to this detailed question about cluster tool operation. We are opening up the question to other readers. Does anyone have any helpful suggestions for Bob?

Scheduling and Dispatching in Wafer Fabs

Introduction

Written by **Professor Scott Mason** (University of Arkansas)

In this article we discuss scheduling and dispatching in wafer fabs and examine how the effective use of these techniques can lead to improved fab performance. Below, we provide an overview of scheduling and dispatching terminology, and then briefly discuss the state of the practice with respect to fab dispatching. After providing a brief overview of some of FabTime's dispatching functionality, we present some case study results describing the positive impact effective dispatching can have on a fab. [Editor's note: dispatching and scheduling were discussed in Issue 6.04 of the newsletter. However, Professor Mason brings updated results, with emphasis on successful case studies in the industry.]

Background

Because the cost of equipment comprises over 75% of a wafer fab's total capital costs, the International Technology Roadmap for Semiconductors suggests that in order to utilize this equipment effectively, significant improvements in factory planning and scheduling are required (ITRS, 2003). Effective planning and scheduling can help to improve a fab's responsiveness to its customers, as good delivery performance consists of order lead times that are both short and reliable. While inflating inventory levels to buffer customers against lengthy manufacturing delays can also allow a fab to be responsive to its customers, this option is simply too expensive, in terms of both holding costs and potential obsolescence issues. For this reason, manufacturing management is

becoming more and more focused on using effective scheduling techniques as a means to achieving a competitive advantage.

As a reference point for this article, it is appropriate to define the following terms in order to promote improve clarity for the reader (Pfund et al., 2006):

PLANNING in a wafer fab involves the development of detailed capacity and material plans that assess the fab's capability to meet market demands. Decisions include determining product mix, deciding on new equipment purchases, and setting staffing levels, for example.

State of the Practice

As part of the Semiconductor Research Corporation (SRC) and International Sematech's first Factory Operations Research Center (FORCe) research funding, a project team led by Dr. John Fowler at Arizona State University surveyed FORCe member companies in order to understand the scheduling and/or dispatching tools that were currently being utilized in wafer fabs (for additional details on the FORCe project, please see Fowler et al. (2002)). The survey was designed to ask specific questions regarding the types of scheduling methodologies currently implemented, the limitations of these methodologies, and the needs for future generation scheduling systems. In total, 16 respondents from 14 companies participated in this survey, representing fabs from Europe, Asia, and North America.

Survey respondents indicated that dispatching rules were the primary means by which fab lots were controlled and selected for processing. Further, all respondents indicated that scheduling / dispatching was beneficial to the fab either because it could improve factory performance measures or because it could control how product moved through the floor. However, a number of technical dispatching challenges were also mentioned with respect to capturing real time data, choosing appropriate dispatching rules, and keeping up with changes in the overall product mix. Finally, people noted that even the best dispatching rules would prove useless if operators did not or could not process the recommended lot. [Editor's note: FabTime has heard similar responses in more recent informal discussions with people from a variety of fabs. Operator dispatch compliance is a key issue in many fabs.]

Priority-Based Dispatching Rules:

Most semiconductor manufacturers use priority-based dispatching rules for a number of, if not the majority of, their fab tools. A lot's priority is typically set by a fab according to its purpose or end customer, from "hot lots" that may represent rush or late customer orders, to engineering or development lots containing new process developments or technologies, to standard production lots. A priority-based dispatching rule selects lots according to these established priorities.

For example, Priority First-In-First-Out (FIFO) dictates that lots are to be processed in terms of decreasing priority or importance (e.g., hot lots should precede engineering lots, which in turn should precede production lots). However, when multiple lots of the same priority are in queue, ties are broken by selecting the lot that has been in queue at the tool of interest the longest. Ties in lot priority occur frequently in practice, as it is not uncommon for 75-85% of the lots in queue at a tool to be production lots.

Priority Critical Ratio is a widely used dispatching approach which first dispatches lots in terms of their priorities (like all priority-based dispatching approaches). However, in the event of priority ties, this rule compares lots in terms of their critical ratios (CRs), a

measure of lot slackness with respect to its due date. Although many fabs calculate CR in their own (often proprietary) ways, the basic intent of computing a lot's CR is to assess the ratio of the amount of time a lot has before it is due to the customer ("time remaining") to the amount of fab processing that remains in order to complete or finish the lot's production ("work remaining"). Lots with more work remaining than time remaining are deemed more important when determining which lot should be run next on a tool.

Time remaining can be positive or negative, depending on whether the lot's due date has passed. Some fabs modify the way in which they calculate a lot's CR according to whether or not the lot's due date has passed. This is done to both maintain only positive computed values for CR and, more importantly, to properly elevate the importance of late lots that are past their due dates. The total amount of remaining processing time which any lot must undergo prior to finishing its process flow (i.e., work remaining) can be easily computed using either theoretical process time information, planned cycle time information, and/or actual cycle time information.

Both Priority FIFO and Priority CR can be thought of as simple dispatching rules in that they focus only on the lots at an individual tool without any comprehension of additional information such as upstream and/or downstream tool/fab conditions. Priority FIFO is commonly used in manufacturing environments when cycle time minimization is the primary performance driver, while Priority CR is more common in fabs focusing on on-time delivery of customer orders. Additional examples of simple dispatching rules include Shortest Processing Time (i.e., pick the lot that will take the least amount of time to process at the current step), and Earliest Due Date (i.e., pick the lot that is due first).

Advanced Dispatching Rules:
In addition to these simple priority-based rules, more complex rules are available. For example, FabTime's dispatching module contains a number of dispatching rules that take advantage of non-local information. As is the case in a number of fabs in practice, regardless of what dispatching system they use, recent dispatching trends suggest that dispatching rules that take upstream and/or downstream fab conditions into account can provide even better dispatching decisions. This is especially true when bottleneck starvation is an issue and dispatching decisions must be made to ensure sufficient amounts of WIP are available to be processed on the fab's bottleneck at all times. In other words, more advanced dispatching rules not only strive to make fab moves and increase throughput, but to make the "right" moves in terms of overall fab performance.

FabTime's Dispatching Module

[Editor's note: Professor Mason has worked extensively with FabTime on advanced dispatch configuration projects for our customers, and has given valuable input into our dispatching module.] FabTime's dispatching module allows users to prioritize the importance of a number of factors that are then combined and blended to produce individual dispatching scores for each lot. The lots with the highest scores then appear at the top of FabTime's Dispatch Lot List chart. Examples of some of the dispatching functionality contained in FabTime include the following:

Downstream Tool Priority – this factor allows for specific tools to be assigned a priority status so that lots being processed are prioritized if their next processing step is on a tool with high priority; this is potentially useful for dispatching lots destined for bottleneck or near-bottleneck tools.

Batch Efficiency – this factor allows for higher preference to be given to "fuller" production batches when dispatching a batch tool; in the case where the most desirable lot to process can be batched together with other lots, the typically long duration of batch processes leads fabs to form batches that are as full as possible, so this factor gives preference to larger batch sizes over small batches.

Shortest Remaining Process Time – this factor can be used if lots closer to the end of their process flow are deemed important by a fab, as in the case when end of the week/month/quarter shipments must be made; as FabTime contains information pertaining to lot process flows, each lot's process step position in its respective process flow is evaluated to determine the total work remaining (similar to the critical ratio discussion above) and lots that can be finished the soonest are prioritized.

Operation Moves – this factor allows fabs to monitor daily performance as compared to desired moves targets for each fab operation; after setting a moves goal for each fab operation, lots are prioritized during dispatching for operations that have not yet met their target number of moves, thereby helping to promote a more balance fab in terms of WIP distribution; moves target setting is often done via discrete event simulation modeling or managerial experience/expertise.

WIP Smoothing – like Operations Moves, this factor monitors fab performance compared to a stated target amount of WIP that is present in some pre-specified segment of the fab, whether it be an operation, a block of operations, or a tool; target setting again is accomplished via experience or by simulation experimentation and lots are prioritized during dispatching which are associated with fab segments or tools that are the furthest behind their associated target WIP levels.

In addition to these dispatching functions, FabTime's dispatching module automatically assesses operator compliance to the recommended lots for dispatching. Dispatching compliance reporting can be used as a communications tool with operators to assess whether or not the proper dispatching logic/rules are incorporated in the fab or if additional operator training is required to promote better adherence to selecting the recommended lots during dispatching.

Fab Scheduling and Dispatching Case Studies

Fab dispatching papers in the literature have focused on a wide variety of levels in the manufacturing environment hierarchy, from individual tools, to toolgroups, to the entire fab. In the best scenario, a proposed dispatching method's superiority is established through experimental testing using actual semiconductor manufacturing data. In this scenario, actual fab data often is extracted from the manufacturing execution system (MES) for use in developing and testing dispatching approaches. In fact, some semiconductor manufacturers use dispatching systems that communicate directly with their MES in near real time, such as FabTime. Once the dispatching rule's efficacy is confirmed, the final step in the process is for the dispatching rule to be implemented in the fab.

Yang et al. (1999) discuss dispatching strategies that were developed for the bottleneck tool in the thin films area of TSMC's Fab 3 in Hsin-chu, Taiwan. The methodology works to reduce lost machine productive time on tools that are downstream from the bottleneck and to increase total moves for these downstream machines. The dispatch system compares machine capacity and throughput rates with each lot's remaining processing time and downstream target WIP levels. Lost machine productive time on the shift where this rule was implemented was 38%

lower than other shift's lost time over three key downstream toolgroups. In addition, total moves increased by more than 18% as a result of the dispatching rule's implementation.

In order to minimize the performance difference between senior and junior operators at Macronix, Hsieh et al. (2002) developed a dispatching methodology that evaluates the impact of running lots on different wet benches in the fab. Machines that required the least amount of time to process the lot were given higher priorities and using this new dispatching approach, junior operators were better equipped to load lots onto more appropriate, faster machines, in order to properly feed the diffusion tools--junior operators' performance improved by 24%. This improvement is significant, as diffusion ovens are tools that potentially could have become the Macronix fab's primary bottleneck if they were not loaded properly.

Dabbas and Fowler (2003) present a multi-objective dispatching strategy for front end wafer fabrication at Motorola. The performance measures of interest for the Motorola MOS 5 wafer fab in Mesa, Arizona under study were on-time delivery, the variance of lot lateness, mean lot cycle time, and the variance of lot cycle time. The authors combine dispatching policies with a fab-wide line balancing algorithm to create a single, comprehensive dispatching rule. However, their approach differs from conventional, complex dispatching approaches because the lot with the highest combined dispatching score is not necessarily the lot that is selected for subsequent processing. Instead, this combined dispatching score is considered in concert with a proportional capacity allocation algorithm to establish the final lot rankings.

The authors tested their approach on a full wafer fab model that represents Motorola's MOS 5 facility. Experimental results suggest that the proposed approach improves on-time delivery of customer orders by 22%, mean cycle time by 24%, and the variability of lateness by 53%. Given these promising results, the authors' combined dispatching methodology was implemented in Motorola MOS 5. Similar to the results obtained during the experimental studies, Motorola MOS 5 experienced a 20% improvement in on-time delivery performance and a 25% reduction in mean cycle time performance after the combined dispatching rule approach has been implemented.

The memory chip market downturn in late 1995/early 1996 dramatically reduced the price of memory chips, and in turn, caused the value of memory chip fabs' work in process (WIP) to decrease. In an effort to avoid potential lost revenue due to rapidly decreasing sales prices, Samsung Electronics implemented a set of methodologies and scheduling applications for managing product cycle time, SLIM (Leachman et al., 2002), which focuses on target fab outs for each device type. This "WIP-management paradigm" sets both production targets and device-level priorities at each fab process step. By implementing SLIM, Samsung reduced cycle times from four days per layer to a range of 1.3-1.6 days per layer. In addition, fab equipment utilization levels were increased and fab WIP levels were redistributed to more appropriate locations.

Conclusions

Scheduling wafer fabrication facilities is very challenging. These systems are extremely complex, the equipment is highly unreliable, and there are often many jobs to schedule. While dispatching appears to be the current state-of-the-practice, varying levels of sophistication are employed in an attempt to improve both tool-level and overall fab performance. Practitioners would like to (and in some cases do) employ techniques that consider

more than just the current lots in queue at a single tool. Case study results suggest that several semiconductor manufacturers have achieved success with sophisticated dispatching systems. These systems have a broader view than traditional, myopic dispatching, which only considers a single tool's view of the fab.

Closing Questions for FabTime Subscribers

What are the primary performance measures of interest at your fab? Which dispatching and/or scheduling policies are in use at your facility? How do you assess the performance of these policies? How has fab performance been affected by the implementation of these policies in terms of the primary performance measures?

Further Reading

- Dabbas, R.M., Fowler, J.W., 2003, A new scheduling approach using combined dispatching criteria in wafer fabs, *IEEE Transactions on Semiconductor Manufacturing*, 16 (3), 501-510.

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- Hsieh, M.D., Lin, A., Kuo, K., Wang, H.L., 2002, A decision support system of real time dispatching in semiconductor wafer fabrication with shortest process time in wet bench, *2002 Semiconductor Manufacturing Technology Workshop*, 286-288.

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- Leachman, R.C., Kang, J., Lin, V., 2002, SLIM: short cycle time and low inventory in manufacturing at Samsung Electronics, *Interfaces*, 32 (1), 61-77.

- Pfund, M.E., Mason, S.J., Fowler, J.W., 2006, Semiconductor Manufacturing Scheduling and Dispatching, Chapter 9 in *Handbook of Production Scheduling*, Herrmann, J.W. (ed.), Springer, New York, 213-241.

- Yang, T.Y., Huang, Y.F., Chen, W.Y., 1999, Dynamic dispatching model for bottleneck resource allocation, *1999 IEEE International Symposium on Semiconductor Manufacturing Conference Proceedings*, 353-354.

Subscriber List

Total number of subscribers: 2730, from 468 companies and universities. 22 consultants.

Top 20 subscribing companies:

- Maxim Integrated Prod., Inc. (252)
- Intel Corporation (154)
- Micron Technology, Inc.(88)
- ATMEL (72)
- Analog Devices (68)
- Freescale Semiconductor (65)
- Infineon Technologies (65)
- X-FAB Inc. (62)
- Cypress Semiconductor (55)
- STMicroelectronics (55)
- Texas Instruments (55)
- International Rectifier (52)
- ON Semiconductor (51)
- Chartered Semiconductor Mfg (50)
- TECH Semiconductor Singapore (50)
- NXP Semiconductors (48)
- IBM (43)
- Spansion (38)
- Seagate Technology (32)
- BAE Systems (30)

Top 3 subscribing universities:

- Virginia Tech (11)
- Ben Gurion Univ. of the Negev (7)
- Nanyang Technological University (7)

New companies and universities this month:

- Design Systems
- Globitech
- L-3 Communications
- Valencia Community College

Note: Inclusion in the subscriber profile for this newsletter indicates an interest, on the part of individual subscribers, in cycle time management. It does not imply any endorsement of FabTime or its products by any individual or his or her company.

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FabTime® Cycle Time Management Training

"It was helpful to see best-in-class methods for wafer fab cycle time management. Discussing these matters in-depth with you was quite valuable, as we could ask questions specific to our fab and processes."

Shinya Morishita
Manager, Wafer Engineering
TDK Corporation

Course Code: FT105

This course provides production personnel with the tools needed to manage cycle times. It covers:

- Cycle time relationships
- Metrics and goals
- Cycle time intuition

Price

$7500 plus travel expenses for delivery at your site for up to 20 participants, each additional participant $300.

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Do you make the best possible decisions?

- Do your supervisors possess good cycle time intuition?
- Are you using metrics that identify cycle time problems early?
- Can you make operational changes to improve cycle time?

FabTime's Cycle Time Management Training is a one-day course designed to provide production personnel with an in-depth understanding of the issues that cause cycle time problems in a fab, and to suggest approaches for improving cycle times. A two-day version is also available upon request.

Prerequisites

Basic Excel skills for samples and exercises.

Who Can Benefit

This course is designed for production personnel such as production managers, module managers, shift supervisors, hot lot coordinators, and production control.

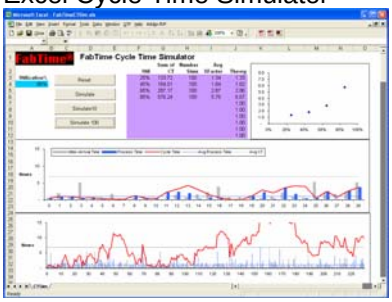
Skills Gained

Upon completion of this course, you will be able to:

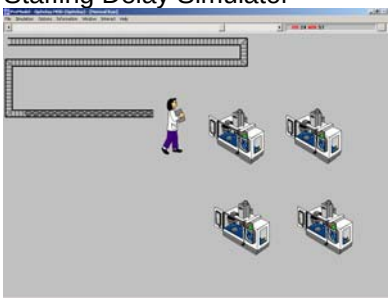
Identify appropriate cycle time management styles.
Teach others about utilization and cycle time relationships.
Define and calculate relevant metrics for cycle time.
Teach others about Little's law and variability.
Quantify the impact of single-path tools and hot lots.
Apply cycle time intuition to operational decisions.

Sample Course Tools

Excel Cycle Time Simulator



Staffing Delay Simulator



Additional Half-Day Modules

Executive Management Session.
Site-Specific Metrics Review.
Capacity Planning Review and Benchmark.