Review Article
Volume 10:11, 2021

Industrial Engineering & Management

ISSN: 2169-0316 Open Access

Improvement of line rearrangement or line lay out in garment department

Wintana Solomun, Berihun Negash*

Department of Garment Technology, Dire Dire Dawa Institute of Technology, Diredawa, Ethiopia

Abstract

Proper lay out gives relief a lot of financial and non financial activates for both users and suppliers. Thus, the propose of this research is to improve the productivity of sewing production line through the layout rearrangement. So that, time, energy and less production gets crashed. The production losing and time consuming due to un proper lay out leads to company unprofitable and customer disaffection. The workers took high energy and time consuming to produce the existing less production because of un proper lay out. Thus, the study was conducted to improve productivities of the company by reducing time consuming process and factors affecting production rate of the company using data from DBL(Bangladesh owned production) manufacturing plc to produce proper lay out. The researcher's analyzed existing lay out and new lay out to compare based on their efficiency, production and cycle time. so, that the existing lay out efficiency is 21.82%, production1387per day sample 3 blocks, and cycle times respectively for the improved lay out efficiency is 24.14%, production 1546 and cycle time.

Keywords: Lay out• production • cycle time

Introduction

Line layout in manufacturing engineering, a product layout refers to a production system where the work stations and equipment are located along the line of production, as with assembly lines. Usually, work units are moved along a line (not necessarily a geometric line, but a set of interconnected work stations) by a conveyor. While facility layout for services may be similar to that for manufacturing, it also may be somewhat different- as is the case with officers, retailers, and warehouses. Because of its relative permanence, facility layout probably is one of the most crucial elements affecting efficiency. An efficiency layout can reduce unnecessary material handling, help to keep cost low, and maintain product flow through the facility.

There are four basic layout types -

- Process or functional layout
- Product or line layout
- Hybrid or combination layout
- Fixed position layout

Process or functional layout

Process layout is found primarily in job shops or firms that product customized, low- volume products that may require different processing requirements are sequences of operations. Process layouts are facility configurations in which operation of a similar nature or function are grouped together. As such, they occasionally are referred to as functional layout. Their purpose is to process goods or provide services that involve a variety of processing requirements. A manufacturing example would be a machine shop.

Advantage of process layout; -

- flexibility
- cost
- motivation
- system protection Disadvantage of process layout; -
- utilization
- Confusion.

Product or line layout

Product or line layout refers to the arrangement of productive machines and equipment in the order of manufacturing operations. There will be a separate production line for each type of machines may be arranged differently in different line.

Advantage of product layout: Output, product layout can generate a large volume of products in a short time.

- Cost, unit cost is low as a result of the high volume.

***Address to correspondence:** Berihun Negash, Department of Garment Technology, Dire Dire Dawa Institute of Technology, Diredawa, Ethiopia; E-mail: negashlove2005@gmail.com*

Received: 03 November, 2021; **Accepted:** 17 November, 2021**; Published:** 24 November, 2021

- Utilization, there is a high degree of labor and equipment utilization.

Disadvantage of product layout:

- Motivation
- Flexible
- System protection

Hybrid or combination layout

Many situations call for a mixture of the three main layout types. These mixtures are commonly called combination or hybrid layouts. For example, one firm may utilize a process layout for the majority of its process along with an assembly in one area. Alternatively, a firm may utilize a fixed-position layout for the assembly of its final product, but use assembly lines to produce the components and subassemblies that make up the final product (e.g., aircraft).

Fixed position layout

A fixed-position layout is appropriate for a product that is too large or too heavy to move. For example, battleships are not produced on an assembly line. For services, other reasons may dictate the fixed position (e.g. a hospital operating room where doctor, nurses, and medical equipment are brought to the patient). Other fixed-position layout example include construction (e.g. building, dams, and electric or nuclear power plants), shipbuilding, aircraft, aerospace, farming, drilling for oil, home repair, and automated car washes. In order to make this work, required resources must be portable so that they can be taken to the job for "on the spot "performance.

Objectives of the project

The objectives are categorized in to two parts those are; general objective and specific objectives. Under general objective; the overall generalized project objective will be under taken. Under specific objective; what the project will cover in specified objectives. These two sub categories are presented as follows.

General objective of the project: The major objective of this project is to improve the productivity of sewing production line through the layout rearrangement.

Specific objectives of the project:-

- To reduce operation crossover.
- To maintain shorter distance among machines.
- To impart smooth material flow in the line.
- To reduce production time taken to produce a single piece of garment.
- To identify bottleneck operation.
- To know the capacity of each operator.

Literature Review

Preparing a line layout, it means designing the presentation of workstation in an assembly and showing the flow of work from start to end. It can be a simple line diagram. See the following image. The rectangle boxes are indicating sewing workstation. The number marked inside the boxes are indicating operations sequence in the operation bulletin (OB) and arrows are showing the flow of work. The line layout is prepared after the operation bulletin is made [1].

Analyze the structure of garment assembly processes, a t-shirt sewing line was considered. The first step performed in this study was to understand t-shirt sewing processes' components and sewing line problems. The objective was to have a clear idea on how a t-shirt production – sewing process line flows and then, how the line can be balanced as well as the performance of production line can be increased [2].

Assembly line balancing, allocation of jobs to machines is based on the objective of minimizing the workflow among the operators, reducing the throughput time as well as the work in progress and thus increasing the productivity. Sharing a job of work between several people is called division of labor. Division of labor should be balanced equally by ensuring the time spent at each station approximately the same. Each individual step in the assembly of product has to be analyzed carefully, and allocated to stations in a balanced way over the available workstation. Each operator then carried out operations properly and the work flow, synchronized line includes short distances between stations, low volume of work in process, precise of planning of production times, and predictable production quantity[3].

An assembly line is defined as a set of distinct tasks which is assigned to a set of workstations linked together by a transport mechanism under detailed assembling sequences specifying how the assembling process flows from one station to another. Since sewing process is labor intensive; apart from material costs, the cost structure of the sewing process is also important. Therefore, this process is of critical importance and needs to be planned more carefully [4].

In garment production, until garment components are gathered into a finished garment, they are assembled through a sub-assembly process. The production process includes a set of workstations, at each of which a specific task is carried out in a restricted sequence, with Hundreds of employees and thousands of bundles of sub-assemblies producing different styles simultaneously (Chan et al, 1998).

To achieve this approach, work-time study, assembly line balancing and simulation can be applied to apparel production line to find alternative solutions to increase the efficiency of the sewing line (Kursun & Kalaoglu, 2009). In order to balance the sewing line as well as to increase the efficiency of the line, at first a detailed work and time study was carried out to find the task durations (Niebel, 1976). However, the time required to complete a task depends on a lot of factors such as the task, the operator, the properties of fabric and sub materials, working environment, quality level of the product, the hour of the day, psychology of the operator etc

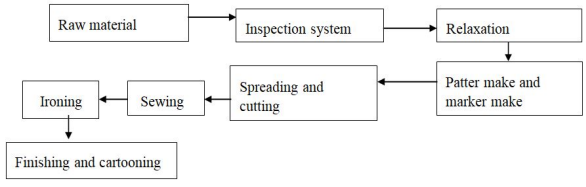


Figure1: Work flow of the garment section.

Research Question

- How to reduce operation crossover?
- How to maintain shorter distance among machines?
- How to impart smooth material flow in the line?
- How to reduce production time taken to produce a single piece of garment?
- How to identify bottleneck operation?
- How to know the capacity of each operator?.

Statement of Problems

Layout plays an important role in sewing section and the entire garment. An effective layout improves space utilization and reduces production costs well as production time. However, DBL industries Ethiopia is losing profit due to its sewing production lines layout problem. The sewing production lines are not arranged in effective way so that the line can allow smooth material flow. Therefore, the main objective of this project is aimed resolved those problems which are prohibiting the line from remarkable achievement.

Methodology

To complete this project report, data were collection through different methods like direct observation; interview and questioners are mainly used. Observation is done within the garment section. Interview (oral) and reviewing identified the problems which are based on line layout arrangement in DBL group industry.

Data collection method

The researcher collected data's which related with researches by two main methods;

I. Primary data collection

- Interview
- Observation
- Questioner

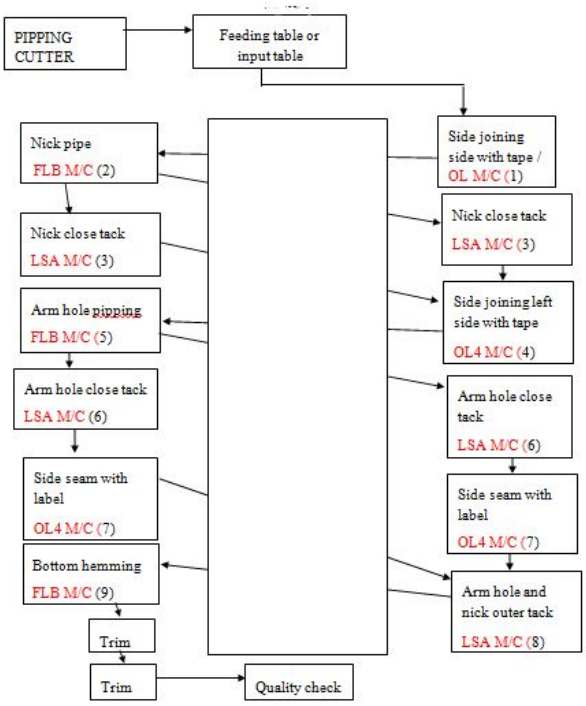


Figure2: Operation Helena Tank Top After Improvement Blocks B Number Line 2 Line1.

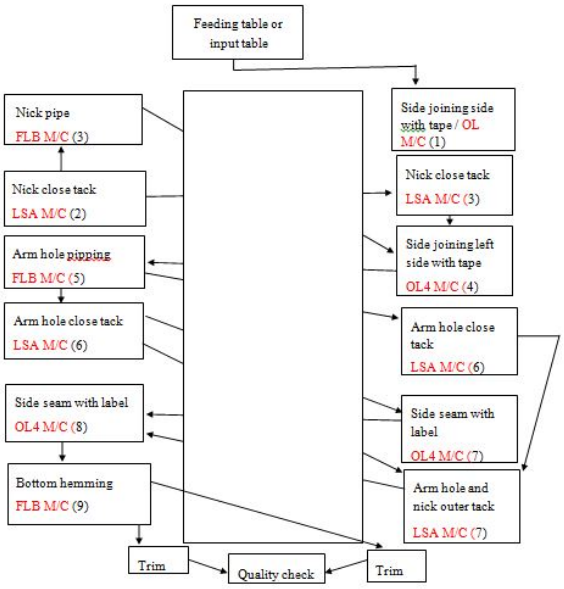


Figure3: Operation Helena Tank Top After Improvement Blocks B Number Line 2.

II. Secondary data collection

As we known both primary and secondary data's are very essential tools to get information's, realties, facts etc. are the main functions of these data collection methods.

The Difference between Existing Improving Line Layout And Improved Line Layout Layout

1. Side joining or side with tape to Nick pipping and cut
2. Nick pipping and cut to Nick close tack

3. Nick close tack to Side joining left side with tape
4. Joining left side with tape to Arm hole pipping
5. Arm hole pipping to Arm hole close tack
6. Arm hole close tack to Side seam with label
7. Side seam with label to Arm hole and nick outer tack
8. Arm hole and nick outer tack to bottom hemming
9. Bottom hemming to Trim
10. Trim to quality check

Before/ Existing Of Line Layout

- There was high wastage of time.
- Low volume production.
- It had high cross over.
- Had more distance between the machines.
- High rework products.

After Improved Line Layout

- Time saving.
- High volume of production.
- Reduce the crossover.
- Reduce the distance between the machines.
- Minimize the rework products.

Op#	Operation	Machine	Attachment	Cycle time	Smv tgt /hr	Capacity/ Hr	Perform %
2	Shoulder join with tape at right side	OL4	Presser feet	0.38	300	158	0.53
	Date: 20/05/2019	Buyer: H&M	Style:	OP:	11		HP:
	Unit: RMG-01	Team: block C-8	Item: Helena tnak top				
3	neck pipping and cut	FLB	D-set	0.56	200	107	0.54
4	Neck close tack	LSA	Plain feet	0.58	333	103	Re.Me
5	Shoulder join left side with Tape	OL4	Presser feet	0.27	375	222	0.59
6	Arm hole pipping	FLB	D-set	0.79	171	76	Re.Me
7	Arm hole close tack	LSA	Plain feet	0.59	158	102	0.64
7	Arm hole close tack	LSA	Plain feet	0.68	158	88	0.56
8	Side seam insert label	OL4	Presser feet	0.73	120	82	0.68
8	Side seam insert label	OL5	Presser feet	0.79	120	76	0.63
9	Armhole and neck outer tack	LSA	Plain feet	0.48	240	125	0.52
10	Bottom hemming	FLB	D-set	0.58	300	103	Re.Me
11	Trimming and body size	HP	Scissor	0.78	200	77	Re.Me
11	Trimming and body size	HP	Scissor	0.88	200	68	Re.Me

Table1: Existing Record Time and Their Capacity.

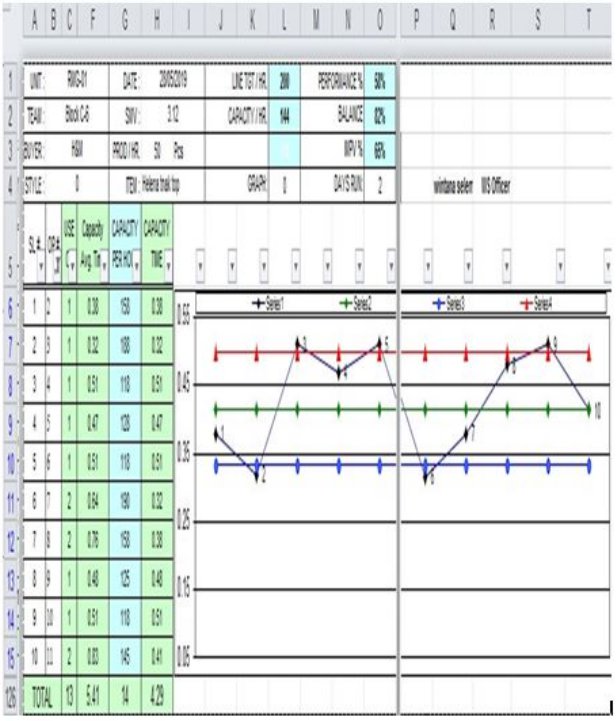


Figure4: exist record graph.

Op #	Operation	Machine	Attachment	Cycle time	Smv tgt /hr	Capacity/ Hr	Perform %
1	Date: 20/05/2019	Buyer: H&M	Style:	OP:	11		HP:
	Unit: RMG-01	Team: block C-8	Item: Helena tnak top				

2	Shoulder join with tape at right side	OL4	Presser feet	0.38	300	158	0.53
3	neck pipping and cut	FLB	D-set	0.32	200	188	0.94
4	Neck close tack	LSA	Plain feet	0.51	333	118	Re.Me
5	Shoulder join left side with Tape	OL4	Presser feet	0.47	375	128	Re.Me
6	Arm hole pipping	FLB	D-set	0.51	171	118	0.69
7	Arm hole close tack	LSA	Plain feet	0.59	158	102	0.64
7	Arm hole close tack	LSA	Plain feet	0.68	158	88	0.56
8	Side seam insert label	OL4	Presser feet	0.73	120	82	0.68
8	Side seam insert label	OL5	Presser feet	0.79	120	76	0.63
9	Armhole and neck outer tack	LSA	Plain feet	0.48	240	125	0.52
10	Bottom hemming	FLB	D-set	0.51	300	118	Re.Me
11	Trimming and body size	HP	Scissor	0.78	200	77	Re.Me
11	Trimming and body size	HP	Scissor	0.88	200	68	Re.Me

Table2: improved record time and their capacity.

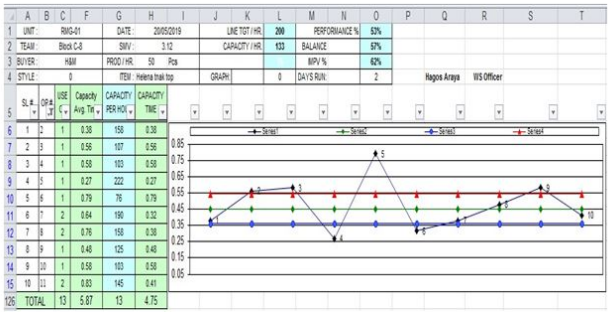


Figure5: improved record graph.

S.NO	HOUR	QC Pass Before	QC Pass After
1	1	50 pcs	57 pcs
2	2	40 pcs	50 pcs
3	3	60 pcs	60 pcs
4	4	70 pcs	76 pcs
5	5	70 pcs	81 pcs
6	6	70 pcs	74 pcs
7	7	70 pcs	73 pcs
8	8	40 pcs	49 pcs
TOTALE	8hr	470 pcs	520 pcs

Table3: List for QC Passing.

Solution to Solve the Problem

Distance

Existing distance = 1874cm

Improve distance = 1278cm

Distance loss = 1874cm - 1274cm = 596cm Efficiency

Existing Efficiency improve efficiency

Eff= Total qc Pass × SMV Eff= Total qc Pass × SMV

total workers × total workor hr on min total workers × total workors hr on min

Eff= 470 × 3.12 = 1466.4 Eff= 520 × 3.12 = 1622.4

14 × (60×8) 14 × 480 14 × (60×8) 14 × 480

= 1466.4 = 21.82% = 1597.44 = 24.14%

6720 6720

Efficiency loss = improve eff – existing

eff = 24.14%– 21.82%

= 2.32%

Production

Existing pro= 158+107+103+222+76 Improve pro = 158+188+118+228+118 102+88+82+76+125+ 102+88+82+76+125+

103+77+68 = 1387 118+77+68 = 1546

Production loss = improve pro – existing pro

= 1546 – 1387 = 159

159 to one line 1line = 159

18 line =?

= 18 × 159

= 2862

Therefore, we get in one block 2862, what about in 3

blocks?1 block = 2862

3 block =?

= 3 × 2862

= 8586 per day

Cycle time

Existing

Bottle neck = arm hole pipping = 0.79 Operation = bottom hemming = 0.58

Excess capacity - Shoulder join left side with tape = 0.27

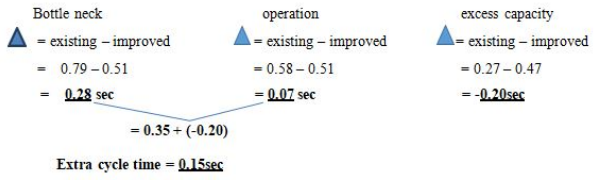
- Armhole close tack = 0.64

Improved

Bottle neck = Arm hole pipping = 0.51 Operation Bottom hemming = 0.51

Excess capacity - Shoulder join left side with tape = 0.47

- Armhole close tack = 0.64



Results and Discussion

Though my observation I found that the line layout in DBL Textile Company is not checked it is put randomly, this arrangement effect on the quantity of the product and take more time that pass from one step to another step. The disarrangement of the line layout also has more distance from one machine to another one because the machine is randomly arranged by someone. Instead of this arrange the line layout of the sewing department.

In the existing distance DBL to sew the product in the sewing department, during this process waste 596cm and production2862per day 2.23% of efficiency because of randomly arrange the machine and also that we not differ the capacity of the operators. During arrange the line layout and record the time, the capacity of the operator to reduce the distance between the machines to increase the production of the products in the sewing.

Conclusion

As per my analysis and observation made on the DBL group company I conclude that the total amount of production increases to 2862per day, distance minimize to 596cm, and also 1.81% efficiency so the major and primary cause to this problem is that not have line design operators and put machines randomly.

The cost of product consists of several factors such as raw material, power, labor, capital (cost of machine) and auxiliary material cost. The cost of product excluding raw material is termed as manufacturing cost. After raw material, capital and energy cost have the higher proportion in the total. If we arrange perfectly this, we get the quality fabric and also increase the productions.

This is the favorable of the following points. These are: -

- Most of the company operators are patrons.
- There are trained operators.
- Most of the company operators are moralized.
- All machines are modern.
- There is effective cleaning.
- There is not improper material handling.
- Supervisors follow up the operator effectively.

Case by case the reduction of line lay out in the section result improvement of productivity and reduction in manufacturing cost of the company.

References

1. Slović, Dragoslav, Stojanović Dragana, and Tomaević Ivan. "Productivity upswing through two-phase continuous process improvement model: The case of apparel manufacturer." *Text Appar* 25 (2015): 89-96.
2. Chan, Keith CC, Patrick CL Hui, K. W. Yeung, and Frency SF Ng. "Handling the assembly line balancing problem in the clothing industry using a genetic algorithm." Int J Cloth Sci Tech10 (1998):21-27 .
3. Fozzard, G, Spragg J, and Tyler D. "Simulation of flow lines in clothing manufacture. Part 1: model construction." Inte J Cloth Sci Tech 8, (1996):17-27.
4. Kursun, Senem, and Kalaoglu Fatma. "Simulation of production line balancing in apparel manufacturing." Fibre Text East Euro 17, (2009): 75.
5. Chan, Keith CC, Patrick CL Hui, K. W. Yeung, and Frency SF Ng. "Handling the assembly line balancing problem in the clothing industry using a genetic algorithm." Int J Clot Sci Tech10 (1998):21-37.

How to cite this article: Solomun Wintana, Negash Berihun. "Improvement of line rearrangement or line lay out in garment department." Indu Eng Manag 10 (2021) : 293.