Auto Kanban

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INTRODUCTION

Have you implemented kanban yet? Have you abandoned it, or been unable to roll it out? Many companies who begin kanban implementation struggle to finish the job. They not only are unable to answer the following questions, in too many cases these questions are not even asked:

- How can we use kanban when we have long lead times, batch production, or long travel distances?
- How do we convert customer demands into the minimum inventories (supermarkets) required to support maximum material flow?
- How do we maintain correct supermarket sizing to reflect inevitable changes in customer demands, product development, engineering designs and production processes?
- How do we obtain the advantages of visual signals on a high volume of parts without having to maintain hundreds or thousands of kanban cards?

For the past fifteen years, on hundreds of kanban implementations, we have helped our clients to address these issues. With AutoKanban, we can also help you to:

- Define the information requirements to quantify your kanban system
- Design the data downloads required from your mainframe manufacturing system
- Develop a model of your supermarkets which can be updated in minutes
- Design electronic, visual signals to schedule your shop floor and outside suppliers, including:
    - Family groupings to minimize operation changeover times
    - Visibility of internal and external customer inventories
    - Fine-tuning of production priorities with visual controls
    - Immediate updating of visual controls when supermarkets are remodeled

The AutoKanban system is implemented in several major steps. We begin with a determination of demand rates for shippable end items, as well as whether or not each item is to be supported by kanban. Second, the end item demand rates are exploded through a bill of materials and summarized to decide which components are kanban and to set demand rates for components. Third, a model of your supermarkets is constructed, based not on theory, but on your ever-changing supply and demand constraints. The final component is an automated visual display of supermarkets and production priorities for both your internal and external suppliers.

MANAGING DEMAND

End item demand rates are usually calculated based on some combination of historical shipments, customer order backlog, and market forecasts. Systematizing this process simplifies the recalculation of kanban supermarkets as demands change. **END ITEM RATES** shows the forecasted demand for seven end items. Based on the average weekly forecasts, and the repetitive nature of each end item, the master scheduler has determined that items 100001, 100004, and 100007 should be supported by component kanban supermarkets, and has set the Weekly Pull Rate of demand for each item to be used in the supermarket calculations of its components.

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END ITEM	KANBAN?	WEEKLY PULL RATE	FORECAST							
			WEEK 1	WEEK 2	WEEK 3	WEEK 4	WEEK 5	WEEK 6	WEEK 7	WEEK 8
100001	KANBAN	4500	3280	3650	3640	4470	5820	3330	5400	5870
100002				260	20		70			40
100003			10	110		420			330	180
100004	KANBAN	500	690	600	340	260	410	570	540	37
100005						170				
100006					110				430	
100007	KANBAN	750	1000	450	850	410	550	1070	840	540

END ITEM RATES

COMPONENT DEMAND RATES

The next step is to explode the weekly pull rates through the bills of materials of the end items. Using a bill of materials explosion simplifies the resizing of kanban buffers when demands, production processes, or product structures change. **PLANNING BOM EXPLOSION** shows the bill of materials explosion for the three kanban end items. To account for commonality among end items, the bill of materials explosion should be summarized to calculate the total demand for each component.

BOM LEVEL	PART	QTY PER	WEEKLY DEMAND
0	PLANNING BOM		
1	100001	1	4500
2	400376	2	9000
2	400377	2	9000
1	100004	1	50
2	400380	1	50
2	400381	1	50
1	100007	1	750
2	400386	1	750
2	400387	1	750

PLANNING BOM EXPLOSION

MODELING SUPERMARKETS

KANBAN BUFFER CALCULATIONS shows the order quantity and order point calculations for the six component items produced for these end items. The key data for calculating the order quantity and order point are the daily demand, the replenishment interval, the replenishment lead time, and the container quantity (See CAPACITY-BASED LOT-SIZING for the replenishment cycle calculation). The order quantity is the replenishment interval in days times the daily rate of consumption, rounded up to a container quantity. The order quantity for ITEM 400376, for example, is 1800 per day times a replenishment interval of 2 days = 3600, rounded up to a multiple of 1000 = 4000 pieces. The order point for that same item would be 1800 per day times a 3-day lead time = 5400, rounded up to a multiple of 1000 = 6000 pieces. Thus, a replenishment order of 4000 pieces of ITEM 400376 should be

released when the on-hand inventory drops below 6000 pieces. The order points and order quantities on the other items are calculated in the same fashion.

ITEM	400376	400377	400380	400381	400386	400387
DAILY DEMAND	1800	1800	10	10	150	150
ORDER INTERVAL DAYS	2	2	10	10	3	3
LEAD TIME DAYS	3	3	2	2	2	2
QUANTITY PER CONTAINER	1000	1000	50	50	200	200
ORDER QUANTITY PIECES	4000	4000	100	100	600	600
ORDER POINT PIECES	6000	6000	50	50	400	400
ORDER QUANTITY CONTAINERS	4	4	2	2	3	3
ORDER POINT CONTAINERS	6	6	1	1	2	2

KANBAN BUFFER CALCULATIONS

DISPLAYING THE SCHEDULE

The AutoKanban **SCHEDULING PANEL** provides an electronic, graphic representation of inventory levels and production priorities for the parts. The red tiles indicate the order point; green indicate the order quantity. These sections are separated by a blue "trigger line". As inventory of an item is consumed, the tiles in its column are changed to yellow, from the top down, to indicate that a container has been emptied. For example, with ITEM 400376, there are 6500 pieces in inventory. Thus three of the authorized ten containers are empty. The remaining red and green tiles are a graphic indication that there are between 6001 and 7000 pieces in inventory.

When all of the green tiles for an item are converted to yellow, that item should be the next one produced. As the table indicates, ITEM 400380 is stocked out, and should be produced immediately. The next priority is item 400386, since the yellow tiles are now below the blue trigger line. None of the other items needs to be produced at this time.

ITEM	400376	400377	400380	400381	400386	400387
ON HAND INVENTORY	6500	8100	0	450	175	425
ORDER QUANTITY						
	1000	1000				
	1000	1000			200	200
	1000	1000	150	150	200	200
	1000	1000	150	150	200	200
ORDER POINT	1000	1000	150	150	200	200
	1000	1000			200	200
	1000	1000				
	1000	1000				
	1000	1000				
	1000	1000				

SCHEDULING PANEL

CONCLUSION

AutoKanban is not a proprietary software system; it is developed for your company using simple tools, such as Microsoft Excel and Access. The data for the AutoKanban table are maintained in a database - not on cumbersome kanban cards, and AutoKanban is interfaced with your inventory system. The data may be refreshed from your master production schedule, bills of materials, and routing files, or the system may be maintained separately. Then, as changes are made to these data, the suppliers, order quantities, and order points for each item are updated automatically.

Since AutoKanban does not require physical kanban cards or trigger boards, it can be easily applied to hundreds or thousands of items at once. The AutoKanban screen is updated in real time as inventories are replenished and consumed, and is displayed on monitors throughout the facility via your company's intranet. It can be accessed anywhere in the plant (and by outside suppliers) to provide immediate visual control of kanban requirements. All of this, without making a single kanban card!

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