



WORK STUDY: A MANAGEMENT TOOL FOR EFFECTIVE PERFORMANCE AND GROWTH OF APPAREL INDUSTRY

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Introduction:

The Textile and Apparel industry caters to one of the most basic requirements of the people and holds importance as a major contributor to the nation's economy. During the year 2013-14, Readymade Garments account for almost 37% of the total textiles exports. As per latest available statistics during the first nine months of 2014-15, exports of RMG account for 47% of the total textiles exports (Annual Report, Ministry of Textiles 2014-15). The sector has a unique position as a self-reliant industry, from the production of raw materials to finished products. In today's competitive environment, it is essential that worker works harder, more productive so that production costs are kept low to meet global challenges. Workers at all levels are the essence of an organization and their full involvement enables their abilities to be used for the benefit of industry. For sustaining the market share and to cope with new competitors it is necessary to deliver quality products in time, at minimum cost for their survival and growth. This demands the increase in productivity and efficiency of the industry which is more challenging today in garment industry.

In the present era, the most economic and effective way to control cost is not only the changes to be brought in production methods or latest techno friendly equipments but there is also a need to look



within the internal processes and ease of workflow and working systems, garment handling, utilize the existing available resources and mechanism in an efficient way. The analysis of a workplace is crucial to establish a safe and effective system for an operator to work in the industry. The layout of departments, production sections, individual workstation, garment handling and control systems are fundamental to the efficient running of a production unit. It is important to remove waste from every process to achieve better efficiency and improve productivity while maintaining certain quality standards. The manufactures must realize the importance of using scientific ways to analyze how best garments can be made and how manufacturing procedures can be improved. Various industrial engineering techniques are used to analyze and improve the work method, to eliminate waste and proper allocation and utilization of resources. Identifying, understanding and managing interrelated processes as a system, contributes to effectiveness and efficiency of industry in achieving its objectives. Work study is one of the best tools used for this purpose. Work study is a systematic technique of method analysis work measurement and setting of time standard that can be ensure the highest productivity by the optimum use of man power, equipment and material. The entire sequence of pick, aligns, sew and dispose of a garment part is a motion and unless done right in a defined manner, generates excessive movement or unnecessary motions, which is a waste that eats into the profits of the industry. The exacting motion needs to be timed for standardizing the outcome. Both 'motion' and 'time' have been integrated and refined into a widely accepted approach to 'work study' to be used together in order to achieve rational and reasonable results.

Literature Review:

Freivalds & Yun (1994) found that a t-shirt folding operation in garment industry subjects to a high rate of cumulative trauma



disorders. On the basis of the frequency of extreme wrist deviations during the turning phase, a foot-controlled suction device was built to automate the actual turning process. The remaining inspection and folding elements were left as manual operations. A trained operator using the automated turner maintained a standard performance of 12 t-shirts per minute, equivalent to the current performance within the manual turning phase. Both tasks were integrated into the current production line without an increase in the workforce. The researcher further concluded that the elimination of critical motions leading to cumulative trauma disorders through properly designed automation can implement at minimal cost to productivity.

Bowes (2010) has worked with Aitken Spence, a shirt manufacturing unit in Sri Lanka to help the company in improving productivity through the measure of efficiency on the sewing teams. A productivity gain from 46% to 58% was achieved by using method study (involves reviewing the individual operations for output improvements). He further preceded a study at Penguin leisurewear, T-shirt, shorts, sweatshirt manufacturer where certain implementations in work process in sorting area led to reduction in time for getting the work to average of 5 minutes, saving up 45 minutes in a day. The final conclusion was drawn that increasing employee productivity is a mix of examining the methods of working for non-value added time, such as sorting, bundling and unbundling, moving work; looking at the method for incentive handling, poor use of machinery or equipment; motivating people to work as effectively they can focus on output & quality; and rewarding people for their efforts.

Roy, Ghosh & Chakraborty (2012) prepared a project on "Application of Industrial Engineering in garments sewing floor". This study was conducted in the stitching section of a shirt manufacturing company. Study includes time studies, the conversion of traditional



batch production into single piece flow and long assembly line into small work cells. The problems related to traditionally operated garment industries like low productivity, longer production lead time, high rework and rejection, poor line balancing, low flexibility of style changeover were addressed. After implementation of lean tools like cellular manufacturing, single piece flow, work standardization, just in time production they found very encouraging results. the production cycle time decreased by 8%, number of operators required to produce equal amount of garment is decreased by 14%, rework level reduced by 80%, production lead time comes down to one hour from two days, work in progress inventory stays at a maximum of 100 pieces from around 500 to 1500 pieces.

Islam & Khan (2013) conducted a study in the garment industry located at Dhaka, Bangladesh in cutting, sewing and finishing section to identify reworks so that they can be eliminated from the system. The suggestive tools developed in this study cover a series of aspects in minimizing reworks in different departments of apparel industries by ensuring quality production. Cutting lot failure rate reduced to zero percent. Sewing percent defective reduced to approximately 40%. In finishing, stitching defects per hundred units (DHU) came down to approximately 8% from 16%, uncut thread defects per hundred units reduced to approximately 10% from 22%. Rework increased the cost of the different work categories between 2% to 30%. The study clearly indicates that by eliminating non-productive activities like reworks in the apparel industries time as well as cost are saved by ensuring quality production which have an important impact on overall industry economy.

Objectives:

- To observe and analyze the workflow and processes of different sections of apparel manufacturing unit.



- To recommend the suggestions for effective performance of the workers and improved productivity.

Methodology:

Sample: For the present case study, an export oriented garment industry was taken based on its productivity, number of workers and organizational set up. Both male (15) and female (5) workers from cutting, stitching, finishing and packaging were taken as sample for the study.

Tools & Techniques: Observation, task analysis and time study sheet were mainly used to collect the data. Interview schedule was developed to note down the responses of the garment workers in four different sections of the industry. Major quantitative data was collected through the observation and time study sheet of different work flow processes in various sections. Other qualitative data was collected through task analysis sheet and interview schedule with the floor manager, managers and finally by asking question to the worker, supervisor and quality checker. Various sections such as designing, sampling, pattern making, cutting, sewing, finishing, packaging of the garment manufacturing units have been investigated and finally cutting, sewing, finishing, and packaging section has been selected for the main study.

Time Study Plan & Procedure:

During the study, time study plan was developed in order to record manufacturing activities. The time was measured using stopwatch tool because it is easier and faster in data recording. The observations and recordings were made while workers performing a task, each task or operation was broken into definite number of elements and time taken for each element were recorded directly on the time study sheet. Appropriate allowances were assigned (e.g. allowing time for necessary but non-productive activities, such as rest break, washroom delays etc.). Time study was carried out for a standard ladies knitted T-shirt as a



base line because operations differ from style to style and it is difficult to correlate all these operations of individual styles. After that, five operators were selected for each operation so that the difference in timing can be cross checked from the observed data of these five operators and to give the ratings of that activity. To obtain better results, each operation time was taken for at least 12 cycles. Once time study was made, the performance rating was given to each operator and actual time was calculated for particular operation. Finally the Personal Fatigue and Delay (PFD) component is added on the calculated time and the operation time is standardized.

The PFD factor is taken as 15% of total time which is a little bit higher than normal industry standard; it is taken higher considering the operator's movement inside the cell. Similarly the average performance rating is taken as 90%. This rating is adjusted average of actual ratings.

Performance rating = Observed performance / Normal performance X 100

The calculated time (Normal time + Allowance time) is standard time for each element in seconds. All elemented time was added and converted into minutes. This was standard minutes or SAM (Standard Allowed Minute).

Results & Discussion:

The general observations made in garment manufacturing unit were as following:

- Workplaces were poorly planned
- Tasks were generally repetitive and burdensome to workers.
- Workspace was congested and sitting postures were typically constrained and uncomfortable



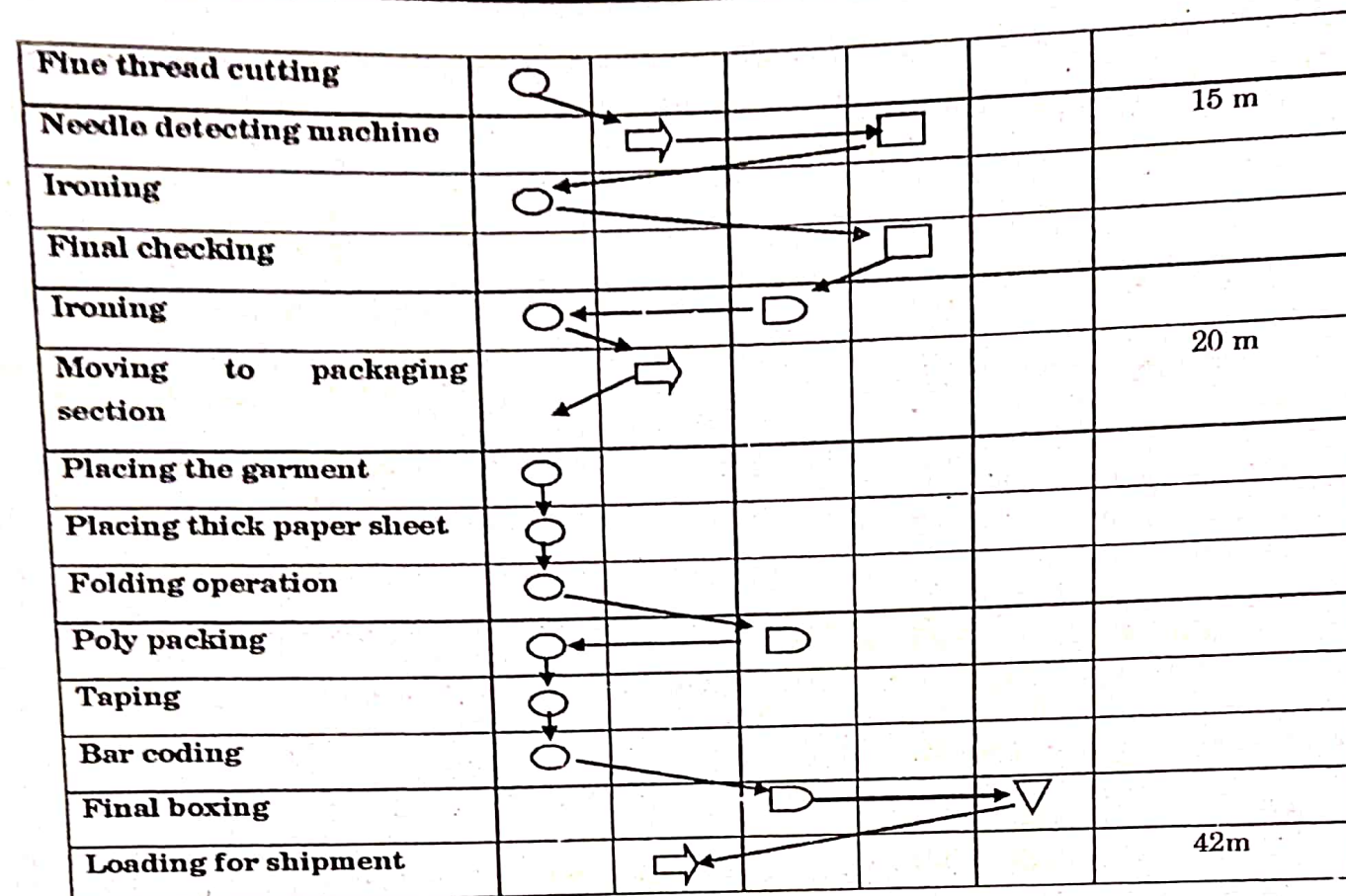
- Gripping and pinching with considerable forces and for extended durations was common.
- The duplication of the processes were shocking
- Seats were devoid of a backrest
- Most of the seats were hard without a cushion
- The sewing table surface was neither adjustable in height nor tiltable.
- Nobody used to wear metal gloves while working with electric cutting machines.
- There were no monitoring systems to establish the performance level of the workers.
- There was a general lack of control over work.



Flow process chart (material) for manufacture of Ladies Knitted T-shirt:

○ Operation ➡ Transport ▭ Delay □ Inspection ▽ Storage

Description	Symbols					Distance (metre)
	○	➡	▭	□	▽	
Collecting the material	○		▭			
Moving to cutting section		➡				30 m
Placing the fabric	○		▭			
Checking placement of plies				□		
Pattern placement	○			□		
Marking the patterns	○					
Checking pattern placement				□		
Cutting the fabric	○		▭			
Moving to sewing section		➡				35 m
Keeping in bundle					▽	
Interlocking	○					
Folding edges	○					
Label attachment	○		▭			
Seam lock	○		▭			
Seam finish	○					
Moving to finishing section		➡				28 m
Checking for measurement				□		
Initial thread cutting	○					
Marking for defects				□		
Spotting	○					
Washing	○	➡				26 m



Summary of the flow process chart for producing Ladies Knitted T-shirt

Event	Present	Proposed	Savings
Operation	22	17	05
Transport	07	05	02
Delay	08	No delay	08
Inspection	07	04	03
Storage	02	01	01
Distance (m)	196 m	161 m	35 m

In the current scenario of apparel manufacturing unit for producing a ladies knitted T-shirt, there were 22 operations in cutting, stitching,



finishing and packaging, where workers were performing a particular task, 7 process were related to transportation of material, 8 delays were observed due to unsystematic flow of goods, waiting time, in search of material and resources, non value operations, 7 times the material was inspected from raw to finished level, 2 times they were stored for partial bundling and final packing. As the department were relatively apart from each other the observed distance travelled in overall process was 196 metre. The proposed 17 operations were made by reducing the repetitive procedures, synchronizing more than 2 task in single process but with complete emphasis on consistent quality. Arrangements of machineries and equipment on the floor area where they belong rather than moving around for completing the task. Delays can be totally eliminated from the workplace if progressive workflow is followed, materials are in order with proper labeling and within the approach of worker i.e., available at their workstation etc. Repeated inspections for the same task can be united to one single process but at accurate time and with complete accuracy. Proposed storage can be reduced in one process and the unnecessary distance travelled was proposed to reduce by 35 metres.

Distribution of standard time recorded in four different departments

Departments	Performance Rating	Personal Fatigue Delay	Standard Time
Cutting	90%	15%	2.03 min
Stitching	90%	15%	3.36 min
Finishing	90%	15%	2.96 min
Packaging	90%	15%	2.09 min
Total minutes			10.44 min



The above recorded time for the completion of one ladies knitted T-shirt can be improved by 15-20% in the apparel manufacturing industry. If the non value added operations discussed below can be eliminated by following some useful suggestions:

Recommendations for eliminating non value operations in four different departments		
Departments	Non value operations	Recommendation
Cutting	Workers have to search for the material to be cut from a messy storage.	<ul style="list-style-type: none"> The storage area can be organized systematically with proper labeling. Bolts/rolls should be placed in shelves near waist height for easy lifting.
	Lifting heavy cloth rolls by a single worker directly from floor area to cutting table.	<ul style="list-style-type: none"> Rolls should be lifted by two workers at one time. Mechanical trolleys or lifters can be used for saving time and effort.
	Single worker with excessive reaching and stretching the arms for cutting.	<ul style="list-style-type: none"> Two workers on each side of the table can be placed. Cutting machine with a long handle can be used.
Stitching	Unsystematic flow of operation, workers move from their place to take and deliver the material.	<ul style="list-style-type: none"> Layout of the department should be set to make the flow of work in a progressive manner.
	The bundles of cut pieces are laid either on the machine or directly on the floor which creates mess up and also the chances of damage to garment is more	<ul style="list-style-type: none"> Hanging system within the easy reach of every worker can be provided at their workstation for worker's efficiency of performing the task and also to save the garments from being stained. Small boxes can be placed on platform at a good height within the worker's reach.
	Worker's have to struggle and wait for the material like thread, needle, bobbin etc once they are finished or damaged	<ul style="list-style-type: none"> Materials and tools of frequent use can be placed within easy reach at their workstation to save production time.
	Workers work on a messy work table without any uniform distribution of workers at one	Workers can be arranged in even manner at their standing workstations, a



Finishing

place.

Duplication of processes like examining the garments for measurement, than iron them, again examine them and send to washing but without removing the thread. At times the garments are examined to up to five times, the threads are cut twice and the pressing is done twice.

Supervisor is required for moving the garment components from one place to another

Unorganized work area hinders the smooth flow of work and take more time to accomplish a task

fuzzy work area leads to low quality and productivity.

- Workers who trim the threads can be trained to work in a set pattern efficiently and to handle each garment in even manner of predetermined sequence to avoid duplication of same process.
- The garment size should be checked at the same time by measuring tape according to standard sizes, fixed to the work table.
- A hanger system works effectively to eliminate creasing after ironing to move throughout, resulting in removal of the final ironing process before packaging
- Hanging-rails on wheels prevent crumpling of ready-to-deliver garments and make the transportation of finished items safer.
- Proper channelized system can be introduced and even distribution of material can save both time and effort of the worker.

Packaging

The work area was not systematically organised, worker has to reach to the material from one place to another for completing the task

Workers have to search for the material most of the times.

Continuous sitting in folding legs and in bent position on hard floor lowers the productivity.

Repeatedly lifting of cartons manually consume more time and effort.

Work area can be organized in the progressive way of operations.

Material related to this section can be placed in shelves or table with racks which are within the reach of workers.

The worker can be asked to work on stable work tables and stools.

Conveyers can be used to transport large cartons which reduce the time.



Conclusion:

Traditionally operated apparel industries are facing problems like low productivity, longer production lead time, repetition of processes, high rework and rejection, poor line balancing, improper methods. The workflow process can be improved by implementing the above mentioned suggestions in four different departments of the garment manufacturing units. This will lead to better utilization of resources, healthy workplace and maintaining consistent quality of the product and improved productivity.

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