FabTime Cycle Time Management Newsletter

Volume 8, No. 2 March 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 the software this month include new tool availability percentage charts, with performance to goal, and a secondary calculation method for the critical ratio dispatch rule/dispatch factor.

Editor: Jennifer Robinson

Contributors: Mike Zhang, Scott Mason, Mike Hillis, Martin Crawford, and Mike Lindstrom

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Welcome

Welcome to Volume 8, Number 2 of the FabTime Cycle Time Management Newsletter! I know that this issue is a bit later than anticipated – I've been traveling extensively, conducting a series of cycle time management classes, and also doing FabTime software training for some of our newer customers. But I'm pleased to be back to bring you another newsletter issue. In this issue we have a call for papers for the 2007 MASM conference, to be held in Scottsdale, Arizona in September. Our software user tip of the month involves using FabTime to track on-time delivery performance. We have no subscriber discussion, though we have been having some informal discussions with people about wafer size transitions and benchmarking, which may be reflected in future issues.

In our main article this month, written by Frank Chance, we discuss the ever-popular, but rarely examined in the literature, fab morning meeting. Nearly all fabs that we know hold a daily morning production meeting. Our hypothesis is that fabs that hold effective morning meetings are also likely to be effective at achieving their manufacturing goals. A morning meeting is effective if it routinely achieves it stated purpose, whether that is to distribute information, hold individuals accountable, make decisions, brainstorm solutions, or another purpose specified by fab management. In this article, we examine the purposes for morning meetings, and explore behaviors that may make meetings ineffective. Our goal is to motivate you to examine and improve the effectiveness of your morning production meetings.

Thanks for reading!—Jennifer

FabTime

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

Community News/Announcements

Call for Papers: MASM 2007 Conference

Mike Zhang from Intel was kind enough to send us the call for papers for the 2007 MASM conference, to be held in Scottsdale, Arizona, in conjunction with the 3rd annual IEEE Conference on Automation Science and Engineering (IEEE CASE 2007), sponsored by the IEEE Robotics and Automation Society (RAS). The conference will be held on September 22 to 25, 2007. See http://www.ieee-case.org for more details. The International Conference on Modeling and Analysis of Semiconductor Manufacturing (MASM) is a bi-annual conference that was initialized in 2001 by Professor John Fowler at Arizona State University. MASM2005 was successfully held in Singapore (http://www.simtech.a-star.edu.sg/masm2005/).

The following text is from the conference call for papers, available in full at http://www.fulton.asu.edu/~case2007/downloads/CFP_IEEE_CASE2007_MASM.pdf.

The fourth International Conference on Modeling and Analysis of Semiconductor Manufacturing (MASM 2007) will again be a forum for the exchange of ideas and best practices between researchers and practitioners from around the world involved in modeling and analysis of semiconductor manufacturing. We are interested in any methodologies, research, and/or applications from other industries, as well, that might also be utilized for the semiconductor industry.

MASM 2007 will be a major track of the 3rd annual IEEE Conference on Automation Science and Engineering (IEEE CASE 2007), sponsored by the IEEE Robotics and Automation Society (RAS), which will be held on September 22 to 25, 2007 in Scottsdale, Arizona, U.S.A. CASE is an offspring of the IEEE Transactions of Automation Science and Engineering. High quality CASE papers will be recommended for publication in this flagship automation journal.

Semiconductor manufacturing is one of the forefronts of automation science and engineering. With the emerging highly automated wafer fabrication facilities (fabs), there is a compelling trend to integrate automation with advanced decision technologies in managing factories, logistics, and supply chain networks. On behalf of the IEEE RAS Technical Committee on Semiconductor Manufacturing Automation, we invite you to submit your original, significant, and visionary papers describing scientific methods and technologies that improve efficiency and productivity of semiconductor manufacturing. Topics to be covered include the following (and others listed in the full announcement):

- Factory modeling, analysis, performance evaluation
- Planning, scheduling, dispatching
- Equipment productivity improvement
- Manufacturing execution systems (MES)
- Cycle time reduction
- Data mining for yield and production improvement
- Benchmark and case studies

FabTime recommends the MASM conference as an excellent opportunity to see high-quality, peer-reviewed papers about a variety of fab performance improvement topics.

FabTime welcomes the opportunity to publish community announcements. Send them to newsletter@FabTime.com.

FabTime User Tip of the Month

Use FabTime to Track On-Time Shipment Performance

Does your site's FabTime database include due dates for each lot? If so, you can now use FabTime to track your on-time delivery performance. To see a distribution of wafers early vs. late, for example, use the new Shipments Early/Late Histogram Chart. You'll find this chart under Shipments on the Chart list. To see more data, change the "From" date on the chart to sometime further in the past. Each column on the chart represents the number of wafers shipped that were late (red columns) or early (green columns) by a given amount. The chart defaults to set each bucket interval to 1 day. So, for example, the first red column will show the number of wafers that were from zero to 1 day late, the next the wafers that were from 1 to 2 days late, etc. This gives you a quick visual representation of how many of your lots were early or late, and by how much. To change the bucket size, just enter a new value in the "Bkt:" control near the bottom of the main set of filters. The unit of measure defaults to days, and is specified according to the U/M drop-down two spots lower on the filter list.

You can also on-time delivery information in the data table of the Shipments Lot List chart (days early vs. days late for each lot, with a flag indicating whether or not the lot was on-time), and as a blue line on the Shipments Trend and Pareto charts (against the right-hand axis). Note that the performance to goal on the Shipments Trend and Pareto charts (the red vs. green of the columns) is performance in terms of number of wafers shipped. The color of the column will not indicate on-time delivery performance. However, the blue line will show the on-time delivery performance for that time period. On-Time Percentage is calculated as Number of On-Time Lots / Total Number of Shipped Lots, for that time period. We hope that these updated charts are helpful to you in tracking, and hence improving, your delivery performance.

Don't currently store updated due dates in your FabTime database? Contact us. As long as the due dates are stored somewhere, or as long as as your site can give us a rule for setting standard due dates (e.g. cycle time = three times process time), we can work with you to populate the due dates.

If you have any questions about this feature, or any questions about the software, just use the Feedback form inside FabTime. Thanks!

Subscriber Discussion Forum

FabTime welcomes the opportunity to publish subscriber discussion questions, or responses to previous articles and questions. There is no subscriber discussion this month. If you have a topic that you would like to address, or to see addressed, in the next issue, please email newsletter@FabTime.com. Thanks!

What Makes an Effective Morning Meeting?

Introduction

Nearly all fabs that we know hold a daily morning production meeting. Usually less than one hour long, this meeting is the daily get-together for the fab manager and production, equipment, and process managers. With so many people in the room, it's an expensive meeting, and for that reason alone it's worth our attention. But the salary expenses are likely dwarfed by the opportunity cost of what these attendees could accomplish were they to have an uninterrupted hour of time at their primary job (which is **not** attending meetings!). In this article, we explore the question of "what makes an effective morning meeting?".

We choose the adjective "effective" (rather than "good" or "useful"), a la Peter Drucker, meaning "to get the right things done". And so we ask, what are the right things that must be accomplished by a morning meeting... in short, what is the purpose of this meeting? Some possibilities include:

1) To distribute relevant information

2) To hold individuals responsible for meeting goals

3) To make necessary decisions

4) To brainstorm solutions to an important problem

1) To distribute relevant information (the "State of the Union" for the fab):

In the morning meetings we have attended, this function often takes the majority of the allotted time. Examples include:

- Review down tools, report the current delay (waiting for parts, waiting for install, waiting for qual, etc), and an estimated uptime.
- Review constraint performance for the prior day and week-to-date.
- Review progress toward daily and weekly goals.
- Review each highest-priority lot, report its current location, holdups yesterday, and expected travels today.
- Review moves / turns / scrap / shipments performance for the prior day and week-to-date.
- Review WIP location.

2) To hold individuals responsible for meeting goals:

As part of the review of progress against goals, we have often seen individuals put on the spot at morning meetings if the performance for their area is falling behind. Depending on company culture, these encounters can range from a friendly jousting to an emotionally charged confrontation.

3) To make necessary decisions:

Occasionally, we have seen morning meetings that cover decisions such as:

- Elevating the priority of a particular lot due to a request by its owner.
- Prioritizing limited equipment resources against down tools, improvement projects, etc. Equipment personnel know what is happening with down tools, equipment install, etc. Production personnel know the relative pain of work that cannot be processed due to equipment problems. Between the two sides an agreement must be reached on priorities.
- Scheduling requests by CIM or IT for support system downtime.

4) To brainstorm solutions to an important problem:

To a very limited extent, we have seen brainstorming at morning meetings. But it

has been a small portion of the agenda, and more often appears in an ad-hoc way in response to a report that is being given, e.g.:

- Scrap was a problem yesterday at operation X... what happened and can we prevent it from happening again?
- A constraint tool was starved for an hour this morning... why wasn't there sufficient WIP to keep it running? What needs to change to keep it busy in the future?
- WIP is piled up in the front end of the line, what can we do about that?

In general, brainstorming is likely done elsewhere, and the results are reported at the morning meeting.

What Makes a Morning Meeting Ineffective?

Looking at the problem from another angle, we ask "What makes a morning meeting ineffective?". If the morning meeting's purpose is a mixture of the items listed above, then the following practices are clearly ineffective:

- Presenting data that has no relation to the big picture, e.g. the health of the fab.
- Presenting data in a format that cannot quickly be understood by attendees.
- Not having backup data available to address questions and challenges.
- Conducting extended discussions about one item to the exclusion of the remaining agenda ("rat hole" discussions).
- Having heated arguments that cannot be resolved with the data on hand.
- Having no clear assignment of responsibilities for tasks that arise.
- Having no followup on tasks assigned at prior meetings.

And lastly, one sure-fire way to make the morning meeting ineffective:

- Allow it to run significantly longer than one hour!

How Should the Morning Meeting Be Structured?

Suppose the time allocation at a typical morning meeting is:

70% to distribute information

20% to hold individuals accountable

5% to make decisions

5% to brainstorm solutions

... is this the right mixture? Are these the right things to do each morning? Is there a way to prune topics that are not required, to leave time for those items that are important and can only be accomplished in a meeting of production, equipment, and process personnel? These are important questions, and we do not have ready answers, but our suggestion is to return regularly, say once a quarter, to first principles and ask:

- What is the purpose of our morning meeting? Is our meeting agenda structured to achieve this purpose?
- Is each topic or report on the agenda still relevant, or was it added in response to a special situation that no longer exists?
- How good are we at assigning responsibility for necessary actions that come from the morning meeting?
- How good are we at following up to confirm that assigned actions have been completed, or cancelled if no longer necessary?
- Can we make our presentation of information more compact, so that we may cover more material in the same time, or the same material in less time?
- Can we improve our productivity by decreasing the amount of preparation time required for the meeting? (These last two are areas in which FabTime's software can help.)

Conclusions

The morning meeting sets the tone for the fab. Our hypothesis is that fabs that hold effective morning meetings are also likely to be effective at achieving their manufacturing goals. A morning meeting is effective if it routinely achieves it stated purpose, whether that is to distribute information, hold individuals accountable, make decisions, brainstorm solutions, or another purpose specified by fab management. We hope that this article has motivated you to examine the effectiveness of your morning production meetings.

Closing Questions for FabTime Subscribers

What is the primary purpose of your morning production meeting? When measured against this purpose, how effective are your meetings? Is anyone responsible for making these meetings more effective?

Acknowledgements

Many thanks to Scott Mason, Mike Hillis, Martin Crawford, and Mike Lindstrom for discussions on this topic.

Subscriber List

Total number of subscribers: 2430, from 461 companies and universities. 25 consultants.

Top 20 subscribing companies:

- Intel Corporation (156)
- Micron Technology, Inc.(81)
- Analog Devices (75)
- ATMEL (74)
- Maxim Integrated Products, Inc. (73)
- Infineon Technologies (64)
- Freescale Semiconductor (63)
- Cypress Semiconductor (59)
- STMicroelectronics (57)
- Texas Instruments (56)
- NXP Semiconductors (51)
- Chartered Semiconductor Mfg (47)
- ON Semiconductor (47)
- TECH Semiconductor Singapore (47)
- X-FAB Inc. (46)
- IBM (36)
- Seagate Technology (33)
- Spansion (32)
- BAE Systems (31)
- Honeywell (29)

Top 3 subscribing universities:

- Virginia Tech (11)
- Ben Gurion Univ. of the Negev (7)
- Arizona State University (6)

New companies and universities this month:

- Asyst Technologies
- Boston Scientific
- Middlesex General Industries, Inc.
- Oregon State University
- SUSS MicroOptics
- Technical University of Malaysia
- UNI-3 System
- Zamil Steel

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.

There is no charge to subscribe and receive the current issue of the newsletter each month. Past issues of the newsletter are currently only available to customers of FabTime's web-based digital dashboard software or cycle time management course.

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FabTime® Software Capacity Planning Module

Installation

For a fixed price, FabTime will:

- Identify the source of any additional data needed for the planning module.
- Automate the process of importing the additional data into FabTime.
- Validate against client data.

Interested?

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Phone: +1 (408) 549-9932
Fax: +1 (408) 549-9941
Email: Sales@FabTime.com
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Do you need to answer questions like:

- Given a target product mix, do we need any new tools?
- Given the tools that we have, and the products that we are running, how many wafers can we expect to produce?
- Given our existing set of products and tools, what happens if the product mix changes? Where can we expect bottlenecks?

Are you tired of maintaining a standalone capacity planning spreadsheet?

FabTime's capacity planning module leverages the data already stored in the FabTime digital dashboard software, to make it easier to build capacity planning scenarios. The only required manual inputs are:

- Weekly ships per product.
- Product line yield percentages.

FabTime uses route information from the fab MES and calculates UPH data (tool speed) based on actual performance. FabTime also uses tool uptime performance to estimate availability (though this can be overridden). These inputs are used to generate predicted utilization percentages for each capacity type. Detailed intermediate calculations (UPH, tool productive time, tool rework percentage, etc.) are also available (an example for one tool is shown below). All outputs can be easily exported to Excel.

Capacity Planning Module Benefits

- Eliminate the need to maintain offline capacity planning models.
- Automatically update capacity planning data to reflect new conditions (process flows, tool uptime characteristics).
- Quickly run scenarios to anticipate (and avoid) bottlenecks caused by product mix changes.

C Type	Output	Value	Notes
1XStep	Rework Moves/Week	21	2004-09-06 10:00:00 to 2004-11-15 10:00:00
1XStep	Total Moves/Week	12310	2004-09-06 10:00:00 to 2004-11-15 10:00:00
1XStep	Rework Ratio	0	Rework Ratio = Rework Moves / Total Moves.
1XStep	Productive%	61	2004-09-06 10:00:00 to 2004-11-15 10:00:00
1XStep	Availability%	76.26	Availability = Productive% + Standby%.
1XStep	Historic Utilization%	79.99	Utilization (Mfg efficiency) = Productive% / Availability%.
1XStep	Productive(Rework)%	0.1	Productive(Rework)=Productive% * ReworkRatio.
1XStep	Net Availability%	76.15	Net availability% = Availability% - Productive(Rework)%.
1XStep	Arrivals (Units/Hour)	79.36	Based on total plan WGR=2025
1XStep	Tool Quantity	8	1XStep#1 ... 1XStep#8
1XStep	UPH	15.02	UPH = (TotalMoves/ToolQty) / (Productive% * 168)
1XStep	Required Hours/Day	126.84	Required hours = 24 * HourlyArrivalRate / UPH
1XStep	Predicted Utilization%	86.75	Util = 100 * ReqdHours / (24 * NetAvail * ToolQty / 100)
1XStep	Max WGR	2334.22	MaxWGR = PlanWGR / PredictedUtilization
1XStep	Historic WGR	2457.8	(Non Rework Moves) / (OperationCount / ProductCount).