

Investigation of Improving the Productivity of Finishing Departments in the Apparel Industry

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ABSTRACT

The research study was carried out with the aim of investigating productivity improvement in apparel industry. One of the major problems of the most of Textile & apparel industry is arising at the finishing department among all the departments of the organization because most of factories are facing low productivity improvement of the finishing department. Although the production department shows high performance, finishing department is not capable to finish garments which are received by the production plant. Also while auditing the finished garments, most of orders should have to be rechecked due to unacceptable quality levels by stopping the daily production at the finishing department. Due to above explained crisis, backlog of the finishing department is increasing day by day. Because of that it was very difficult to meet the delivery time without working night shifts. Therefore this is one of the main issues of the certain apparel factories on present time, Hence this research study was done to identify and understand the root causes for production variation and to give favorable solutions to the factory.

KEYWORDS: Textile & Apparel Industry, Finishing department, Productivity, Needle break downs, Quality

INTRODUCTION

The Textile and Apparel sector is one of the most significant and dynamic contributors to the Sri Lanka's economy. During the 1990s, the garment industry grew at 18.5 per cent per annum. The export-led expansion of the industry led to the replacement of tea by garments as the nation's largest foreign exchange earner (Kelegama, 2005). The organization in which this research was carried out is one of the key players of the Sri Lankan textiles and apparel Industry. The Company makes significant contribution to the Sri Lankan economy by earning foreign currency

The group of this organization was established in year 1974, before the liberalization of the economy in 1977. The group consists of more than ten branches by expanding their factories throughout the country. Each and every factory do not produce all kinds of garments and each plant is specialized in one kind of garment like shirts or shorts or baby kits etc; they produce only the garments which are specialized to their factory. According to that principle factory, in which this research was carried out is responsible for producing shorts & trousers. These products are exporting to the countries such as USA, UK, Korea, Singapore etc. Primary departments of the factory are cutting department, production department, finishing department and other supplementary functions are carried by the planning, quality, finance, stores and human resource departments.

The main process of the factory is going through the following departments.

Stores → Cutting department → Production department → Finishing department

Background of the Rationale for the Research

Month	Labour Productivity	Avg Efficiency
August	3.41	37.1
September	4.41	42.1
October	3.30	38.6
November	4.15	45.7

Table 1. Production details of the finishing department

Table 1 show that there is no significant improvement of the productivity and the efficiency of the finishing department. Due to this reason backlog of the finishing department is arising and most of the times machines were kept in ideally without any work to progress. Therefore this research was carried to identify the root causes for productivity loss at the finishing department and research was mainly went through the process of the finishing department.

Research Objectives

The objective of this research was identification of root causes for the productivity losses and examine at options to eliminate, reduce or control these causes and ultimately wish to improve the productivity by utilizing the resources effectively and efficiently.

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LITERATURE REVIEW

Ever since the beginning of the civilization, man has attempted to improve productivity of his limited resources in order to maximizing creation of wealth, which is essential for survival and enjoyment of life. His first resources were manpower and animal power and then he created hand tools and later the machines and the machine tools to improve the productivity of man power. The continued pursuit of higher productivity since then led to the dawn of industrial age and gave birth to the industrial engineering during the mid twentieth century by maximizing the performance of interactive man machine material systems (Telsang, 1998). Today organizations work in constantly changing environment due to that there is a constant pressure to improve the productivity to meet the success against the current financial crisis.

As per British Institute of Management Foundation (1976) the term 'productivity' denotes in the apparel sector the productiveness of the factors of production. As regards selection of the right productivity indicators, physical measure like ratio of output to labour inputs is suggested for single or similar product industry.

Productivity has now become as very vital to the welfare of the industrial firm as well as for the economic progress of the country. Productivity is the quantitative relation between what we produce and what we use as a resource to produce for that. It refers to the efficiency of the production system and indicates how well the factors of production are utilized (Telsang, 1998).

Productivity improvement is the rate of increase the output is more compared to rate of increase input through utilizing all the resources. Productivity improvement can be measured as the productivity growth. In this research Productivity improvement means increasing the output of the finishing department by providing the standard of quality in garments which is expected by the each buyer. While improving those things it should not harm to the employees and always should concern about their needs and wants to get the maximum utilization from them.

Present techno economic scenario is marked by increasing competition in almost every sector of economy. There is a challenge before the industries to manufacture goods of right quality and quantity and at right time and at minimum cost for their survival and growth. This demands an increase in productive efficiency of the organization. Industrial engineering is going to play a pivotal role in increasing the productivity. Various industrial engineering techniques are used to analyze and improve the work methods, to eliminate waste and proper allocation and utilization of resources. Some of industrial engineering techniques are work study, time study, method study, motion

economy layout, financial and non financial incentives, pre production planning, inventory control and ergonomics (Telsang, 1998). Productivity studies analyze that productivity is related to the concept of efficiency. While productivity is the amount of output produced relative to the amount of resources (time and money) that go into the production, efficiency is the value of output relative to the time of inputs used. Productivity improves when the quantity of output increases relative to the quantity of input. Efficiency improves, when the time of inputs used is reduced relative the value of output.

Industrial engineers view productivity as the efficiency of manpower in the labour intensive industries (Telsang, 1998). As the apparel sector is a labour intensive, this research also measures productivity as the efficiency. While comparing the daily productivity it concerns as efficiency, because working time duration per day and the standard minute value per-most of outputs are changing. Efficiency is the relationship between the earned time by producing the output and the working time which worked to complete the output (Telsang, 1998). Earned time is based on the standard minute value of the general sewing structure.

$$\text{Efficiency} = \frac{\text{Earned time}}{\text{Worked time}}$$

$$= \frac{\text{No. of outputs} * \text{Standard Minute value} * 100}{\text{Worked time} * \text{No. of Workers}}$$

(Laszlo, 1991)

Productivity Improvement Techniques

5S, Kaizen, TPS, Benchmarking and JIT are some of the productivity techniques which are highly employed in many developing countries (Graham, 2009). 5S is a method for organizing a workplace, especially a shared work place and keeping it organized. It's sometimes referred to as a housekeeping methodology. The key target of 5S is improving workplace morale, safety and productivity through efficiency. Five phases of 5S are seiri, seiton, seiso, seiketsu and shitsuke. Kaizen is the Japanese philosophy that focuses as on continuous improvement throughout all aspects of process. When applied to the workplace, kaizen activities continually improve all functions of a business, from manufacturing to management and from the CEO to the assembly line workers by improving standardized activities and processes, kaizen aims to eliminate waste (Wikipedia, 2009). Toyota Production System (TPS) refers to an integrated socio technical system, developed by Toyota that comprises its management philosophy and practices. The main objectives of the TPS are to design out overburden and inconsistency and to eliminate waste (Wikipedia, 2009).

RESEARCH METHODOLOGY

Research design is the science of planning procedures for conducting studies so as to get the most valid findings. The first step in research design is to identify a research problem. The purpose of this research became as improve the productivity by finding the root causes for productivity loss. Therefore this research can be classified as an applied research. Since this is an inductive research (study in which theory is developed from the observation of empirical reality) general inferences are induced from particular instances (Hussey, 1997). Therefore data collecting techniques like individual observation, interviews and report reviews to gather primary and secondary data as qualitatively and quantitatively were considered. In this study data collection was carried out for four months time period Data analysis was carried out using statistical tools to illustrate the influence of the certain root causes for the main problem which was the basis for conducting this research. By getting the percentages of frequency, mean values and standard deviations data analysis part was done based on the statistical outcome root causes were identified and the alternative solutions were discovered. The best solution was selected for implementing in the process to improve the productivity of the finishing department.

DATA COLLECTION & ANALYZING

Finishing Department is the place which finishes the washed or non-washed garments by button attaching, thread trimming; ironing and packing. Those activities are carrying out in sequential linear process. Therefore to achieve the target and monotonous output, there should be smooth flow of the product throughout the each workstation without any bottleneck. If the preceding workstation is operated as a bottleneck operation it will cause to drop the production in next workstation. Thus to keep the productivity in the optimal level it is important to compare the actual production with its production capacity to identify the bottleneck workstations. Based on that button attaching, thread trimming, ironing and the appearance checking workstation were identified as bottlenecks. Hence analysis part was carried out separately through the above mentioned workstations.

1). Button attaching workstation

As the first problem is arising at the button section, by observing and the interviewing the different level of workers could identify needle breakages is the major issue of the button attaching workplace. Because if there is no needle breakdown occurred at that time workers can achieve the target. But there is some probability for losing productivity due to needle breakdowns. But data shows that no machine break downs have been occurred. Figure 1 shows how the needle break downs affect to production progress. As

seen from figure 1 it is clear that higher needle breakdowns cause to make the productivity loss.

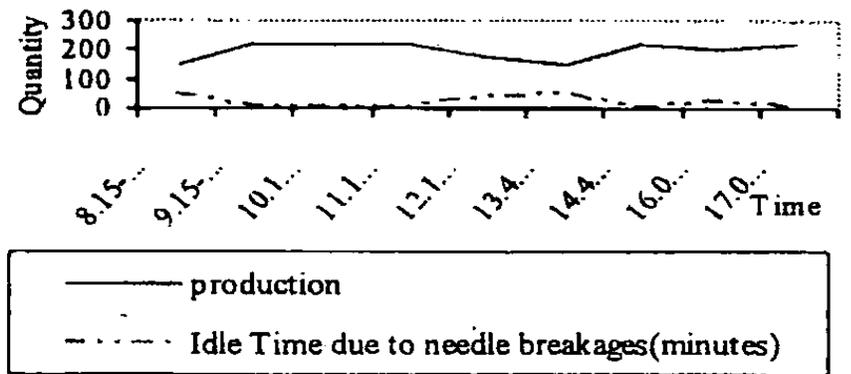


Figure 1. Relationship between production quantity & needle breakages

Table 2 shows how production quantity is affected the needle break downs. It shows while increasing the production quantity, it causes to generate more needle breakdowns and reduce the productivity.

Month	No: of needle breakages	Production qty	Production per needle breakage	Total idle time
September	122	86050	705	1410
October	143	100443	702	1945
November	152	102883	676	1880
December	205	113870	505	2495

Table 2. Details of production qty & no. of needle breakages

Also by analyzing the data it could discover working time is affected to the needle breakages. Figure 2 shows needle break downs percentage based on the working time. It shows during the first two hours, after the lunch and evening tea break there is high probability to occur the needle breakdowns.

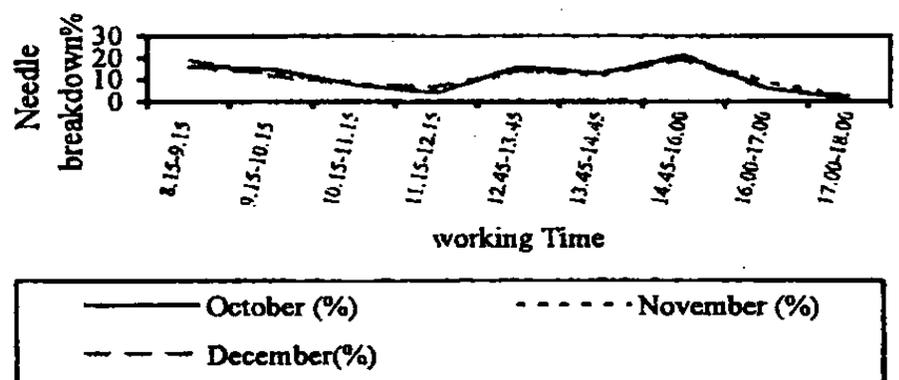


Figure 2. Monthly needle breakdown percentage Vs working time

By observing the process it was identified that higher probability of needle breakdowns were appeared at the newest machines and less experience workers. Figure 3 shows needle breakdowns based on the working experience for different workers. It demonstrates needle breakages percentage is reducing

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with the working experience of employees.

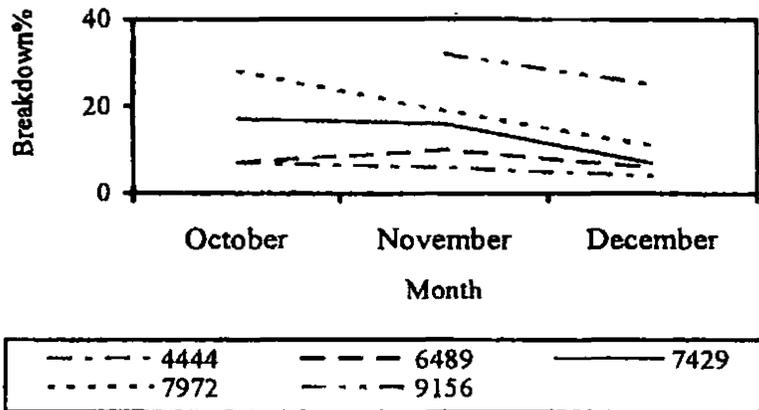


Figure 3. Needle breakdown percentage Vs employee experience

2). Thread trimming workstation

Table 3 shows relationship between the thread consumption for various garment styles and time taken to thread trimming. It verify time taken to thread trimming is proportional to the thread consumption. Last two data are relevant to normal pants and others are relevant to three quarter pants. Therefore more time is consuming while trimming the three quarter pants than others. Because these pants consist with additional stitches and decorations.

Total thread consumption(meters)	Actual time taken to thread trimming(minutes)	
246.52	1.16	} Three quarter pants
268.25	1.25	
269.65	1.28	
294.11	0.96	} Normal pants
289.28	0.94	

Table 3. Relationship between thread consumption & consuming time for different styles

3). Ironing workstation

Next problem is arising between the sucker machines and ironing workstation, because the distance between those two points is near to the thirty meters. Due to that to transport the garments from sucker machine to the ironing station takes around 3 minutes. Therefore large percentage of working time is lost here due to the improper layout designs.

4). Appearance checking workstation

Table 4 shows average damage percentages of some garment styles based on some criteria.

Criteria	Total (%)
Fabric	6
Stain Marks	24
Broken Stitch	43
Cut Damage	6
Colour Shading	6

Table 4. Damage percentage base on some criteria

According to data on Table 4 highest portion of damages are coming due to the broken stitches. These damages are originated at the production department, and out of the control of finishing department. Quality checkers of finishing department have to spend additional time to recheck and rework on damage garments instead of checking original garments.

RESULTS AND DISCUSSION

Button section, Thread trimming, Ironing and appearances checking workstations are the major places that influence to drop down the productivity of the finishing department. Table 5 shows the productivity of these workstations.

Workstation	Avg productivity (output/input)
Button section	0.91
Thread trimming	0.83
Ironing	0.96
Appearances checking	0.78

Table 5 .Productivity at bottleneck workstations

Among those workstations the lowest productivity is recorded in appearances checking workstation. Therefore major attention was paid for appearances checking and next to thread trimming workstations to sort out this problem. Although the ironing section has the highest productivity, problem arises due to the production gap between the output of the preceding workstation and input of the ironing section.

In appearance checking workstation productivity was reduced due to the damages of garments. Looking at the analyzed data it can be determined that high damage percentage is coming due to the broken stitches & next is stain marks. Production department is responsible for broken stitches of the garment. Also damage percentages of three quarter pants are higher than the normal pants. Therefore while producing the three quarter pants high attention should be paid to quality than normal pants.

This research identified that damaged garments coming from the production department is the

main issue & to overcome this situation damage receiving should be controlled. Therefore if there is damage garment found finishing department can return those to the production plant instead of repairing at the finishing department. But after repairing those garments quality checkers have to recheck that. Therefore they have to spend time at two terms. Otherwise finishing department should check quality of garment before entering the finishing process. If there are any damages coming from the production department, they can return damage garments to the production department. Although they checked garments at the beginning of the finishing process, finishing department should recheck it before packing. Because while garments are running through the finishing department damages like stain marks, cut damages may happen. Therefore two quality checking sections can introduce before button attaching workstation and the present appearance checking workstation. To do that finishing department should have to recruit new workers and it will cause to increase the cost and may affect to the productivity and efficiency of the department. The best solution should manage the damage generation. Therefore solutions can suggest improving the productivity at the production department to gain the maximum benefits by eliminating the problems at the origin.

Before handing over the garments to the finishing department, production department already checks the quality of garment. At that time quality can be checked as same as the standard using at the finishing department. Without chasing out only the target, production department also can improve the quality of the garment. Most of the operators at the production department are not much concerned about the quality; therefore programs can be conducted to deliver the importance of quality. To maintain the good quality, Training program can be conducted. Because of lack of training, operators use incorrect methods. Also kaizen can be introduced to continuous improvement. Presently quality is checked only at the end of the production department. Therefore new quality checking workstation can be introduced to the middle of the production process and it will cause to identify the origin of the damage early than now. Management can encourage quality auditors of the finishing department to go and check the quality of the garment at the production department. Because they are the people who know the quality requirement of the buyers. Hence workers who have good experience for certain operation may layoff or absent. Then inexperienced workers are working to continue that operation and it will cause to make more damages. Thus relationship between the superiors and subordinates should improve and always management should try to satisfy needs of the workers to control labour turnover and the absenteeism. Among above discussed solutions, introducing new check point to middle of the production line will be the best feasible

solutions. As well as at long run any organization can get benefits by launch new training programs and introducing new productivity techniques.

The next highest priority is given to the low quality which comes as stain marks. To manage that there should be cleaning environment. Because of scatter environment stain marks are on garments. However 5S concept was introduced to the any organization, to gain maximum benefits it should be communicate and maintain well. If every one is keeping their working environment in clean and maintaining the machines regularly those problems can be controlled in future.

The second lowest productivity was at the thread trimming workstation. In this workstation production target was given by considering only the normal pants. Therefore while running three quarter pants workers are unable to achieve their production target. Therefore management should adjust and pre plan the production according to each style by doing production studies and time studies.

The next problems were encountered at the button attaching workstation and the ironing workstations. At the button attaching workstation problem was arose due to needle breakdowns. When needle breakdown happened, all the pieces of the needle should find out to get new needle. Due to the scatter environment it is not easy to find the needle parts and because of that whole process will be idle. Therefore factory should maintain the clear environment to gain the benefits from different aspects. The research shows working time is wasted due to the distance between the sucker machine and the ironing workstation. Therefore to do the activities effectively and efficiency there should be proper layout designing. While fixing the needle detector machine, it should be nearest to entrance of the department. While transporting garments with split needle pieces, those garments should not been transported through long distance.

By investigating the behavior of all employees in the finishing department during the six month time period, the relationship among the employees was not being in well standards. They haven't strong group objectives. Although finishing department is running as modules, there are more than fourteen workers per each modular. Due to the large number of members with in the groups, they haven't strong commitment to achieve their objectives. To get the maximum commitment from all of workers, there should be a good inter relationship. Therefore management should develop the correlation among all the workers by arranging teams with changing the attitudes and beliefs of the workers. Also they should have separate group objectives. Motivation is the managerial process to get the maximum commitment from workers for certain tasks. Hence incentives can play major role to motivate

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employees. These are the behavioral things to affect for the improvement of the productivity.

Pre planning is very essential to manufacturing industry. While preparing the plan for finishing department, goods receiving date from the production department should be clearly identified. In this organization the finishing department has very simple plan schedule. But most of the time plan was difficult to implement, because production department is not achieving its plan. Due to that production styles should have to change frequently. Therefore there should not be huge deviation between the plan and the actual one. Also when planning it should be considered about the learning curves by minimizing the style changes, the actual production capacity and the washing duration.

In general, Most of workers are working on stand. Therefore it should be change into a sit- stand workplace. Because it is more desirable than either sit or a stand workplace. If a sit- stand workplace is to be suitable for use of the operators, it must be provided with an adjustable height chair and an adjustable foot rest. However, the workplace for a standing job will be greatly improved if it is made adjustable in height. When this is done, the distance from the floor to the top of the working surface, should be variable from 36 to 42 inches for females and 40 to 46 inches for males.

CONCLUSION

The main goal of this research is to improve the productivity at the finishing department in apparel industry. Whilst doing the research it was founded, that productivity was declining due to the high percentage of damage meeting. Therefore productivity can enhance by 20% if the factory can control the quality. Due to the lack of concern to the quality of the garment, productivity of the finishing department is dropping down. Therefore by paying the more attention to the quality of the complex garments than the normal garments, management should try to enhance the productivity. Otherwise, although the production plant produced large amount of garment quantity, it might not be dispatch to the foreign countries due to the low quality and ultimately it will cause to loss the well reputed buyers to the organization and as well as to the country. Therefore management should not only chase the production quantity. Quality is a very important thing while competing with the others and to survive the Sri Lankan apparel industry in the world market. Production quantity is a tool to show the power only among the factories which belongs to one group of companies, by showing high efficiency than others. Beyond the group, to win the world market, quality is acting as a powerful weapon. Therefore all the members of the organization should think about the quality concept as same as the target. Not only the management but also the machine operators should

also gain knowledge of quality. Therefore factory should launch training programs and introduce new productivity techniques. Also to discuss about quality issues quality circles can be appointed. This research was done to find out root causes for productivity loss at the finishing department. But by investigating it was found, major cause is coming from the production department. Therefore quality at the production department should be developed to improve the productivity of the finishing department.

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