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Implementation of Industrial Engineering Activities in Small Scale Industry

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***Abstract*: In the current scenario, the fashion industry needs to satisfy various customer needs in terms of both quantity and quality of products. In traditional methods, the clothing industry used basic sewing machines for all operations with the help of human power, so introducing different styles in clothing was very difficult at that time. Industrial engineering concepts are applicable in this field to improve productivity and quality in order to surpass the competitive market. Garment manufacturing involves a number of operations in different departments. In the garment sector, to improve productivity and quality, they must focus on machine, method, material and man. Thus, the concept of industrial engineering will cover and handle all the above factors and help to improve the productivity as well as the quality of products that will satisfy the needs of consumers. This article will discuss the existing (manufacturing) methods in garment units and help them to improve their productivity by applying one of the latest techniques such as capacity study, work study, time study, operator performance, tracking, incorporation. -Progress and the KAIZEN method are already proven techniques for improving productivity in various industries.**

***Keywords*: Industrial engineering, garment, KAIZEN, industry improving productivity.**

1. Introduction

Industrial Engineering (IE) plays a vital role in the apparel industry; hence Industrial The roles of engineers are very important for a garment factory When we need to reduce costs and improve work efficiency in this competitive age, the garment industry hires an industrial engineer to do the job smartly the apparel industry is growing rapidly with the use of IE in their equipment. In this article, we list IE activities in a garment factory to help you understand the roles of industrial engineering in a garment factory. Learning and implementing production-level IE tools and methods can improve overall performance. The goal of industrial engineering is to establish methods for improving operations and managing production costs by eliminating waste and non-value-added activities. The overall work of the sewing section is completed by different operators. So, without a standard goal it is impossible to reach the goal. To set a standard target time and movement study is mandatory. This document represents the time and motion study practice used in the clothing sector. By conducting a time and motion study an assumption can be made of the total time required for any particular product or garment i.e., really important to deliver the product to the buyer on time. Index Terms - time study, motion study, productivity and contribution.

"Kanban" system for inventory control in its traction system. "Kanban" is a combination of the two Japanese words "Kahn" meaning card and "bahn" meaning signal. Kanban means a card carrying a signal. It is a visual indication to display parts requested. Kanban is a card control system for passing instructions not produced until needed.

The goal of Kanban is to minimize inventory work in progress (WIP) and total inventory cost. This is an effective inventory management system. Kanban can control stock levels in systems to regulate production. When the buffer reaches its limit planned maximum level, operator or machine instruction to stop production of the next piece. Further that maintains inventory levels by sending a signal to production and delivering a new shipment stating that the material has been consumed. By controlling the release of inventory to the system achieves a smoother production flow' with a more stable and predictable output by reducing fluctuations. The Kanban system is a very effective tool for improvement productivity-: optimizes the process; reduce idle time process; makes the process flexible for any proposals; reduce waste; ongoing deliveries to the customer and are increasing device efficiency. Moreover, it improves quality, reduces costs, shortens implementation time and increases flexibility. He introduced Kanban among many companies.

2. Materials and Methods

Material:

Women's pajamas have been used as material.

Fabric: Single jersey

Fiber: 100% combed cotton

Problem Identification:

Especially in the clothing industry, there is a delay in the productivity of the given product. So that the problem is identified through the concepts of method study and time study belong to IE concepts. The following issues have been identified with lag or excessive time required to complete various product operations. 1. Damage to the machine, 2. Improper training of tailors (work), 3. Improper layout plan, 4.

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Poor knowledge of machine handling and maintenance, etc.

Solution to the problem:

This project was analyzed to show that the main delays and defects occur mainly in the production area. After cutting and numbering, the fabrics are passed to the sewing department, the main sewing operations are done by hand. The production of a production unit always depends on a qualified and trained workforce, the correct adjustment of the machine with regard to the operational malfunction of the garment, good working conditions of the sewing machines; All the above-mentioned factors are very important for saving time and also for increasing the productivity of the company.

The "Kanban" system for inventory control in your traction system. "Kanban" is a combination of two Japanese words "Kahn" meaning card and "bahn" meaning signal. Kanban means a card carrying a signal. It is a visual indication to show the required parts. Kanban is a card-based control system for passing instructions that are not created until they are needed. The goal of Kanban is to minimize work-in-progress (WIP) and total inventory costs. It is an effective inventory management system.

Kanban can manage inventory levels in production control systems. When the buffer reaches its limit planned maximum level, operator or machine instruction to stop production of the next piece. It also maintains stock levels by sending a signal to production and delivering a new shipment that the material has been used up. By controlling the release of inventory into the system, a smoother production flow is achieved with a more stable and predictable output by reducing fluctuations. The implementation of Kanban includes six rules: do not pass defects - if defects are detected - stop the entire line so that the defects are fixed; signals from the following process go to the previous process until parts are downloaded; the number of parts produced must equal the number of parts removed by the following process; parts that may not be produced or transported if there is no Kanban; The Kanban must be connected to the actual parts - the number on the Kanban must agree with the number of actual parts. The Kanban system is a very effective tool for improving productivity-: it optimizes the process; reduce process downtime; makes the process flexible for any proposals; reduce waste; continuous deliveries to the customer and increase the efficiency of the equipment. In addition, it improves quality, reduces costs, shortens implementation time and increases flexibility. He introduced Kanban to the methodology of many companies.

Time & Method Study in Industry:

It is a technique used to record the time and method of performing a certain activity to identify the time required by an operator to complete a specific task by a certain method. Time study and method study are the main techniques of industrial engineering concepts that are needed to improve productivity in the garment industry. So, in this project we studied the methods as well as the time to improve the production by reducing the time by implanting the necessary changes in the sewing line. To study the time study first, the design needs to be properly analyzed with their specifications. Once the design is properly analyzed, a traffic breakdown is needed for that particular style. Then the calculation of the required machines and the efficiency of the operator must be carried out. After that, you need to plan a suitable layout according to the style of the garment. Time should be recorded for each change made in the line to improve productivity to identify the improvement made in the industry.

3. Result and Discussion

After observation of method and time to complete the garment the following Kanban card system has been introduced to reduce the idle time as well as improve the quality in

Table 1
SAM value for t shirt

S.No.	Operation list	Before SAM Values (min)	After SAM Values (min)	Total Time saved (min)
1	Bottom hem	0.58	0.45	0.13
2	Yoke attached	0.51	0.40	0.11
3	Button hole	0.25	0.20	0.05
4	Button attaching	0.29	0.25	0.04
5	Sleeve attach	1.01	0.50	0.11
6	Sleeve top attach	0.55	0.48	0.07
7	Main label	0.30	0.21	0.09
8	Care label	0.30	0.21	0.09
9	Join neck rib to the body	0.50	0.41	0.09
10	Placket doubt	0.58	0.47	0.10
11	Front placket stitch	0.60	0.48	0.12
12	Cutting placket	0.45	0.38	0.07

Table 2
SAM value for pant

S.No.	Operation list	Before SAM Values (min)	After SAM Values (min)	Total Time saved (min)
1	Measure and cut stain tape	0.40	0.30	0.10
2	Leg cuff attach	1.10	0.54	0.16
3	Leg cuff stitch	0.50	0.44	0.06
4	Label attach	0.25	0.20	0.05
5	Side seam	0.60	0.51	0.09
6	Inseam	0.35	0.28	0.07
7	Bottom hem	0.30	0.23	0.07
8	Attach waistband	0.50	0.42	0.08
9	Pocket process	2.48	2.15	0.33
10	Total	6.48	5.07	1.01

production process. The construction process has been lagged into so many operations.

By using Kanban is a visual card or billboard; A Japanese word that means Cards or board, a lean manufacturing tool for visualizing the teamwork of the entire production on production management, with a focus on creating a more effective and efficient production system, focusing mainly on production and logistics activities. Kanban is a visual system because the "Signal Card" shows what to do, items are inserted when needed, Kanban cards order the necessary task, update with time and certainly reduce waste. In this article, you will have an idea of how a kanban board is used in garment manufacturing.

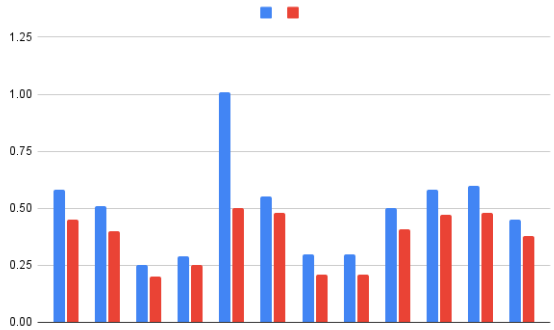

Fig. 1. Value for t-shirt

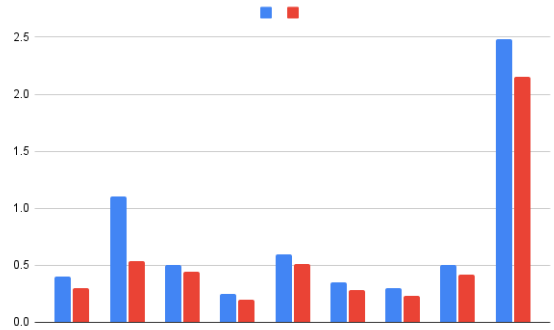

Fig. 2. Value for pant

A. Outcome

1) T-Shirt

- Operation Time (Before implementation of IE concepts (Time study) =5.92 – Operation time (After Implementing IE concepts) 4.44 = Reduction time:1.48seconds.
- To manufacture one women pajamas the time has been reduced from 5.92 to 4.44 seconds, Obviously it states that production & productivity of that particular product will improve. There are nearly 25 machines being used in the industry, for constructing a womens pajamas it requires 18 machines.
- Equation used to calculate the production: Total machine productivity = (total no of output per day per line)/ no. of machines used
- We get after implementation of time study concept Daily machine productivity = working time per day* no. of sewing machines/total time per garment = 480*15/5.92 =1216 By using equation [1].
- We get after implementation of time study concept Daily machine productivity = working time per day* no. of sewing machines/total time per garment = 480*15/4.44 = 1621.

2) For Pant

- Operation Time (Before implementation of IE concepts (Time study) =6.48 – Operation time (After Implementing IE concepts) 5.07 = Reduction time:1.41seconds.
- To manufacture one women pajamas the time has been reduced from 6.48 to 5.07 seconds, Obviously it states that production & productivity of that particular product will improve. There are nearly 25 machines being used in the industry, for constructing a women's pajamas it requires 18 machines.
- Equation used to calculate the production: Total machine productivity = (total no of output per day per line)/ no. of machines used.
- We get after implementation of time study concept Daily machine productivity = working time per day* no. of sewing machines/total time per garment = 480*15/6.48=1111 By using equation [1].
- We get after implementation of time study concept Daily machine productivity = working time per day* no. of sewing machines/total time per garment =480*15/5.07 = 1420

4. Conclusion

A pull system integrated with a Kanban system is a has proven to be highly effective in the manufacturing industry. This research implemented the Kanban system to a high degree labor intensive garment manufacturing industry. Despite several line stops due to various problems during monitored period of 2 weeks, production was increased by 22%. Plus, the right number of Kanban's cards to collect points Kanban is a label effective implementation of the Kanban system. The selected factory implemented some of the main one's lean manufacturing tools and techniques. Setup reduction, after implementing these tools and techniques would be the reason for effective implementation of the Kanban system. If the machines failures were high, and if quality problems were high, Kanban cards would not flow as expected. Number Kanban card at collection points together with improvement in production is an indirect indicator the success of other tools. As the skill matrix suggests operators, the factory has a highly skilled workforce. Highly trained workforce, implementation of major Lean production tools and techniques are essential components for the successful implementation of the Kanban system.

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