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Implementation of Kanban System in Manufacturing Process

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ABSTRACT

A successful implementation of kanban system have been done in the production system, in search of the ideal results of it, whole setup was done at a leading TMT manufacturing unit, A pull nature of kanban have been established and then the data is collected first, before that proper training is given to the workers of the organization, and keeping in mind all the necessary before implementation like 5s just in time and lean manufacturing concepts, after that 3 sets of data has been taken after the implementation of the kanban process, taking all the factors viz replenishment factor, buffer stock etc after that calculation has done and the optimum results have been achieved, the required results are then compared with the old data which was taken before the implementation of kanban, Results have been bifurcated in terms of Time , increase in Production and Increase in profit as well as cost savings.

Keywords : Kanban, Replenishment, Process Parameter

INTRODUCTION

The Japanese word kanban, which translates as "signboard," has become synonymous with demand scheduling.1 Kanban traces its roots to the early days of the Toyota production system. In the late 1940s and early 1950s, Taiichi Onho developed kanbans to control production between processes and to implement Just in Time (JIT) manufacturing at Toyota manufacturing plants in Japan. These ideas did not gain worldwide acceptance until the global recession in the 1970s. By using kanbans, he minimized the work in process [1] (or WIP) between processes and reduced the cost associated with holding inventory. Originally, Toyota used kanban to reduce costs and manage machine utilization. However, today Toyota continues to use the system not only to manage cost and flow, but also to identify impediments to flow and opportunities for continuous improvement.

BENEFITS OF KANBAN

- ✓ Reduces inventory
- ✓ Improves flow
- ✓ Prevents overproduction
- ✓ Places control at the operations level (with the operator)
- ✓ Creates visual scheduling and management of the process

- ✓ Improves responsiveness to changes in demand
- ✓ Minimizes risk of inventory obsolescence

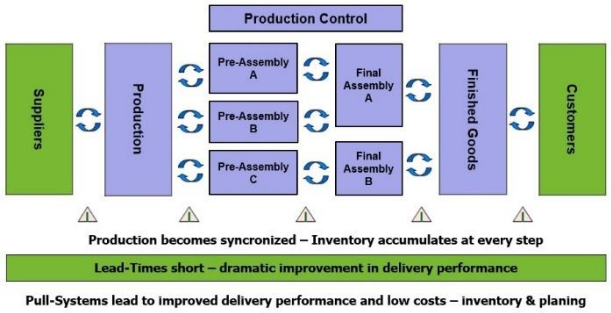

Fig 1 : A typical Kanban flow chart in assembly line

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Push vs. Pull System: The kanban system described is a pull system. Traditionally, a push system is and has been employed [2]. The push system is also more commonly known as the Materials Requirements Planning (MRP) system. This system is based on the Planning Department setting up a long-term production schedule which is then dissected to give a detailed schedule for making or buying parts. This detailed schedule then pushes the production people to make a part and push it forward to the next station. The major weakness of this system is that it relies on guessing the future customer demand to develop the schedule that production is based on and guessing the time it takes to produce each part. Over-estimation and under-estimation may lead to excess inventory or part shortages, respectively

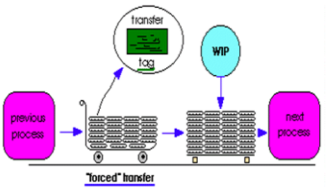
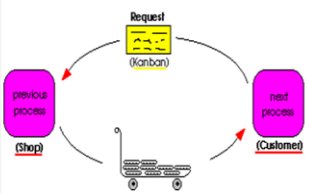
Push	*Pull*
	
Work-pieces manufactured by "previous process" are transferred to "next process" irrespective of its readiness to receive and process them.	Next process "orders" from previous process "just" what, when and in the quantity it needs.
Flow of Information and Flow of Materials are different. Tools. The required tools are: Volume Planning – Material Requirement Planning (MRP1) – Manufacturing Resources Planning (MRP2) – or the more modern ERP (Enterprise Resource Planning).	Flow of Information and Flow of Material are "parallel". Nothing takes place upstream unless something is taking/has taken place downstream.
"Independent Process Production" (each Processing Station follows its own schedule, independently of all other Processing Stations.	"Next-Process Dependent Production.
Not flexible at all to changes in production schedules.	Extremely flexible to changes in production schedules.

Fig 2 : Kanban Push Vs Pull system

Just in time manufacturing process.

JIT is sometimes said to have been invented by Henry Ford because of his one-at-a-time assembly line, circa 1913. This is an incorrect conclusion since Ford's system could handle no variety and was designed for large volumes and large batch sizes of the same parts. JIT was invented by Taiichi Ohno of Toyota shortly after World War II. Ohno's system was designed to handle large or small volumes of a variety of parts. Many people are intimidated by JIT because of its association with Japan. If these people take a broader look at JIT [3], they will see that it is nothing more than good, common sense manufacturing.

METHODOLOGY

$$\text{Adjusted Production Requirements} = \frac{\text{Average Production Order}}{(1 - \text{System Scrap})}$$

Fig 3 : Equation for adjusted production requirement

$$\text{Time Required for Production} = \text{Sum}\ (\text{Adjusted Production Requirements} \times \text{Cycle Time Per Part})$$

Fig 4 : Equation for production time

$$\text{Available Time} = \text{Total Time in a Shift} - (\text{Planned and Unplanned Downtime})$$

Fig 5 : Equation for available time

Calculating the Buffer: The last step in the process of sizing the kanban is to calculate your buffers. The buffers will provide you with the necessary lead time to produce the replenishment interval part quantities without stocking out your process or customer. The buffers also provide the necessary time required for process activities to occur

$$\text{Adjusted Production Requirements} = \frac{\text{Average Production Order}}{(1 - \text{System Scrap})}$$

$$\text{Adjusted Production Requirements} = \frac{\text{Average Production Order}}{(1 - \text{Process Scrap})(1 - \text{Downstream Scrap})}$$

$$\text{Available Time} = \text{Total Time in a Shift} - (\text{Planned and Unplanned Downtime})$$

$$\text{Available Time (Continuous Processes)} = \text{Total Time in a Shift} - (\text{Time for Planned Maintenance, Cleaning, and Breakdowns})$$

$$\text{Time Required for Production} = \text{Sum}\ (\text{Adjusted Production Requirements} \times \text{Cycle Time Per Part})$$

$$\text{Time Available for Changeovers} = \text{Total Available Time} - \text{Time Required for Production}$$

$$\text{Replenishment Interval} = \frac{\text{Total Time } \textit{Required} \text{ for Changeovers}}{\text{Total Time } \textit{Available} \text{ for Changeovers}}$$

$$\text{Container Quantity} = \frac{(\text{Buffer Quantity} + \text{Replenishment Interval Quantity})}{\text{Container Quantity}}$$

Where:

$$\text{Buffer Quantity \& Replenishment Interval Quantity} = (\text{Buffer} + \text{Replenishment Interval}) + \text{Adjusted Production Requirement}$$

Fig 6: formulae used in calculating Kanban

Calculation Sheet:

On basis of Route card :

Machine	Run Time(in min)
M 1 (SMS)	45
M 2 (CCM)	40
M 3 (Rollers)	25
M4 (Quenching & Inspection)	30

(*we have collected the data according to a billet turned into final product i.e TMT)

Time required for changeover per part = 10 min.

Planned Downtime = 50 min.(i.e. Lunch).

Unplanned Downtime included in production run considering time study done by planning team of SRMPL Raipur.

Production cycle per part = 45+40+25+30 = 140 min/part.

Total Time in a shift == 480 min.

Available Time for production = 480-50 = 430 min.

Taking 3 parts produced previously by workers/organization per shift.

Total Available Time for changeover = 430-(3x140)

= 10 min.

Total Time Required for changeover = 10x3

= 30 min.

$$\text{Replenishment Interval} = \frac{\text{Total Time } \textit{Required} \text{ for Changeovers}}{\text{Total Time } \textit{Available} \text{ for Changeovers}}$$

Replenishment interval = 30/10

= 3.

RESULT

The following results were obtained while implementing KANBAN in SRMPL Raipur:-

- As per of the consideration, there were 3 shifts in a day in SRMPL which includes an 08:00 hours per shift. On implementing KANBAN, 40 minutes of extra spare time is left per shift for production purpose. On other way, 40 minutes per shift is well saved by KANBAN system for more work.
- Up to 3 parts per shift is being produced by the workers there in a shift of 08:00 hours of span. By the implementation of KANBAN, with an extra time reserved for 40 minutes, an extra part can be well made by the workers there.

- As an extra part can be well made, there is much more increase in the inventory level of the production for the organization, which in turn increase the production level much more on annual terms.
- Scrap obtaining from the machining process for every part is very well accomplished by the KANBAN system as it tends to maintain the smooth functioning of the process & thus descends the scrap & controls the scrap management.

With an effective conclusive result, a time span of 14 hours per week is well being saved by implementing KANBAN system in SRMPL Raipur.

CONCLUSION

From the above we conclude that because of implementation of Kanban system in a manufacturing process, following benefits or advantages we can get-

- It gives the accurate & detailed information of production.
- Defective parts & items are found accurately & sent back.
- The production flow rate tends to have an increase.
- It doesn't required to have an extra record of process.
- Once understand, it can be well accepted on large basis.

REFERENCES

[1]. "Implementation of Kanban system for inventory management for assembly line", by Kalpesh V bhagat, Sharad V Gaikwad, Mangesh Ashtekar, NCRTME-2018

[2]. "Overview of Kanban Methodology and its implementation" by Rajat B Wakode, Laukik P Raut, Pravin Talmale Vol-3, Issue No-2, IJSRD-2015.

[3]. "Optimization approach of Vehicle Routing by a Milk-Run material suppy system" by Dipesh kumar patel, Dr M.B patel , Vol-1, Issue No-6, IJSRD-2013

[4]. "AIDT- Just in time manufacturing" September 11,2006. American Society for Quality Control (ASQC).

[5]. "A Guide to the Project Management Body of Knowledge", 4th ed. Pennsylvania, USA: Project Management Institute, Inc., 2008.

[6]. "Applying the Kaizen Method and the 5S Technique in the Activity of Post-Sale Services in the Knowledge-Based Organization",proceedings of the international multi conference of engineers & computer scientists 2010 vol3,IMECS2010,march 17-19,2010,Hong Kong.

[7]. "Basic concepts of Lean Manufacturing" Marek Piatkowski - F.S.P. Consulting Inc. Toronto,Canada,1994,

[8]. "Implementing World Class Manufacturing", Rubrich, L. & Watson, M. (1998), Fort Wayne, IN: WCM Associates.

[9]. "Japanese Manufacturing Techniques", Schonberger, R.J. (1982), New York, NY: The Free Press.

[10]. "Just-In-Time: Alive and Well in the Sout" by Dr. Anthony Inman.

[11]. "Kanban made simple" by John M. Gross.

[12]. "Leadership and project management: Time for a shift from fayol to flores," G. A. Howell, H. Macomber, L. Koskela, and J. Draper, in Proceedings of the 12th Annual Conference of the International Group for Lean Construction (IGLC-12), August 2004, pp. 22–29.

[13]. "Operations Management: Strategy and Analysis", Chapter 11 - Krajewski & Ritzman Seventh Edition © 2004 Prentice Hall, Inc.

[14]. "Review on just in time techniques in manufacturing systems "Agrawal N.,

Manufacturing process & automation department,Netaji subhash Chandra bose institute of technology, New delhi-110078, APEM journal, 2010, ISSN 1854-6250.

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