

Rapid Returns on Cycle Time Investments

Jennifer Kalmbach - agileTCP

The Need for Cycle Time Improvement

The need for reduced cycle time has never been greater. Semiconductor end markets have gradually moved from defense, to business, to consumer. One of the largest markets now for consumer products is teenagers, whose desire for a new gadget can change monthly ... if not by lunch. To respond to the market demand, fabs have to be agile, able to change product mix and volume rapidly to hit the maximum unit-selling price while the market is hot. To guess wrong on market timing due to slow cycle times, poor yield or equipment downtime can result in loss of market window, which translates to loss of market share.

300 mm Next-Generation Fab Solutions

Industry groups, such as International SEMATECH Manufacturing Initiative and SEMI, have recognized the need for agile fabs and have focused their efforts on new initiatives such as 300mm Prime and 300mm Next Generation Fab architectures. Last year, results from a survey conducted by SEMI concluded that chip makers demand cycle time improvements. Likewise, in the recently released ISMI 300mm NGF Guidelines for predictive, preventive, condition-based equipment maintenance (PPM) and tool monitoring, are key elements of a

comprehensive solution. Industry experts, such as Arie Greenberg, Qimonda; and Elizabeth Williamson, IBM, speaking at ASMC and SEMICON West, respectively, have emphasized equipment uptime and performance as major factors in improving fab utilization and cycle times.

Cycle Time and Tool Maintenance

As mentioned, equipment performance directly impacts cycle times. Unscheduled downtime and equipment maintenance, as well as variation in mean time to repair (MTTR), are major contributors toward reduced cycle time. While some solutions clearly reside with the equipment manufacturer in designing new equipment and software to meet the demands of 300mm NGF, many fabs are running more mature or legacy equipment. Much of the responsibility of keeping this equipment running at optimal performance resides with the equipment team that monitors and maintains tool performance on a constant basis. Even optimizing the performance of newer equipment with good diagnostics capability is a nontrivial challenge. Tools cannot fix themselves.

The Heart of the Problem

Assumptions hurt. We don't often know what we don't know. Highly skilled, effectively trained technicians are vital in successful and lean manufacturing. The knowledge

base must be measured. We have seen that optimal performance is maintained by a team who understands the fundamentals of engineering and basic mechanics of operations. A technician who can rapidly diagnose a complex problem using fundamental knowledge is a key part of the equation.

Unfortunately, some of these basic skills required can be lost over a period of time. In some cases, comprehending the nuances for operating and maintaining a complex semiconductor tool has not been passed on to the current staff or shared across all shifts. Often, technicians, through lack of training, may misdiagnose, miscalibrate or simply miss the problem solely because they didn't know to investigate the issue. Or in other cases, it may be as simple as the wrong screwdriver size. Stripping out a screw on the chamber head cover can frustrate even the most experienced technician.

Even the best maintenance manuals cannot anticipate all of the issues that may occur with a complex piece of equipment. However, an experienced, well-trained technician, armed with the industry best known methods (BKMs), can anticipate or predict the problems before they occur.

Investing for Cycle Time Improvement

While waiting for industry standards and initiatives to make their way into equipment design and fab architecture, there are immediate investments that can be made for rapid payoff. Improve your yield and output through educating and measuring those who are wrenching on the tools. Return on investment analysis shows that investment in education and training on fundamental skills can bring a rapid return in improved

productivity and reduced cycle time. Monthly dynamic cycle time improvements of 2-5 percent or more have been shown, purely by investing in strategic training with site-appropriate mode of delivery.

Investment Risk

How often has a process engineer worried about the gamble of upgrading software on a high-value piece of equipment? What is the measured impact of a few hours of unscheduled downtime? A day of downtime? Longer? Tens to hundreds of thousands of dollars can be at stake in what may be seemingly simple software or hardware upgrades. Contrast this with the risk of providing solid, hands-on training in fundamental skills for equipment maintenance and operations. It can be applied anytime, without scheduled or unscheduled downtime – the payoff is immediate but the impacts are long term.

How It's Done Assessment and Analysis to Measure Organizational Knowledge

Designing, developing and implementing a comprehensive training plan to achieve business objectives is nearly impossible without measuring the existing skill levels of the organization's personnel. The analysis of this data helps the organization determine a roadmap for targeted technical training for the purposes of raising the knowledge base to required levels of competency. Give them what they need. *Only* what they need. Too much is wasted in off-the-shelf, 40-hour, drinking-from-the-hose, hope-they-catch-it-style training. Be strategic in what you feed your team. Don't waste their time or your money!

Sustaining the Investments

While the term “train the trainer” may be overused in industry, it is a key element in the process. The knowledge management company builds a core curriculum around the resident expert’s knowledge, the site’s BKM’s and industry standards. Along with the training, it helps to create or update preventative maintenance checklist guides and job aids so that the resident experts in the fab can develop and train the team long after the original trainer has gone.

Challenges and Obstacles

Buy-in. Just say the word “assessment” and you can hear the rumor-mill generator spin into overdrive. Ensure all are aware of the purpose for the assessment, to establish a baseline of skill sets to be shared across all areas and shifts, thus creating a stronger equipment team.

Key challenges to overcome during implementing such a system are basic – we are dealing with people, not just the machines they operate. A wide range of skill sets complement the factory flow when properly profiled. Regardless of a technician’s training, age or background, there can be a distrust of the goals and purpose of embarking on such a program internally. Likely, past initiatives to solve problems in education and in maintenance have been launched – and depending on how the assessment data was used and on how well follow-through was done, some healthy skepticism can remain. It is essential for the staff to gain the trust of the company and management’s intentions and roles up front. The trust is gained through protecting the privacy of assessments and follow-through on delivery and promises. Calling all management: Let your “yes” be yes and your “no” be *no*.

Residual Benefits

In addition to the rapid, tangible benefits from improved cycle times and better tool and fab performance, there are many benefits to investing in worker education. The ability to grasp deep-seated knowledge of semiconductor tools physics and engineering provides your teams with greater morale, balanced confidence and stellar employee retention.

How To Get Started: Maximize Time on the Line

Get started rolling out a detailed, targeted skills assesment for the operators, technicians and engineers in your fab. Determine the key issues and build a roadmap to success in solving fundamental problems. Partnering with a knowledge management company with experience in developing an end-to-end program in the development of your internal program provides a jump start toward your goal of improved fab performance and cycle time reduction. Improve your cycle time through an intelligent workforce. Investing wisely in your factory’s greatest asset – your people – will help you realize your goal of improved fab performance and cycle time reduction!

About the Author

Jennifer Kalmbach

Jennifer Kalmbach is agileTCP’s global engagement manager, focusing on cycle time improvement programs in both aging and next-generation fabs. Her specialty is identifying and fulfilling site-specific customer goals through equipment manufacturing, maintenance and workforce development.