Achieving the Required Productivity at the Lowest Cost

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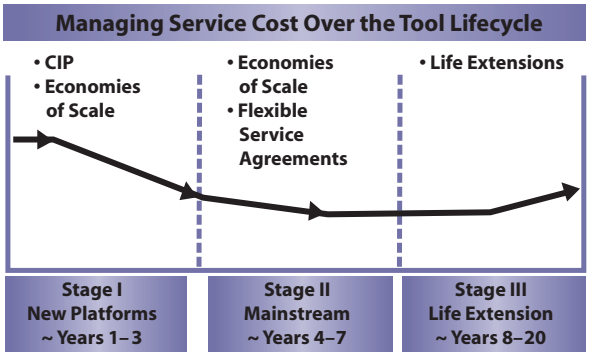
KLA-Tencor
Accelerating Yield

Fabs today are facing the severe price pressure inherent in a consumer-driven market. Success depends on maximizing revenue at the lowest cost. Fab managers agree that to achieve operational excellence—tracked by such metrics as fab output, yield, cycle time, and cost per wafer – they must balance three critical components: productivity, performance, and operating expenses.

For example, matching process control tools with advanced specifications can reduce cycle time and increase yield when coupled with an appropriate sampling strategy. However, if the tools are not properly maintained or calibrated the benefits to cycle time or yield may degrade. In other words, focusing on operating cost reduction, a necessity in today's environment, without taking into account the impact on productivity and performance can actually result in higher overall costs by negatively impacting the fab's operational excellence.

Most process tools demand frequent maintenance as parts erode, by-products accumulate, and process chemicals are replaced. However, the situation is different for metrology and inspection tools. They have few consumables and have a much lower frequency of scheduled and unscheduled events. However, when they do fail, they require unique expertise in optics, image processing, precision stage control, and software. In addition, complex supply chain challenges must be overcome due to the low usage, high mix parts environment inherent to inspection and metrology tools. Supplier service engineers are typically needed for their expertise and best delivered through service agreements with defined coverage, engineer response time, and parts stocking and delivery. All attributes of the agreement are typically optimized to provide the required tool productivity and performance. To address the pressure for cost reduction, opportunities exist to achieve cost-effective productivity and performance over the lifecycle of the fab, tool, and application.

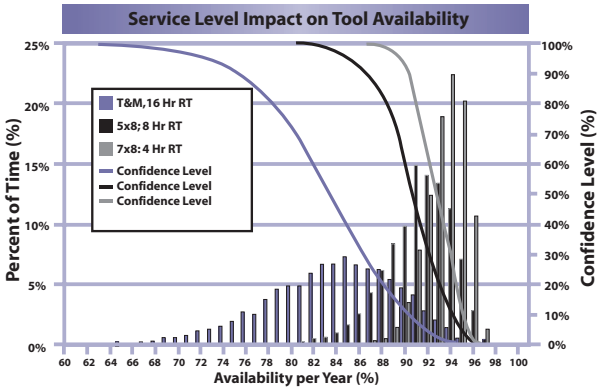


Semiconductor capital equipment typically goes through three stages during their lifecycle.

Early in the equipment life cycle, new inspection and metrology tools require the highest levels of sensitivity, cap rate, and precision in order to support leading edge processes.

Availability and matching are critical as higher sampling rates are typically required in the early stages of a new process or fab ramp. Service agreements with 7x8 coverage, fast response time, and local parts availability ensure high levels of tool productivity and performance to help the fab reap the benefits of a faster ramp. Moreover, hardware and software evolve rapidly during this period. Participation in a continuous improvement program ensures timely installation of updates that improve productivity and performance while reducing service cost. As the fab adds tools and reaches full production capacity, it benefits from economies of scale. A larger install base spreads the costs of experts and supply network to reduce cost on a per tool basis.

After several years when a process and its associated tools are fully ramped the emphasis shifts to maintaining process stability. Mission critical tools may still need a high level of service, however, less critical or lower complexity tools can benefit from the cost savings of reduced service levels.



Higher service level translates into higher availability and less variation.

Lastly, mature tools must continue to support older fabs for at least 15 to 20 years. Due to the low parts usage in inspection and metrology tools, the cost tends to increase with age. Many parts require expensive lifetime buys or even redesign and qualification by the tool OEM due to sub-component end of life by their suppliers. Extending tool life maintains lower costs for a fab through avoidance of capital spending.

Today, fabs are under tremendous pressure to reduce costs. However, fab cost (operational excellence) does not just include operating expenses such as tool service agreements, but also the expense of not optimizing system productivity and performance, which translates into lost output, cycle time, or yield.

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