Reducing Capacity Loss with Workload Balancing

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Today's semiconductor industry is a capital-intensive industry that is somewhat cyclic in nature. It is during a down phase of these cycles, this capital intensive industry feels shocks from any inefficiencies in the operation which are amplified several times over.

Simple business sense dictates that such an industry needs to maximize its production with available capacity in order to make the most of every dollar spent. Production capacity can be lost as a result of many avoidable and unavoidable reasons. Some inherent capacity loss factors are product mix, basic nature of reentrant flow, process time windows and rework to name a few. Controllable capacity loss factors are yield loss, equipment dedication, number of hot lots in the system, staffing availability during and at the end (or beginning) of the shift. Typically semiconductor factory capacities are calculated based on machine capabilities. However, on numerous occasions we find these very machines sitting idle waiting for lots to be loaded or unloaded.

If this idle time is occurring on a non-bottleneck tool within acceptable duration then it may not decrease overall capacity of the plant. But, on many tools, excessive idle time results in lost capacity and lost opportunity to make revenue. In this paper, a tool and a business process is illustrated to control loss in production due to operator availability.

The tool illustrated here works at two levels. At a macro level it tries to balance available staffing to various work areas or "bays" according to short and long term WIP conditions in those bays. This staffing allocation is tried over several hours to see the effect of variation in WIP vis-à-vis efforts to change staffing allocation.

At a micro level, it tries to assist the staff that is assigned to a bay by indicating to them priority of tasks that are to be carried out in a clear and understandable manner. Such a prioritization is intended to assist associates working in the bay to take care of the tasks in the order of their impact on certain measurable goals.

Result of this two-tier approach can be made available to associates in a manner that is easy to understand and easy to customize within certain limits. Therefore, it is also an intent of this work to build an interface that uses the two-tier approach to balance workload among associates in an easily understandable and user-friendly, interactive tool.

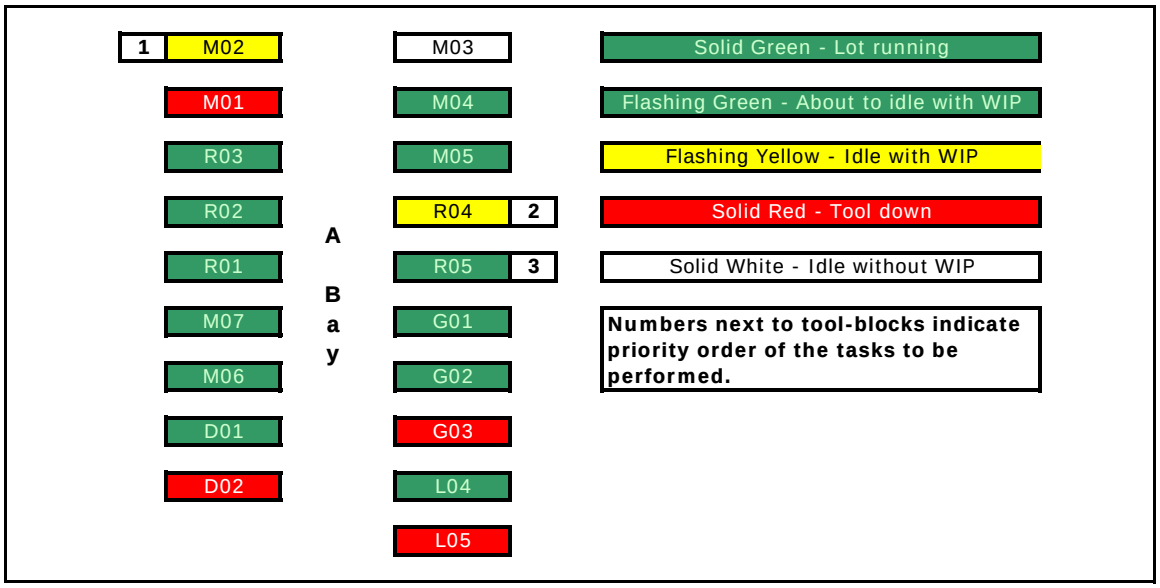
Macro-level workload balance:

This is first stage of staffing allocation wherein workload due to immediate tasks and other planned tasks is calculated. This overall workload is then used to assign available staffing to various bays.

Update Time	4/7/2006 9:00		
Refresh Time	2 hours		
Available Staffing	10		
	Bay A	**Bay B**	**Bay C**
Immediate task workload (minutes)	12	19	8
Other planned workload (minutes)	96	144	62
Total workload (minutes)	108	163	70
Staffing Allocation based on above workload	**3**	**5**	**2**

Micro-level workload balance:

In second stage of this procedure, set of tasks are identified and assigned priorities based on their potential impact on loss of capacity.



The authors believe that this combined approach of providing a more dynamic guideline to re-distribute labor and providing the associates with a live visual control indicating priority for multi-tasking, minimizes the probability that expensive capital equipment is non-productive due to labor. A secondary result is the reduction in "non-value added" activities an associate has to perform overall. The approach is inline with synchronizing labor, machine, and material to achieve output, reduce variability and achieve lean manufacturing.