



Daffodil
International
University

**Faculty of Engineering
Department of Textile Engineering
Daffodil International University**

**“Study on Bottleneck Problem in Sewing Line for
Garments Production”**

Course Title: Project(Thesis)

Course Code: TE4214

Submitted by:

Name	ID
Jayed Al Foysal	191-23-605
Sourav Sarker	191-23-606

Supervised by:

Md. Mominur Rahman

Assistant Professor

Department of Textile Engineering

Daffodil International University

A Thesis submitted in partial fulfillment of the requirements for the degree
Of

Bachelor of Science in Textile Engineering

Advance in Apparel Manufacturing Technology

Study On Bottleneck Problem in Sewing Line For Garments Production

LETTER OF APPROVAL

To
The Head,
Department of Textile Engineering
Daffodil International University
DSC, Ashulia, Savar, Dhaka

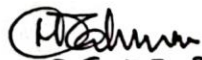
Subject: Approval of Thesis Report of B.Sc. in TE Program

Dear Sir

I am just writing to let you know that this report titled as “**Study On Bottleneck Problem in Sewing Line For Garments Production**” has been prepared by the student bearing ID 191- 23- 605 and 191-23-606 is completed for final evaluation. The whole report is prepared based on the factory data with required belongings. The students were directly involved in their industrial attachment activities and report become vital to spark of many valuable information for the readers.

Therefore, it will highly be appreciated if you kindly accept this report and consider it for final evaluation.

Yours Sincerely


25.02.2023


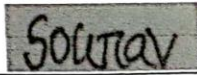
Md. Mominur Rahman

Assistant Professor
Department of Textile Engineering
Faculty of Engineering
Daffodil International University

Study On Bottleneck Problem in Sewing Line For Garments Production


DECLARATION

The thesis entitled “Study On Bottleneck Problem in Sewing Line For Garments Production” is conducted under supervision of Md. Mominur Rahman, an Assistant Professor and Head (In-Charge) of textile engineering at textile department, (DIU). We declare that the written submission report is our own original work and best of our knowledge. This report has not been currently submitted to any candidate for any other degree or diploma.

Name	ID	Signature
Jayed Al Foysal	191-23-605	
Sourav Sarker	191-23-606	

This is to certify that the above declaration made by the candidate is correct to the best of my knowledge.

Supervisor:


25-02-2023

Md. Mominur Rahman
Assistant Professor
TE, FE, DIU.

ACKNOWLEDGEMENT

First of All, Gratitude to the Almighty Allah, by his kindness we can completed this thesis without any hassle and without any issue. Thanks to “**Liz Fashion Industry Limited**” and “**Aboni Textile Limited**” for their support.

We extend deep appreciation, respect and gratitude to our honorable supervisor, Md. Mominur Rahman, Assistant Professor and Head(In-Charge) of the Textile Engineering Department of Daffodil International University for his motivation, continuous guidance , direction , valuable advice, constructive criticism, enormous support and his continuous monitoring helps us to completed this thesis work. Without his guidance it will not be possible to complete this thesis. His enormous knowledge and enthusiasm really assist us in completing our thesis.

We are very much grateful to Sr. Executive Khandaker Nuzmul Hossain Sir and Jr. Executive Md. Khairul Amin Bhai for their motivation and help us for collecting the Data. We also want to express gratitude to all of the employees, supervisors, Line chief.

We would like to thanks every faculty member and stuff of our Department for their support during this thesis. Specially Thanks to Md. Kamrul Islam, Lecturer, Department of Textile Engineering and Mr. Abdullah Al Mamun, Associate Professor, Department of Textile Engineering for their valuable advice.

Finally, we express our sincere gratitude to our father, mother, brother, friends and their continuous support, ideas and love during my studies.

ABSTRACT

In garment industry Production floor management is one of the most powerful techniques and one of the challenging tasks to manage the floor in a proper way. Sewing floor or Sewing section is one of the most important and critical stage in the garment industry. In sewing section, all the item or process is not easy, there are some critical processes and in the sewing floor all the Operator and helper are not well skilled to do some operation. For that reason, operator faces some difficulties during those critical operation as well as in easy process. For facing this kind of difficulties, the production gets hampered in that line and the sewing line cannot fulfilled the production for one or two operation and this problem is known as bottleneck. Bottleneck occurred for many reasons and for Bottleneck the Capacity decreases. Basically, it happens when the workload comes too early. There are many ways to overcome from this problem and by reducing it the capacity or the production will be increased. By doing motion improvement, method improvement, process sharing, adding manpower and uniform line balancing Bottleneck can be removed. By improving this we can reduce the cycle time and increased the efficiency and achieve the target capacity. This thesis report will show how to reduce bottleneck and its remarkable improvement in production.

Table of contents

LETTER OF APPROVAL	ii
DECLARATION	iii
ACKNOWLEDGEMENT.....	iv
ABSTRACT.....	v
INTRODUCTION.....	1
1.1. Background of the Study.....	2
1.2 Objective of the study	2
1.3 Importance of the study.....	2
1.4 Scope of the study	3
1.5 Limitation of the study.....	3
2. LITERATURE REVIEW	4
2.1 Definition of IE.....	4
2.2 Responsibilities of Industrial Engineer	5
2.3 Objectives of Industrial Engineer	6
2.4 Organogram of IE Department	7
2.5 Definition of Line Balancing.....	8
2.6 Objective of Line Balancing	8
2.7 Importance of Line Balancing.....	9
2.8 How to maintain Line Balancing.....	10
2.9 Flow Chart of IE Department.....	11
2.10 Definition of SMV.....	12
2.11 Factors of SMV.....	12
2.12 Necessity of SMV	12
2.13 Formula and Example of SMV.....	12
2.14 Definition of work Study.....	13
2.15 Technique of work Study.....	14
2.16 Role of work Study in Apparel Industry.....	14
2.17 Flow chart of work Study.....	14

2.18 Definition of Method Study.....	15
2.19 Objective of Method Study.....	15
2.20 Steps involved in Method Study.....	16
2.21 Definition of Time Study.....	17
2.22 Tools used in Time Study.....	17
2.23 Flow chart of Time Study.....	17
2.24 Definition of Cycle Time.....	18
2.25 Definition of Capacity Study.....	18
2.26 How to measure Capacity.....	18
2.27 Definition of Production Study.....	19
2.28 Necessity of Production Study.....	20
2.29 Definition of Motion Study.....	20
2.30 Basic Motion.....	21
2.31 Benefits of Motion Study.....	21
2.32 Definition of Bottleneck.....	22
2.33 Arise of Bottleneck.....	22
2.34 Importance of Finding Bottleneck.....	22
2.35 Ways of Reduce Bottleneck.....	22
3 . METHODOLOGY.....	24
3.1 Materials and Method used in this Project.....	25
3.2 Data Collection.....	25
3.3 Bottleneck Operational Data.....	26
3.3.1 Techpack and Style Information.....	26
3.3.2 Product Description.....	28
3.3.3 Trims and Accessories Details.....	29
3.3.4 Construction Details.....	30
3.3.5 Measurement Sheet.....	31
3.3.6 Capacity Study During Bottleneck.....	32
3.3.7 Capacity Study After Bottleneck Solving.....	34
3.4 Bottleneck Operational Data.....	36

3.4.1 Sketch Details...	36
3.4.2 Product Details...	37
3.4.3 Color Details...	38
3.4.5 Measurement Sheet...	40
3.4.6 Capacity Study During Bottleneck...	41
3.4.7 Capacity Study After Solving Bottleneck...	43
4. RESULT AND DISCUSSION.....	45
4.1 Bottleneck Result and Discussion.....	46-47
5.PROFESSIONAL RESPONSIBILITIES, SAFETY, SOCIO CULTURAL AND ENVIRONMENT COORDINATION	48
5.1 Codes and Standard Used.....	49
5.2 Ethical Principle and Professional Commitment... ..	49
5.3 Impact on Society ,Health Safety and Legal Cultural Issues... ..	49
5.4 Benefits of Removing Bottleneck... ..	49
6. CONCLUSION.....	50
Conclusion.....	51

LIST OF FIGURES

Figure Name & Number	Page Number
Figure-3.3.1 Techpack & Style Information	27
Figure-3.3.2 Product Description	28
Figure-3.3.3 Trims & Accessories Details	29
Figure-3.3.4 Construction Details	30
Figure-3.3.5 Measurement Sheet	31
Figure-3.3.6 Capacity Study During Bottleneck	32
Figure-3.3.7 Capacity Study After solving Bottleneck	34
Figure-3.4.1 Sketch Details	36
Figure-3.4.2 Product Details	37
Figure-3.4.3 Color Details	38
Figure-3.4.4 Color Details	39
Figure-3.4.5 Measurement Sheet	40
Figure-3.4.6 Capacity Study During Bottleneck	41
Figure-3.4.7 Capacity Study After solving Bottleneck	43

CHAPTER-1

INTRODUCTION

1.1 Background of the study

To manufacture or complete a garment sewing is an essential Part. Without sewing it is not possible to manufacture a garment. But during sewing we faces many difficulties. For example, machine disturbance, input issue, thread problem, lack of skill of the operator or lack of labor efficiency and one of the major issue or problem is bottleneck problem. It can be said that one of the common problem during sewing. The bottleneck problem creates a great impact on production and as well as pricing of the product. This Problems also causes efficiency and Productivity difficulties in sewing line. To overcome from this we took some proper steps and at the end of the day we can reduce this problem by implement some necessary steps

1.2 Objective of the study

The intention of this report is distinctive, we are working on certain target. They are,

1. For produce higher productivity of the garments.
2. For finding the easiest way to complete a process or operation.
3. Find out the reason behind the problem and remove it.
4. For balancing the line as well as equivalence in sewing floor.
5. Find out the capacity of the worker and improve.

1.3 Importance of the study

1. Knowing about the different activities of the department of industrial engineering in textile sector.
2. To know about time study, capacity, line balance, production study.
3. To know how to increase productivity, capacity, target and efficiency by applied different method.
4. To identify the bottleneck Process or Problem.

1.4 Scope of the study:

1. There is a huge number of opportunities to do something creative in the IE department of a garment Industry.
2. In this era IE working on how to increase the production continuously with a least amount of money.
3. Every RMG sector understand for better production the role of IE is very much important.
4. Remove the bottleneck process as well as reduce other problems by analyses different types of line balancing.

1.5 Limitation of the study:

1. Shortage of IE for 16 line.
2. Shortage of counselling with operator and helper.
3. Lack of skilled operator.
4. Lack of Proper training.

CHAPTER 2

LITERATURE REVIEW

2.1 Definition of Industrial Engineering:

Industrial engineering is the branch of engineering that is basically working with 3M. And it is man, machine, and material. Industrial Engineering is connected with the design, development and improvement of integrated system of 3M for the benefit of the mankind. IE Department always thinks about the improvement and the betterment of the industry. The People involve involved in the IE department is called the Industrial Engineer. Basically IE thinks how to represent any complex thing in an easiest way. IE basically doing operation breakdown or process breakdown to increase the productivity. To increase or improve the productivity IE use different techniques such as time study, work study, method study, motion study etc.

Industrial engineering (IE) =production↑ cost↓ proper use of all elements↑ efficiency↑ profit↑

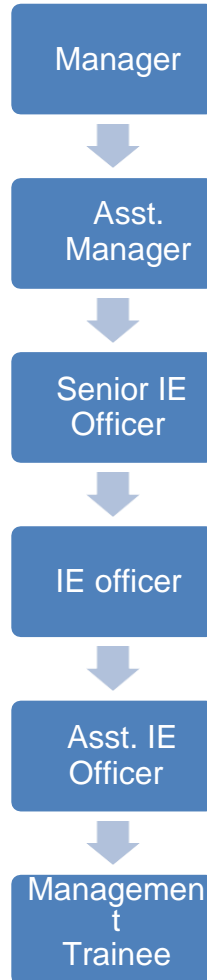
2.2 Responsibilities of industrial Engineer:

- By Research and analyses improve the process for increase the productivity.
- To prepare daily, weekly, monthly Production Plan.
- Find out the way how to reduce the manpower on a line.
- Find out the proper way to control the wastage.
- Find out a proper way to trained up the operator.
- Do Time study, production study and set the line in a balanced way
- Monitoring the line all the time to reduce or remove the bottleneck problem.
- Ensure the optimize use of the machine and do a proper plan to increase the efficiency of a line.

2.3 Objectives of industrial engineering:

- Increase the efficiency.
- Reduce the non-value added time by reducing the motion of any worker.
- Make a plan of optimum uses of any resources and reduce the wastage.
- Make a proper lay out with the help of technician.
- Getting out the maximum output from the worker by training her/him.
- Make the workplace standard for the worker.

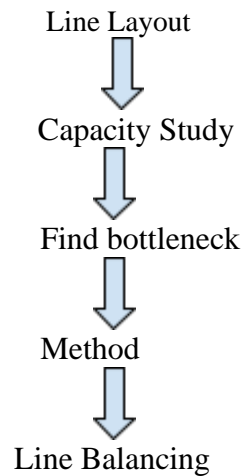
2.4 Organogram of IE department:



Line Balancing:

2.5 Definition of Line Balancing:

Line Balancing is the levelling of workforce or workload across all process in a line to remove the bottleneck Process. Basically it minimize or reduce the idle time of the worker and increase the productivity of the worker.



2.6 Objectives of line balancing:

1. To reduce the unnecessary or unassigned at the workplace.
2. To remove the bottleneck Process and levelling the workflow or workload across all process and smooth the production rate.
3. To execute actual number of work station and operations in each section.
4. To distribute the exact manpower for the exact process.
5. To reduce the delay of the production.
6. To reduce or minimize the wastage of Production.

2.7 Importance of Line Balancing:

1. It calculates the total number of machine and total number of manpower or worker.
2. It is easy to execute the exact the exact work Plan.
3. It reduce the excess time during production.
4. It increase the production and reduce the production cost.
5. It minimizes the faults during production.
6. It increases Profitability.

2.8 How to maintain line balancing:

Accurate machine arrangement and machine settings is an important task in garment industry. Accurate machine settings helps to increase the productivity and smooth the workflow and accurate machine settings ensure the remove of bottleneck process during production. The example of line balancing (Sporty Top) is given below:

SL NO	Operation Name	Machine Requires
1	Join right shoulder	Overclock Machine
2	Attach elastic at neck and trim	Flat Lock leaching
3	Join left shoulder	Overclock Machine
4	Attach elastic at armhole	Flat Lock leaching
5	Join side seam with label	Overclock Machine
6	Bartack at armhole and shoulder	Bartack
7	Butterfly bartack	Bartack
8	Bottom hemming	Flat Lock

2.9 Flow Chart of IE department:

SL No.	Process	Procedure
01	Negotiation with garments merchandiser	It is the very first work of an industrial engineer. Here, he should vastly discussed with garments merchandiser about the in-coming garments product.
02	Garments analysis	Confirmed garments product is clearly analyzed here by industrial engineer. It helps to complete rest of the processes very easily.
03	Make P.P meeting	Here, P.P meeting should be organized if all the required fabrics, trimmings and accessories are in housed and take all the pre-cautions for the up-coming garments production.
04	Production target	Production target should set here according to factory capacity. It helps to respect the shipment date.
05	Set machine layout	Machine layout is set here according to total processes needed to complete a garment item.
06	Line setting	In this process, actual line setting should be done to utilize the garment workers properly. If it takes more time in line setting then garments production will be decreased.
07	Line balancing	To minimize the number of work stations, cycle time, line balancing is done here. Its a very important process to achieve desired production target.
08	Continuous production meeting	Production meeting should be done here at regular interval. If any problem will arise during garments production, should take necessary actions to solve that.
09	Collecting production data	Production data should be collected here for preparing production report.
10	Preparing production report	Here, total garments production report has prepared to analysis about the whole production.
11	Production report analysis	Garments production report is analyzed here from different points of view.
12	Report submit to factory manager	Finally garments production report have to submit into the factory manager.

Standard Minute Value

2.10 Definition of SMV:

Basically SMV means Standard Minute Value. It may be defined as the time required to complete a task in a standard environment and in a standard way. SMV mostly used in the garments industry and it is the process of the time study. SMV can be varies garments to garments.

2.11 Factors of SMV:

1. Garment Size
2. Complicity of the process.
3. Types of Fabrics.
4. Types of Garments.
5. Garment Design.
6. Types of Machine.

2.12 Necessity of SMV:

1. For figure out or knowing the exact costing of the garments SMV is calculated.
2. For set the line target and setting the right target SMV calculation is necessary.
3. For find out the capacity SMV calculation is required.
4. For calculated the efficiency of the workers SMV calculation is required.

2.13 Formula and example of SMV:

S.M.V = Standard minute value

SMV= Basic time +Allowance

Basic time = Observe time*Performance rating

Observe time = Total cycle time/total cycle number

Basic Time: Basic time is the time which is obtained by multiplying rating factor to the cycle time.

Performance rating: Performance rating is like a KPI (Key Performance indicator) of a worker. This rating is given to the worker as per her or his working performance, it indicates if the worker's performance is good or bad.

Performance rating basically depends on:

- ✓ Skill
- ✓ Effort
- ✓ Consistency
- ✓ Condition

Example:

Let five cycle time= 8.04 sec,9.08 sec,7.00 sec, 6.00 sec, 5.00 sec and the given performance rating is 70% and the allowance is 10%. Find out the SMV of this example?

$$\begin{aligned} \text{SMV} &= (\text{cycle time} / \text{Cycle number} * \text{Performance Rating}) * \text{Allowance} \\ &= (8.04+9.08+7+6+5 / 5 * 70\%) + 10\% \\ &= 5.41 \text{ Second} / 60 \text{ (Here sec is converted into minute)} \\ &= 0.09 \text{ min} \end{aligned}$$

WORK STUDY

2.14 Definition of work study:

Work study is the study of industrial engineering that plays an important role in reducing garment manufacturing costs and increasing productivity.

2.15 Technique of work study:

There are two technique of work study;

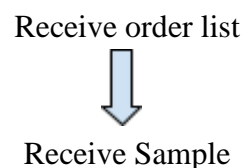
1. Method study: Technique is a methodology study that study that systematically collects and analyzes current and potential working processes in order to create and apply methods that are simpler and more efficient and minimize costs.

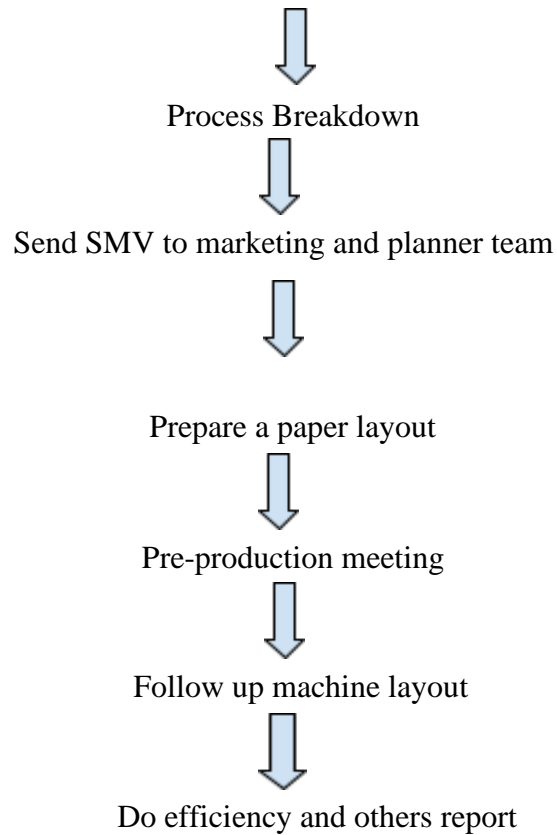
2. Work measurement: Work evaluation is the use of technique designed to set the time for a new skilled worker to complete a particular task at a given performance level.

2.16 Role of work study in the apparel industry:

1. To maximize the method of doing a job.
2. To minimize the unit cost.
3. To determine the standard time for doing a job.
4. To utilize the facilities such as man machine and materials.

2.17 Flow chart of work study:





Method Study

2.18 Definition of method study:

It is the process of analyzing the methods involved in a workflow to increase productivity. It deals with doing the work in a better way, with less time and effort. That is why it is also termed work simplification.

2.19 Objective of Method Study:

1. The improvement of processes and procedures.
2. Factory and workplace layout improvement.
3. Improvement in the design of plant and equipment.
4. Reduction in unnecessary fatigue and movements.

5. Use of improved materials, machines and manpower.
6. Better Working conditions.

2.20 Steps involved in method study:

1. **Select:** The duty to be investigated.
2. **Record:** By extracting information from device and via constant supervision.
3. **Examine:** Through question the target, location, process and job design.
4. **Develop:** modern techniques focused on the contribution of the parties involved.
5. **Evaluate:** The outcomes of the reasonable options.
6. **Install:** latest approaches and preparation.
7. **Maintain:** Develop monitoring method.
8. **Define:** Alternative ideas and results exist.

Time Study and Capacity Study

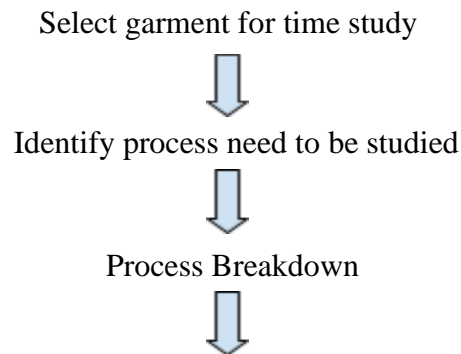
2.21 Definition of Time Study:

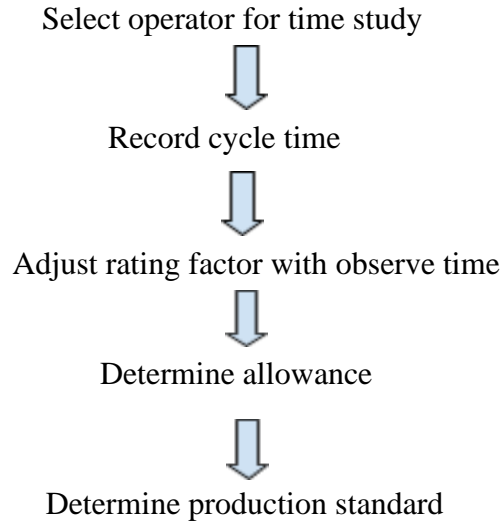
As an IE it is important to record the time study data. Time study is a widely used work measurement technique in repetitive manufacturing processes. Basically Time study helps to define how much time is necessary for an operator to carry out the task at a defined rate of performance. On the other hand it can be said that Time study is the work measurement technique for recording the times of performing a specific jobs.

2.22 Tools used in Time Study:

- Pen or Pencil.
- A stop watch for measure the Cycle Time.
- Time Study Board.

2.23 Flow Chart of Time Study:





2.24 Definition of Cycle Time:

Basically Cycle time is the duration of the time from the starting point of a task to the starting point of the next Task. This time is captured by the Observation of a Person's work by stopwatch. By measuring the cycle time We can easily figure out the capacity of a worker.

2.25 Definition of Capacity Study:

Capacity study is one of the most used term in Apparel garment Industry. The capacity of the factory is how many machines they have also calculated the production.

2.26 How to measure the Capacity:

We can find out the Capacity of a worker by the help of time study. First Of all we need to take cycle time at least

5 times and the average it and then divided 3600 by average cycle time. It means the formula is

$$\text{Capacity} = (3600 / \text{average cycle time})$$

Example:

A working doing Join right shoulder. His Cycle time is like, 6 sec, 5 sec, 6 sec, 5 sec, 5 sec. His/her average cycle time is about 5.

So, Now the Capacity = $(3600/5)$

$$= 720 \text{ Pcs (per hour)}$$

Work measurement related formula:

Standard minutes value (SMV) = Observed time*rating +15% (Allowance)

Daily Target = Manpower*10(daily working hours)* 60* Efficiency

$$\text{SMV}$$

$$\text{Efficiency (\%)} = \frac{\text{Output} * 100}{\text{Quantity] Input}} \quad [\text{Output} = \text{SMV} * \text{pro.}]$$

$$\text{Individual worker target/Hr} = \frac{60 * \text{Wanted Efficiency}}{\text{SMV}}$$

Production Study:

2.27 Definition of Production Study:

Production Study is basically a lengthy Process and it is done to find out the actual factors that is affecting the rate of the output of the worker. By Production Study it is easy to find out the Non Productive Time. By this study we can easily find out that in which area worker face difficulties. Such as there maybe thread breakage problems, machine problems etc. And as an IE need to reduce this difficulties and increase the productivity or capacity of the worker.

2.28 Necessity of Production Study:

When a worker give the lowest capacity of production, as an IE the main work is to find out that what is the problem behind the worker's lowest output or Capacity. To find out the reason behind this lowest capacity we need to do production study and by this study we can easily find out that in which portion worker face problems or worker consuming more time. Worker may face problem when the thread break frequently, M/C problems and they may consuming time by gossiping during bundle changing.

Motion Study

2.29 Definition of Motion Study:

Motion study is the science & effective way of eliminating wastefulness, resulting from using unnecessary, ill directed and inefficient motion.

On the other hand, it is the systematic recording and critical examination of existing and proposed ways of doing

work as a means of developing and applying easier and more effective method and thereby reducing cost.

2.30 Basic Motion:

There are six Basic Motion and they are:

1. Pick up
2. Put under the presser feed
3. Align
4. Stitch
5. Remove from the presser feed
6. Dispose

2.31 Benefits of Motion Study:

1. The efficiency of workers is increased because they are asked to follow correct methods, use proper tools and eliminate wasteful motions
2. Effective use of men and machines is ensured.
3. It helps in simplifying the existing operations by laying down the best sequence of essential operations.
4. It leads to economy in labor and reduction of cost.

BOTTLENECK

2.32 Definition of Bottleneck:

The bottleneck is the point in the production line where production is running slow from the normal flow of production. The lowest output point in the production line is called a bottleneck. In the textile industry bottleneck refers to the lowest point of one or more operations which result in lowest production which causes the lowest profit. So identifying bottleneck operation and minimizing it is a very important task in the garment sector.

2.33 Arise of bottlenecks:

- i. Poor line balancing.
- ii. Difficult operation.
- iii. Wrong workers selection.
- iv. Sickness of operator.
- v. Machine problem.

2.34 Importance of finding bottleneck:

1. Bottlenecks occur due to the problems faced by operators for the completion of the process in the right time.
2. Bottlenecking causes lower production, which leads to poor performance of the operator and lesser efficiency.
3. Identifying and removing bottlenecks improves the production and removes the cost of the production.

2.35 Ways of reduce bottleneck:

1. **Motion Improvement:** By Motion improvement it could be easy to minimize the bottleneck process. By reducing the unnecessary body movement bottleneck process can be reduced.

- 2. Method Improvement:** Industrial engineers calculate method study to find out a better method for minimizing bottleneck production in the sewing line. For example using some special types of guides, folder etc.

- 3. Process Sharing:** It is another way to reduce the bottleneck process. The bottleneck process can easily minimized by sharing the process with high capacity worker.

- 4. Develop layout plan:** By putting high skilled workers in the difficult operation and removing less skilled workers from the difficult operation is done by developing the work station layout.

- 5. Increase extra manpower:** The first way to increase production at the bottleneck point is to add more man power. This will definitely reduce bottleneck operation from the production.

CHAPTER 3

METHODOLGY

3.1 Materials and Method used in this project:

In this project numerous data was used for the analysis of this project. The collected data that has been tabled with firstly and in accordance with traditional operation breakdown then according to work study method and then lean line operational breakdown. In this project very normal materials are used.

They are:

1. Pen
2. Pencil
3. Rubber
4. Statistical Data
5. Calculator
6. Stopwatch

These following methods are being used in this project:


1. Motion Improvement
2. Production Study
3. Add a Better Operator
4. Changed operator
5. Workplace Organization

3.2 Data Collection:

In our project we gathered some information and some data which is simply taken from the factory, where we have done our industrial training. This data is fully authentic and it is collected from the IE Department.

3.3 Bottleneck Operational Data:

3.3.1-Techpack and style information:

	DATE CREATED: 20/01/2022 SEASON #:		REFERENCE PHOTO 1st Fit 11/03/2022		
	BRAND LOGO		GRS30413MN 1st Pre-Pro 11/04/2022		
VENDOR:	LEI TAK FUNG TE	STYLE #:	GRS30413MN	DESIGNER:	JOANNE JOSEPH
SEASON NAME:	Spring/Summer 2022	PROD SPEC#:	17418925	PRODUCT DEV:	JESSICA JURKOV
BRAND:	George	SIZE RANGE(S):	XS-2XL	REVISION DATE:	11/07/2022
DEPARTMENT:	27	COUNTRY:	BANGLADESH	REVISED BY:	12026
BUYER:	Carina Chandrakata	DESCRIPTION: 2 PC TEE WITH POCKET AND SHORT SET			
CREATED BY:	Vanessa Ducharme				

REFERENCE PHOTO

APPROVED PP TOP SAMPLE - GRS10405MN

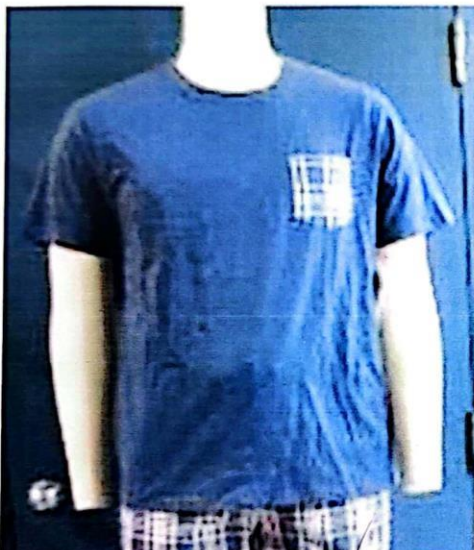

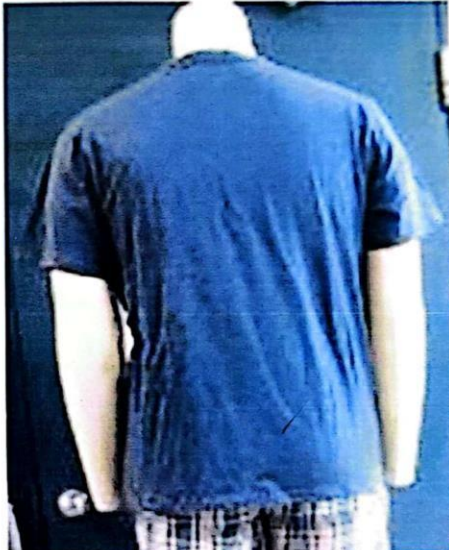




Figure: 3.3.1

3.3.2-Product Description:


 Brand Logo		DATE CREATED:	20/01/2022	TRIMS	
		SEASON #:		1st Fit	11/03/2022
GRS30413MN					
					1st Pre-Pro
VENDOR:	LEI TAK FUNG TEX	STYLE #:	GRS30413MN	DESIGNER:	JOANNE JOSEPH
SEASON NAME:	Spring/Summer 2022	PROD SPEC#:	17418925	PRODUCT DEV:	JESSICA JURKOV
BRAND:	George	SIZE RANGE(S):	XS-2XL	REVISION DATE:	11/07/2022
DEPARTMENT:	27	COUNTRY:	BANGLADESH	REVISED BY:	12026
BUYER:	Carina Chandrakate	DESCRIPTION:	2 PC TEE WITH POCKET AND SHORT SET		
CREATED BY:	Vanessa Ducharme				
BLOCK/STYLE REFERENCE #:	DIRECT REPEAT - GRS2 0413 MN			REVIEWED BY:	
FABRIC DETAILS:	FABRIC 1	FABRIC 2	FABRIC 3		
PRODUCT COMPONENT	TEE / PANT BODY / BACK NECK TAPE / POCKET ✓	TEE NECK RIB			
FIBER CONTENT	100% COTTON JERSEY	95% COTTON, 5% SPANDEX			
DESCRIPTION	SOLID & AOP ✓	1X1 RIB ✓			
WEIGHT	150GSM ✓	200 GSM ✓			
CONSTRUCTION					
YARN COUNT					
FABRIC FINISH/CLAIMS	PRESHRUNK, SOFT HANDFEEL, MUST MEET ALL SHRINKAGE REQUIREMENTS ✓	PRESHRUNK, SOFT HANDFEEL, MUST MEET ALL SHRINKAGE REQUIREMENTS ✓			
GARMENT FINISH					
SPECIAL REQUESTS / COMMENTS	CONTRAST COLOR BACK NECK TAPE / SCREEN PRINT BEHIND CHEST POCKET ✓	DTM BODY ✓			
FABRIC APPROVED BY:					
FABRIC APPROVAL DATE:					

Figure-3.3.2

3.3.3-Trim and Accessories Details:


 Brand Logo	DATE CREATED: 20/01/2022	TRIMS							
	SEASON #:	1st Fit	11/03/2022						
GRS30413MN		1st Pre-Pro	11/04/2022						
TRIMS, ACCESSORIES AND EMBELLISHMENT DETAILS:									
Component	Description	Location	Quantity	Color	Size	Code			
THREAD	SIZE AND QUALITY OF THE THREAD MUST COMPATIBLE WITH THE QUALITY OF THE ACTUAL FABRIC ✓	INNER SEAMS AND TOPSTITCHING ✓	AS NEEDED ✓	DTM ✓	REG GAUGE ✓				
TAPING	COTTON TWILL HERRINGBONE TAPE ✓	ALONG INNER BACK NECK SEAM ✓		SEE ARTWORK	3/8" WIDE ✓				
ELASTIC	COTTON COVERED, PRE-SHRUNK, NON-ROLLING ✓	AT INNER WAIST BAND ✓	AS NEEDED ✓	WHITE FOR LIGHT COLOURS / BLACK FOR DARK COLOURS ✓	1 3/4" WIDE ✓				
INTERFACING	PELLON FUSING, COMPATIBLE TO FABRIC WEIGHT ✓	CF WAISTBAND FOR BUTTONHOLES ✓	AS NEEDED ✓						
DRAWCORD	COTTON FLAT HERRINGBONE TWILL TAPE W/ CLEAN FINISHED EDGES ✓	WAISTBAND ✓	1	DTM	5/8"W				
BUTTON	4H PLASTIC WITH RIM ✓	CF FLY / POLY BAG ✓	1+1	DTM	20L				
HANG TAG DETAILS:		LABEL DETAILS:		MAIN LABEL:		CARE/CONTENT:			
GEA2917-059	Ref#		CAGENCL002 (BLACK) / 003 (WHITE) / 004 (GREY)	CASS0003	CANBOXBAR6				
FOLDED PACK HANGER CARD WITH PERFED PRICE - MEN'S T-SHIRT & KNIT PANT SET ✓	Description ✓		GEORGE CONTENT CARE LABEL	SIZE STICKER	UPC STICKER				
SEASONAL IDENTIFIER (GNN0218-004, 05 or 06) - FOLLOW BUYER'S PO	Type		HEAT TRANSFER						
HANGER DETAILS:		Material		EACH TOP & BOTTOM					
OVER RIDER HANGER REF# B4008 (HG16)	Placement Guide	AS PER PLACEMENT GUIDE							
NATURAL	Supplier	NOMINATED SUPPLIER ✓							
CARE INSTRUCTIONS:		Placement Guide		AS PER PLACEMENT GUIDE		ZONE: SLEEPWEAR			
		Supplier		NOMINATED SUPPLIER					

Figure-3.3.3

3.3.4-Construction Details:

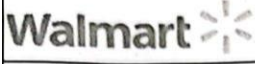
 Brand Logo		DATE CREATED: 20/01/2022	INITIAL SPECIFICATIONS SHEET		
		SEASON #:	1st Fit	11/03/2022	
		GRS30413MN		1st Pre-Pro	11/04/2022
VENDOR:	LEI TAK FUNG TEX	STYLE #:	GRS30413MN	DESIGNER:	JOANNE JOSEPH
SEASON NAME:	Spring/Summer 2022	PROD SPEC#:	17418925	PRODUCT DEV:	JESSICA JURKOV
BRAND:	George	SIZE RANGE(S):	XS-2XL	REVISION DATE:	11/07/2022
DEPARTMENT:	27	COUNTRY:	BANGLADESH	REVISED BY:	12026
BUYER:	Carina Chandrakate	DESCRIPTION:	2 PC TEE WITH POCKET AND SHORT SET		
CREATED BY:	Vanessa Ducharme				
CONSTRUCTION, WORKMANSHIP AND ISO DETAILS					
Location	Description / Construction			ISO Standard	
SPI DETAILS	ALL INNER SEAMS: 12-14 SPI				
	ALL TOPSTITCHING: 10-12 SPI				
	ALL BARTACKING: 85 SPI			304 - ZIG ZAG LOCKSTITCH	
REQUIRED AT: ALL JOINS & BULKY SEAMS	REINFORCED OR REVERSE STITCHING				
TOP:					
ALL INNER SEAMS	12-14 SPI ✓				
ALL TOPSTITCHING	10-12 SPI ✓				
BARTACKING (IF APPLICABLE)	85 SPI ✓			304 - ZIG ZAG LOCKSTITCH	
ALL INSIDE SEAMS	SAFETY SERGE			514 - 2 NEEDLE 4 THREAD OVEREDGE	
NECKLINE	CREW NECK: 1X1 RIB BAND, 2 PLY, FOLDED EDGE, SERGED TO NECKLINE - 1/8" W, SINGLE NEEDLE EDGESTITCH (ON BODY) BACK NECK: CLEANFINISHED WITH WOVEN TAPING - SINGLE NEEDLE EDGESTITCH ALONG TOP AND BOTTOM EDGE TO ATTACH			514 - 2 NEEDLE 4 THREAD OVEREDGE 401 - CHAINSTITCH 301- LOCKSTITCH	
SLEEVE OPENING/ HEM	SINGLE TURN, 1/4" WIDE, 2 NEEDLE COVERSTITCH, 1" MARGIN ✓			406 - 2 NEEDLE BOTTOM COVERSTITCH	
SHORT:					
ALL INNER SEAMS	SAFETY SERGED			514 - 2 NEEDLE 4 THREAD OVEREDGE ✓	
GROWN ON WAISTBAND	SELF, GROWN ON WAISTBAND - ELASTIC SERGED TO THE WAISTLINE - SINGLE TURN - 1/4"W, TWIN NEEDLE CHAINSTITCH ALONG BOTTOM EDGE OF WAISTBAND			504 - 3 THREAD OVEREDGE 401 - TWO THREAD CHAIN STITCH	
	2X VERTICAL BUTTONHOLES AT CF WAISTBAND FOR DRAWCORD EXIT - SPACED 2" APART			304 - ZIG ZAG LOCKSTITCH ✓	
SIDE ON SEAM POCKETS	TOPSTITCHING APPLIED 1/4" FROM SIDE SEAM			301 - LOCKSTITCH	
	TOP & BOTTOM EDGE OF SIDE POCKET REINFORCED WITH BARTACKS			304 - ZIG ZAG LOCKSTITCH	
POCKET BAGS	SELF POCKET BAGS SAFETY SERGED TOGETHER ✓			514 - 2 NEEDLE 4 THREAD OVEREDGE, 3 GAUGE - SERGE SEAM ALLOWANCE	
LEG OPENING	SINGLE TURN, 1/4" WIDE, 2 NEEDLE COVERSTITCH, 1" MARGIN			406 - 2 NEEDLE BOTTOM COVERSTITCH	
FLY FRONT	SINGLE NEEDLE TOPSTITCH AT CF FUNCTIONAL FLY WITH BUTTON CLOSURE BARTACK AT BOTTOM OF FLY - SEE REFERENCE PHOTOS			301 - LOCKSTITCH 304 - ZIG ZAG LOCKSTITCH	

Figure-3.3.4

3.3.5-Measurement sheet:


Walmart 		DATE CREATED: 20/01/2022		GRADED MEASUREMENTS						
		SEASON #:		1st Fit		11/03/2022				
Brand Logo		GRS30413MN				1st Pre-Pro		11/04/2022		
VENDOR:	LEI TAK FUNG TEXTILE & C	STYLE #:	GRS30413MN	DESIGNER:	JOANNE JOSEPH					
SEASON NAME:	Spring/Summer 2023	PROD SPEC#:	17418925	PRODUCT DEV:	JESSICA JURKOV					
BRAND:	George	SIZE RANGE(S):	XS-2XL	REVISION DATE:	11/07/2022					
DEPARTMENT:	27	COUNTRY:	BANGLADESH	REVISED BY:	12026					
BUYER:	Canna Chandrakate	DESCRIPTION:	2 PC TEE WITH POCKET AND SHORT SET							
CREATED BY:	Vanessa Ducharme -CTL									
MEASUREMENTS										
BLOCK/STYLE REF #:	DIRECT REPEAT - GRS2 0413 MN			SAMPLE SIZE:				M		
POINTS OF MEASURE: FLAT MEASUREMENTS		TOL +/-	XS	S	M	L	XL	2XL	METHOD REF#	
TOP		0	1ST FIT REPEAT STYLE - PP GRADING RELEASED							
BODY LENGTHS		0								
FRONT LENGTH - HPS TO HEM AT HIP (REG. LENGTH)		1/2	28 1/2	29	29 1/2	30 1/4	31	32 1/2	B-03-GEN	
NECKS/COLLARS		0								
BACK NECK WIDTH - SEAM TO SEAM AT HPS		1/4	7 1/4	7 1/2	7 3/4	8	8 1/4	8 1/2	B-13-GEN	
FRONT NECK DROP (TO SEAM)		1/4	4 1/4	4 1/2	4 3/4	5	5 1/4	5 1/2	B-18-GEN	
BACK NECK DROP (TO SEAM)		1/4	3/4	7/8	1	1 1/8	1 1/4	1 3/8	B-20-GEN	
NECK TRIM DEPTH		1/8	5/8	5/8	5/8	5/8	5/8	5/8	B-33-GEN	
MINIMUM NECK STREYCH		0	26	26	26	26	26	26		
BUSTICHEST		0								
BUST AND CHEST WIDTH - 1" BELOW ARMHOLE		3/8	17 1/2	19 1/2	21 1/2	23 1/2	25 1/2	27 1/2	D-08-GEN	
WAIST		0								
WAIST POSITION FROM HPS (TOPS)		1/8	17	17 1/2	18	18 1/2	19	19 1/2	H-01-GEN	
WAIST WIDTH FROM HPS (TOPS)		3/8	17 1/2	19 1/2	21 1/2	23 1/2	25 1/2	27 1/2	H-02-GEN	
HEM/SWEEP		0								
HEM/SWEEP		3/8	17 1/2	19 1/2	21 1/2	23 1/2	25 1/2	27 1/2	J-01-GEN	
HEM HEIGHT		1/8	3/4	3/4	3/4	3/4	3/4	3/4	J-13-GEN	
ARMHOLE/STRAP/SLEEVE		0								
ARMHOLE - STRAIGHT (SEAM TO SEAM)		1/4	8 1/2	9	9 1/2	10	10 1/2	11	G-02-GEN	
SHORT SLEEVE LENGTH OVERARM - FROM C/B NECK		3/8	16 1/2	17 1/4	18	18 3/4	19 1/2	20 1/4	G-28-GEN	
SLEEVE OPENING - SHORT SLEEVE		1/4	6 3/4	7 1/4	7 3/4	8 1/4	8 3/4	9 1/4	G-48-GEN	
BICEP 1" BELOW ARMHOLE		1/4	7 1/4	7 3/4	8 1/4	8 3/4	9 1/4	9 3/4	G-44-GEN	
HEM HEIGHT AT SLEEVE OPENING		1/8	3/4	3/4	3/4	3/4	3/4	3/4	G-52-GEN	
SHOULDER/ ACROSS FT & BK		0								
SHOULDER POINT TO POINT (REGULAR)		1/4	16 1/2	17 1/2	18 1/2	19 1/2	20 1/2	21 1/2	D-03-GEN	
ACROSS FRONT - AT MID-ARMHOLE		1/4	14 1/2	15 1/2	16 1/2	17 1/2	18 1/2	19 1/2	D-14-GEN	
ACROSS BACK - AT MID-ARMHOLE		1/4	15 1/4	16 1/4	17 1/4	18 1/4	19 1/4	20 1/4	D-19-GEN	
SHOULDER SLOPE/ DROP		1/8	1 3/4	1 7/8	2	2 1/8	2 1/4	2 3/8	D-07-GEN	
FORWARD SHOULDER		1/8	1/4	1/4	1/4	1/4	1/4	1/4	D-17-GEN	
LEFT CHEST POCKET		0								
FRONT POCKET POSITION FROM HPS		1/4	8 1/2	8 3/4	9	9 1/4	9 1/2	9 3/4	O-03-GEN	
FRONT POCKET POSITION FROM C/F		1/4	1 3/4	1 7/8	2	2 1/8	2 1/4	2 3/8	O-04-GEN	
POCKET LENGTH AT CENTRE		1/4	4 1/4	4 1/4	4 1/4	4 1/2	4 1/2	4 3/4	O-20-GEN	
POCKET LENGTH AT SIDE		0	3 3/4	3 3/4	3 3/4	4	4	4 1/4		
POCKET WIDTH AT TOP EDGE/ OPENING		1/4	4	4	4	4 1/4	4 1/4	4 1/2	O-24-GEN	
BOTTOMS		0								
BODY LENGTHS		0								
INSEAM LENGTH - CROTCH TO HEM AT MID THIGH		1/4	9	9	9	9	9	9	A-66-GEN	
WAIST		0								
WAIST - FULLY ELASTICATED		3/8	12	14	16	18	20	22	H-08-GEN	
WAIST EXTENDED		3/8	17	19	21	23	25	27	H-10-GEN	
WAISTBAND DEPTH		1/8	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	H-15-GEN	
HIP		0								
HIP POSITION FROM CROTCH SEAM		1/8	2 1/2	3	3 1/2	4	4 1/2	5	I-23-GEN	
HIP FROM CROTCH SEAM - 3 POINT MEASUREMENT		3/8	17 1/2	19 1/2	21 1/2	23 1/2	25 1/2	27 1/2	I-25-GEN	
THIGH / KNEE		0								
THIGH WIDTH 1" BELOW CROTCH		3/8	10 1/2	11 3/4	13	14 1/4	15 1/2	16 3/4	L-12-GEN	
KNEE WIDTH AT 13-1/2" BELOW CROTCH		1/4	9	9 3/4	10 1/2	11 1/4	12	12 3/4	L-14-GEN	
LEG OPENING/ HEM		0								
LEG OPENING AT MID-THIGH-SHORT/TROUSER		3/8	9 1/2	10 1/2	11 1/2	12 1/2	13 1/2	14 1/2	J-09-GEN	
HEM HEIGHT		1/8	1	1	1	1	1	1	J-13-GEN	
RISE		0								
FRONT RISE TO TOP EDGE		1/4	11 3/4	12 1/4	13	13 3/4	14 1/2	15 1/4	L-01-GEN	
BACK RISE TO TOP EDGE		1/4	14 3/4	15 1/4	16	16 3/4	17 1/2	18 1/4	L-05-GEN	
FRONT SLANT / SCOOP POCKETS		0								
FRONT POCKET POSITION FROM WAISTBAND		1/4	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	O-01-GEN	
SIDE POCKET OPENING		1/4	7	7	7	7 1/4	7 1/4	7 1/2	O-12-GEN	
POCKET BAG HEIGHT		1/4	12 1/2	12 1/2	12 1/2	12 1/2	12 1/2	12 1/2	O-31-GEN	
POCKET BAG WIDTH		1/4	7 1/2	7 1/2	7 1/2	7 3/4	7 3/4	8	O-32-GEN	
MISCELLANEOUS		0								
DRAWCORD LENGTH - MEASURED FROM EXIT POINT (WITH WAIST IN RELAXED STATE)		0	12	12	12	12	12	12		
FLY LENGTH		1/4	6 3/4	6 3/4	7	7 1/4	7 1/2	8	N-01-GEN	
FLY WIDTH		1/8	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	N-03-GEN	

Figure: 3.3.5

3.3.6- Capacity study of the style during Bottleneck:

Buyer: Walmart Canada
Style: GRS30413MN
SMV: 6.961

Time Study Sheet

Line: LB608 Buyer: Walmart Canada Style: GRS30413MN/TOP SMV: 6.961 LBR% 45% Date: 30/10/20 Capacity: 900

SL No.	Name	ID	Operation Description	M/C Type	1st	2nd	3rd	4th	5th	Actual	Average	Capacity	Total Capacity
1	Mojhara	L26301	Make Skape by Iron	HP	18	18	19	17	18	18	18	200	
2	Sabina	L622304	Pocket Servicing	OL	10	11	11	10	11	11	11	327	
3	Sabrina	L622523	Mark Pocket Position	HP	28	27	28	25	27	28	28	129	
4	Silpi	L924212	Attach Chest Pocket	PM	60	62	61	61	61	61	61	591	
5	Salma	L622560	II	II	61	60	60	59	60	60	60	603	119
6	Shanta	L625097	Join Shoulder	OL	28	27	26	23	26	27	27	171	
7	Habiba	L624020	Neck Ring Tack	PM	13	14	14	13	14	14	14	257	
8	Chameli	L62223	Make neck ring & Servicing	PM	34	30	31	30	33	32	32	113	
9	Sabina	H35581	Attach neck ring to neck	OL	28	27	28	29	27	28	28	129	
10	Shanta	L622303	II	OL	31	34	29	28	30	30	30	1203	299
11	Sonali	L622655	Match all cut Parts for Sleeve	Mana	12	13	13	12	13	13	13	247	248
12	Shobin	L621009	Attach Sleeve with Armhole	OL	44	41	43	42	44	43	43	84	
13	Roshmi	L622304	II	OL	50	50	50	50	50	50	50	72	156
14	Mahruza	L622201	Join Side Seam	OL	46	47	42	46	45	46	46	178	155
15	Akhi	L622705	II	OL	52	53	53	53	52	53	53	68	146
16	Salma	H42218	Hemming Bottom	FL	27	29	27	26	28	27	27	133	
17	Sona	H14894	Trim excess thread	Mana	21	20	21	21	21	21	21	171	
18	Rohit	H35023	Hemming sleeve	FL	31	30	24	31	29	30	30	120	
19	Rojina	L623126	Trim excess thread	Mana	23	24	24	24	24	24	24	150	
20	Shantona	L622401	Tack security at sleeve	PM	29	26	28	29	30	28	28	129	
21	Surni	L624843	Trim excess thread	Mana	20	20	20	19	20	20	20	180	
22	Nila	L624026	Trim extra raw edge	II	27	29	28	28	28	28	28	129	
23	Nazma	L625116	Mark & Attach back neck tape	PM	35	35	35	36	34	36	36	100	
24	Kanta	L924244	Close Back neck Tape	OL	22	22	21	21	21	21	21	171	
25	Ayesha	H34550	Front neck Top stitch	FL	29	29	29	28	28	28	28	129	
26													
27													
28													
29													
30													
31													
32													

Figure-3.3.6

[Here, we doing capacity study and find out the bottleneck process and it is mark and attach back neck tape is the first bottleneck process. Second make neck ring and servicing and 3rd attach chest Pocket. Here Line Target 900 pcs in 8 hour]

Calculation of LBR% and efficiency before solving bottleneck:

Here,

Bottleneck Process Manpower=1 (Mark and attach back neck Tape)

SMV=6.961

Bottleneck Process Average Cycle Time=36

Total Manpower=25

We know,

$$\begin{aligned} \text{LBR\%} &= \frac{\text{Bottleneck Process Manpower} \times \text{SMV} \times 60}{\text{Bottleneck Process Average Cycle Time} \times \text{Total Manpower}} \times 100 \\ &= \frac{1 \times 6.961 \times 60}{36 \times 25} \times 100 \\ &= 45 \% \end{aligned}$$

$$\begin{aligned} \text{Capacity at 8 hour} &= \text{Total Manpower} \times 60 \times 8 / \text{SMV} \\ &= 25 \times 60 \times 8 / 6.961 \\ &= 1724 \text{ for } 100\% \text{ LBR} \\ &= 778 \text{ for } 45\% \text{ LBR} \end{aligned}$$

So, Here LBR% is about 45 % and Line Capacity was 778 Pcs for 8 hour during Bottleneck.

3.3.7 Capacity Study after Bottleneck Solving:

Time Study Sheet

Line: LB608 Buyer: Nalmart Canada Style: GRS30413MNTOP SMV: 6.961 LBR% 57% Date: 08/10 Capacity:

Sl No.	Name	ID	Operation Description	M/C Type	1st	2nd	3rd	4th	5th	Actual	Average	Capacity	Total Capacity
1	Majhara	L26301	Make Shape by Iron	H/P	18	18	19	17	18		18	200	
2	Sabina	L622304	Pocket Servicing	O/L	10	11	11	10	11		11	327	
3	Sabina	L622523	Mark Pocket Position	H/P	28	27	28	25	27		28	120	
4	Silpi	L424212	Attach Chest Pocket	PM	60	62	61	61	61		61	531	
5	Salma	L622560	"	"	61	60	60	59	60		60	601	149
6	Shanta	L622862	"	"	60	62	60	60	60		60	601	
7	Shanta	L625097	Join Shoulder (L&R)	OL	20	22	19	23	19		21	171	
8	Habiba	L624020	Neck ring Jack	PM	13	14	14	13	14		14	257	
9	Shonali	L624830	Make neck ring & servicing	"	27	27	26	27	27		27	123	
10	Sabina	H35501	Attach neck ring to neck	OL	28	27	28	29	27		28	120	
11	Shanta	L622303	"	"	31	34	29	28	30		30	120	249
12	Shonali	L622655	Match all cut Parts	H/P	12	13	13	12	13		13	277	
13	Shirin	L621999	Attach sleeve with arm	OL	44	41	43	42	41		43	84	
14	Kashmi	L622704	"	"	50	50	50	50	50		50	42	156
15	Mafnusa	L622201	Join side seam (L&R)	OL	46	47	42	46	43		46	178	
16	Akhi	L622705	"	"	52	53	53	53	52		53	68	146
17	Salma	H42218	Hemming Bottom	FL	27	29	27	26	28		27	133	
18	Uosna	H19894	Trim excess thread	H/P	21	20	21	21	21		21	171	
19	Rohita	H35923	Hemming Sleeve (L&R)	FL	26	24	27	27	27		27	133	
20	Rozina	L625126	Trim excess thread	H/P	24	24	24	24	24		24	130	
21	Shantona	L622401	Take security of sleeve & join	H/P	27	26	28	29	30		28	120	
22	Nita	L624086	Trim excess thread	H/P	19	20	20	19	20		20	180	
23	Nazma	L625116	Trim raw edge of pocket	"	23	23	28	28	28		28	120	
24	Kanta	L924849	Mark & Attach back neck	PM	27	27	27	28	27		27	133	
25	Ayesha	H34550	Close back neck tape	"	20	22	21	21	21		21	171	
26	Sumra	L627322	Front neck Top stitch	FL	28	27	29	28	28		28	120	
27													
28													
29													
30													
31													
32													

Figure: 3. 3.7

Here,

SMV=6.961

Bottleneck Process Average Cycle Time=28

Total Manpower=26

After removing those bottleneck process by Motion improvement, Added one extra Manpower and changing manpower the LBR% we get,

$$\begin{aligned} \text{LBR}\% &= \frac{\text{Bottleneck Process Manpower} \times \text{SMV} \times 60}{\text{Bottleneck Process Average Cycle Time} \times \text{Total Manpower}} \times 100 \\ &= \frac{1 \times 6.961 \times 60}{28 \times 26} \times 100 \\ &= 57\% \end{aligned}$$

$$\begin{aligned} \text{Capacity at 8 hour} &= \text{Total Manpower} \times 60 \times 8 / \text{SMV} \\ &= 25 \times 60 \times 8 / 6.961 \\ &= 1724 \text{ for } 100\% \text{ LBR} \\ &= 983 \text{ for } 57\% \text{ LBR} \end{aligned}$$

So, Here LBR% is 57 % and Line Capacity is 983 Pcs for 8 hour

After reducing the bottleneck Process we can achieve the Daily line target and improve the line balance.

3.4 Bottleneck Operational Data:

3.4.1 Sketch Details:

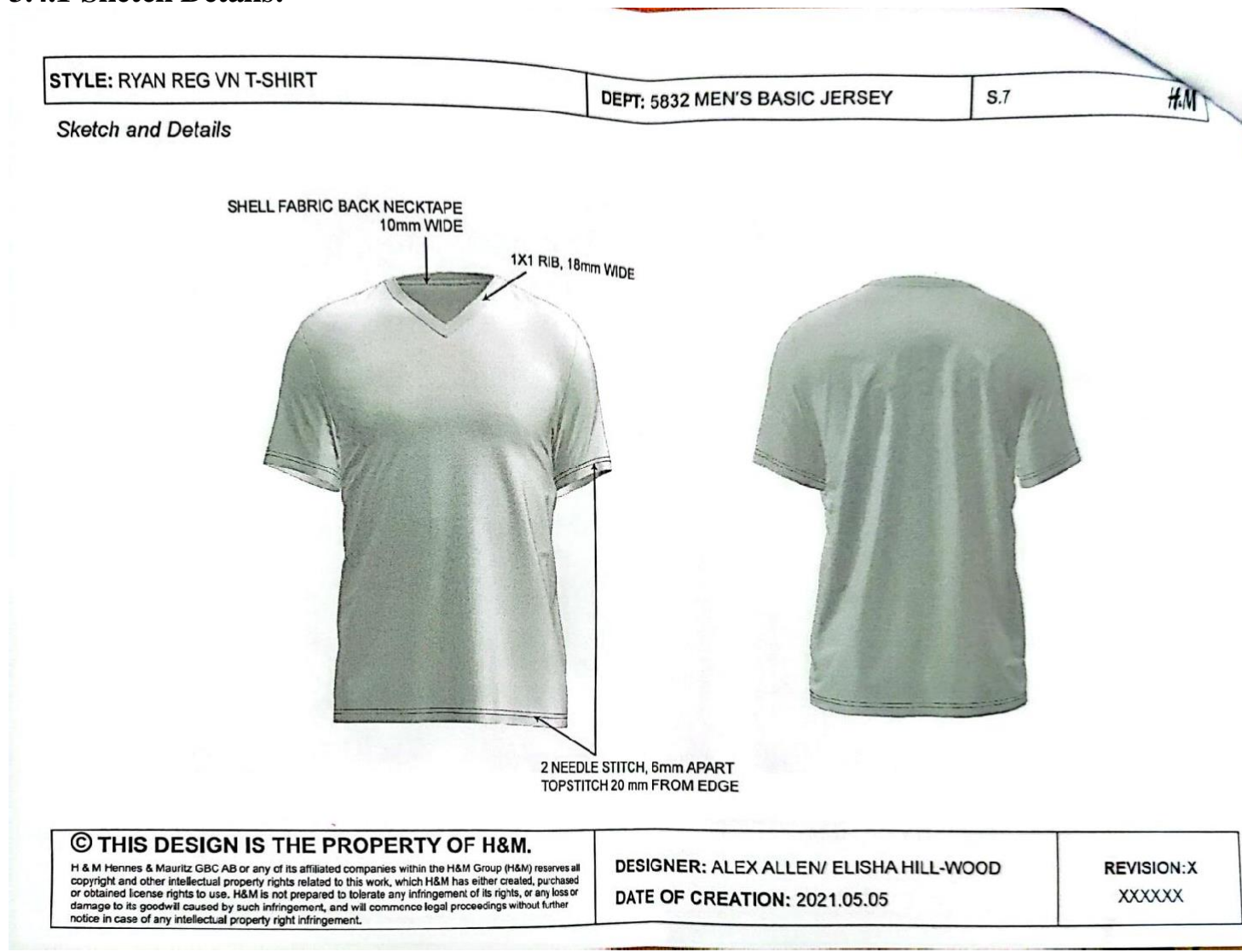


Figure-3.4.1

3.4.2 Product Details:



Product Request		RYAN RG VN T-SHIRT - 1129172D
Product Development No	1129172D	
Product Development Name	RYAN RG VN T-SHIRT	
Date of Request	13 May 2022	
Our Reference	Rahman Tanim, Moshlur	
Supplier	ABONI KNITWEAR LTD	
Product Development Description		
Product Development Description		
RYAN REG VN T-SHIRT		
CARRY OVER OR S.7		
ISW: 05 & ONWARD		
QNTY: TVP, PLS SEE BBQ		
QLTY: MLK1		
SOLIDS 100% BCI CTN. MINIMUM 60% CTN IN MELANGES		
SAMPLES: PLS HELP TO SEND SAMPLES OF CW 3-5		
FIT: CAN BE LOCALLY APPROVED		
M-chart and Sizes		
M-chart Name	M-chart Id	Base Size
RYAN REG SS VN T-SHIRT	005-26615S-1 Short	M/S
RYAN REG SS VN T-SHIRT	005-12407-1 Regular	M

Figure-3.4.2

3.4.3 Color Details:

STYLE: RYAN REG VN T-SHIRT	DEPT: 5832 MEN'S BASIC JERSEY	S.7
-----------------------------------	--------------------------------------	------------

Colours
ALL STITCHES DTM BODY COLOUR, UNLESS MENTIONED OTHERWISE.



CW 1	CW 2	CW 3	CW 4	CW 5
BODY: 10-100	BODY: 09-090	BODY: 96-109	BODY: 74-313	BODY: 13-337
RIB: 10-100	RIB: 09-090	RIB: 96-109	RIB: 74-313	RIB: 13-337
RUNNING	RUNNING			

<p>© THIS DESIGN IS THE PROPERTY OF H&M.</p> <p><small>H & M Hennes & Mauritz CBC AB or any of its affiliated companies within the H&M Group (H&M) reserves all copyright and other intellectual property rights related to this work, which H&M has either created, purchased or obtained license rights to use. H&M is not prepared to tolerate any infringement of its rights, or any loss or damage to its goodwill caused by such infringement, and will commence legal proceedings without further notice in case of any intellectual property right infringement.</small></p>	<p>DESIGNER: ALEX ALLEN/ ELISHA HILL-WOOD</p> <p>DATE OF CREATION: 2021.05.05</p>	<p>REVISION:X</p> <p>XXXXXX</p>
---	---	--

Figure-3.4.3

Appearance Number	Appearance Name	Colour	Colour Code	Colour Name	Colour Supplier	Colour Supplier Code	Graphical Appearance
001	CW 1	■	09-090	Black Dark	HM	H&M Black	Solid
002	CW 2	□	10-100	White Light	HM	H&M Optic white	Solid
003	CW 3	■	96-109	Green Dark	Pantone	19-5914 TCX	Solid
004	CW 4	■	74-313	Blue Light	Pantone	14-4316 TCX	Solid
005	CW 5	■	13-337	Beige Medium Dusty	Pantone	14-1208 TCX	Solid

Bill of material: Materials and Trims								
Position	Placement	Type	Description	Composition	Construction	Consumption	Weight	Component Treatments
Shell	NECK LINING	Rib	Neck rib: 95% BCI cotton 5% elastane 30's 2 OD 18GG 260G SM 1x1 Rib (Full feeder elastane)	95% BCI COTTON, 5% ELASTANE	30/1+20/1 / 18 G / 1x1		260.0 g/m2	
Shell	SHELL	Single Jersey	Body: 100% BCI cotton 30's 28 GG 150gsm s/j	100% BCI COTTON	30/1 / 28G		150.0 g/m2	

Figure-3.4.4

3.4.5 Measurement Sheet:

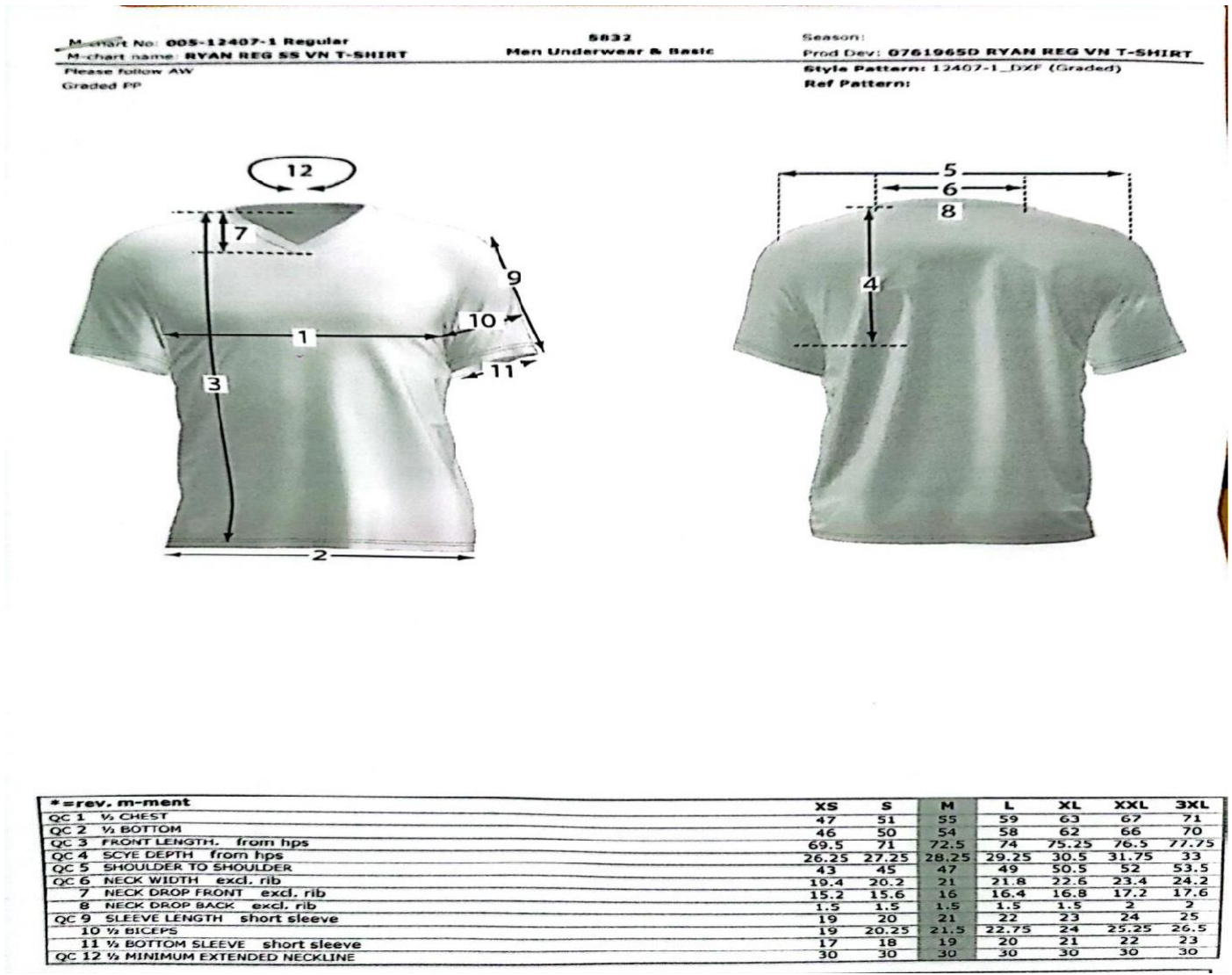


Figure-3.4.5

3.4.6 Capacity Study during Bottleneck:

BABYLON CAPACITY STUDY SHEET

Buyer's Name: **H&M** Line No.: _____ Date: _____
 Item: **T-shirt** Fabric Name: _____ SM: _____ Order No.: _____ Order Qty: _____
 Note: _____

PIN	Name	Operation Name	MIC Type	Condition	Sewing Length(C)	Order Qty:										Basic Time (Sec)	Allowance%	Cycle time (Sec)	Capacity pcs/Hr	LBR%	Bottle
						OB-1	OB-2	OB-3	OB-4	OB-5	OB-6	OB-7	OB-8	OB-9	OB-10						
1	Masad	Heat seal	F/S			19	20	20	21	20						20		180			
2	Abul	Shoulder joint(i)	O/L			12	11	13	12	11						11.8		305			
3	Putul	Shoulder joint(ii)	O/L			14	13	15	14	13						13.8		267	2563		
4	Kaden	Care level	P/M			14	15	17	17	15						15.6		231	→	LB	
5	Rana	Rib mark	M/M			11	12	12	10	9						10.8		333			
6	Sile	V-Make	P/M			5	6	4	5	6						5.2		692			
7	Sadia	V-attach	P/M			11	10	9	10	12						10.4		346			
8	Kamrul	V-attach	M/M			6	5	5	6	6						5.6		643			
9	Belal	V-Joint	P/M			12	10	11	10	12						11		327			
10	Rubi	Neck joint(i)	O/L			30	30	29	30	30						29.8		121	220		
11	Panvee	Neck joint(ii)	O/L			29	28	29	28	27						28.2		128	220		
12	Rani	Back Part Piping	F/L			4	4	4	5	3						4		200			
13	Anitha	Back Top Seam	P/M			8	8	8	7	7						7.6		474			
14	Emon	Thread cutting	M/M			7	5	6	6	5						5.8		621			
15	Rima	Body Sleeve match	M/M			10	8	7	7	8						8		450			
16	Salma	Sleeve joint(i)	O/L			26	25	25	22	26						25.8		139	267		
17	Aklina	Sleeve joint(ii)	O/L			28	26	29	29	28						28		123	267		
18	Selim	Side joint(i)	O/L			33	32	31	34	32						32.4		111			
19	Fatema	Side joint(ii)	O/L			32	32	31	28	30						30.6		118	3523		
20	Kulsum	Side joint(iii)	O/L			29	30	28	29	30						29.2		123			
21	Khaleeda	Sleeve Sticken Remove	M/M			6	7	7	8	8						7.2		500			
22	Ratna	Body Sticken Remove	M/M			8	9	9	9	8						8.6		479			

Submitted By: _____ N. B: This sheet is generated & controlled by R & D Department, AKL Babylon Group

BABYLON CAPACITY STUDY SHEET

Buyer's Name: _____ Line No.: _____ Date: _____
 Item: _____ Fabric Name: _____ SM: _____ Order No.: _____ Order Qty: _____
 Note: _____

PIN	Name	Operation Name	MIC Type	Condition	Sewing Length(C)	Order Qty:										Basic Time (Sec)	Allowance%	Cycle time (Sec)	Capacity pcs/Hr	LBR%	Bottle
						OB-1	OB-2	OB-3	OB-4	OB-5	OB-6	OB-7	OB-8	OB-9	OB-10						
23	Dipa	Sleeve hem(i)	F/L			11	10	12	14	11						11.6		310			
24	Finoz	Sleeve hem(ii)	F/L			12	14	13	12	13						12.8		281			
25	Chameli	Thread cutting(i)	M/M			21	21	21	22	22						21.4		162	35		
26	Manu	Thread cutting(ii)	M/M			23	22	21	22	22						22		162			
27	Puja	Body hemming	F/L			10	10	10	9	8						9.4		332			

Figure-3.4.6

Brand: H & M
 Item: T-shirt
 SMV: 5.96

[Here line target 235 pcs per hour or 1880 pcs in 8 hour and LBR% need to be 88%. Here Bottleneck Process is Attach Care Label]

Here,

Bottleneck Process Manpower=1 (Attach Care Label)

SMV=5.96

Bottleneck Process Average Cycle Time=16

Total Manpower=27

We know,

$$\begin{aligned} \text{LBR}\% &= \frac{\text{Bottleneck Process Manpower} \times \text{SMV} \times 60}{\text{Bottleneck Process Average Cycle Time} \times \text{Total Manpower}} \times 100 \\ &= \frac{1 \times 5.96 \times 60}{27 \times 16} \times 100 \\ &= 82\% \end{aligned}$$

$$\begin{aligned} \text{Capacity at 8 hour} &= \text{Total Manpower} \times 60 \times 8 / \text{SMV} \\ &= 27 \times 60 \times 8 / 5.96 \\ &= 2174 \text{Pcs for } 100\% \text{ LBR} \\ &= 1783 \text{ Pcs for } 82\% \text{ LBR} \\ &= 223 \text{ Pcs Per hour} \end{aligned}$$

So, Here LBR% is about 80% and Line Capacity was 1783 Pcs for 8 hour during Bottleneck.

3.4.7 Capacity Study after Solving the Bottleneck:

BABYLON GROUP
CAPACITY STUDY SHEET

Unit Code : _____

Line No.: _____ Date: _____

Buyer's Name: HSM Note: _____

Item: T-shirt Fabric Name: _____ SM: _____ Order No.: _____ Order Qty: _____

PIN	Name	Operation Name	M/C Type	Condition	Sewing Length (")	CB										Basic Time (Sec)	Allowance %	Cycle time (Sec)	Capacity pcs/hr	Pieces per hr
						CB-1	CB-2	CB-3	CB-4	CB-5	CB-6	CB-7	CB-8	CB-9	CB-10					
1	Masud	Heart sea	H/S			19	20	20	21	20						2.0		180		
2	Abril	Shoulder joint(i)	O/L			12	11	13	12	11						11.8		305		
3	Patal	Shoulder joint(ii)	O/L			14	13	15	14	13						13.8		267	266	
4	Kajer	collar label	P/M			14	14	13	14	14						13.8		267		
5	Rana	rib mark	M/H			7	12	12	10	9						10.8		333		
6	Sila	V-make	P/M			5	6	4	5	6						5.2		692		
7	Sadia	V-Tuck	P/M			11	10	9	10	12						10.4		346		
8	Kamra	V-cel	M/H			6	5	5	6	6						5.6		643		
9	Beli	V-Joint	P/M			12	10	11	10	12						11		322		
10	Rabi	Neck joint(i)	O/L			30	20	29	30	30						29.8		121		
11	Ravej	Neck joint(ii)	O/L			29	28	29	28	27						28.2		128	245	
12	Ran	Back part piping	F/L			4	4	4	5	3						4		900		
13	Prithura	Back top seam	P/M			8	8	8	7	7						7.6		424		
14	Emon	Tread cutting	M/H			7	5	6	6	5						5.8		621		
15	Aima	Body sleeve match	M/H			10	8	7	7	8						9		450		
16	Salma	Sleeve joint(i)	O/L			26	25	29	26							25.8		139		
17	Aklina	Sleeve joint(ii)	O/L			28	26	29	29	28						28		128	267	
18	Selim	side joint(i)	O/L			33	32	31	34	32						32.4		111		
19	Fatema	side joint(ii)	O/L			32	32	31	28	30						30.6		118	355	
20	Kulnab	side joint(iii)	O/L			29	30	28	29	30						29.2		125		
21	Khaleda	Sleeve sticker remove	M/H			6	7	7	8	8						7.2		500		
22	Rafal	Body sticker remove	M/H			8	9	9	9	8						8.6		479		

Studied By: _____

N. B: This sheet is generated & controlled by R & D Department, AKL Babylon Group.

BABYLON GROUP
CAPACITY STUDY SHEET

Unit Code : _____

Line No.: _____ Date: _____

Buyer's Name: _____ Note: _____

Item: _____ Fabric Name: _____ SM: _____ Order No.: _____ Order Qty: _____

PIN	Name	Operation Name	M/C Type	Condition	Sewing Length (")	OB										Basic Time (Sec)	Allowance %	Cycle time (Sec)	Capacity pcs/hr	Pieces per hr
						OB-1	OB-2	OB-3	OB-4	OB-5	OB-6	OB-7	OB-8	OB-9	OB-10					
23.	Dipfi	sleeve hem(i)	F/L				11	10	12	14	11						11.6		310	
24.	Finoz	sleeve hem(ii)	F/L				12	14	13	12	13						12.8		281	
25.	Chameli	Tread cutting(i)	M/H				21	21	21	22	22						21.4		168	
26.	Manufa	Tread cutting(ii)	M/H				23	22	21	22	22						22		167	335
27	Puja	Body hemming	F/L				10	10	10	9	8						9.4		383	

Figure-3.4.7

Here,

Bottleneck Process Manpower=2 (Neck Joint)

SMV=5.96

Bottleneck Process Average Cycle Time=30

Total Manpower=27

After removing the bottleneck by properly arranging the workplace and improve the motion the LBR% we get,

$$\begin{aligned} \text{LBR}\% &= \frac{\text{Bottleneck Process Manpower} \times \text{SMV} \times 60}{\text{Bottleneck Process Average Cycle Time} \times \text{Total Manpower}} \times 100 \\ &= \frac{2 \times 5.96 \times 60}{27 \times 30} \times 100 \\ &= 88\% \end{aligned}$$

$$\begin{aligned} \text{Capacity at 8 hour} &= \text{Total Manpower} \times 60 \times 8 / \text{SMV} \\ &= 27 \times 60 \times 8 / 5.96 \\ &= 2174 \text{ Pcs for 100\% LBR} \\ &= 1913 \text{ Pcs for 88\% LBR} \\ &= 239 \text{ Pcs Per hour} \end{aligned}$$

So, Here LBR% is about 88% and Line Capacity 239 pcs per hour meet the target.

CHAPTER: 04
RESULT AND DISCUSSION

4.1 Bottleneck Result and discussion:

Here we choose Basic T-shirt of different style and different buyer from two factory to find out the bottleneck Process. Then this sewing line was Chosen for increase the Line Balancing Rate of the line and increased the line capacity to meet the daily target by removing the bottlenecks from those line. We collect the product SMV, taking the cycle time of every worker and then find out the capacity of every worker and figure out the bottleneck process of those line. Then, By Motion improvement, Adding manpower, worker exchange and organized the workstation or workplace we can reduce it.

Problem 1: In, Walmart Canada T-shirt we have calculated the capacity of worker. For figure out the capacity per hour we need to take 5 cycle time and then average it and by dividing 3600 by average cycle time we can easily find out the capacity of a worker and can easily found the bottleneck. In this sewing line, Bottleneck is Mark and attach back neck tape which is done by Nazma and it is 23 number Process, Then Make neck ring and servicing which is done by Shonali and it is 8 number process , Then Attach chest Pocket which is done by Shilpi and Salma

And it is 4,5 number process.

For this problem Line Balance was 45% and didn't meet the line target.

Solution: For solving the Problem first of all, we changed Nazma from the Mark and attach back neck tape process and added skilled operator Kanta. Then, Make neck ring and servicing which is done by Shonali and in this operation her motion is not right. She doing some unnecessary movement like she is doing re align many times and unnecessary shoulder movement and by production study we also found that she face some problem such as thread break, needle break. Then we improve her motion and changed the machine and then her capacity is increased. Lastly in Attach chest Pocket we added extra manpower which name is Shahnaz. By implement this things the line balance increased and it is about 57% and it can easily meet the daily basis line target.

Problem 2: In H& M T-shirt, we have calculated the capacity of worker. For figure out the capacity per hour we need to take 5 cycle time and then average it and by dividing 3600 by average cycle time we can easily find out the capacity of a worker and can easily found the bottleneck. In this sewing line, Bottleneck is Attach care label which is done by Kader and it is 4 number process.

For that reason the Line Balance was 82% and didn't meet the daily basis target on that line.

Solution: For solving this Problem, we do production study and figure out that his workplace is not well organized and when he took label from the machine bed it takes more time to align it. Then we arrange Casket. Where the Label are placed and then he can easily took the label and attach the label in a short time.

By implement this, the line Balance is increased and it is about 88% and it can easily meet the daily basis target.

Chapter 5
Professional Responsibilities, Safety, Socio Cultural and
Environmental Coordination

5.1 Codes and Standards Used:

1. ISO-9000 United Registrar of System
2. CERES-0187- Content Standard (Organic 100)
3. BSCI- Business Social Compliance Initiative
4. WRAP- Worldwide responsible Apparel Production

5.2 Ethical Principle and professional commitment:

When do research it should be kept in mind that there are some ethical factors behind it. Need to be well behavior to all people and need to be patience. Need to be well mannered to all the staff and should not be rude. Moreover need to maintain some professional commitment. When do this research we are committed that we are loyal about our research and we are going out by complete this and we can simply make difference by doing our research.

5.3 Impact on society, health safety and legal cultural issues:

No one has any single health issue during this research because all the safety things are maintained here. By doing this research there is a great impact on the society. By removing bottleneck the production will be increased and more the production the company will be more benefited and ultimately company can play a role for the economic growth of a country and all the people of a country live peacefully if their economic condition is fine.

5.4 Benefits of Removing Bottleneck:

Bottleneck is the barrier for the highest production of a line and it will ultimately hamper the total factory production and sometimes the shipment gets delayed for this reason and the buyer not satisfied for this delay shipment. For this reason, company will lose their valuable client. By removing bottleneck, it can be possible to get out the highest production of a line and there will be no delay of shipment and company get new client. By removing bottleneck the process time will be saving and increase the productivity and after all ultimately increase the factory efficiency.

Chapter-6

Conclusion

Conclusion:

This thesis report exhibited some information from the department of Industrial Engineering. This thesis report shows that what is bottleneck, how can bottleneck can be measured and how can it could be minimized. The major Problem of bottleneck is low production, lowest efficiency and unbalanced line. If it is happened then it is tough to achieve the daily target. If the bottleneck can be reduced the production will be increased, line will be balance and there will be highest efficiency. At last, the paper is finished up as:

- A. We have discovered some bottleneck process in a line which is the reason behind the lowest efficiency and the lowest output or lowest production.
- B. It has been found that, there are many reasons behind this problem. Such as, unnecessary body motion or movement of operator, problem during alignment, lack of skill, lack of proper workplace organization.
- C. Then we work with those particular operators who are the reason behind this problem. We try to give them proper guideline for overcome this problem. We improve their motion, alignment and organized the workplace.
- D. It is found that, after solving this problem the production goes higher, efficiency higher and can easily meet the daily basis line target.

In our short period of time we try our level best for gathering information for finish the thesis paper, Because of some obstacle we didn't get all the data.

Turnitin Originality Report

Processed on: 21-Feb-2023 20:38 +06

ID: 2019622428

Word Count: 6836

Submitted: 1

605,606 By Jayed Sourav

Similarity by Source	
Similarity Index	
22%	
Internet Sources:	20%
Publications:	1%
Student Papers:	14%

exclude quoted
 include bibliography
 exclude small matches
 mode:

6% match (Internet from 26-Oct-2022)

<http://dspace.daffodilvarsity.edu.bd:8080>



4% match (student papers from 13-Feb-2023)

Class: MK- thesis Fall 22

Assignment: msc thesis

Paper ID: [2012979496](#)



2% match (Internet from 17-Dec-2022)

<https://textilemerchandise.com/2019/07/27/957/>



1% match (Internet from 06-Jan-2023)

<http://dspace.daffodilvarsity.edu.bd:8080>



1% match (student papers from 11-Apr-2018)

[Submitted to Daffodil International University on 2018-04-11](#)



1% match (Internet from 15-Feb-2023)

<https://www.textiletoday.com.bd/getting-rid-of-bottleneck-operations-in-garments-industry/>



1% match (Internet from 03-Feb-2023)

<https://www.onlineapparelstudy.com/2020/11/Cycle-Basic-Standard-Time.html>



1% match (Internet from 13-Jan-2023)

<https://www.slideshare.net/virshit/work-studypptx>

