Overview on Kanban Methodology and its Implementation

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Abstract— Kanban methodology is very significant philosophy which plays an important role in many production units. In this paper Kanban methodology has been reviewed and has been implemented on 'Swing Lever Assembly' of the Bajaj Steels Pvt. Ltd Nagpur. The Kanban system involves the selection of two important parameters i.e. the lot size and the numbers of Kanban used in the process. The main objective of Kanban system is to maximize the productivity of a unit and this is done by reducing the idle time of the process. Kanban system is a very cost efficient process if applied in proper manner.

Key words: Kanban System, Just in Time, Lean Manufacturing, Total Quality Control

I. INTRODUCTION

A. *What exactly Kanban System means?*

Just in Time is a manufacturing philosophy used in many production company's of producing what is needed in the right quality in the right place and at the very right time. Kanban methodology when coupled with a pull system is a means of implementing JIT. Kanban Methodology has been recently used in many manufacturing systems, assembly systems and supply chain systems in very effective way. It's a work scheduling system that maximizes the productivity of a team by reducing idle time. Idle time can occur within any process, workflow or procedure & can usually be traced back to opportunities within the process itself. The Kanban system focuses on the reduction of waste in all informs over-production, unnecessary motion, defects, over-processing & waiting.

B. *Principles of Kanban System:*

- Visualize work.
- Limit work in process.
- Focus on flow.
- Continuous Improvement.

C. *Kanban System Adapts:*

1) *Kanban Cards*

Kanban cards are vital component of Kanban System. It signals the need to move material within a manufacturing or production facility or move materials from an outside supplier to the production facility. The card indicate the signal that there is a depletion of product, parts etc. When received the Kanban will faster the replenishment of product. More consumption and this demand for more products are signalled by the Kanban card.

2) *3 BIN SYSTEM*

Example of simple Kanban System implementation might be 3 bin systems for the supplied parts, where there is no in-house manufacturing.

- One bin is on factory floor.
- One bin is the factory store.
- One bin is at the supplier.

It contains removable card containing the product details and other relevant information. When the bin on the factory floor is empty, the empty bin and its card are returned to the factory store. The factory store replaces the empty bin on the factory floor with the full bin form the factory store, containing card. The factory store sends the empty bin with its card to the supplier. The supplier full product bin, with its Kanban card, is delivered to the factory store and the supplier keeps the empty bin. Thus, the process will never run out of product and could be describe as a closed loop in that in provides the exact amount required so there will never be an oversupply.

II. LITERATURE REVIEW

Before learning about Kanban System, there must be some knowledge about Just in Time and Total Quality Control.

A. *What do we understand by JIT?*

In the competitive world, the industries need to seek competitive advantage by emphasising on performance factors such as flexibility, quick response, cost, efficiency, quality, reliability and service. JIT is recognized as a philosophy rather than a methodology. JIT's main intension is to optimize process and procedure by continuously pursuing waste reduction. JIT can be technically defined as 'Production methodology which aims to improve overall productivity through elimination of waste and which leads to improved quality'. JIT ensures for the cost efficient production in an organisation.

Shigeo Shingo, a Japanese JIT authority and engineer at the Toyota Motor Company identifies seven wastes as being the targets of continuous improvement in production process. By attending to these wastes, the improvement is achieved

- Waste of production: Eliminate by reducing set up times, timing between process and layout problems.
- Waste of waiting: Eliminate bottle necks and balance uneven loads by flexible workforce and equipment.
- Waste of transportation: Establish layouts and location to make handing and transport unnecessary if possible. Minimize transportation and handling if not possible to eliminate.
- Waste of processing itself: Question regarding the reasons for existence of the product and then why each process is necessary.
- Waste of making defective products: Develop the production process to be preventing defects from being produced, so as to eliminate inspection. Make the process defects free. This will lead to always yields quality products.

B. Total Quality Control:

JIT methodology of progressive improvement includes TQC. TQC refers to the achievement and improvement in quality of the product of the company.

C. Internal Customer Concept

According to traditional organization mind sets customer is a person, who is outside the company, who buys and uses the products and services. But JIT adds a concept to this concept of internal customer who is the next person or department or processes that uses or further processes them. If each of the employee sends only defect free item to this internal customer no defective final products will be produced.

D. Quality at Source

Each employee should be responsible for quality of product at his workstation. Employees are trained in quality principles and testing procedure, so that they can inspect their own work to ensure that defects are not passed to next person or process. If there any defects in the part they are more easily detected by the internal customer. In this way TQC ensures good and standard quality to product to the customer.

E. Kanban – Motives and objectives

Japan was the country who recognized that the wastage of resources must be avoided at any cost. Kanban was developed by Toyota and introduced in 1962 to ensure the flow of material to their car assembly plants with minimum use of resource. Kanban has proved to be an excellent tool to reduce waste of resources and to optimize material flow.

There are many such reasons for implementing Kanban in a production industry. Some of them are as follows:

- Force to make efficient process.
- Reduce inventories. (Inventories generally refer to the materials in stock. The items which are either stocked for sale or they are in the process of manufacturing or they are in the form of materials which are yet to be utilized.)
- To diagnose weakness in process.
- Reduction of lead time.
- Reduction of scrap and rework.
- Reduce manufacturing steps.
- Increases flexibility.

F. Principle of Kanban System

There are a lot of causes for problem in manufacturing industries such as:

- Long set up time.
- Quality of product.
- Scrap.
- Non uniform production speed.
- Confusing sequence.
- Fault deliveries.

The intension of the Kanban System is to signal the needs for more parts and to ensure that those parts are produced in respective time, so that the subsequent fabrication or assembly can be done. This is achieved by pulling parts through the assembly line. Only final assembly line receives a schedule from the dispatch office. All other operators and suppliers receive Kanban cards from subsequent work centres.

Matthias Becker and Helena Szczerbicka stressed that the Kanban mechanism is a way to manage the flow of the parts in a manufacturing system. According to the JIT methodology, parts should only be produced or moved until there is an immediate need [1]. Production control by Kanban cards was first implemented by Toyota in Japan and hence used by many production industries all over the world.

In the atmosphere of intense competition all over the world, the philosophy of Kanban system coupled with Pull system production mode has been accepted by many small scale as well as large scale industries. 'When the market demands some products, we will produce a variety of the products' [3]. Not only can this reduce large scale keeps in stocks and produce the Work in Process quantity [3]. Kanban system reduces cost of production, makes the unit flexible of any type of demand, fasten response ability and also helpful in promoting organization's management level.

Kanban is a Japanese word which means signboard, when the word Kanban is used in production, it refers to what, when and how to produce [4]. It is claimed that Kanban is one of the most vital elements that executes Lean thinking in practice [7]. Eliminating waste is the most important principle of Lean thinking, it requires continuous growth and commitment from personnel as well as management [4]. Kanban is also one of the key operation management tools in Lean manufacturing [8]. Kanban system initiates to measure average time to complete one task, to inspect workflow and to optimise work in Process at every work station.

The company which implements Kanban methodology in their production unit is benefited in many ways such as reduction in inventories prevents overproduction, improvement in workflow, flexible in nature with respect to demands, improved organisation's management level on procedure etc which also in turn gives increase quality, lower production cost of unit and reduction in idle time.

III. Application of Kanban System

As mentioned earlier that the Kanban System is applied on swing lever assembly of the Bajaj Steels Pvt. Ltd. As far as the current status of the assembly, it gives an idea of complete confusion as the swing lever is drilled in one corner of company. This drilled part is manually handled and is taken to other part where swing lever cover & swing lever bearing has to be fitted. Semi-assembled part is again manually taken to sub stores of the company where this part is used in assembly of ginning machine. As per as company's current record the total time required for completing one swing lever with its fitting is 22 minutes and 11 seconds i.e. 22.11 minutes. During investigation it was identified that the procedure followed by the company has some lacunas.

A. Analysis and Suggestions:

Here are some suggestions to rectify the lacunas in the process. As the swing lever parts and the swing lever are carried from one place to another it produces lots of chaos

and sometime causes over supply of products. By using flashlights or Kanban cards system the oversupplying of the parts can be eliminated. By using above to important parameters in an orderly manner the task can be completed in effective way. Also by arranging the unit chronological way the time required for transferring the parts manually can be eliminated. As the time required to complete the procedure is reduced the overall productivity of the procedure increases. As the parts are manually supplied to different parts, the time can be reduced by using conveyor belts, so that parts can be easily & quickly transferred. The time can also be cut-off from idle time if the drilling procedure, swing lever cover, machining part & sub assembly stores these places are adjacent to each other, so that the time which is actually required to transport these parts to another can be cut-off.

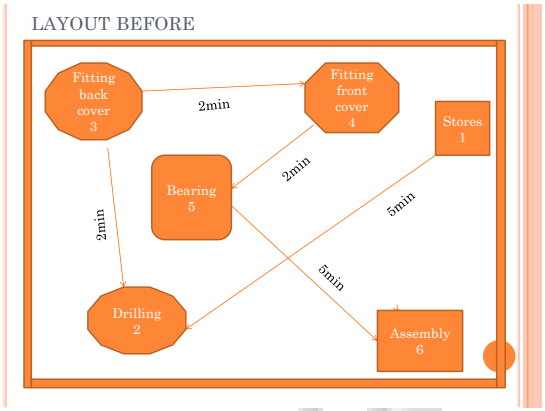

Fig. 1: Layout of swing lever assembly

Figure 1 shows the layout of swing liver assembly, the procedure followed to perform operation, and time required to transfer from one operation point to another. The total time required for completing one swing lever with its fitting is 22 minutes and 11 seconds. Figure 2 shows the components used in Kanban system.

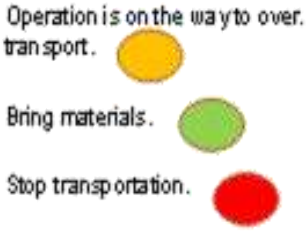

Fig. 2: Component used in Kanban

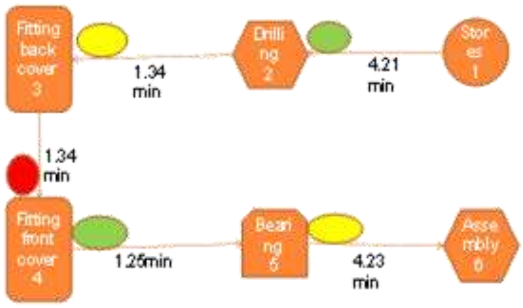

Fig. 3: Layout After

Figure 3 shows the systematic arrangement of the layout after the after implementing Kanban. Table 1 shows the production cost and time required before the application of Kanban system and table 2 shows the production cost and time required after the application of Kanban system. From table 2 we can conclude that there is an appreciable change in production cost and time after implementation of Kanban system and rearrangement of layout.

x	Operational Unit	Component	No. of persons working	Operation time (min)	Travelling time/ Workers required	Total Time	Cost/ month
1	Drilling Operation	Swing lever tap	3	1.39 min	5 min/ 3	6.39	60000
2	Fitting (manual)	Front cover	3	1.12 min	2 min/ 2	3.12	50000
3	Fitting (manual)	Back cover	3	1.12 min	2min/ 2	3.12	50000
4	Fitting (m/c)	Bearing	2	12 min	2 min/ 2	14	40000
5	Swing lever assembly	Assembling	2	6.5 min	5min/ 3	11.5	50000
Total						36.13 min	250000

Table 1: Data of Production cost and time (Before)

Sr. No.	Operational Unit	Component	No. of persons working	Operation time (min)	Travelling time/ Workers required	Total Time	Cost/ month
1	Drilling Operation	Swing lever tap	3	1.39	4.21 min/2	6	50000
2	Fitting (manual)	Front cover	3	1.12	1.34min/2	2.46	40000
3	Fitting (manual)	Back cover	3	1.12	1.34min/2	2.46	40000
4	Fitting (m/c)	Bearing	2	12	1.25min/1	13.25	30000
5	Swing lever assembly	Assembling	2	6.5	4.23min/2	11.13	40000
Total						35.3min	200000

Table 2: Data of Production cost and time (After)

IV. CONCLUSION

- Kanban System is a very effective tool in improving the productivity.
- It will optimize the process; reduce idle time of the process, makes the unit flexible for any proposes.
- Reduce wastage, continuous deliveries to costumer and increases efficiency and productivity of plant.
- It will lead to "*just in time*" manufacturing.

The paper presents the application of Kanban System on Swing Lever Assembly. If the Kanban System is implemented properly on swing lever assembly of Bajaj Steels Pvt. Ltd. it can help in

- Improving flexibility of production.
- Reducing production time.
- Increase productivity.
- Increase efficiency.
- Focus on continuous delivery.

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