FabTime Cycle Time Management Newsletter

Volume 11, No. 2 March 2010

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 tool state comments now visible on the Tool WIP and State List data table and dispatch list optimization when a list is called for multiple tools.

Editor: Jennifer Robinson

Contributors: David Jimenez (WWK); Detlev Glüer (GlobalFoundries)

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Welcome

Welcome to Volume 11, Number 2 of the FabTime Cycle Time Management Newsletter. Unbelievable as it seems to me, this is our 100th issue of the newsletter. Issue number 1.01 was sent out on April 14th, 2000, to 33 subscribers from 17 different companies and universities (plus several consultants). Some of those initial companies don't even exist anymore, while others have merged and split and changed almost beyond recognition. It's hard to keep track. But we're happy to still number some of those initial subscribers among our current 2731 newsletter recipients. And, given the year that the semiconductor industry went through last year, we're happy to still be here. For our main article this month, we'll be revisiting the 10 years of newsletter issues, in a bit of a 100th issue celebration.

In this issue, we also have a call for papers for the 6th International MASM Conference and links to several recent news articles that we thought that our subscribers would find of interest. Our FabTime user tip of the month is about using customized text in email alerts.

Many thanks to all of our subscribers, from those who have been with us since that first issue 10 years ago to those who just found us last week. We hope that you'll continue to find the newsletter useful. We welcome your feedback on any topics that we should consider, or changes that might make the newsletter more useful to you. Thanks also to the wonderful customers for our software and our cycle time class, without whom we wouldn't be able to produce this newsletter in the first place.

Thanks for reading!—Jennifer

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Community News/Announcements

Call for Papers: 6th International Conference on Modeling and Analysis of Semiconductor Manufacturing (MASM) 2010

We received this call for papers from **David Jimenez (WWK)**, conference organizer: "The 2010 International Conference on Modeling and Analysis of Semiconductor Manufacturing (MASM, Baltimore, MD, December 5-8, 2010) 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 high-tech manufacturing systems. We are convinced of the worth and importance of the continuation of the MASM events held in Tempe, Arizona in 2000 and 2002, Singapore in 2005, Miami, Florida in 2008, and Austin, Texas in 2009.

The MASM 2010 conference will be fully contained within the Winter Simulation Conference 2010 (WSC 2010), the leading conference in discrete event simulation (http://www.wintersim.org). WSC 2010 features a comprehensive program ranging from introductory tutorials to state-of-the-art research and practice. WSC 2010 will take place in Baltimore, Maryland, USA. All attendees of the MASM conference will register for WSC 2010 at the same cost. All participants of WSC 2010 can attend MASM 2010 sessions.

While historically we sought to examine the current IC semiconductor industry state-of-the-art, neither presenters nor attendees need to be in the IC industry to participate. We are interested in any methodologies, research, and/or applications from other industries such as TFT-LCD, flexible displays, bio-chip, solid state lighting (LED), and photovoltaics (PV) that might also share or want to share common and new practices. The conference includes tutorials and related software demonstrations within WSC 2010. A broad range of papers is sought, including theoretical developments, applied research, and case studies. Interested individuals within academia, government agencies, equipment and material suppliers, manufacturers, students, contractors, and other interested parties are encouraged to participate.

The conference will be built around the following three tracks:

1. Operational Modeling and Simulation
2. Manufacturing Economics
3. Photovoltaics (PV) and Solid State Lighting (LED)

Conference Organizers:
Enver Yucesan, INSEAD, Enver.YUCESAN@insead.edu (Program Chair, WSC 2010)

David Jimenez, Wright Williams & Kelly, Inc., david.jimenez@wwk.com

Paper Submission
Please follow the WSC 2010 Author Kit to prepare your MASM 2010 paper at http://www.wintersim.org.

Important Dates
Paper Submission Deadline April 1, 2010
Notification of Acceptance June 7, 2010
Camera Ready Paper due July 16, 2010"

More details can be found here: http://wintersim.org/MASM.htm.

Recent News Articles of Interest

We ran across several news articles recently that we thought that our subscribers might find of interest.

Fabs vs. Fab-Lite

EE Times reports, in an article by **Peter Clark**, on **Malcolm Penn's** criticisms of the fab-lite model. Here's a brief quote from the article:

"According to Penn the fab-lite business model is: structurally deceitful, operationally faulty, and financially flawed." Fab-lite is yet another bean-counting financial analyst deception, just

like the disgraced private-equity 'debt is good' business model. Going IDM to fabless does not solve the underlying problems. It is simply dicing with death," Penn told attendees at a one day seminar on the state of the global semiconductor market... Penn favors IDMs that continue to build fabs but use foundries to smooth the cyclic peaks and troughs in demand. The problem is that such models are not in the foundries best interest who see orders being pulled back into the IDM".

You can find the article here: http://www.eetimes.com/news/design/showArticle.jhtml?articleID=222600264. There's some discussion in the comments, too.

Fabless Outsourcing for Solar Cells

Speaking of outsourcing, the **Gerson Lehman Group** recently did an analysis evaluating fabless outsourcing models for solar cells vs. microchips. The gist of their conclusion is that "the capital budget for microchips is orders of magnitude higher than for solar cells. As more countries, including the U.S., invest in clean energy such as solar manufacturing for its economic, environmental and national security benefits, it is less likely that companies will follow the pervasive fabless outsourcing model of the semiconductor industry... However, the U.S. will lose a major manufacturing opportunity to foreign lands without the proper incentives to retain and attract new solar manufacturing operations."

You can find the full article here: http://www.glgroup.com/News/Evaluation-of-Fabless-Outsourcing-Model-for-Solar-Cells-vs.-Microchips-46666.html (with links to a more detailed analysis).

The Next Chip Battleground: Smart Phones

The New York Times Technology section recently ran a piece by **Ashlee Vance** about the next phase of "the chip wars", in which "the manufacturers will be fighting to supply the silicon for one of the fastest-growing segments of computing: smartphones, tiny laptops and tablet-style devices. The fight pits several big chip companies — each trying to put its own stamp on the same basic design for mobile chips — against Intel, the dominant maker of PC chips, which is using an entirely different design to enter a market segment in which it has a minuscule presence."

You can find the full article here: http://www.nytimes.com/2010/02/22/technology/22chip.html

Perhaps some of these articles will spark new subscriber discussions. If you find the inclusion of links like this of value, please let us know. FabTime welcomes the opportunity to publish community announcements, including conference notices and calls for papers. Send them to mailto:newsletter@FabTime.com.

FabTime User Tip of the Month

Use Custom Text in Alert Messages

FabTime recently added support for a custom message to be sent in place of the standard FabTime alert subject line. For most types of alerts, you can now enter text into the "Custom Message" field. This text is then sent as the subject line of the alert email. The standard FabTime alert message body is sent as the body of the alert email. For home-page chart alerts you

can go one level further in customizing. You can substitute fields from the chart data table (when sending row-level alerts) and have those fields show up in the subject line of the alert.

For example, to be alerted whenever a new scrap event occurs, and notified of details about that scrap event:

1. Create a Scrap Lot List chart for (start of today) to (start of tomorrow).

2. Add this Scrap Lot List chart to your home page.

3. Confirm the home page tab where this Scrap Lot List chart appears is set to auto-slide daily at the same time as the starting time for the chart.

4. Go to the FabTime Alerts page.

5. Add a home-page chart alert for this scrap lot list chart, with data rows >= 1 and sleep-after=24 hours. Click on Save.

6. When the alerts redisplay, it will show all the fields available in the chart's data table, along with an option to "Send Row Alerts".

7. Enable "Send Row Alerts", and set the custom message to "%Units. wafers scrapped from %Lot. at op %Operation. by %Employee. Notes=%Comment."

8. Set "Sleep Text" to "%Lot. %Time.": This will keep FabTime from notifying you again for the same scrap event.

9. Save the alert.

Now, whenever scrap occurs, you should receive an email similar to "2 wafers scrapped from L12345 at op 2256 by J.BROOK Notes=scratch on wafer-unable to fix". You can use this functionality for other types of home page chart alerts, such as when a tool goes down or a new lot arrives to a particular tool.

Please note that full use of this new alerting functionality requires software patches 98 and 99.

If you have any questions about this feature (or any other software-related issues), just use the Feedback form in the software.

Subscriber Discussion Forum

FabTime welcomes the opportunity to publish subscriber discussion questions and responses. Simply send your question or contribution to mailto:Jennifer.Robinson@FabTime.com. We have no new subscriber contributions this month.

100th Newsletter Issue Celebration

Introduction

This is the 100th issue of the FabTime newsletter. Issue number 1.01 was sent out on April 14th, 2000 to 33 subscribers from 17 different companies and universities (plus several consultants). Some of those initial companies don't even exist anymore, while others have merged and split and changed almost beyond recognition. It's hard to keep track. But we're happy to still number some of those initial subscribers among our current 2731 subscribers. And, given the year that the semiconductor industry went through last year, we're happy to still be here. For our main article this month, we'll be revisiting the 99 past newsletter issues, and adding enhancements to make the past issues easier to search and reference. We'll also take a more in-depth look at our subscriber profile.

New Newsletter Feature: Keywords

After 100 newsletter issues, many of which contain extensive subscriber discussion, on a variety of topics, it's become a bit difficult to keep track of which topics have been covered in which issues. Inspired by a brilliant subscriber suggestion (see acknowledgement below), we decided that it was high time that we went through and generated keywords for all of the past newsletter issues. We've indexed both the main articles and the subscriber discussion sections, with the keywords for the main article listed first for each issue. We included keywords for the FabTime Tip of the Month sections only when those seemed of general interest (e.g. about topics like Holds or Alerts, rather than about software functionality). We did not include "Fab" or "Cycle Time" in the keywords, since those would have applied to virtually every issue. We also didn't include any keywords for the Community Announcement section, since those tend to be highly perishable. While we tried to keep the number of keywords per issue to a minimum, some of the articles that contain extensive subscriber discussion do have quite a few.

In future issues, we'll include the keywords in the general information section at the top of each text issue, and in the File Properties (under Keywords) for the PDF version. For those of you who keep your past issues, we think that this will make it easier to search for topics of interest.

Past Issues (including a Raffle!)

As most of you know, past issues of the newsletter are generally only available to customers of our course or our software. This is one small way that we reward the companies that enable us to stay in business, and thus indirectly fund the newsletter. However, this is the 100th issue celebration, and we would like to do what we can to help people to take advantage of the new keywords. So here's the plan:

1. If you work at a FabTime software customer site, and would like us to send you the full, updated set of PDF issues, with the keywords, just send your request to newsletter@FabTime.com. We'll get those out to you shortly.

2. If don't work at a site that uses FabTime's software, you can enter a raffle to receive one of three full sets of the past issues, with keywords, in PDF. To enter, send an email to mailto:newsletter-@FabTime.com with "100th Issue Contest" in the subject. We'll draw three winners from the names received. This contest is only open to current newsletter subscribers (people who received this issue), one entry per person. Because the full set of past issues adds up to more than 20 MB of files, the archives may be sent by postal mail (e.g. on CD or USB drive). Entries must be received by April 1st, 2010.

3. From now through April 1st, each current subscriber (anyone who received this issue) can request all of the past issues for any one keyword. Email your request to newsletter@fabtime.com. The full set of keywords is included below, along with an index of keywords by issue.

Keywords:

- **Alerts** (Issues 5.08, 11.02)
- **AMHS** (Issues 4.04, 4.05, 4.11, 6.02)
- **Batching** (Issues 2,01, 2.02, 2.03, 3.08, 4.02, 4.03, 4.05, 7.06, 7.07, 7.08, 8.07, 8.08, 8.09, 9.03)
- **Benchmarking** (Issues 2.07, 2.09, 2.10, 3.02, 3.03, 3.04, 3.06, 8.09, 8.10, 9.01)
- **Bottlenecks** (Issues 1.04, 1.06, 1.07, 3.10, 4.09, 10.09)
- **Capacity Planning** (Issues 2.09, 2.10, 3.09, 5.06, 5.07, 5.08, 5.09, 8.01, 8.06)
- **Cluster Tools** (Issues 8.06, 8.07, 8.09, 8.10, 9.08)
- **Cycle Time Entitlement** (Issue 4.03, 5.06)
- **Delivery Performance** (Issues 4.06, 4.07, 7.04, 8.02, 9.05, 10.03, 10.04, 10.06)
- **Dispatching** (Issues 3.04, 5.05, 5.06, 6.04, 6.05, 6.07, 8.07, 8.08, 9.02, 10.02, 10.03, 10.04, 10.05, 10.08)
- **Dynamic X-Factor** (Issues 4.08, 4.09, 5.03, 5.06, 5.07, 7.03, 9.04, 9.06)
- **Fab Management** (Issues 3.06, 3.07, 4.07, 4.09, 5.04, 5.10, 6.04, 6.10, 7.09, 7.10, 8.01, 8.02, 8.05, 8.08, 8.10, 9.02, 9.07, 9.09, 9.10, 10.05, 10.08)
- **Factory Behavior** (Issues 1.03, 1.04, 1.05, 1.07, 3.04, 3.06, 6.10, 7.06, 7.09, 8.04, 8.05, 8.10, 10.09)
- **Factory Ramp-Up** (Issues 2.10, 3.05, 3.06, 5.02, 10.06)
- **Factory Size** (Issues 2.10, 4.11, 5.01)
- **Financial Impact of Cycle Time** (Issues 2.06, 2.09, 2.10, 3.05, 4.03, 6.10, 7.07)
- **Forecast Arrivals** (Issues 6.09, 8.03, 8.04, 8.08, 10.06, 10.07, 11.01)
- **Holds** (Issues 5.03, 6.06, 7.10, 8.03)
- **Hot Lots** (Issues 3.02, 3.03, 3.10, 6.08, 10.08)
- **Industry Cycles** (Issues 2.03, 9.10, 10.06, 11.02)
- **Kanban** (Issue 1.05)
- **Lean Manufacturing** (Issues 7.05, 7.06, 9.09, 9.10)
- **Linked Tools** (Issues 1.08, 4.04, 4.05, 8.06)
- **Lot Release** (Issues 3.05, 3.06, 7.08, 7.09)
- **Lot Size** (Issues 2.02, 2.03, 2.09, 2.10, 3.03, 3.04, 8.09)
- **Lot Transport** (Issue 7.08, 9.02)
- **Metrics and Goals** (Issues 1.06, 2.04, 2.08, 3.01, 3.10, 4.01, 4.07, 4.08, 4.09, 5.01, 5.03, 5.04, 5.05, 5.07, 6.02, 6.03, 6.07, 6.09, 6.10, 7.01, 7.02, 7.03, 7.10, 8.09, 8.10, 9.09, 10.07)
- **New Product Introduction** (Issues 2.09, 7.01, 7.02, 8.01, 8.09, 8.10)
- **Non-Bottlenecks** (Issue 1.07)
- **OEE** (Issues 1.06, 1.08, 2.04, 2.05, 2.06, 2.07, 3.01, 3.03)
- **Operating Curves** (Issues 2.07, 2.08, 3.01, 3.03)
- **Operators** (Issues 2.10, 3.01, 3.02, 3.05, 3.06,3.07, 3.08, 3.09, 3.10, 4.01, 4.02, 4.06, 4.07, 5.04, 5.05, 7.01, 7.02, 7.09, 7.10, 8.01, 10.08, 10.09, 11.01)
- **Paperless Fabs** (Issues 5.09, 5.10, 6.03, 6.07, 9.04, 9.05)
- **Product Mix** (Issues 4.09, 6.01, 6.02, 7.01, 7.02, 7.09, 8.01, 8.10, 11.01)
- **Queueing Models** (Issues 1.02, 1.03, 1.08, 2.01, 2.03,2.07, 2.10, 3.02, 3.03, 4.01, 4.02, 4.05, 5.07, 6.05, 6.08, 8.04, 9.04, 10.02)

- **Recipe Management** (Issues 3.06, 3.07, 3.08)
- **Reporting** (Issues 4.09, 4.10, 4.11, 5.04, 5.05, 8.02, 8.03, 9.07, 10.07)
- **Setups** (Issues 4.11, 6.07)
- **Simulation** (Issues 2.01, 2.10, 3.09, 4.05, 8.06, 9.03, 9.05, 9.07)
- **Single-Path Tools** (Issues 1.08, 5.10, 8.05, 9.01)
- **Spreadsheet Tools** (Issues 2.06, 2.07, 2.08, 3.05, 7.07)
- **Theoretical Cycle Time** (Issues 6.08, 6.09)
- **Theory of Constraints** (Issues 1.04, 1.05)
- **Time Constrained Processing** (Issue 5.08)
- **Tool Availability** (Issues 2.04, 2.05, 3.07, 4.02, 4.03, 4.04, 4.05, 4.10, 4.11, 5.07, 5.08, 7.01, 7.02, 7.03, 7.06, 9.08, 10.01, 10.03, 10.04, 10.05)
- **Tool Qualification** (Issues 1.08, 3.03, 3.04, 3.10, 6.05)
- **Utilization** (Issues 1.02, 1.06, 2.01, 2.02, 4.04, 4.10, 4.11, 5.03, 5.05, 5.06, 6.02, 6.03, 6.04, 6.05, 7.06, 7.09, 8.05, 8.06, 10.03, 10.09)
- **Variability** (Issues 1.02, 1.03, 2.03, 2.08, 3.09, 4.01, 4.02, 4.03, 4.04, 4.05, 4.06, 6.05, 6.07, 7.02, 7.03, 7.04, 7.05, 7.06, 7.08, 8.04, 10.02, 10.03)
- **Wafer Size** (Issues 5.08, 5.09, 5.10, 10.09)
- **WIP Management** (Issues 1.03, 1.04, 1.05, 5.01, 5.05, 5.06, 6.02, 6.03, 6.04, 6.09, 6.10, 8.05, 9.04, 9.09, 10.01, 10.04)
- **WIP Turns** (Issues 1.06, 6.05)
- **Worker Behavior** (Issues 1.01, 10.08)
- **Yield** (Issues 2.10, 3.04, 3.05, 3.06, 5.01, 5.02, 5.03, 9.06, 9.07)

Issues:

1. **The Hawthorne Effect** (Issue 1.01) Keywords: Worker Behavior

2. **The P-K Formula** (Issue 1.02) Keywords: Variability, Utilization, Queueing Models

3. **Little's Law** (Issue 1.03) Keywords: Variability, WIP Management, Factory Behavior, Queueing Models

4. **Theory of Constraints** (Issue 1.04) Keywords: Factory Behavior, WIP Management, Theory of Constraints, Bottlenecks

5. **Theory of Constraints vs. Just-In-Time Manufacturing** (Issue 1.05) Keywords: Theory of Constraints, WIP Management, Factory Behavior, Kanban

6. **Performance Measures in Wafer Fabs** (Issue 1.06) Keywords: Metrics and Goals, OEE, WIP Turns, Bottlenecks

7. **Improving Factory Cycle Time at Non-Bottlenecks** (Issue 1.07) Keywords: Bottlenecks, Non-Bottlenecks, Factory Behavior

8. **Understanding the Impact of Single-Path Tools** (Issue 1.08) Keywords: OEE, Linked Tools, Tool Qualification, Single-Path Tools, Queueing Models

9. **Batch Size Decision Rules and Cycle Time** (Issue 2.01) Keywords: Queueing Models, Batching, Simulation

10. **Lot Size and Cycle Time** (Issue 2.02) Keywords: Batching, Utilization, Lot Size

11. **Cycle Time Improvement during A Downturn** (Issue 2.03) Keywords: Batching, Lot Size, Queueing Models, Variability, Industry Cycles

12. **In-Depth Guide to OEE Resources** (Issue 2.04) Keywords: OEE, Tool Availability, Metrics and Goals

13. **One-Year Anniversary Issue** (Issue 2.05) Keywords: Tool Availability, OEE

14. **Dollar Value of Cycle Time Reduction** (Issue 2.06) Keywords: Financial Impact of Cycle Time, OEE, Spreadsheet Tools

15. **Characteristic Curve Generator** (Issue 2.07) Keywords: Spreadsheet Tools, OEE, Queueing Models, Benchmarking, Operating Curves

16. **Setting Goals for Fab Performance** (Issue 2.08) Keywords: Metrics and Goals, Operating Curves, Spreadsheet Tools, Variability

17. **Implicitly Including Cycle Time in Capacity Planning** (Issue 2.09) Keywords: Capacity Planning, Lot Size, Financial Impact of Cycle Time, Benchmarking, New Product Introduction

18. **Explicitly Including Cycle Time in Capacity Planning** (Issue 2.10) Keywords: Capacity Planning, Lot Size, Financial Impact of Cycle Time, Benchmarking, Factory Size, Operators, Factory Ramp-Up, Queueing Models, Yield, Simulation

19. **OEE and Cycle Time** (Issue 3.01) Keywords: OEE, Operators, Metrics and Goals, Operating Curves

20. **Cycle Time and Hot Lots** (Issue 3.02) Keywords: Hot Lots, Operators, Benchmarking, Queueing Models

21. **Tool Dedication and Cycle Time** (Issue 3.03) Keywords: Tool Qualification, Hot Lots, OEE, Lot Size, Operating Curves, Benchmarking, Queueing Models

22. **Cycle Time and the Core Conflict** (Issue 3.04) Keywords: Factory Behavior, Yield, Tool Qualification, Benchmarking, Lot Size, Dispatching

23. **Bottom-Line Benefits of Cycle Time Improvement** (Issue 3.05) Keywords: Financial Impact of Cycle Time, Spreadsheet Tools, Lot Release, Operators, Factory Ramp-Up, Yield

24. **Cycle Time Management Styles** (Issue 3.06) Keywords: Factory Behavior, Fab Management, Lot Release, Operators, Factory Ramp-Up, Yield, Benchmarking, Recipe Management

25. **Newsletter Retrospective** (Issue 3.07) Keywords: Operators, Fab Management, Recipe Management, Tool Availability

26. **Simple Rule of Thumb for Batching Decisions** (Issue 3.08) Keywords: Batching, Recipe Management, Operators

27. **Staffing and Cycle Time** (Issue 3.09) Keywords: Operators, Capacity Planning, Simulation, Variability

28. **Quality Moves Performance Measure** (Issue 3.10) Keywords: Tool Qualification, Bottlenecks, Hot Lots, Metrics and Goals, Operators

29. **Quantifying Wafer Fab Variability** (Issue 4.01) Keywords: Variability, Operators, Metrics and Goals, Queueing Models

30. **Quantifying Availability Variability** (Issue 4.02) Keywords: Variability, Tool Availability, Queueing Models, Operators, Batching

31. **Cycle Time Entitlement (Budget)** (Issue 4.03) Keywords: Cycle Time Entitlement, Variability, Tool Availability, Batching, Financial Impact of Cycle Time

32. **Cycle Time Effects of Equipment Downtime** (Issue 4.04) Keywords: Tool Availability, AMHS, Linked Tools, Utilization, Variability

33. **Arrival Variability and Cycle Time** (Issue 4.05) Keywords: Variability, Simulation, Queueing Models, Batching, Tool Availability, AMHS, Linked Tools

34. **In-Depth Guide to Operators and Cycle Time** (Issue 4.06) Keywords: Operators, Variability, Delivery Performance

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36. **Dynamic X-Factor** (Issue 4.08) Keywords: Dynamic X-Factor, Metrics and Goals

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Reporting, Dynamic X-Factor, Product Mix

38. **Tool Standby and Productive Time Reporting** (Issue 4.10) Keywords: Tool Availability, Reporting, Utilization

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41. **Cycle Time and Yield Revisited** (Issue 5.02) Keywords: Yield, Factory Ramp-Up

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46. **Quantifying the Effect of Tool Downtime** (Issue 5.07) Keywords: Tool Availability, Queueing Models, Capacity Planning, Metrics and Goals, Dynamic X-Factor

47. **Real-Time Alerting Based on Fab Conditions** (Issue 5.08) Keywords: Wafer Size, Alerts, Time Constrained Processing, Tool Availability, Capacity Planning

48. **Analyzing Capacity Using MES Data** (Issue 5.09) Keywords: Capacity Planning, Wafer Size, Paperless Fabs

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50. **Product Mix and Cycle Time** (Issue 6.01) Keywords: Product Mix

51. **A WIP-Centered View of the Fab: Part 1: WIP States** (Issue 6.02) Keywords: WIP Management, Utilization, Metrics and Goals, Product Mix, AMHS

52. **A WIP-Centered View of the Fab: Part 2: Overall WIP Effectiveness** (Issue 6.03) Keywords: WIP Management, Utilization, Metrics and Goals, Paperless Fabs

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54. **The Three Fundamental Drivers of Fab Cycle Time** (Issue 6.05) Keywords: Utilization, Variability, Tool Qualification, Queueing Models, Dispatching, WIP Turns

55. **Cycle Time and Holds** (Issue 6.06) Keywords: Holds

56. **Setup Avoidance and Dispatching** (Issue 6.07) Keywords: Setups, Dispatching, Paperless Fabs, Variability, Metrics and Goals

57. **Cycle Time and Hot Lots Revisited** (Issue 6.08) Keywords: Hot Lots, Theoretical Cycle Time, Queueing Models

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59. **Operational Recommendations for Wafer Fab Cycle Time Improvement** (Issue 6.10) Keywords: WIP Management, Metrics and Goals, Financial Impact of Cycle Time, Fab Management, Factory Behavior

60. **Running Development Lots in a Production Fab** (Issue 7.01) Keywords: Product Mix, New Product Introduction,

Metrics and Goals, Tool Availability, Operators

61. **Operator Variability and Cycle Time** (Issue 7.02) Keywords: Operators, Variability, New Product Introduction, Product Mix, Metrics and Goals, Tool Availability

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63. **Cycle Time Variability** (Issue 7.04) Keywords: Variability, Delivery Performance

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65. **Resolving the Cycle Time vs. Utilization Conflict** (Issue 7.06) Keywords: Factory Behavior, Utilization, Tool Availability, Variability, Lean Manufacturing, Batching

66. **Financial Justification for Cycle Time Improvement Efforts** (Issue 7.07) Keywords: Financial Impact of Cycle Time, Batching, Spreadsheet Tools

67. **Ways that Fabs Create Arrival Variability** (and Cycle Time) (Issue 7.08) Keywords: Variability, Lot Release, Batching, Lot Transport

68. **7 Things You Should Know About Wafer Fab Cycle Time** (Issue 7.09) Keywords: Fab Management, Lot Release, Utilization, Factory Behavior, Product Mix, Operators

69. **In-Depth Guide to Cycle Time Management Resources** (Issue 7.10) Keywords: Fab Management, Metrics and Goals, Operators, Holds

70. **Highlighting Cycle Time Problems for New Products** (Issue 8.01) Keywords: New Product Introductions, Product Mix, Capacity Planning, Operators, Fab Management

71. **What Makes an Effective Morning Meeting?** (Issue 8.02) Keywords: Fab Management, Reporting, Delivery Performance

72. **Estimating Planned Operation Cycle Times** (Issue 8.03) Keywords: Forecast Arrivals, Reporting, Holds

73. **Sources of Variability in Wafer Fabs** (Issue 8.04) Keywords: Variability, Queueing Models, Factory Behavior, Forecast Arrivals

74. **Conquering WIP Bubbles** (Issue 8.05) Keywords: WIP Management, Factory Behavior, Fab Management, Single-Path Tools, Utilization

75. **Cluster Tools in Wafer Fabs** (Issue 8.06) Keywords: Cluster Tools, Linked Tools, Capacity Planning, Simulation, Utilization

76. **Scheduling and Dispatching for Wafer Fabs** (Issue 8.07) Keywords: Dispatching, Cluster Tools, Batching

77. **Wafer Fab Flow Control** (Issue 8.08) Keywords: Dispatching, Fab Management, Forecast Arrivals, Batching

78. **Definitions for Cycle Time Benchmarking** (Issue 8.09) Keywords: Benchmarking, Metrics and Goals, New Product Introduction, Cluster Tools, Batching, Lot Size

79. **A Fab Cycle Time Improvement Checklist** (Issue 8.10) Keywords: Fab Management, Factory Behavior, Metrics and Goals, Cluster Tools, New Product Introduction, Product Mix, Benchmarking

80. **Our Top Recommendation for Cycle Time Improvement: Tackle Single Path Operations** (Issue 9.01) Keywords: Single-Path Tools, Benchmarking

81. **Manual Lot Transfer in Wafer Fabs** (Issue 9.02) Keywords: Lot Transport, Fab Management, Dispatching

82. **Batch Loading Policies for Wafer Fabs** (Issue 9.03) Keywords: Batching, Simulation

83. **Dynamic X-Factor and Shipped Lot X-Factor** (Issue 9.04) Keywords: Dynamic X-Factor, Queueing Models, WIP Management, Paperless Fabs

84. **Paper vs. Electronic Lot Travelers** (Issue 9.05) Keywords: Paperless Fabs, Delivery Performance, Simulation

85. **Definitions for Short-Term Line Yield Metrics** (Issue 9.06) Keywords: Yield, Dynamic X-Factor

86. **How to Extend the Life of Your Fabs? Measure, Monitor, and Control** (Issue 9.07) Keywords: Reporting, Fab Management, Yield, Simulation

87. **Tool State Calculations for Cluster Tools in Fabs** (Issue 9.08) Keywords: Cluster Tools, Tool Availability

88. **WIP Bubbles in Wafer Fabs** (Issue 9.09) Keywords: WIP Management, Fab Management, Metrics and Goals, Lean Manufacturing

89. **Improving Cycle Time during a Downturn, Redux** (Issue 9.10) Keywords: Industry Cycles, Lean Manufacturing, Fab Management

90. **Setting WIP Goals in Wafer Fabs** (Issue 10.01) Keywords: WIP Management, Tool Availability

91. **Correlation in Wafer Fab Data** (Issue 10.02) Keywords: Variability, Queueing Models, Dispatching

92. **Equipment Availability vs. Equipment Uptime and Manufacturing Time** (Issue 10.03) Keywords: Tool Availability, Utilization, Dispatching, Delivery Performance, Variability

93. **Responses to Four Recent Discussion Topics** (Issue 10.04) Keywords: Dispatching, Delivery Performance, Tool Availability, WIP Management

94. **Problems that Stem from Broken Assumptions** (Issue 10.05) Keywords: Dispatching, Tool Availability, Fab Management

95. **Forecasting Lot Completion Dates** (Issue 10.06) Keywords: Forecast Arrivals, Delivery Performance, Factory Ramp-Up, Industry Cycles

96. **Using Short-Term Indicators to Improve Long-Term Performance** (Issue 10.07) Keywords: Metrics and Goals, Reporting, Forecast Arrivals

97. **The Hawthorne Effect Revisited** (Issue 10.08) Keywords: Worker Behavior, Operators, Fab Management, Dispatching, Hot Lots

98. **Improving Factory Cycle Time through Improvements at Non-Bottleneck Tools** (Issue 10.09) Keywords: Bottlenecks, Utilization, Factory Behavior, Operators, Wafer Size

99. **Product Mix and Cycle Time Revisited** (Issue 11.01) Keywords: Product Mix, Operators, Forecast Arrivals

100. **100th Newsletter Issue Celebration** (Issue 11.02) Keywords: Alerts, Industry Cycles

Extended Subscriber List

In the interest of space, we stopped printing the full list of subscribing companies and universities back in late 2003 (Issue 4.10), when we had 1400 subscribers. However, we thought that some of you might be curious to know a bit more about the range of subscribing companies. Thus we're including below the list of companies and universities that currently have three or more subscribers to the newsletter (113 companies and universities total - another 350 or so companies and universities have one or two subscribers - too many to list here).

Total Subscribers: 2731

Maxim Integrated Products, Inc. (179)
Intel Corporation (144)
Chartered Semiconductor Mfg (87)
Micron Technology, Inc. (79)
Western Digital Corporation (77)
X-FAB Inc.(68)

Texas Instruments (64)
TECH Semiconductor Singapore (61)
ON Semiconductor (58)
Freescale Semiconductor (55)
Analog Devices (54)
NEC Electronics (50)
International Rectifier (49)
IBM (46)
Infineon Technologies (46)
STMicroelectronics (44)
GLOBALFOUNDRIES (40)
Seagate Technology (39)
Cypress Semiconductor (38)
ATMEL (33)
Honeywell (30)
NXP Semiconductors (30)
National Semiconductor (29)
BAE Systems (28)
SVTC Technologies (includes ATDF) (26)
Headway Technologies (25)
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FlipChip International (24)
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Avago Technologies (16)
TSMC (16)
WaferTech (16)
Eastman Kodak Company (13)
Samsung (13)
Cree, Inc. (12)
Integrated Device Technology, Inc. (12)
Medtronic (12)
Soitec (12)
Agilent Technologies (11)
IM Flash Technologies (11)
International SEMATECH (11)
KLA-Tencor (11)
Raytheon (11)
TriQuint Semiconductor (11)
UMC (11)
Global Communication Semi (GCS) (10)
Virginia Tech (10)
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Ben-Gurion University of the Negev (8)
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Jazz Semiconductor (6)
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Nanya Technology Corporation (6)
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Dublin City University (3)
E2V Technologies (3)
FormFactor (3)
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SAE Magnetics (3)
Sandia National Labs (3)

Sapphicon Semiconductor (3)
Shanghai Grace Semiconductor Mfg. (3)
SiGen Corporation (3)
Technical University of Eindhoven (3)
Telefunken Semiconductor (3)
Toppoly Optoelectronics (3)
University of Virginia (3)
Wright Williams & Kelly (3)

Quite a snapshot of the semiconductor industry, isn't it? It's hard to say for sure how many fabs are represented, since some of these companies have many fabs, but out guess is that FabTime newsletters make their way to something like 500 fabs around the world each month, large and small, along with various other support organizations and universities. Many thanks to our subscriber base, for giving this newsletter such a global reach, and such a diversity of perspectives.

Conclusions

When we started the FabTime cycle time management newsletter ten years ago, we said: "The purpose of this newsletter is to build a community of people who are interested in cycle time management, and give these people a way to communicate with each other and share new ideas. We're also trying to better define cycle time management as a category within manufacturing management, because we think that it's an important area." Mission accomplished, I'd have to say.

I don't think that we ever anticipated a day when we'd be sending out our 100th issue, to more than 2700 subscribers from around the world. We're grateful to everyone who has taken the time to subscribe to this newsletter, now and in the past. And we're especially grateful to those of you who have taken the initiative to write to us and to contribute to the subscriber discussion in the newsletter. I think that one of the things that's helped keep the newsletter going all these years is that it's not just about what I think, or what Frank thinks, or what our friends think. It's about the issues that affect all of you, out there working in and supporting the semiconductor manufacturing industry. Thanks for keeping us on track.

Here's to 100 more issues! -- Jennifer

Closing Questions for FabTime Subscribers

As you might imagine, after 100 issues, it gets difficult sometimes to continue coming up with new articles. Do you have any topics related to wafer fab manufacturing performance improvement that you'd like to see us cover in the future? Are there other format changes (like the addition of the keywords) that you think would help to make the newsletters more useful? We welcome your feedback.

Acknowledgements

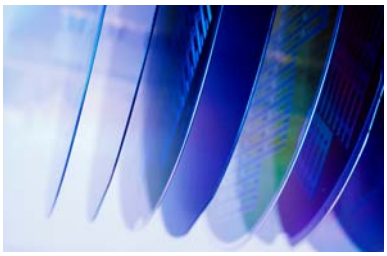
Many thanks to Detlev Glüer from GlobalFoundries for the suggestion of adding keywords to the newsletter issues. Thanks also to FabTime's new associate, Teresa Fallwell, for her help in compiling the keyword information.

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.

To subscribe to the newsletter, send email to newsletter@FabTime.com, or use the form at www.FabTime.com/newsletter.htm. To unsubscribe, send email to newsletter@FabTime.com with "Unsubscribe" in the subject. FabTime will not, under any circumstances, give your email address or other contact information to anyone outside of FabTime without your permission.

FabTime® Dispatching Module



Dispatch Configuration and Support

We offer our dispatching and planning modules together for a single, fixed monthly fee (on top of your regular FabTime subscription). This includes:

- Dispatch rule and factor configuration via user-friendly web-based interface.
- Training.
- Dispatch list feed to the MES (if applicable).
- Support and upgrades.

Dispatch Factors

- Batch code at the current tool.
- Lot priority.
- Downstream tool priority.
- Current tool FIFO.
- Current tool idle time.
- Downstream batch efficiency.
- Critical ratio.
- Earliest-due-date.
- Current step processing time.
- Remaining processing time.
- Current step qualified tool count
- WIP level or staging time at downstream tools.
- Up to 20 other site-specific factors.

Interested?

Contact FabTime for details.

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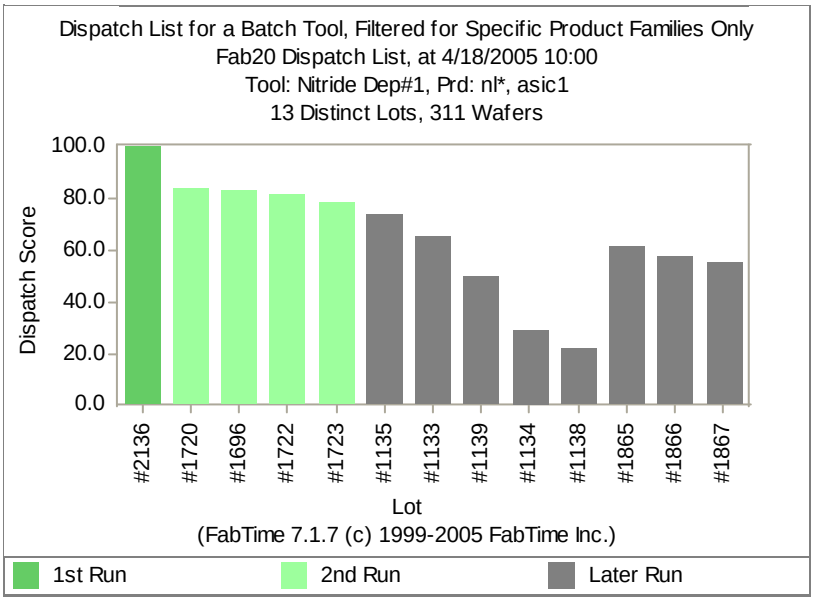
Fax: +1 (408) 549-9941
Email: Sales@FabTime.com
Web: www.FabTime.com

Do your operators make the best possible dispatching decisions?

- Do you struggle to balance lot priorities and due dates with tool utilization and moves goals?
- Do your critical bottleneck tools ever starve?
- Do you use standard dispatch rules, but feel that your fab's situation is more complex, requiring custom blended rules?
- Do you know how well your fab executes your dispatch strategy?

FabTime's dispatching module is an add-on to our **web-based digital dashboard software**. At any point, for any tool in your fab, FabTime will show you the list of all lots qualified to run on that tool. This list will be ordered by the dispatching logic that your site has selected for that tool. This logic can use standard dispatch rules such as Priority-FIFO and Critical Ratio. However, you can also create custom dispatching logic using any combination of dispatch factors (shown to the left).

You can display dispatch lists in FabTime, and/or export them back to your MES. FabTime also includes a dispatch reservation system to hold downstream tools when a lot is started on an upstream tool, as well as dispatch performance reporting.



FabTime Dispatching Module Benefits

- Ensure that wafers needed by management are in fact the wafers that are run, while requiring less manual intervention on the part of management.
- Improve delivery to schedule, and the display of performance to schedule.
- Document the dispatching logic used by the best operators and make this available to all shifts.