

PROBLEM ANALYSIS AND PRODUCTIVITY IMPROVEMENT OF A KNITWEAR CUTTING SECTION: A CASE STUDY OF ABONI KNITWEAR

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ABSTRACT

In knitwear industry, quality product with low price is the first preference to the buyers (customers). The buyers always seek quality product from their options (all around the globe) and the manufacturers keeping the best quality gets the green signal. Bangladesh is among those who are keeping the balance between supply and demand of knitwear and other ready made garments by supplying. Its investment friendly environment, comparatively cheap labor cost, availability of resources and high interest attract the global investors to make it their second local. Previously a knitwear industry in Bangladesh faced challenges from only its local counterparts. But now due to the quota free economy the competition is among all companies around the world. For an industrialist, the challenge is to tune up the product with all desirable qualities keeping the cost minimum so that the customers' expectations are met and maximum profit can be earned. This paper focuses on the application of 5S, time study and general concepts of layout on the cutting section of a renowned knitwear industry to minimize its cost of product through keeping the quality as before. The objective of this work is to provide the case company with a methodology that allows them to improve the productivity.

Keywords: 5S, Time study.

1. INTRODUCTION

5S is the name of a workplace organization methodology that uses a list of five Japanese words which, transliterated and translated into English, start with the letter S. This list is a mnemonic for a methodology that is often incorrectly characterized as "standardized cleanup", however it is much more than cleanup. It is a method for organizing a workplace, especially a shared workplace (like a production floor or an office space), and keeping it organized. It's sometimes referred to as a housekeeping methodology; however this characterization can be misleading, as workplace organization goes beyond housekeeping.

The key targets of 5S are improved workplace morale, safety and efficiency. The assertion of 5S is, by assigning everything (that is needed) a location, time is not wasted by looking for things. Additionally, it is quickly obvious when something is missing from its designated location. Advocates of 5S believe the benefits of this methodology come from deciding what should be kept, where it should be kept, how it should be stored and most importantly how the new order will be maintained. This decision making process usually comes from a dialog about standardization which builds a clear understanding,

between employees, of how work should be done. It also instills ownership of the process in each employee.

The 5S's are:

Phase 1 - **Seiri/Sorting**: Going through all the tools, materials, etc., in the plant and work area and keeping only essential items. Everything else is stored or discarded.

Phase 2 – **Seiton/Straighten or Set in Order**: Focuses on efficiency. When we translate this to "Straighten or Set in Order", it sounds like more sorting or sweeping, but the intent is to arrange the tools, equipment and parts in a manner that promotes work flow.

Phase 3 - **Seisō/Sweeping or Shining or Cleanliness**: Systematic Cleaning or the need to keep the workplace clean as well as neat. At the end of each shift, the work area is cleaned up and everything is restored to its place. This makes it easy to know what goes where and have confidence that everything is where it should be. The key point is that maintaining cleanliness should be part of the daily work - not an occasional activity initiated when things get too messy.

Phase 4 – **Seiketsu/Standardizing**: Standardized work practices or operating in a consistent and standardized fashion. Everyone knows exactly what his or her

responsibilities are to keep above 3S's.

Phase 5 – **Shitsuke/Sustaining the discipline**: Refers to maintaining and reviewing standards. Once the previous 4S's have been established, they become the new way to operate. Maintain the focus on this new way of operating, and do not allow a gradual decline back to the old ways of operating. However, when an issue arises such as a suggested improvement, a new way of working, a new tool or a new output requirement, then a review of the first 4S's is appropriate.[1]

A time study and motion (or time-motion study) is a business efficiency technique. It is a major part of scientific management (Taylorism) [2]. Time Study or Time Measurement (MTM) is a predetermined motion time system that is used primarily in industrial settings to analyze the methods used to perform any manual operation or task and, as a byproduct of that analysis, set the standard time in which a worker should complete that task.[3] Films were taken using constant speed cameras, running at 16 frames per second, of the work performed by qualified workers on the shop floor at the Westinghouse Brake and Signal Corporation. Each sequence was rated during filming by three qualified Industrial Engineers. These ratings had to agree within a close band, otherwise the sequence was not used.

The rating, or Leveling, system used was the Westinghouse or LMS system – so called after its originators Lowry, Maynard and Stegemerten. This system considers four factors independently:

- Skill – Proficiency in following the given method
- Effort – The will to work
- Conditions – The general work surroundings
- Consistency – of performance

Each factor is assigned an alpha rating, e.g. “B-“, “C+”, “A”, etc. which has a numeric value which is applied later. This reduces the possibility of “clock rating” and ensures that all factors are considered in the composite rating. Appendix 1 shows the model for Causes of Difference in Output on which the LMS system is based. Layout, distances, sizes of parts and tools and tolerances were accurately measured and recorded on the shop floor to complement the later analyses.

The films were then projected frame-by-frame and analyzed and classified in to a predetermined format of Basic Motions. These Basic Motions were Reach, Grasp, Move, Position, Release, etc. A motion was taken to begin on the frame in which the hand first started performing the motion and was taken to end on the frame in which the motion was completed. This allowed a time for each recorded motion to be calculated in seconds, by means of a frame count, and then “leveled” to a common performance [4-5].

2. CASE STUDY: ABONI KNITWEAR

Aboni Knitwear, a sister concern of Babylon Group has been established in 2001. It is a joint venture knit wear project with Mens Fashion A/S, Denmark for the production of knitted fabrics and garments. It is located at Savar near Dhaka. The knit textile project has been designed with all European best Machinery and

Technical know-how. The garments unit produces about 450,000 pcs of T- shirts/Tank Tops and 300,000 pcs of Polo shirts per month depending on the styles. Its permanent customer list includes, but not limited to Tesco, Zara, H & M, Mono Prix, Wal-Mart etc.

To be a sustainable and consistent industry in knitwear sector Aboni Knitwear is working to achieve the following objectives:

- Better quality product and provide reliable support to buyers.
- Contribute in national income.
- Minimize loss and increase revenue earning to become a profitable business entity.
- Better working environment.

Different concepts of Industrial Engineering tools are employed to assess current condition of cutting section and to improve the findings. Thus, this paper will mainly concentrate on the improvement of productivity (utilizing the space of the storage of cutting section efficiently, allocating manpower in different operations of this section such as lay spreading, numbering, bundling, input-man etc., reduction of fabric wastage, utilization of time properly).

2.1 Overview of Cutting Section

Generally in a cutting section of knit wear industry, following steps are maintained:

1. Temporary storage of uncut fabric.
2. Lay spreading.
3. Cutting.
4. Numbering.
5. Bundling.
6. Quality check.
7. Storage of cut fabric.

3. PROBLEMS FOUND

3.1 Transferring Fabrics from Fabric Storage to Cutting Section

In the knitwear section, the fabric storage is on the 5th floor and the cutting section is on the 3rd floor. The sewing sections are in 2nd and 4th floor. Before cutting the fabrics have to be carried by the workers from the storage to cutting section. Extra manpower is used. Time wastage can also be said to be a concerning matter in this matter. If there would have been a simple means of transferring the fabrics there could be some savings in both the manpower and also in time.

This paper suggests a tunnel for transferring the fabrics from the fabric storage to the cutting section. If this tunnel is designed then the whole transferring system can be easier than the previous method. And another important fact is that the time for transferring these fabrics would also be less than the previous method.

Here, the tunnel is designed across two floors. Thus the fabrics have to be passed a long way. A concerning fact in this matter is that there might be a possibility of damage of fabrics. In that case, there has to be a system of trolley on which the fabric will fall. If the bed of the trolley is made of foam, then the damage of the fabric can be prevented.

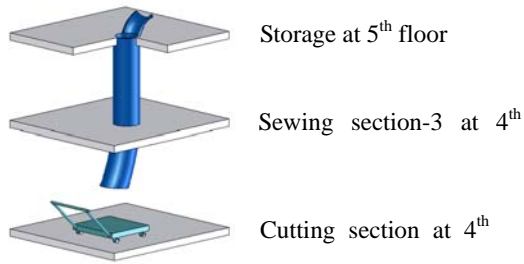


Fig 1. Transfer of fabric.

3.2 Storage System

The first stage of the workflow in the cutting section starts from the storage system. The fabrics are brought from the fabric storage and then stored in the sub-store. As the cutting finishes then there is also storage of finished fabrics.

In this section two types of fabrics are stored:

- Uncut fabrics
- Cut fabrics

Before cutting the sacks of fabrics are kept in a haphazard way here and there. So when any fabric is scheduled to cut workers find the appropriate fabric from pile of sacks which wastes time. Besides, workers sometimes select wrong fabric and start cutting which results direct waste of fabric.

In this paper it is suggested to-

- Use selves which are arranged near the cutting table so that the nonproductive time to bring the fabric to cutting table is minimized.
- Arrange fabrics according to their cutting schedule.
- Use different shelves and sacks of different colors for different buyers.
- Use bin card to identify the exact fabric easily.

After cutting the cut fabric are numbered and bundled into sacks again and are kept randomly. The input men of sewing section bear the cut fabrics to the sewing floor according to their sewing schedule. It was observed that nearly half of their time the input men pass in searching the particular sack of fabric. In this paper the shelves for finished fabrics are suggested to be near the exit of the cutting floor which may significantly reduce the wastage

of time.

3.3 Problems Faced In Lay Spreading

It was observed that there is no definite rule for allocating workers in the operation of spreading lay. Most of the time 4/5 workers are on each side of the fabric; thus 8-10 workers on the both sides of the fabric. One worker is in the position of throwing fabric and scissoring. And another worker is opposite to this worker (in case of fabric of width more than 60 inch this number is two). Thus a total of 10-12 workers are around fabrics while spreading lays.

The time for each worker to finish their respective jobs was taken, for example the time for the worker to throw the fabric, the time for spreading the lay and level it, the time for scissoring. After studying the workers for a certain time, it was decided that excess workforce is being used in lay spreading. The decision comes from the following points:

- The workers are not acting effectively.
- The work range for each worker is less than enough. They only move their hands to spread. But if they move themselves too they can work in a large range.
- While spreading a fabric of a dia/ width very much less than the width of table the workers have to sit on the table in one side.
- Though sometimes fabrics of about 70-75 inch are dealt with, but maximum time the width of the fabrics are below 50 inch. While spreading these 48 inch width lay workers have to sit down in one side of the table. When labors sit, their comfort zone of working becomes limited. So, excess labors are needed to spread lays.
- When working in the tables of 7ft or 8ft the lays are spread in one side of the table so that at least in one side of the table labors can stand and work comfortably. In such situations on the other side of the table no other lay can be set to spread. For example, if a 48 inch lay is being set in one side of the 84 inch table the remain space is not enough for setting another lay. So there is no difference between a table appropriate for 48in lay and a table of 84in or 96in rather the later one is consuming more space and allows the worker to sit on the table for spreading with in ergonomically harmful.

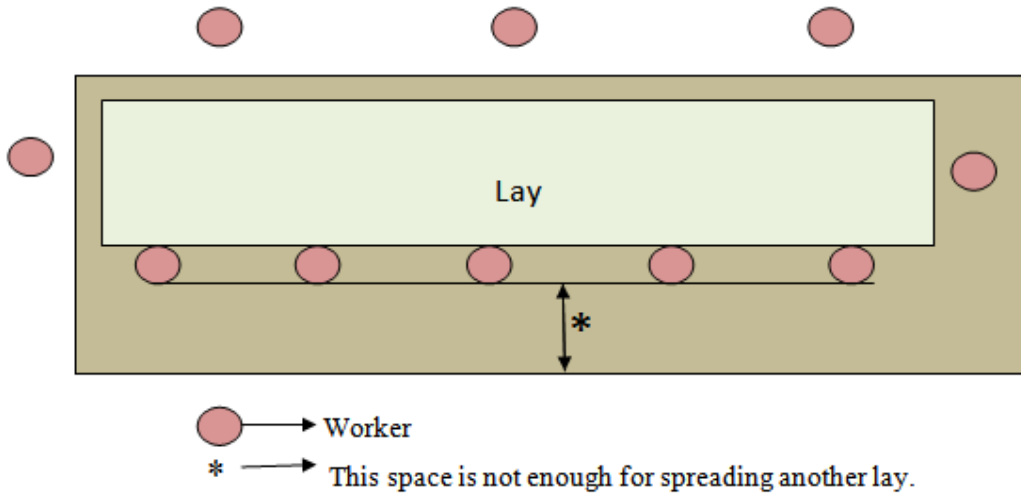


Fig 2. Lays of 64 inch dia is being cut on a table of 84 inch width.

- In some cases three lays are set in one table. In such case the worker who throws the lay in the mid position stands in a very awkward position. It becomes difficult for him to throw the lay. And this job needs extra time.
- Short width tables permits space for more tables and allows workers to spread the lays by standing.
- For fabric of high dia two tables can be joined.
- Shorter tables of about 8 yards can facilitate

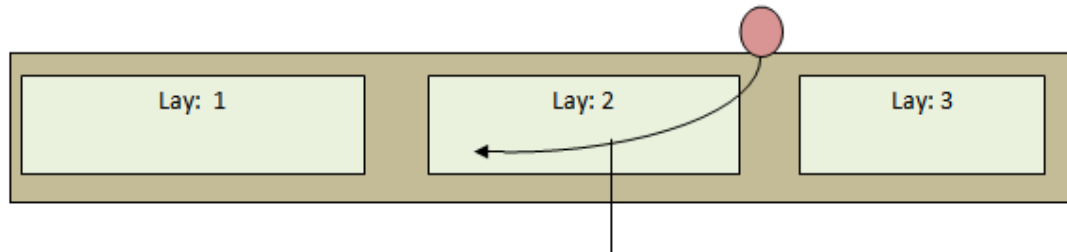


Fig 3. Three Lays are being cutting on a table.

3.4 Solution to these problems

The solution of the above problems can be solved by focusing on the followings:

- The comfort zone of the workers can be increased and they can work more efficiently.
- Number of workers for each spreading can be reduced and this worker can be employed to spread more other lays.

The dimensions of the existing tables are:

Table 1: Dimensions of different table (existing)

| Table | Length (feet) | Width (feet) |
|-------|---------------|--------------|
| 1 | 70 | 8 |
| 2 | 90 | 7 |
| 3 | 80 | 4 |
| 4 | 80 | 7 |

Based on the discussion it is noticed that the tables are not being used effectively. So tables of shorter length and width can be a solution. This is because of the following:

easy movement of tables.

- Long tables cause difficulty for mid position workers.

Finally the follow dimensions of table can be production friendly:

- 11 tables are of 55inch width and 8 yards length.
- One table is of 84inch width and 16 yards length.
- One table is of 84inch width and 8 yards length.

In the new dimensions the workers don't have to sit on any side of the fabric. On both sides of the fabric the workers will be on the standing position.

The number of workers can be redefined for a certain size of the fabric according to the followings:

- Every four yards there will be one worker.
- After every four yards one more worker will be added.

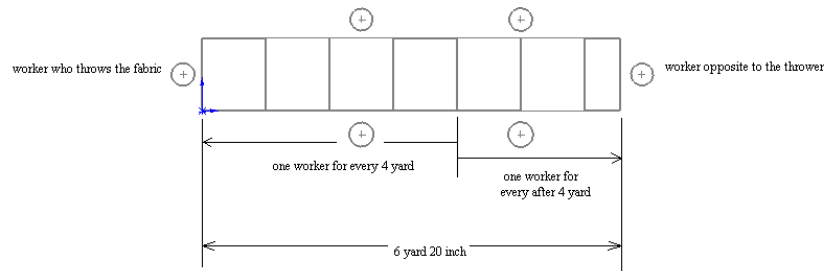


Fig 4. Fabric with width 41 inch and length 6yard 20 inch

Here is an example where the number of worker is redefined for a particular fabric spreading in a particular table.

Thus the total worker in this case = 6, where in the existing dimension the no. of workers is 10.

3.5 Proposal for Layout

Layout has a significant role in improving productivity. This paper presents the findings of existing layout and the proposed layout below

3.5.1 Problems in the Existing Layout:

- While fabrics are cut they are needed to pass the quality check. For this all the fabrics are bundled and kept in a sack and brought in front of the QC tables. Here again the sacks are opened and fabrics are checked. Here actually
- These opening of sack are an extra work done two times in the same floor.
- As there is no dedicated place for numbering, bundling and laying the workers have to wander the whole floor when they complete one of their works. These actually hamper the flow of work. If a zone of work could have been created for a group of worker it could have improved the efficiency of the cutting section.

There is no specific place for finished cut fabric. Some fabrics need to be relaxed in specific temperature and humidity. But the fabrics are kept bare for relaxation in a open space which degrade the quality of the fabric.

3.5.2 Proposed Layout

- In our proposed layout the QC tables are decentralized. Here shelves are designed for each table which will provide space for cut fabrics waiting for quality check. These decentralized tables can help to limit too much wandering of a worker.
- Here in between two QC tables one numbering table is set. After cutting, fabrics will be moved to this numbering table and then to the QC shelves.
- A relaxation room is designed beside the temporary storage of uncut fabrics. In this place all the fabrics needing relaxation can be kept which can keep these fabrics dust-free.
- Three areas are specified for keeping finished fabric storage. These storage places are provided with shelves. These shelves not only helps to utilize the space efficiently but also helps the sorting of fabrics easier.

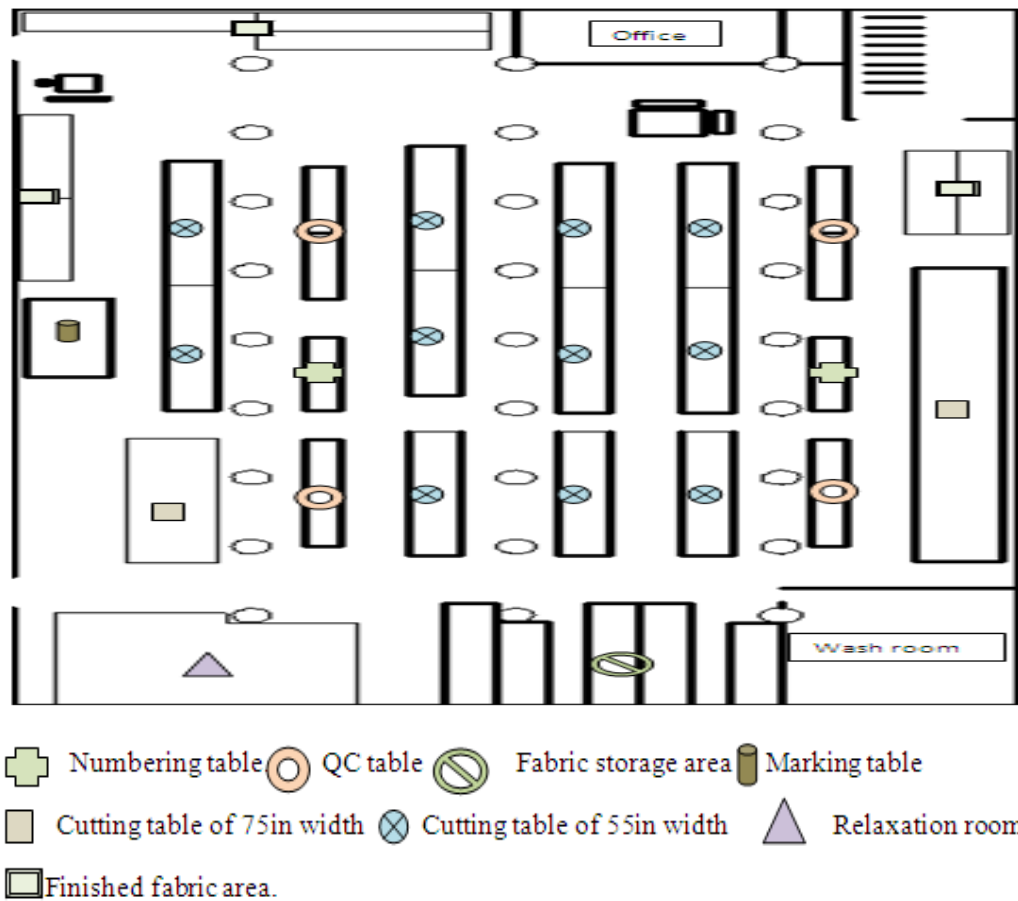


Fig 5: Proposed Layout

4. CONCLUSION

This study revealed the present condition of knitwear or the apparel industry of Bangladesh. During the study many activities that hamper the productivity and working environment have been observed. Among many other problems this study reveals only a few due to its time limitation. This paper suggests the methodology to utilize the manpower, to improve the arrangement of working floor that reduce the time wastage and encourage the working environment.

One severe problem during the study was acute power crisis. It is the main problem behind major anomalies.

Now a day the apparel industry mostly the knitwear industry holds the top most position among the foreign money earners for its reliable status to the buyers. But the primitive concepts and poor work management push the brake of its motion. More studies should be done in order to find the problems in this sector and cut out excess costs incurred in unnecessary steps keeping the quality high. The worker should be trained properly. They have to be satisfied by fulfilling all their demands. Besides, government should subsidize on its necessary demands and provide an uninterrupted power supply. Thus, the economy of Bangladesh can get an expected growth.

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