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Implementation of Production Control Tools in Garments Manufacturing Process Focusing Printing Section.

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Abstract

Traditional printing works in maximum garment industries are facing different problems like low productivity, longer production lead time, high rework and rejection, low flexibility, lower quality product, high non-value added work etc. In this study these different problems were identified by using numerous effective production control tools like process analysis, layout of work station, motion and time study, work standardization etc. The encouraging results after implementing these tools give the way to go forward and thrust to reach at the end point. Some key benefits of this implementation are reduction of excess motion and non-value added work by 50%, decreasing of sample rejection level by 70%, reduction of work level for repairing works by 80%. As a result total processing time for final output is decreased. After the implementation of these tools effectively the result shows the significant improvement of the production than before.

Keywords: *Production control tools, process analysis, motion study, Layout, Time study.*

1. Introduction

In this paper study was conducted in the printing section under a garment manufacturing company. From textile industry fabric comes to printing section for being the output of sewing section. So, printing section plays a vital role for apparel industries. Printing section involve different types of critical work like expose work, color mixing according to recipe, die work, drying and curing work etc. This study introduces general procedures for promoting improvement and production layout as a means of production design.

Background

Due to the increasing labor wage in developed countries, the apparel manufacturing has been migrating from the high wage developed world to low wage developing countries. Garment industries in developing countries are more focused on sourcing of raw material and minimizing delivery cost than labor productivity because of the availability of cheap labor. Due to this, labor productivity is lower in developing countries than in the developed ones.Now the worry is about labor productivity and making production flexible; because the fashion industry is highly volatile and if the orders are not fulfilled on time, the fear for losing business is real.In some cases it has been observed that, in developing countries the garment industries are run as family business lacking skilled personnel as well as capital to implement new technologies for improving productivity and flexibility. Because of this, industries have been running in a traditional way for years and are rigid to change. They don't have much confidence and will towards innovation over old processes. Now the time has come to struggle with global market demand and niche market in garment industries if they want to run it further.The best way to cope with all these challenges is the implementation of production control tools. This will serve our purpose of flexibility and save a lot of money by reducing production lead time, reducing the inventory, increasing productivity, training operators for multiple works, and by reducing rework.

2. Process analysis

Processes are units of divided work which form a series of work. Purposes of process analysis are given below [1]:

(i) To clearly define the order of the processes.
(ii) To clearly define the manufacturing method.
(iii) To make further improvements in each process.
(iv) To provide basic information on improving the performance.
(v) To provide basic information on production design.
(vi) To provide teaching materials for workers and sub-contractor.

For process analysis here a special sign is used (Fig.1).

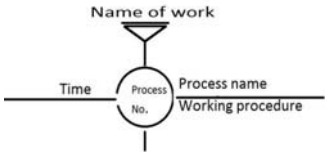

Fig.1. Sign used for process analysis.

Process analysis diagram is shown in figure 2. At first work begin with expose work. Expose is the work to produce die which is the vital equipment of printing work. Process 1 includes adjustment of art design which is sent from buyer. After completing adjustment of design a film is produced with the help of printer which is process 2. In process 3 die is made with combining film and frame with pressing mechanism. After expose work, color related work is carried out. Color composition is one of the most important tasks for printing work. In process 4 color composition work is done according to color pattern. Additional work 5 and 6 are needed for further processing. Gum and tape are sent everywhere of working bed where printing will be carried out. Cutting part is then set on working bed with the help of gum and tape. Inprocess 7 the main value added work is carried out with combining the output of process 3 and process 6.After process 7, decision making stage is come out. In this stage the color on cutting fabric is examined with buyer requirement. If it seems that the color is perfect than it goes for further processing as primary sample and if not then the process 4, 5, 6 would be carried out according to the way described earlier. After getting primary sample, it sends for curing operation which is process 8. After final inspection, final sample is come out in process 9. After getting final sample it sent to buyer for approval. Buyer can reject final sample in two ways, one for misalignment as well as error of design adjustment and another is for error in color mixing. It will be awkward for company if buyer reject final sample for error in design adjustment. Because then the whole process from 1 to 9 would be carried out according to the way described earlier. If buyer reject final sample for the reason of color mixing then process 4 to 9 would be carried out. If buyer approve final sample then it goes for bulk production. In process analysis time study has performed for 72 fabrics for sampling wok and 250 fabrics for bulk production. So, after process analysis it can be said that the process of design adjustment is more sensitive than any other process. Hence more attention should give for design adjustment to reduce sample rejection rate. With proper concerning on design adjustment and color activity, it is shown that the sample rejection rate can be reduced up to 70%.

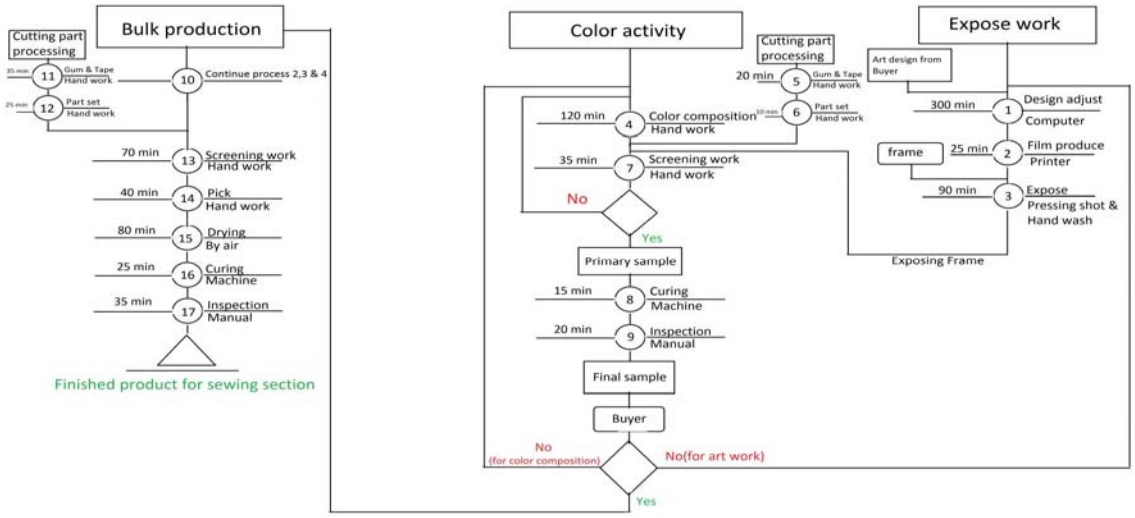

Fig.2. Process analysis.

3. Layout

In developing a layout for an operations system we seek the optimum allocation of space to the components of the production process [7].The need for layout planning arises both in the process of designing new facilities and in redesigning existing facilities.Layout refers to the configuration of departments, work centers, and equipment, with particular emphasis on movement of work (customers and materials) through the system [6].

Building layout

During observation of different process of printing section it is noticed that the orientations of work stations are not good enough. For these reason excess motion and extra work are needed [2]. Types of existing work station on different floor (Fig.3) are given below:
In ground floor only screening work of all over printing is carried out. First floor consist design adjustment room of piece by piece and all over printing. It also consist an expose room for sampling work of both types of printing but used only for the bulk production of piece by piece printing. A cutting work of all over printing output and repair work of piece by piece printing are carried out on first floor. Second floor consist expose room of all over printing. And also bulk production, curing and inspection of piece by piece printing are carried out there. In third floor only bulk production of piece by piece printing is carried out. In fourth floor sampling work of both type of printing and bulk production of piece by piece printing are carried out.
After completing capacity analysis [7] of each floor we propose a new layout besides the existence layout of workstations for each floor of 5 stored building. Types of workstation on different floor in proposed layout (Fig.3) are given below:
In ground floor, expose room and screening work of all over printing both will come together. Because of sufficient space curing, inspection, repair work of piece by piece printing and also cutting work of all over printing will come together on first floor. In second and third floor only bulk production of piece by piece printing will be carried out. Fourth floor will be accomplished with design room and sampling work of both type of printing. Fourth floor also consist an expose room which will be used for sampling work of both type of printing but only for the bulk production of piece by piece printing.

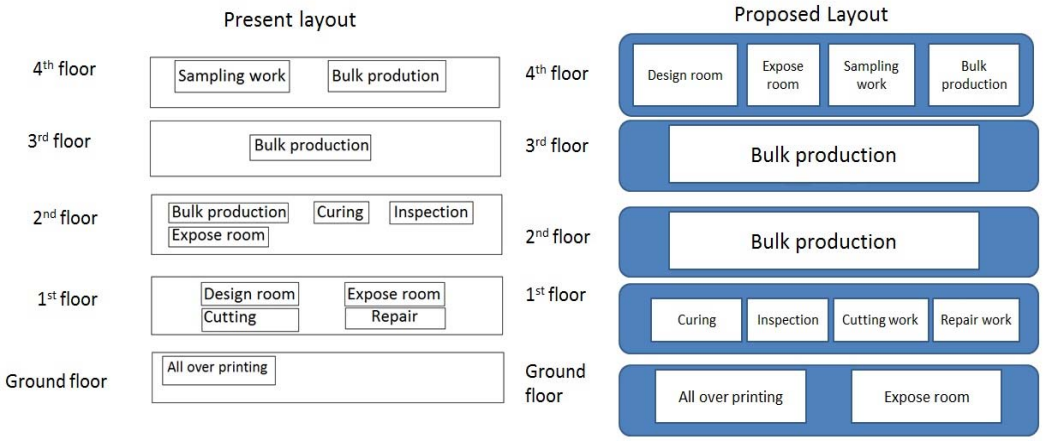

Fig.3. Layout of workstation in different floor.

The results after implementing the proposedlayout are given below:

(i) It minimizes the effort of workers to carry the exposed die for sampling work.
(ii) It remedies the difficulties for workers of lifting exposed die.
(iii) It reduces extra motions and forms linear flow of material by eliminating circular flow.

It is shown that the proposed layout causes reduction of non-value added work by reducing extra motion, transportation distance, idle time. It also increases worker reliability, smooth material flow.

Curing process layout

In curing process for existing layout operators require extra motion for picking and disposing fabrics from working table because of backward movement [2]. Some operators are waiting beside the input table during idle time. Input and output box are not efficiently distributed. More operators required for this process.It is shown that a smooth production flow is achieved with minimum interruptions after implementing the suggested layout [3] for curing process. It also causes better working condition, less processing time and fewer workers to accomplish the task.

The existing and the proposed layoutfor curing process (Fig.4) are given below:

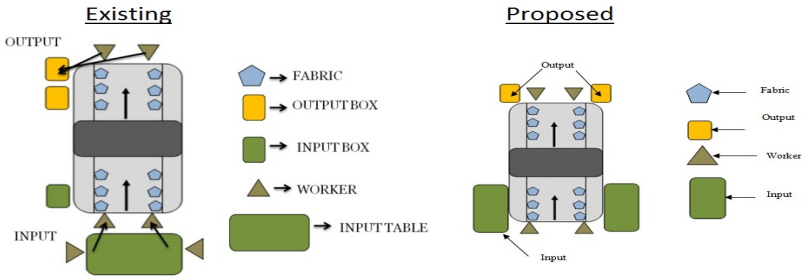

Fig.4. Existing and proposed layout of curing process.

Inspection system layout

In existing layout of inspection involved larger processing time. Works cannot be distributed properly among workers because of incorrect layout of inspection system. Extra workers are needed for the inspection system. Because of communication gap it causes less flexibility for workers [4]. The existing and the proposed layout for inspection system (Fig.5) are given below:

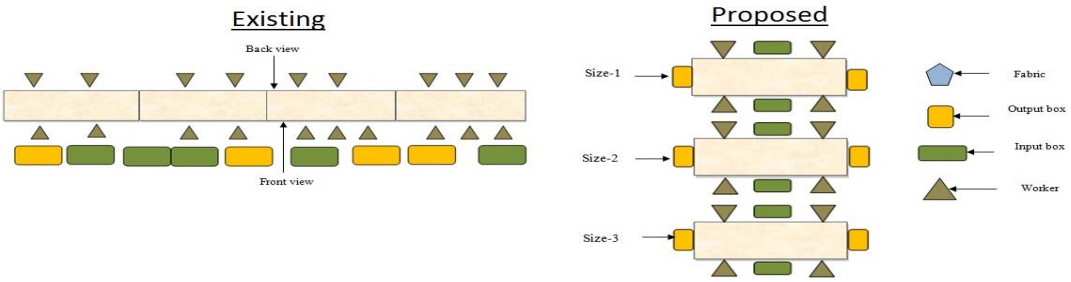

Fig.5. Existing and proposed layout of inspection system.

By implementing suggested layout for inspection system it is shown that work can be easily distributed among worker and it also reduce the number of worker needed to accomplish the inspection work. It also increases reliability by reducing communication gap among worker.
The improvement of the existing layout of work station, curing and inspection system causes reduction of non-value added work by 50%.

4. Work study

Work study is a generic term for those techniques, method study and work measurement which are used in the examination of human work in all its contexts. And which lead systematically to the investigation of all the factors which affect the efficiency and economy of the situation being reviewed, in order to effect improvement. Work study forms the basis for work system design. The purpose of work design is to identify the most effective means of achieving necessary function [9].

Transportation

The traditional transportation systems for drying included the following steps:

(i) First one person separates the fabric from table which is attached with table by gum.
(ii) Another person brings a stick which is used to carry the fabric.
(iii) Then a person put the fabric on the stick to carry in the drying area.
(iv) Then the Fabric stays in drying area more than 30 minutes. The drying time is varying due to some reasons such as weather, air circulation system, color combination etc.
(v) Then another person takes the sticks with fabric from drying area and delivers the fabric for inspection.

There are some problems in traditional transportation system. The Problems are given below [3]:

(i) Need extra times to separate fabric from table.
(ii) Need lot of equipment to carry the fabric.
(iii) Need extra workers
(iv) More waiting time
(v) Not proper utilization of man, equipment and time.
(vi) Material flow is not smooth

These difficulties can be eliminated by using conveyor system instead of traditional transportation system. Conveyor system will also increase production rate as well as overall efficiency [8].
The designed conveyor for drying (Fig.6) andthe working procedures of that conveyor [8] (Fig.7) are given below:

(i) A U shaped conveyor system will be established upon the working bed.
(ii) U shaped conveyor will consists of lot of hanker to carry the fabric.
(iii) After completing the printing of fabric a worker will take the fabric from bed and will put it on hanker of the U shaped conveyor.
(iv) Then hanker will goes to the drying area according to the path of conveyor system.
(v) Then another empty hanker will come upon the bed and after that same procedure will be repeated.

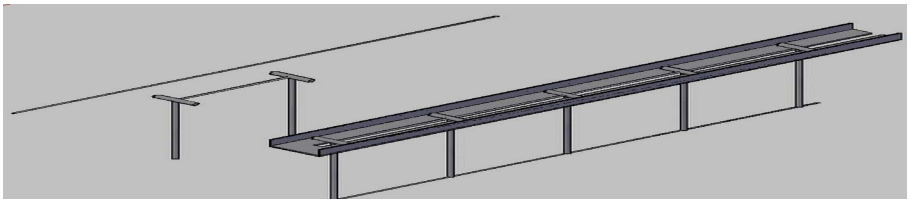

Fig.6. Designed conveyor for drying process.

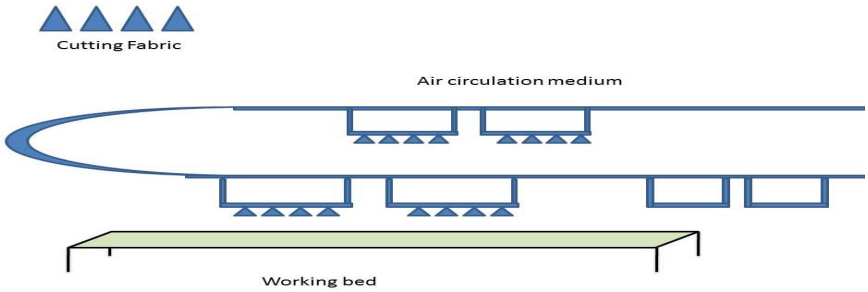

Fig.7. Working procedure of designed conveyor

Delivery section

After the drying section the fabric goes to the inspection section. In this section the fabric inspected by workers to maintain the quality and find out the defects. If find any disorder of the color or printing problem or another defects then the fabric goes to repairing section to repair the defects. And the good product goes to delivery section to deliver the output toward sewing section.
The procedures followed for deliver the output are given below:

(i) After completing the inspection the fabric put on a basket according to their size.
(ii) Then the baskets are sent to the delivery section.
(iii) In delivery section a worker transfer all the fabric into a sack.
(iv) Then a worker tied the bundle
(v) Then it stored to deliver for sewing section.

Problems involved in traditional delivery system of final output are[3]:
(i) It needs extra time to transfer the fabric from basket.
(ii) It need extra worker to transfer the fabric from basket and one worker in idle.
(iii) When a worker tied the bundle the quality of the fabric may be hampered.
(iv) Face lot of waiting time to deliver the sewing section.

These problems can be eliminated by introducing a lift system which will carry the final output for sewing section just after the inspection stage. By introducing lift system for deliver the output reduce the time needed for transportation and also reduce the number worker needed to accomplish the task. By the utilization of gravity it also increases flexibility for worker [5].

5. Repair work:

Repair work means doing the job over again, because it wasn't right the first time.Set up procedure of the fabric has identified as the main cause for repair work. The steps involved to set a fabric on working table are given below:

(i) At first a worker sweeps the working bed by gum.
(ii) Then a worker distributes the Tape.
(iii) Then a worker distributes the fabric.
(iv) Then a worker attached the tape and fabric on the table.

After two or three cycle of printing, it is necessary to clean the table for next cycle. In this situation it produces a lot of dirt due to gum and tape. When it is cleaned it may be present in the air with small amount which may be fall in the fabric in next cycle and then it causes poor printing quality. For these reason repairs work is needed to improve the printing quality of the fabric. It is shown that using of wax instead of gum and tape on working table causes reduction of repair work by 80%.

6.Summary and conclusion

The research consists of conducting time and motion study of printing operations. By doing this, printing operations will be standardized and production targets for each operation will be fixed. Secondly, working condition, space utilization increases and also processing time, number of workers decreases by the implication of new layout. In the research the unit layout has been implemented to increase the productivity. Similarly, the sitting operations have been converted into standing operations for the better movement of operators in between the machines, from the perspective of work balancing and uniform work load distribution. Finally, flexibility in production is achieved by the reduction of work in progress and complexity in material flow.

7. Recommendation for Future Research

In this research, only the printing operations are standardized due to time limitation. But this work can be extended forotheroperations like stitching, storing etc.This will minimize the duplication of work and it is easier to calculate standard time of new style by reallocation of some operations over existing. In this research conveyer system with hanger has been suggested for drying process, but it is necessary to be reviewed some other way also which will be profitable for long period. It is also important to be reviewed some other material instead of wax for table to reduce repair work more effectively.

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