Manufacturing Review

Volume 22, 2008

Channel Flow

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We often work on difficult applications of Lean Principles and find that sometimes (not very often); we must deviate from the standard applications. This week was the second time in the last decade that I had to deviate from the standard Kanban application in order to eliminate the waste of over processing (in the name of Lean). Our client had an excellent implementation of a pull system through a number of batch processes, yet they were always frustrated and disappointed in the excess lead time that the process took to "cascade" the signal through the upstream processes to get the parts through these processes.

Now let me add that the "excess" time was always within 16 hours! In their current state, however, almost 320,000 parts sequenced through these batch operations every 24 hours. Imagine handling the Kanban cards and managing the pull system through a system of sequenced pull that can fit 75 to 100 parts per bin and circulating 3500 bins through these processes to make it flow in small batch sizes through multiple operations. Does this task sound more difficult than your own Kanban system? I assure you it was; and, in addition to the hundreds of Kanbans, discrete issue process parts numbering 14,000 plus had to be handled by work orders. Sometimes Kanban can be more difficult than its output results warrant. I remember very well when one of my Sensei's from Toyota had dinner with us in 2000. Mr. Niwa was an "architect" of the first Kanban systems in Toyota. He kept reminding us that Kanban was a band-aid for a deeper problem. His statement kept ringing in my ear that, "we should have just worked harder on one piece flow".

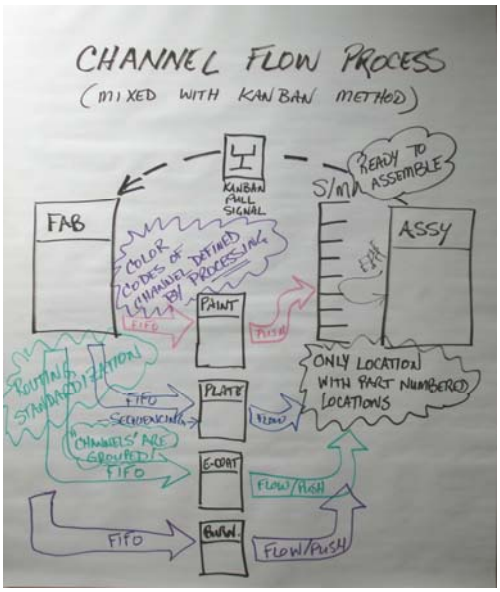
With the mission of simplification at task; this is where the origins of "channel flow" begin. Many companies cannot just pick up and move all of their equipment. Channel flow is a modification of Kanban systems that enables the fastest feedback to the upstream supplier of a process series that can vary into multiple paths. All of these processes are defined by multiple batch loops. The complexity of such a system, and the necessity to ensure parts follow only their designated paths, is a major problem for quality flow and ensuring all parts get only their specified steps without fail (and never

get over-processed either). The only way to assure such process control would seem to be one of two alternatives…neither of which is simple.

One alternative is the old-fashioned "traveler" card for those of you with a little "gray hair" might remember. The parts were routed by material handlers or expediters through each process and when the process-operator had finished with the batch, they signed- off on the process card router card. This required lots of transactions and waypoints for inventory to be tracked and "nurtured" through the correct processes by material handlers. Undoing these traditional steps is why we all learned Lean.

The other "more lean" solution is to create multiple Kanban loops with part number specific locations and kanbans that would allow parts to progress step-by-step through the appropriate processes from pull supermarket to the next step. However, management of the system, and the multiple loops of kanbans, created untenable lead times and complexity for this company. Also the amount of space consumed by these supermarkets was outrageous in their high volume multiple part number complexity.

Few Lean Thinkers know of the seldom-used solution of Channel Flow, also known as, structured flow from the late 70's and early 80's. This tool was used by many companies that were just learning this thing call Just-in-Time. This was in the time before a truly-Lean enterprise was bold enough to completely convert their batch processing into one-piece-flow cells. It was expensive (and career limiting or risky) to pick up all of your machines and move them into flow paths as defined by the tool of Routing Standardization.



I had a unique understanding of channel flow years ago as we converted from batch and queue machining processes that were centralized by processes into rough turning and finish turning areas, through heat treat, grind, hone and finally to assemble in a high volume machining environment. So how does one execute the flow paths of Routing Standardization without picking up each and every machine and placing them into defined flow cells?

There is a technique that was simple, logical and error proofed to ensure proper process-step control for each and every part by using colored flow paths. "Channel Flow" did not require multiple Kanban loops, keeping the build signals to upstream processes simple and sure. (Always remember that the first choice for implementing

Routing Standardization is to execute process flow by moving machines.) Channel Flow will always be a lesser alternative.

Step one is to complete your routing standardization by properly taking the top 80% of your volume by part number and segregating the part number by common routing and detailing these processes. Never before, have I had to use more than five flow paths to balance the work through the "virtual cells" or flow path "channels".

Once this first step is complete, assign a color code to each flow path…I recommend staying away from the color red due to its bad connotations. Keep it always reserved for scrap or urgency, whichever, is the local practice. Now that you have color specific flow paths, you can paint flow lanes on the floor, or assign machines by painting the flow path color on each machine. I have seen everything from stripes on the floor to entire machines painted, or colored flags at each process step. Now all of those parts assigned to that flow channel need only to be designated by color cards or colored bins to ensure their step-by-step advance from process to process. This provides the mistake-proofing simplicity and common sense first-in, first-out (FIFO) necessary to ensure parts never go idle or dwell in obscurity of the "lost part" dust collection stages.

Each operator after processing his/her FIFO lane only must know to "flow" or "push" the parts into the subsequent process's FIFO lane. This is NOT a push system, because no parts will get requested unless there is a FG's pull signal. All parts must flow in a FIFO lane to ensure timely delivery. The rules of channel flow systems are short and simple for everyone in the organization to understand and follow. Good luck, but remember one-piece-flow is always better!

Rule 1 The first process step is only called for when a pull signal or Kanban signal is sent back from the FG's pull or last process in the channel flow.

Rule 2 Color defines the flow path and maintains our quality assurance that no step is missed in the standard routing of that part family.

Rule 3 No part number specificity is required in any of the batch flow processes. In other words, there is little, to zero, set up required for heat-treat, paint, or plating type operations.

Rule 4 If a process is an actual constraint in the flow channel, then a sequencing system must get created to allocate that resource equally across multiple flow channels. This is much like weighting consumption (mixed model leveling) by percentage of volume of part family. Note that some batch processes can process some part families faster than others. Hanging patterns for paint, density, volume, or batch size considerations will enter into the allocation percentages.

Rule 5 First in, First out! Expediting is like a drug. Be careful once you begin, you may not be able to control yourself.

Caveats and notable risks

1. Batch operations become “blind” to the true customer demand. They must trust the pull system of FIFO.
2. If the upstream process over-produces and creates a “glut” of one channel’s parts, then other parts will be trapped in a waiting pattern and could become late. Overproduction without the pull signal must be strictly forbidden.
3. Process flow is defined by color NOT part number. FIFO system restricts the practicality to expedite. Lots of supermarket space can be reclaimed since NO empty spaces need be reserved. Supermarket methodology creates “white space” not in use because every part number has a slot. Much greater density of part flow can be achieved in a FIFO flow rack preceding each batch process; however, parts must get located in the final ready-to-assemble (or FG’s) supermarket for pull signals to work. Make the parts constantly move first in, first out and let them rest only when they are in the final state of readiness for assembly or sale.
4. Constraint operations must have a mixed model sequencing plan. You must not allocate too much process time to any one channel. Apportion processing by volume percentage or in accordance with batch size and volume percentage proportions.