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# Item Standardization and Inventory Management using Kanban System

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## Abstract

In today's market supply chain management is integral part of any industry. Supply chain management is end to end process in all industries. It is a flow of materials, information and resources from supplier to manufacturer to wholesaler to retailer. Major problems in industry are mostly faced due to poor supply chain management. Reasons of these problems are mainly because of insufficient information, uncertainty in and supply, no proper arrangement to keep the material, wrong track of material etc. To avoid all these problems proper supply chain management is necessary demand. Information technology facilitates smooth functioning of supply chain. The appropriate flow of information is must to run any supply chain. Smooth processes reduce the lead time. In this paper different terms are explained such as Enterprise Resource Planning (ERP), KANBAN, Safety Stock Inventory, Lean Manufacturing etc. The project topic Item Standardization and Inventory management using Kanban system focused on how to improve the delayed at the time of delivery and also find the safety stock, Using this safety stock we show the how to manage the inventory. Let's see the important terms in detail.
**Keywords: SCM, JIT, FIG, DIG, PR, PO etc.**

## I. INTRODUCTION

The best companies in the world are finding a powerful new source of competitive advantage. It's called supply-chain management and it encloses all of those integrated activities which bring product to market and achieves customer's satisfaction. The Supply Chain Management combines topics from manufacturing, purchasing, transportation to physical distribution into one integrated program. Successful supply chain management coordinates and combines all these activities into a smooth and continuous process. It embraces and links all the partners in the chain. In addition to the departments within the organization, external partners include vendors, information system providers, third party companies, and carriers

### *A. Kanban:*

Kanban is a scheduling system for lean manufacturing and just-in-time manufacturing (JIT). Taiichi Ohno, an industrial engineer at Toyota, developed kanban to improve manufacturing efficiency. Kanban is one method to achieve JIT. The system takes its name from the cards that track production within a factory. For many in the automotive sector, kanban is known as the "Toyota nameplate system" and as such the term is not used by some other automakers.

Kanban became an effective tool to support running a production system as a whole, and an excellent way to promote improvement. Problem areas are highlighted by measuring lead time and cycle time of the full process and process steps. One of the main benefits of kanban is to establish an upper limit to work in process inventory to avoid overcapacity. Other systems with similar effect are for example CONWIP. A systematic study of various configurations of kanban systems, of which CONWIP is an important special case, can be found in Tayur (1993), among other papers.

A goal of the kanban system is to limit the buildup of excess inventory at any point in production. Limits on the number of items waiting at supply points are established and then reduced as inefficiencies are identified and removed. Whenever a limit is exceeded, this points to an inefficiency that should be addressed.

## II. METHODOLOGY

### *A. Process Flow*

*1) Step 1:*
As per given in table we find out the standard hardware from the system which is continuously in demand. With the help of Warehouse department collected the all continuously consumed items.

*2)Step 2:*
After that find the last five month consumption and their actual lead time in the system. Because using data we have to calculate average of consumption in last five month, average of lead time, standard deviation of consumption and lead time.
*3)Step 3:*
From the supplier we have taken the standard lead time.
*4)Step 4:*
According to the average and standard deviation of lead time and demand we have calculated combined standard deviation using the following formula and decided the service factor for each item code. And using this both combined standard deviation and service factor I calculated the safety stock. Formula has given below, which is the standard formula for safety stock that is proven by Rutgers University.

Notations for Average demand, Average lead time, standard deviation of demand and standard deviation of lead time, combined standard deviation, service factor have given below:

**The Safety Stock Calculation**

Please review the following notation:

SS = safety stock

k = service factor

Note: number of standard deviations to cover for a given service level

Sc = combined standard deviation of lead time and demand

t = average replenishment lead time

Sd = standard deviation of daily sales

d = average daily sales

St = standard deviation of replenishment cycle

***B. Formula for Combined Standard Deviation of average demand and lead time:***

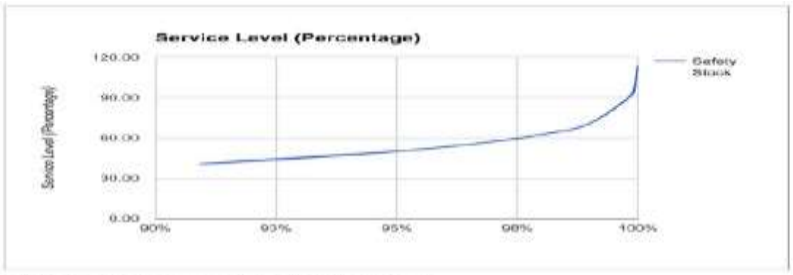
**Step 1: Calculate the Combined Standard Deviation of Lead Time and Demand**

$$S_c = \sqrt{t \times S_d{}^2 + d^2 \times S_t{}^2}$$

**Step 2: Pick your desired Service Level**

This step depends on how much inventory you can carry to prevent a stockout. The higher the service level the more inventory you need to carry. Most companies pick a service level between 90% and 99%.

***C. Formula for Safety Stock:***




**Step 3: Calculate the Safety Stock**

$$SS = k \times S_c$$

*5)Step 5:*
After calculating the Safety stock we had confirmed that how much safety stock we have to keep in the stock. So, Now,we have requirement for a Rack to place that items and manage the inventory.

I had search the supplier who manufactures and install that rack and confirmed four suppliers and arranged the visit of that supplier in our plant to take the measurement and confirm the technical terms.

*6) Step 6:*
At the time of visit, suppliers had taken the all measurement and material weight to decide the capacity of rack. As per that they had given the quotations with design. After that I Negotiate with that suppliers with material quality, Price, payment terms, Transportation cost and Delivery time.

*7) Step 7:*
After Negotiation, We have taken the requisition of rack from warehouse department. I filled Prices, payment terms, freight, qty in that requisition and processed it to our Plant head and Finance Dept.

*8) Step 8:*
After getting approval from plant head and finance dept it comes towards me to create the purchase order. I create the purchase order in the system and sent to the Supplier.

*9) Step 9:*
Material has reached in the premises from supplier within a lead time. After that supplier has installed that rack in our warehouse. The Quantity of the standardize hardware we had already ordered that material was in our premises. The ware house staff unloaded that material in the particular compartment of rack against given item no on the rack. Rack constructed like, it has given two compartments, and one for safety stocks another one for consumption stock.

## III. RESULT AND DISCUSSION

| *Item No* | *1A1704NXXX* | |
|---|---|---|
| | *Demand* | *Lead Time* |
| *Aug-18* | *2500* | *35* |
| *Sep-18* | *2450* | *33* |
| *Oct-18* | *2300* | *26* |
| *Nov-18* | *2700* | *27* |
| *Dec-18* | *2550* | *30* |

In Demand column, last five month orders qty we have taken to calculate how much safety stock and how much consumption stock we need. In lead time column supplier actual lead time has given. It means that on that day supplier has delivered material and warehouse dept had done the GRN.

### *A. Average Demand:*

Calculate the average of all numbers from demand columns.

Average Demand= (2500+2450+2300+2700+2550)/5=2500

### *B. Standard Deviation of Demand:*

Calculate the standard deviation of the demand form demand column. In excel we can directly use the "stddev" formula to calculate the standard deviation.

Standard Deviation of Demand= stdev(2500:2450:2300:2700:2550)=146

### *C. Average of Lead Time:*

Calculate the average of all the numbers from the Lead time columns.

Average of Lead time= (35+33+26+27+30)/5=30

### *D. Standard Deviation of Lead Time:*

Calculate the standard deviation of Lead time from lead time column. Same formula we can use to find the standard deviation of lead time which we have already used to find out standard deviation of average.
Standard Deviation of Lead Time= stdev(35:33:26:27:30)=4

### *E. Combined Standard Deviation:*

Using following formula calculates the combined standard deviation.

$$S_c = \sqrt{t \times S_d^2 + d^2 \times S_t^2}$$

Sc= 9619

### *F. Service Level:*

It depends on how much inventory you can carry to prevent a stock out. The higher the service level the more inventory you need to carry. Most Companies pick a service level between 90% and 99%.
In our case, As per discussed with my manager and ware house manager we decided to take service level 57% it means Normsinv(0.57)=0.16

### G. *Safety Stock:*

Using following formula I calculate the safety stock

$$SS = k \times S_c$$

### H. *Results Obtained:*

| | |
|---|---|
| *Average Demand* | *2500* |
| *Standard Deviation of Demand* | *146* |
| *Average lead time* | *30* |
| *Standard deviation of Lead time* | *4* |
| *Combined Standard Deviation* | *9619* |
| *Service Level(Percentage)* | *0.57* |
| *service level (K)* | *0.16* |
| *Safety stock* | *1574* |

## IV. CONCLUSION

- Proper placement of stock has been done by using KANBAN and hence delivery time is reduced.
- Transportation cost due to improper placement of stock has been significantly reduced which improved efficiency and also improves profitability.

### A. *Before Implementation:*

| *Sr. No* | *Transportation Route* | *PO* | *From* | *To* | *Detention Charges* | *Transportation Cost* |
|---|---|---|---|---|---|---|
| *1* | *Indapur plant to Gujarat Location* | *PO23156* | *14/08/2018* | *17/08/2018* | *6000/-* | *10000/-* |
| *2* | *Indapur Plant to Mumbai* | *PO23398* | *21/08/2018* | *26/08/2018* | *10000/-* | *7000/-* |
| *3* | *Indapur plant to Karnataka Location* | *PO24018* | *09/09/2018* | *11/09/2018* | *4000/-* | *8500/-* |

### B. *After Implementation:*

| *Sr. No* | *Transportation Route* | *PO* | *From* | *To* | *Detention Charges* | *Transportation Cost* |
|---|---|---|---|---|---|---|
| *1* | *Indapur plant to Mumbai* | *PO26223* | *16/01/2019* | *16/01/2019* | *Nil* | *8500/-* |
| *2* | *Indapur Plant to Mumbai* | *PO26260* | *23/01/2019* | *23/01/2019* | *Nil* | *12000/-* |
| *3* | *Indapur plant to Coimbatore* | *PO26714* | *02/02/2019* | *02/02/2019* | *Nil* | *16000/-* |

- Standardization helped company to maintain safety stock and by this company overcomes sudden shortages by vendor end and which helps to complete our prior commitments to our consumers on time.

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