Implementation of kanban system for inventory control and performance improvement: A Case Study

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ABSTRACT

Lean manufacturing has been the buzzword in the area of manufacturing for past few years. The Kanban system is one of the manufacturing strategies for lean production with minimal inventory and reduced costs. The study is carried out at Chiller manufacturing industry from one of the leading manufacturers of cooling systems. This study considers eight different variants of models ranging from 0.5TR-5Tr.The objectives of this study are 1) to determine the number of Kanban cards required to meet the worth of materials and 2) to reduce the burden on the target stores. The focus of this approach is to eliminate non value added activites. A kanban card is developed which shows the batches of pre designed capacity ,quantity consumed and quantity replenished periodically. The results shows the reduced inventory levels and also increased productivity and efficiency.

Keywords: Kanban system, operation strategies, vendor participation

1. INTRODUCTION

Nowadays many industries are facing huge challenges of modern logistics and supply chain management to provide high level quality to customers because of high rate of changing in demands. JIT philosophy focuses to reduce inventories involved in manufacturing process by providing materials of quantity at right time in right condition. Eliminating waste is a big deal in any manufacturing industries. This principle creates different kinds of strategies to optimize operational and improve manufacturing efficiency.

LEAN MANUFACTURING: Lean manufacturing means manufacturing without waste, there are seven types lean waste transportation, inventory, motion, waiting, over production ,over processing ,defects .The objectives of lean manufacturing is to reduce waste in human effort and inventory, The lean concept originated from Toyota production system ,It determines the value of the process by differentiating value added activities and non-value added activities ,Kanban is tool used to control inventory levels in the production to produce products and provide service fastest as possible.

KANBAN

It is a tool used under lean manufacturing system to reduce burden on inventory and also to reduce material wastage in the production area. Kanban literally means “visible cards” it refers to signal cards. The key word used in implementing Kanban system includes inventory management, vendor and supplier participation, quality improvement, quality control and employee and top management commitment.

INVENTORY: A company’s good inventory management is the key to achieve low cost strategy, Inventory is classified into 4 categories raw material inventory work in process inventory finished goods inventory operation inventory.

SUPPLIER PARTICIPATION: Kanban System
requires supplier commitment in rendering effective supply of raw materials Kanban System is basically maintaining minimum level of inventory in production area and equal amount of inventory in the store as well.

EMPLOYEE AND TOP MANAGEMENT

COMMITMENT: To ensure the people in organisation to cooperate with each other and to achieve their objective, one should have commitment between employee and top management. In this case they are loyal, flexible and willing to work long hours when needed.

2. PROBLEM IDENTIFACTION

In recent years, at Werner finely a chiller manufacturing company has experienced huge expansion and increased customer demand, because their process is over constrained and insufficient with the increase in customer demand, because of this they are experiencing some of the problems in the organization:

- Increased inventory levels
- Poor visibility of materials
- Lack of control over materials
- Material wastages

3. Lost time due to poor material placement and visibility

METHODOLOGY

The study was took place at Chiller manufacturing industry. In that plant we selected eight variants of chillers ranging from 0.5-5Tr and observed some of issues in the production area. To overcome those issues kanban system is implemented. The following steps are involved in the implementation of Kanban system.

- Collecting the bill of materials of eight variants of chiller.
- Choosing a product or product family and study of manufacturing methods and sequence of operations.
- Identification of wastes and the number of items that go into the kanban
- Study the existing layout and finding location for kanban layout.
- Construction of kanban layout, number of bins required and bin cards.
- Analysis of economic benefits associated with proposed concept..

4. SOLUTION METHODOLOGY

KANBAN SYSTEM

A lot of material obtained will be lost and misplaced because of improper management processes, poor visibility of materials, these are some of the problems. to overcome those problems a Kanban system is implemented, there are eight different types of chillers are present, Kanban stands for many of the items ranging from shelves, bins, electronics messages and order slip to the ROP .In order to have flexible and efficient

,smooth work flows ,it's just the right components to be there to build the products.

KAN=VISUAL BAN=CARD

It is signal to replace what has been consumed. The main objective is to control the inventory levels.

4.1 FUNCTIONS

- It reduces the transaction with the stores.
- Reduces burden on stores.
- Provides production information.
- It is a way to control inventory level.

4.2 CRITERIA

- Next up is based on value of the items to be selected.
- Selected based on the operation sequence during production.
- For stable process

4.4 TYPES OF KANBAN SYSTEM

There are three types of cards that can be used are:

PRODUCTION KANBAN: IN this type the card signals that production line or stores.

VENDOR KANBAN: In this type the card signals the vendor to send some of the items that tracks in the production line or stores.

MOVE KANBAN: This card signals the material handling persons to move the items from stores to the production area

4.3 CHOOSING PART FAMILY

All parts in the BOM are considered depending upon specific property and physical appearance of the part.

Under **A** class the following product families have been recorded namely, Axial fan, Cold Room, Structure, Compressor, Pump and Refrigeration
Under **B** class the following product family has been recorded namely, Electrical.
Under **C** class the following product families have been recorded namely, Plumbing and Others.

4.5 STRUCTURED BOM

After the ABC analysis the BOM is sorted in the order of A, B and C. Since, the company gives more priority to the values of the product rather than the cost of the product the C class items are separated from the Bom and then again it is segregated on the basis of the cost to prepare the kit for the Kanban.

The below table 1 shows the C class items of eight variants of chillers.

MODEL	CATEGO	SL.NO	ITEM CODE	ITEM DESC	UO	QTY PER BO	UNIT C	RATE	CLASSIFICATIO
2TR 3PH	OTHERS	132	M4 Nut	Nut	Nos	4	0.25	1	C
2TR 3PH	OTHERS	124	M5 Nut	Nut	Nos	2	0.3	0.6	C
2TR 3PH	OTHERS	125	M5 Washer	Washer	Nos	2	0.3	0.6	C
1TR 3PH	OTHERS	83	M4 X 10 Screw	Screw	Nos	10	0.48	4.8	C
2TR 3PH	OTHERS	121	M8 x 25OD Washer	Washer	Nos	16	0.9	14.4	C
2TR 3PH	OTHERS	133	M4 SERRATED WASHER	Washer	Nos	4	1	4	C
5TR 3PH	OTHERS	71	M8 X 20 BOLT	BOLT MS	Nos	20	1	20	C
2TR 3PH	OTHERS	122	M6 Washer	Washer	Nos	16	1.2	19.2	C
2TR 3PH	OTHERS	123	M6 Nut MS	Nut	Nos	4	1.2	4.8	C
2TR 1PH	OTHERS	61	M6 X 20 BOLT	Bolt & Nut	Nos	10	1.8	18	C
0.5TR 1PH	OTHERS	66	M6 X 30 BOLT MS	BOLT MS	Nos	4	1.8	7.2	C
4TR 3PH	OTHERS	87	M6 X 30 SCREW SS	M6 X 30 SCREW	Nos	60	2	120	C
2TR 3PH	OTHERS	98	M6 X 16 FLANGE BOLT MS	FLANGE BOLT	Nos	4	2	8	C
5TR 3PH	OTHERS	66	DOOR SCREW 6 X 30 PHILIPED	DOOR SCREW PHILIPED	Nos	10	2	20	C
1TR 3PH	OTHERS	52	M8 X 50 BOLT	BOLT	Nos	4	2	8	C
1TR 3PH	OTHERS	63	M6 X 15 BOLT MS	BOLT MS	Nos	10	2	20	C
4TR 3PH	OTHERS	88	M8 X 30 BOLT MS	BOLT MS	Nos	30	3.25	97.5	C
1TR 1PH	OTHERS	50	M5 X 15 BOLT MS	BOLT	Nos	6	4	24	C
0.5TR 1PH	OTHERS	36	M4 X 10 BOLT MS	BOLT MS	Nos	2	4	8	C
5TR 3PH	OTHERS	81	END CAP 3/4" PLASTIC	END CAP 3/4" PLASTIC	Nos	1	4.25	4.25	C
1TR 1PH	OTHERS	37	END CAP 1/2" PLASTIC	END CAP 1/2" PLASTIC	Nos	3	4.5	13.5	C
2TR 3PH	OTHERS	57	END CAP 1" PLASTIC	END CAP 1" PLASTIC	Nos	2	5	10	C
5TR 3PH	OTHERS	114	49001033	TIE BASE	Nos	10	6	60	C

Table 1:C class items of eight variants of chillers

The below table shows the information about the number of items present in BOM and number of items which come under single items and Kanban system.

Table 2: Description about single and kanban item

Model	BOM	Single items	Kanban item
0.5 TR 1PH	121	80	41
1 TR 1PH	119	73	46
1 TR 3PH	124	77	47
2 TR 1PH	130	83	47
2 TR 3PH	116	71	45
3 TR 3PH	140	84	56
4 TR 3PH	113	74	39
5 TR 5PH	131	91	48

4.6 DESIGN OF KANBAN CARD

It is document that contains all information about every single item card contains the following information;Items codes

- Item names
- Category
- Location
- Box number

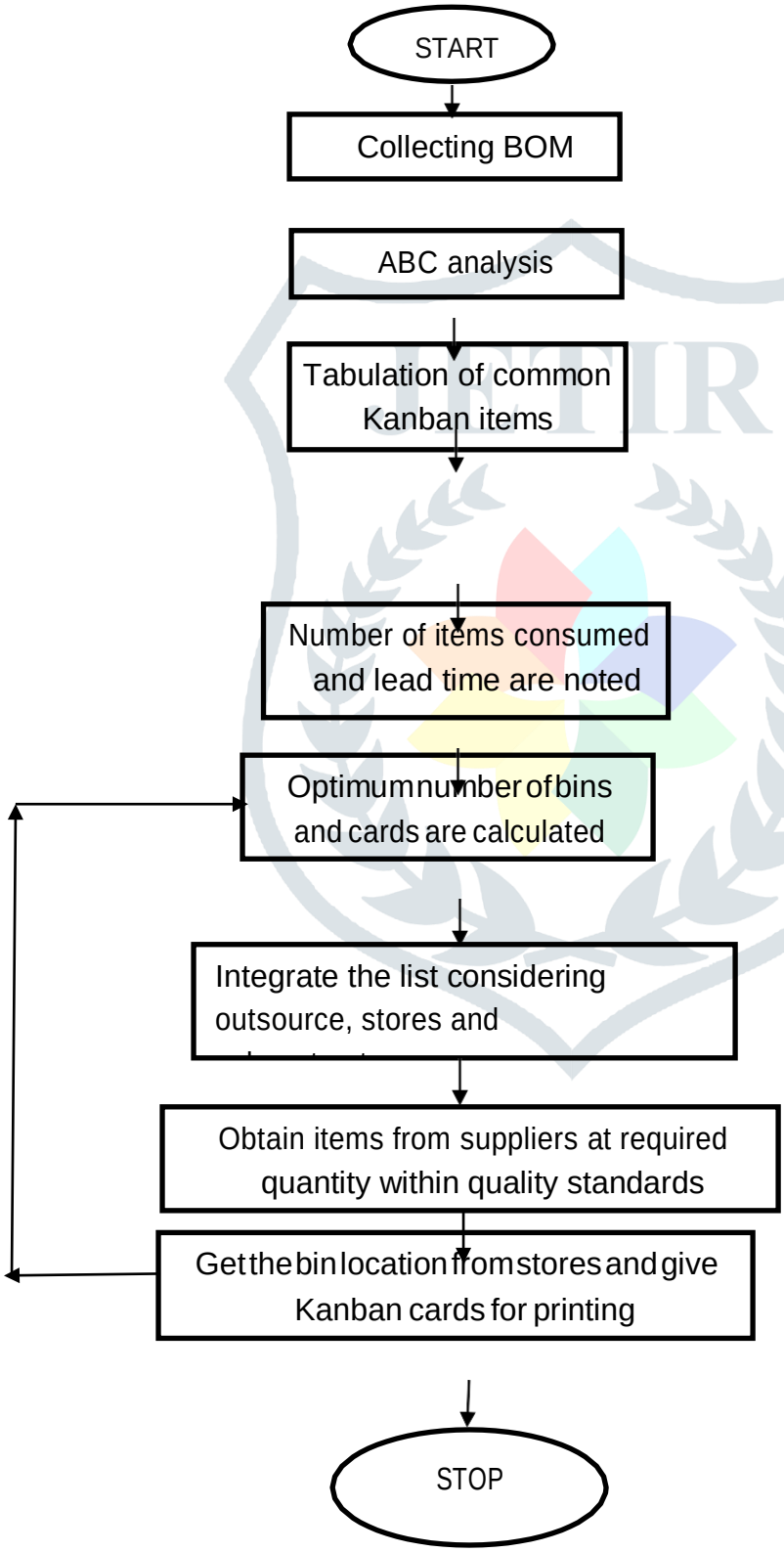
KANBAN CARD

SL NO	ITEM CODE	ITEM NAME	CATEGORY	LOCATION	BOX NO		9:30-10:30	10:30-11:30	11:30-12:30	12:30 - 13:30	13:30-14:30	14:30-15:30	15:30-16:30	16:30-17:30	OVER TIME	BALANCE	WASTAGE	REJECTED
1	48020025	Cable Tie	ELECTRICAL	R1FB	1	QTY CONSUMED												
						QTY REPLENISHED												
2	M4 Nut	Nut	FASTNERS	FR1B	2	QTY CONSUMED												
						QTY REPLENISHED												
3	M4 Washer	Washer	FASTNERS	R2F2	3	QTY CONSUMED												
						QTY REPLENISHED												
4	COPPER COIL 1/4"	COPPER COIL 1/4"	MECHANICAL	BO	4	QTY CONSUMED												
						QTY REPLENISHED												
5	48520605	Ring Lug	ELECTRICAL	R2F4	5	QTY CONSUMED												
						QTY REPLENISHED												
6	POP REVIT	POP REVIT	ELECTRICAL	R6B3	6	QTY CONSUMED												
						QTY REPLENISHED												
7	M4 X 15 Screw	Screw	FASTNERS	R2F1	7	QTY CONSUMED												
						QTY REPLENISHED												
8	M8 X 50 BOLT	BOLT	FASTNERS	R3M2	8	QTY CONSUMED												
						QTY REPLENISHED												
9						QTY CONSUMED												
						QTY REPLENISHED												
10						QTY CONSUMED												
						QTY REPLENISHED												
11						QTY CONSUMED												
						QTY REPLENISHED												
12						QTY CONSUMED												
						QTY REPLENISHED												

4.7 JOB FLOW

The logistics flow of chiller plant is shown below. The members of the plant are responsible for unloading, moving, and stocking of all varieties of

items that are essential for production are moved into target stores



4.8 NUMBER OF KANBAN CARDS Number of cards , y = DT(1+x)

C

Where,

- Y – number of cards
- D – demand per unit of time
- T – lead time
- C – bin capacity
- x – buffer or safety factor

5. RESULT AND DISCUSSION

If daily demand for an item is 12units and lead time is about 2 days. The level of safety stock maintained in stores is 25% and bin capacity is 30 units. Then find number of kanban cards required for smooth flow of production?

Number of cards, y = DT (1+x)

C

= (12*2) * (1+0.25) 30

= 1 card

How many days' worth of demand will 1 card represents?

30/12 = 2.5 days of worth of material

At chiller manufacturing industry if target store is considered to be 100% full of items, then after implementing the kanban system about 60% of the items got roots in the production area that reduces burden on stores and also reduces the workers making frequent transactions with the stores. Kanban keeps records of all the items periodically and reduces inventory cost.

6. CONCLUSION

From the implementation of Kanban it is clear that it is profitable and successful endeavour for investing in it. Many of the problems faced by Chiller manufacturing industry has been solved by the implementation of Kanban system, the outcomes of the implementation are listed below:

- Reduced inventory levels
- Increased visibility and traceability of materials
- Increased production productivity and efficiency
- Reduced lost time due to improved material placement and visibility
- Reduced material shortage.

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