Comparing mrp and kanban case study example

Business

Introduction

Material Requirements Planning (MRP) and Kanban control systems are one of the most prominent production planning and inventory control systems of today. These systems are the most popular implementations of push and pull strategies respectively. Speaking of MRP, it is a material control system that tries to maintain adequate inventory levels to ensure that the required materials are available, when needed. MRP is used where there are multiple items with complex bills of materials. It is not suited for continuous processes that are tightly linked.

The major objective of an MRP system is to simultaneously:

- Ensure the material availability, components, and products for customer delivery and planned production.
- Maintain lowest possible inventory.
- Plan manufacturing activities, delivery schedules and purchasing activities.

The production structure records, or bill of materials (BOM), possess information on every item or assembly that is needed to produce end items. Information on individual items such as the description, part numbers, quantity, next higher assembly, lead times and quantity per item, must be available. The inventory status records possess the status of all the items present in the inventory, including inventory at hand and schedule receipts. These records must be updated, and its integrity must be maintained by recording every receipt, disbursement and withdrawal. MRP will decide from MPS and product structure records (BOM) , the gross component requirements. This requirement will then be compared and reduced by the available inventory status records.

Kanban, which is another method for Inventory release, is an important arm of Just in Time and Lean Manufacturing philosophy. It was first devised by Toyota in 1950 as a process for material flow on an assembly line. Over past few decades, Kanban system has transformed itself into a highly efficient and effective manufacturing process, and companies across the globe have been using this technique.

Kanban stands for Kan-Card, which means a Ban-Signal. The base of Kanban concept is that a manufacturer or producer must only deliver components as and when they are needed, so that there is no excess spare inventory at hand. In this system, workstations that are present through the production lines only produce desired components and signals when they receive a card and an empty container, highlighting that additional item will be required in the production. In a case of interruptions and halts, each Kanban card will only produce enough components to fill the container and then stop the process.

Kanban minimizes the inventory levels by acting as a driver to produce more inventories. Since, Kanban is a closed cycle in which orders move from one process to another, the delivery components are ‘ pulled’ into the production lines, as compared to MRP system, where parts are ‘ pushed’ into the production lines.

In Just in time (JIT) systems, the subassemblies and the parts required for final assembly are pulled into small batches from the work centres whenever required. The most popular method of implementing Just in Time is through the use of Kanban. The main advantage of using Kanban process is that it provides quick and precise information and provides quick response to changes. There is also a limit to overcapacity in this process and it avoids

any situation of overproduction in the system. It minimizes waste, full controls can be maintained and it effectively delegates responsibility to the line workers.

Application of MRP with example

We can illustrate the MRP computation through following examples:

(Guillermo, 2010):

Suppose you need to produce 100 units of product an eight weeks from now, where product A requires one unit of product B and two units of product C, while product C requires one unit of product D and two units of product E. How many units of each type do you need? In this example, it is easy to compute the requirements of each item to produce 100 units of product A: Req(B)= 100, Req(C) = 200, Req(D)= 200, Req(E)= 400. Suppose, further that the lead times for the product are as follows. Product A, four weeks, Product B three weeks, product C two weeks, we must have products D and E one week each . Since the production lead time for product A is four weeks, we must have products B and C available at the end of week four. Since product B has a lead time of three weeks, we need to release the production of product B by the end of the first week. Similarly , product C need to be released for production at the end of week 2, while products D and E must be released for production at the end of week one.

A material requirements plan has been developed for product A , based on product structure of A and lead time needed to obtain individual component. Planned order release of the parent item is used to determine gross requirement for its component items. Planned order release dates are simply obtained by offsetting the lead times.

The computation and steps of MRP process are not complicated, they involve simple arithmetic. However, Bills of material explosion must be done with utmost care. The product structure might get complicated , particularly when a given component is used in different stages of the production of a finished item.

The MRP process has following steps:

- Establishing the gross requirement.
- Determining the net requirements by deducting the scheduled receipts and in hand inventory from the gross requirements.
- Time phasing of the net requiremetn.
- Determining planned order releases.

Standard MRP Table

Application of Kanban with example

Kanban has become an effective tool for running a production system as a whole. It is basically a logistic control system that is developed by Toyota company . It uses the demand rate to control the production. Today, Kanban is used throughout the world, several companies provide the best manufacturing practices by combining the best of Kanban techniques.

An example of a simple Kanban system is a ‘ three bin system’, where there is no manufacturing involved. One bin is present on the factory floor, one bin is available on the factory store and one bin is available at the end of the supplier. These bins have a removable kanban card containing product information and other necessary information. When the bin of the factory floor is empty , the empty bin and the kanban card is sent to the factory store, which is the point of inventory control. The factory store replaces the

empty bin at the factory floor with a full bin that was there at the factory store , which also has s Kanban card. The factory store sends the empty bin along with its kanban card to the supplier. The supplier’s bin, which is full, along with the kanban card, is delivered to the factory store. The empty bin is then retained by the supplier.

In this way, the shop will never run out of an inventory and this is a ‘ closed loop’ that provides the exact amount that is required , at the right place and the right time. There will be only one spare bin that provides a cushion for uncertainty and supply constraints.

Source : www. kaizen-news. com

Analysis of MRP and Kanban Systems

Material control systems can be classified into push, pull or hybrid strategies. This case compares the performance of MRP (Push) and Kanban (Pull) for production systems. The main difference between push and pull strategies is based on the principle of how and when are the production orders are released to the work stations in response to the demands.

Considering the research that was based on the performance of MRP /push strategies , it can be inferred that there are three main concerns in push systems. 1. Estimating proper lead times for MRP 2. Deciding on the future requirements for the different components and products. 3. Determining the right quantity of lead time and safety stock that is needed to ensure that the required service levels are maintained for different products.

Kanban Systems:

Kanban is a Japanese word for the term “ signal”. The system of Kanban is based on principles of “ pull” method, that involves keeping the production

lines stocked and filled with the necessary parts and components in the right quantity and at the right time. As the stock is consumed in the production process, the depleted inventory is immediately replaced either through a kanban card or a computerized kanban program.

One of the success factors of Kanban is based on its approach where “ pull’ is generated from the demand. The production of a concerned path is dependent on the actual demand of the customers and not through a pre-meditated planning approach. As compared to a scenario, where supply time is long and it is very difficult to predict the demand, the best alternative is to respond quickly based on the observed demand. This is exactly what Kanban does. The demand is immediately generated in the system and its travels immediately through the supply chain. This ensures that the stocks that are present in the supply chain are effectively utilized and better managed. Moreover, it prevents the use of ‘ extra’ or ‘ unnecesary’ stock and the resulting quantity is small and accurate for the job. If there is a situation where the supply is not able to sustain itself with respect to the demand, additional kanban cards can be placed in the system .

Kanban system is a demand-driven system , and such systems lead to faster turnarounds in productions and results in lower inventory levels, this helps the companies in implementing such systems more often and increases the productivity, making them more competitive.

These days, Kanban systems are also incorporated and integrated into enterprise resource planning (ERP) systems, this enables real time demand generation across the supply chain and improves the efficiency of the system. These systems are known as Electronic kanban systems or e-Kanban systems.

Suggestion on which System is better and why?

In an MRP system, the production quantities and dates and evaluated based on the planned requirements. The necessary quantity and dates of the components are decided by exploding the bills of material. The production quantities can be calculated for various requirements. The dates that are calculated in MRP are the results of a planned run for current production levels even before knowing when the material is required for the subsequent production level. The material is ‘ pushed’ through the production and results in queue time before even the production starts. This results in higher inventory and higher lead times of production.

On the other hand, Kanban works on the ‘ Pull’ principle and material is requested from the supply source only when it is required. This results in a closed loop and Kanban cards are exchanged in the cycle. Each Kanban card represents a specific material quantity , when the card is consumed, it is given the status of being ‘ empty’ and is sent back to the supply source. The replenishment frequency is based on the actual consumption and not the ‘ planned consumption’, which is the case in MRP system. The rate of the circulation of kanban cards depends upon the rate of demand. Thus, there is never more material in circulation than is defined by the kanban in the cycle, and production levels are always in a position to start the production.

According to me, Kanban system is more efficient and effective as compared to an MRP system. In a competitive and cost effective scenario, more and more companies must use Kanban systems instead of MRP , the reasons for this are:

- In multi-tier supply chains, MRP systems distances the manufacturers from their customers, as it is not a demand driven system as Kanban.

- In MRP , the ‘ supply’ information is diluted and processed by each layer of the distribution system. The excessive inventory (minimum inventory in case of Kanban) and costly last minute modifications create pressures on the supply chain.

- There is a huge inventory carrying costs that are associated with MRP systems, this is not the case in Kanban. MRP system is not full proof and can still run out of key parts. This results in delays in production , delay in customer shipments, increase of freight costs and disrupt the plant operations by applying additional changeovers.

- The stock-outs that may occur in MRP systems can lead to an excessive part buying, and this often results into excessive inventory.

- Excessive inventory causes several problems such as wastage of precious resources, working capital, storage space and production time.

- Kanban system, as seen from the case, re-orders parts and components based on the actual consumption scale.

- There can be some issues in a manual Kanban system, when an external supplier enters the chain. An electronic kanban is the solution to this. Information is translated into a barcode, scanned and communicated at each stage of the replenishment cycle, just like a Kanban card.

- Kanban’s ‘ pull –based’ manufacturing philosophy synchronizes the production and consumption with demand in real time.

- This increases on time delivery performance, reduces chances and occurrences of stock-outs and last minute changes.

- Kanban reduces the buffer inventory because of its ‘ closed loop’ cycle. The continuous information flow provides good visibility to suppliers and the customers.

- Beacuse of high visibility and accuracy of the system, excess buffer stock can be eliminated and this results in improved productivity.

- The level of uncertainty of production is much lesser in Kanban system as compared to an MRP system.

Therefore , we can conclude that a ‘ pull strategy’ (kanban) is much more predictable, certain, accurate and effective as compared to a ‘ push strategy’ for dynamic production systems.

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