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Overall Analysis and Evaluation of the Kanban Implementation at Kirloskar Brothers Limited, Dewas

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ABSTRACT

Kanban is a method for increasing productivity with emphasis on just in time manufacturing process in which movements of materials in a process are recorded on Kanban cards. The purpose of this paper is to show how a kanban system is used and improved to a certain extent in a pump manufacturing plant having demand fluctuation in the orders, which forms a trigger to overall system. The existing plant works on the principle of Mixed Model Assembly Line. The One Hourly Line Feeding System is an application of Kanban system which has been implemented in the pump manufacturing company to increase the efficiency of Kanban System implemented. This Paper shows how this system has been implemented in production/assembly line and it's working. As the name implies, in this system production is scheduled for each single hour. Because the production planning is done for a single hour there is no need of keeping large inventory on shop floor as well as in the store. One hourly Line Feeding System is the technology introduced by the company. The result of using this system is huge inventory reduction as well as better material/product control and tracking as this system uses Radio Frequency Identification (RFID) for signaling and tracking the product.

Keywords--- Production, Mixed model, Kanban system

I. INTRODUCTION

Just-In-Time (JIT) manufacturing system was developed by Taiichi Ohno which is called Japanese "Toyota production system". JIT manufacturing system has the primary goal of continuously reducing and ultimately eliminating all forms of wastes. Based on this principle, Japanese companies are operating with very low level of inventory and realizing exceptionally high level of quality and productivity[1].

JIT emphasizes "zero concept" which means achievement of the goals of zero defects, zero queues, zero inventories, zero breakdown and so on. It ensures the supply of right parts in right quantity in the right place and at the right time. Hence, the old system of material acquisition and, buyer and seller relationships are changed to new revolutionary concepts. Similarly, JIT becomes an inevitable system at plant level, which integrates the cellular manufacturing, flexible manufacturing, computer integrated manufacturing and Robotics. Due to the technological advancement, the conventional method of push production system linked with Material Requirement Planning (MRP) was changed to pull type JIT production system to meet out the global competition, where the work-in-process (WIP) can be managed and controlled more accurately than the push- production system [2].

KANBAN system is a new philosophy, which plays a significant role in the JIT production system. Kanban is basically a plastic card containing all the information required for production/assembly of a product at each stage and details of its path of completion. These cards are used to control production flow and inventory. This system facilitates high production volume and high capacity utilization with reduced production time and work-in-process[2].

The existing plant works on the principle of Mixed Model Assembly Line. A Mixed Model Assembly line is configured to produce several models without changeover.

II. LITERATURE REVIEW

In the paper by Monden Y. [4], a comprehensive presentation of Toyota production system is given. A successful Kanban system will drastically reduce the throughput time and lead time.

Karmarker and Kekre [5] have concluded from their studies that the reduction in container size and increase in number of Kanbans lead to better results. Many researchers were interested in finding the optimal number of Kanbans. The Toyota formula is very much useful in determining the optimal number of Kanbans.

According to John M. Gross [1], there are seven steps in which Kanban can be implemented in any factory: Data Collection, Calculation of Kanban Size, Designing the Kanban, Training of everyone, starting the kanban, auditing and maintain the kanban, and improving the Kanban.

III. APPLICATION OF KANBAN

One Hourly Line Feeding System

One hourly line feeding system is an application of Kanban system adopted by the existing plant. The goal of one hourly line feeding system is same as Kanban system; reduce WIP inventory and elimination of wastes. Wastes eliminated can be in terms of excess man power, excess inventory on the shop floor. Also this system aims to better material tracking throughout the supply chain. This system is a very new philosophy implemented in single phase assembly line of the existing plant only.

One hourly line feeding system and its working is shown in the figure.

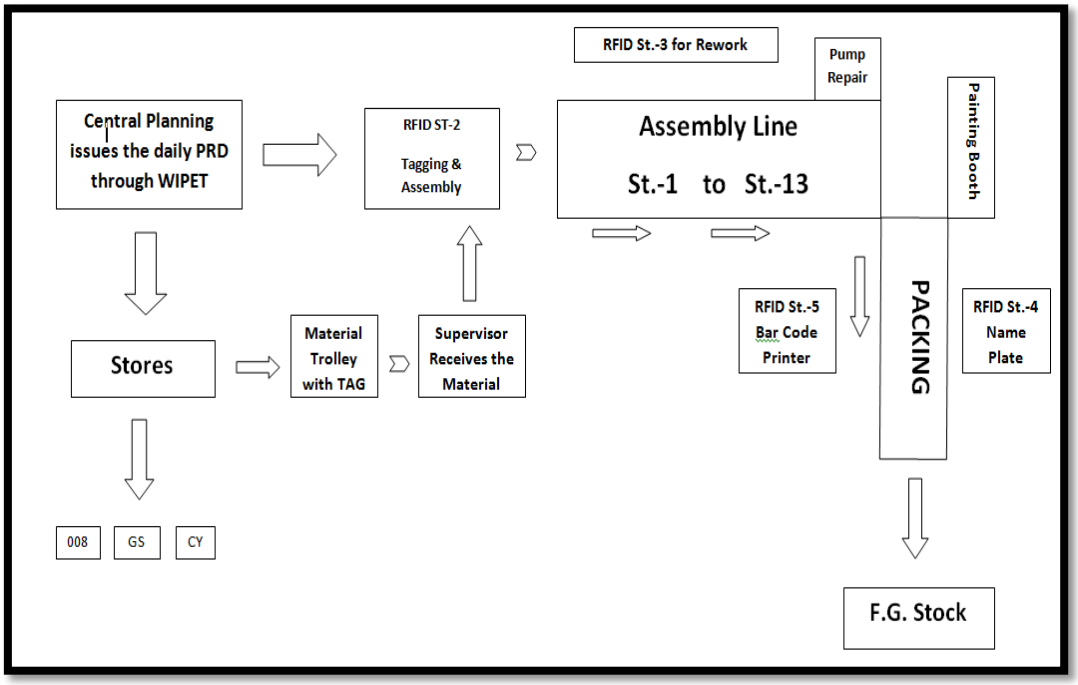

Fig.1: One Hourly Line Feeding System

How does this system works?

As shown in figure, Central Planning Department issues the daily Product Release Document (PRD) to Assembly line and Stores based on the demand of customer. Based on this demand the planning department releases 8 PRDs for every single hour of production per day; that means one PRD for one hour.

Product release document is a format which indicates the stores and assembly line that how much pumps to be assemble in single hour duration. It consist of all the information about the materials (i.e. order number, material code, material description, quantity to be supplied, status in the store and store location) to be assembled. The list contain all the materials to be assembles for making a pump. The firm has its own three stores located near the assembly line: General Store (GS), Store 008, and Store CY.

A format of PRD is shown in table below

.

Table 1: Product Release Document

ORDER NO.	MATERIAL	MATERIAL DESCRIPTION	QUANTITY IN UNITS	STATUS	STORE LOCATION
14345093	02302430	Bearing (Ball) 6302 ZZ or Equi.	50	REL	GS
14345093	02302450	Bearing (Ball) 6304 ZZ or Equi.	50	REL	GS
14345093	02400040	External Fan M-80L	50	REL	GS
14345093	02410080	Fan Cover M-80L	50	REL	GS
14345093	02450050	Terminal Board M-80L (1C2) KJ-10V	50	REL	GS
14345093	0246005	Terminal Board M-80L	50	REL	GS

	0	(1C2)			
14345093	02600040	Capacitor 20 Micro Farad	50	REL	GS
14345093	02700060	Mechanical Seal type 6 or EOU 19.0 mm DJA	50	REL	GS
14345093	02730930	Clamping Plate for GJA Pumps	50	REL	GS
14345093	06089620	Packing box Corrugated KJ-V/H 0.5/1 New	50	REL	GS
14345093	06540010	Pressure Gauge 2" Dia (0-100 Psi)	50	REL	GS
14345093	06600010	Pressure Regulating Valve KJ Pump-1"	50	REL	GS
14345093	11250191	Flange Suction KJ-10V (1"X1 1/4" BSP)	50	REL	GS
14345093	12130041	Cover NDE M-80L (1C2 & 1.5C2)	50	REL	GS

When the store gets the PRD, the storekeepers and workers prepare a trolley with full of material required for the hour. The materials which are to be sent to the assembly line are tagged with a Radio Frequency ID (RFID). This RFID contains the necessary information about the product like technical specifications, make etc. They prepare separate trolley for different materials with RFID tag on it.

The figure shows the arrangements of the trolleys inside the store.

At Stores

Fig.2: Store prepares the trolleys with the materials according to the fixed quantity as per the released PRD. These trolleys are parked at a predefined location inside the stores.

Line Side Stock Area

Fig.3: The next one hour material which is to be produced in line on the second hour is kept ready for delivery in fixed quantity beside the line in a predefined area.

Now the trolleys with specified quantity of materials are taken to the assembly line floor area. The next one hour material which is to be produced in line on the second hour is kept ready for delivery in fixed quantity beside the line in a predefined area.

Figure 3, shows how materials for next hour is kept at their pre defined area.

On the shop floor matrials are kept on the trolleys in specified quantity as shown in the figure 4.

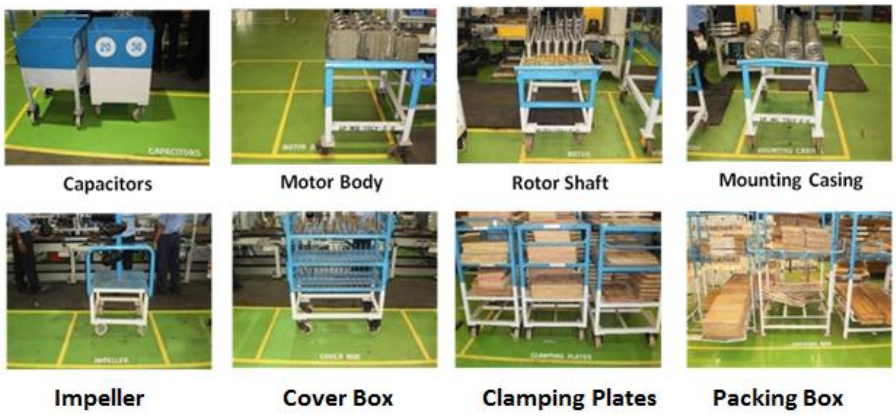

Fig.4: Materials on the shop Floor

On the shop floor, the engineer on assembly line prepares a chart containing the all information regarding the assembly of pumps for the day. A format of the chart is shown in table 2.

Table 2: List of Models to be prepared as per PRD at Single Phase Assembly Line

MODEL	Qty.
KV 20 3ϕ	20
KDS 134 (25 X 25) 1ϕ	80
KDS 212 NP	50
KAM II (80 X 80)	180
KAM II LV (80 X 80)	110

When material is reached to the assembly line, on the RFID station the RFID is tracked and necessary information is generated in that. In the next step the material is assembled on the assembly line. After that painting and packing is done. After the assembly the assembled pump is sent to the RFID station where the Serial Number, Batch Number and other information about the product is generated in the RFID.

After that product is send to the Finished Goods stores.

Benefits of One Hourly Line Feeding System:

a. As it works on Just in Time philosophy, the ultimate goal of this system is to eliminate the wastes through reducing Work in Process Inventory. Because only specified quantity of materials are brought from the stores as per the PRD there are no excess inventory on the shop floor. Production Rate for single hour is fixed so there is a huge reduction in WIP Inventory.
b. Sufficient space for the workers on the assembly floor to move because limited numbers of raw materials are present on the shop floor and the place for keeping them is fixed.
c. RFID contains all the information regarding the product. And it is placed on the product itself. Hence there is a very easy tracking of the product throughout its life.
d. As RFID itself contains all the information like batch no., serial no. etc. there is no need of putting other information on the packing box about the product. Hence it eliminates the work of putting such information. So there is no use of keeping a man for this work. Therefore this system eliminates excess man power.

IV. CONCLUSION

The implementation of Kanban system results an increase in material availability and reduction of excess inventory inside the firm. While by using one hourly line feeding system also the existing firm is looking for the further improvement in material handling. As discussed above, there are several benefits of implementing this technology in the existing assembly line which has made the firm more efficient in material handling and more promising towards the customers.

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