Facilitator Notes from the LeanMan:

The LeanMan Deluxe PLUS Heijunka Simulation is a complete Lean Principles training package. The “Leveling the Waves” presentation presents an alternate way of approaching the function of master scheduling and planning for a lean manufacturing environment.

Heijunka is for mixed-mode production, so by definition, all models produced in the work cell controlled by the Heijunka box must meet the criteria established for the production line, i.e., uses same technology, requires a subset of the same resource requirements, meets a multiple of the flow rate requirements, and so on, plus it must have a turn rate such that several of them can be produced inside one pitch interval or time period. That way a mix of several models can be broadcast from the line to meet demand within one interval.

The first step, after reviewing the “Leveling the Waves” presentation, is to establish a capacity plan for each model. The plan results in the specific resource "puzzle shape" for each model and allows the team to determine how to mix the different shapes into a pitch interval, and how many of each can be produced in a particular time period. The time period is the top to bottom "column" in the box, with each slot in the column a different model. So, if you determine a mix of AABD is valid (the allowed time is sufficient to produce 2 AA and 1 B and 1 D), there would be two A cards in the top slot, one B card in the second slot, and one D card in the fourth slot. The team should pull from the top and work down the column building each model as defined by the card. When complete, the team moves to the next time period which is the second column, and repeats from the top down.

In the real world the time period may be a shift, or a week. I have used this technique using a cadence of half-shift, so every 4 hours the team knows they should shift to the next column. The team members, regardless of their physical distance from each other in the shop, can visually see the wall clock and determine if they are ahead or behind schedule by a glance at the clock. The planners who insert the cards into the box typically work a few days ahead of the flow so the team can also see their expected work load a few days out which allows them to plan personal time off when it won’t interfere with production schedule. The advance plan of a day or two also gives the planners the ability to reschedule and remix models every half day if necessary, as long as they stay at least one pitch ahead of the work. So when you produce AABD, the second A may have be requested at a time after D, but both will be produced in the same interval so neither customer should care that the A was pulled ahead of the D.

The tables used in the presentation excel file provide a discussion on progressive thinking stages the team might go through as they relate the total process touch time to the assignment of process steps performed by each person. The excel chart totals the individual touch times and provides a sum which is compared to the takt time and desired pitch interval. It's an iterative process of crafting a flow with balanced distribution of labor such that the constraint labor point is still able to produce at least the desired number of toy cars. You rarely get it right the first time. The thought process continues over and over as bits of labor are shifted between the labor points to create balance without giving up the minimum number of each car. The iterative process cycles until an optimum balance is designed by the team, and usually requires the team perform a run or two to verify performance. In the real world, the same approach is used as the team and the planners work to optimizer the planning rules (puzzle shapes and quantities) until the team is assured it can keep pace with the demand.

The basic issue with Heijunka sequencing is that the schedule it produces is not as finitely controlled as a fixed rate single model line so you can't just have a planner create it alone in a vacuum, it requires team participation. It is also not likely to utilize resources at 100% like a single model line. But the flexibility it provides and the overall reduction in finished goods levels offset the efficiency waste that one or two of the models might introduce to the work cell. You give up a little work cell efficiency, such as stopping the line early on one model or on the last pitch for the week so you don't overproduce, but you gain big in overall value stream. So, you should step back from the point process, take a look at the bigger value stream, and see where you might be able to convert that excess resource into another use, such as completing a 5S support function.

In the situation where cars might be over produced, the task is to either balance the labor if possible; or remix the schedule if possible; or reduce the number of people and rebalance labor if possible. Keep working one constraint against the other. Perhaps one model should be thrown off the team and produced in a fixed schedule method and use the Heijunka method for the remaining models. It's important that there is a good fit of resource, materials and capacity for each model added to a mixed-mode work cell. If the things you can control within the team become the limiting factor and you still overproduce, then begin looking at the value stream ahead and behind the operation for the possibility of absorbing some of the support functions into the team to balance the stream. It's sort of a question of rather it is better to have 4 workers carry the same load, even if it's only 85% capacity, or have 3 workers maintain 95% capacity and 1 worker provide 55% for this team and perform another task elsewhere the remaining time.

The two simulations provided with the kit are intended to show the leveling that the Heijunka method can provide when comparing fixed versus random inputs. The next step is not provided, but is implied for the team to rethink the simulation by using lean principles to provide a “tuned up” third simulation of your own design. You might start with the 5S concepts as something that consumes team resource and could be worked into the flow such that it is performed in the background (like during a machine cycle) with no interruption to production flow rates. Look at the value stream and attempt to reduce the effect of the non-value adding but essential activities that we call incidental waste. Sometimes a little repositioning of workers, tables or materials provides a little help. Look at taking on another product model or detail feature that can be produced by the team without impact to existing demand.

The repetitive idea behind Heijunka scheduling is to maintain the rhythm of flow. Each worker gets into the cadence and intuitively adjusts his or her timing to match the beat of the drum over several pitch increments. In the simulation, this is provided by the "timekeeper" moving at a fixed rate across the top of the box to provide a visual cue. Cadence assures capacity and delivery. In real situations, it can be the repeating sound of some machine clacking or the wall clock overhead, but it is important to maintain cadence and not adjust production speed according to rather or not one model might be over produced. So a buffer is sometimes added. If all models are in balance but one, and it is going to be over produced by the end of the last pitch, then create a repetition mix like AAABBC AAABBC that provides best balance and best delivery to meet all demand, and drop out the over producer model from one pitch at the end of the week (or shift) and fill in the time with another support function. You will only over produce that one model during a very short period, but then recapture schedule after another short period of time. Thus, you create a small inventory buffer for a small time increment, usually less than one pitch, rather than loose cadence.

Good Luck

The LeanMan.

