Faculty of Engineering
Department of Textile Engineering

Study on Capacity Study to Find Bottleneck Problem with Probable Solution

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A thesis submitted in partial fulfillment of the requirements for the degree of
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Advance in Apparel Manufacturing Technology

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Study on Capacity Study to Find Bottleneck Problem with Probable Solution

LETTER OF APPROVAL

To

The Head

Department of Textile Engineering

Daffodil International University

Daffodil Smart City, Ashulia, Savar

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 Time Study and Line Balancing to Find Bottleneck with Probable Solution"** has been prepared by the student bearing ID: 191-23-5619, 191-23-5543 and 191-23-5584 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 thesis activities and the 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

16-02-2023

Md. Mominur Rahman

Assistant Professor

Department of Textile Engineering

Faculty of Engineering

Daffodil International University

DECLARATION

We hereby declare that the work which is being presented in this thesis entitled, **"Study on Time Study and Line Balancing to Find Bottleneck with Probable Solution"** is original work of my own, has not been presented for a degree of any other university and all the resource of materials uses for this thesis have been duly acknowledged.

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

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Above all, we praise the almighty Allah who gave me His enabling grace to successfully complete this research work.

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MD. SAGOR AHMED

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ABSTRACT

The global competitiveness in the apparel industry consists of cost reduction, increased productivity, and enhanced quality. Industrial Engineering is concerned with maximizing production, quality, and waste reduction. Therefore, an industrial engineer has a fantastic potential to contribute to the garment manufacturing industry by implementing all engineering tools for this industry's growth. IE team works in cutting, sewing, and finishing to reduce personnel and WIP, set up line Layout (operation breakdown), and improve work efficiency and productivity. Forecasting demand and creating new designs Develop Design, Utilize Various Quality Tools Bend product and seasoning development, Efficiency, Wage and income calculation, CNC machine operation, Scheduling, Capacity analysis, Line balance, Kaizen, Kanban, Production planning, Calculate NPT, Bottleneck elimination, etc.In this work, we examined several procedures regarding time, capacity, target, including experimental discussion, experiment results, and discussion of this analysis. Different item SMV information is available. We analysis 10 capacity study of different item and give the probable solution of them.

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CHAPTER 1

INTRODUCTION

Time study is the main way to determine the capacity of a swing line. Bottleneck in a swing line can easily identified by time study. This bottleneck is the biggest curse in the production of a line. A running line's production target is not acquired for this bottlenecks. By finding out this bottleneck through time study we can now find its solution

1.1 Background of the Study

An Industrial Engineer perform many task for increasing the profit of the industry. They try to gain maximum output by using minimum input. They utilize man, machine and material properly and earn maximum profit. In the production floor, we observe many problem. Many department is working to solve this problem. In sewing line bottleneck is a common phenomena. Industrial engineer's one of the main concern is to balance the line and solve the bottleneck of the sewing line. Bottleneck really hampers the production line. For this problem, the maximum output cannot come out from the line. Body parts gather near the operator. We did 10 different sewing line time study and balanced the line. After that, we found out the bottleneck. We solved the bottleneck by using different techniques. This solution will help the industry hopefully for minimization the bottleneck. An opportunity was given to us to doing the intern of Liz Fashion Industry Limited and completed this research work. We did our research and game out with the probable solution. This study will help the industry and the people we are trying to overcome this problem. The final production will be more as a result, the country will earn more profit.

1.2 Objective of the study

General Objectives

- To analysis the reason of bottleneck and way of solution of bottleneck.

Specific Objectives

- To identify how bottleneck find by time study.
- To compare about the bottleneck and line balancing.
- To analysis the way of bottleneck solution to line balancing.
- To analysis the data of 10 sewing line and solve the bottleneck and do line balancing.

1.3 Significance of the Study

By reading this article, general people will able to know about the IE activities to solve the bottleneck. They will get clear idea about line balancing and way of finding bottleneck with solution. Those who are curious about solution of bottleneck process, they can minimize their curiosity briefly or shortly by reading this article

Students can collect knowledge from here and can get clear idea about industry. They can relate this work with their theory and can enrich their knowledge.

We will do a production study later on the process in which the bottleneck will be created. So that we can verify the authenticity of the bottleneck process. Also we can know about an operator issues creating bottleneck. To solve the problem we can fix the operator's motion and do process sharing in case of over production. We can also remove bottleneck by adding a method. Sometimes an operator takes more time to complete a job. Then IE add a method with that process so that the process take less time than previous. This is called method study. By doing all above study we can eliminate the bottleneck. The experts can find what young engineers are thinking to solve this huge problem. They really get a clear idea whether this method is effective or not also they can take necessary step for the welfare of this sector.

We took 10 time study for 10 sewing line. After taking 10 time study, we found out 10 bottleneck in 10 sewing line. Now as an IE, we should remove these bottleneck from sewing line and make sewing line balance. In case of solution, we will do 10 production study for 10 line and will be able to know about the main problem of those operator whom are creating bottleneck. We will fix the problem and make a solution by adding method, perfect motion and job sharing.
Industry will get clear idea of their IE officer's necessary step to solve this huge problem. Industry authority can get the idea how they will lead their IE team to solve the bottleneck and line balancing problem.

1.4. Limitations of the study:

- Limitation of time to research this topic. .
- Limitation of accurate data.
- IE officers are sometimes very busy.

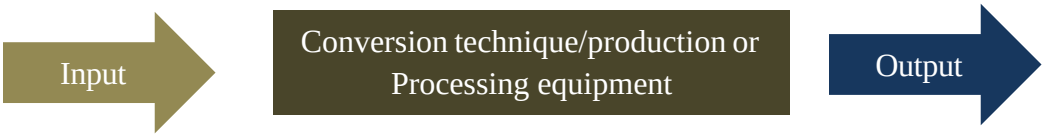
CHAPTER-2
LITERATURE REVIEW

2.1 Definition

Industrial Engineering is a discipline of engineering that focuses on the efficient utilization of machinery, materials, complicated processes, and, most significantly, human resources throughout production.
Industrial Engineering is focused with improving the current system to a better one, maximizing the system's efficiency, and ensuring improved output.

2.2 Concept of IE

Industrial Engineering is a discipline of engineering that focuses on the efficient utilization of machinery, materials, complicated processes, and, most significantly, human resources throughout production. Industrial Engineering is focused with improving the current system to a better one, maximizing the system's efficiency, and ensuring improved output.



2.3 Responsibility of industrial engineering

1. Safety precautions.

2. Each row is the same length

3. Perfect - process tampering

4. Training—teaching new workers how to do their jobs. 5. Operator productivity—keeps a surplus of efficiency and makes it easier for low-level operators to do their jobs.

6. Loss manipulation – off-general loss reduction

7. Waste management for products, materials, and tools

8. Usual language: inside the machinery at the factory while sewing.

As a leader, it can be a great example of how everyone should act. Each manager stands for the company, and everything he or she does is a reflection of the company.

2.4 IE's Activities

Several pursuits are listed

• Develop ways for enhancing production.

• Examine the probability of equipment replacement.

• Assist in determining the optimal lot size and work in process requirements for each step of an operation.

• Analyze the planned production schedules and stock levels.

• To aid in the formulation of detailed job specifications and evaluate them.

• Analyze a large project using CPM and PERT methodology.

• To lower the man-to-machine ratio.

2.5 Line Balancing

Each operator must work the same amount. Nobody other can perform one's work. Work should not be a burden for others. If not, line symmetry is adequate.

Line balancing is a crucial activity that makes production difficult if it is not completed at the appropriate time.

Without line balancing, it is impossible to acquire the same quantity of output from each process. In some businesses, commodities will be stacked, while in others, fewer things will be stored, making production more challenging. In order to address this issue, line balancing is performed during each line operation at a predetermined target.

2.5.1 Line Balancing's Objectives

The purpose of line balancing is to reduce the burdens on the line while maintaining the required output. Listed below are the aims of line balancing:

• To enhance productivity

• Minimize production cost.

• To identify the bottleneck space and eliminate it.

· To increase the output.

• To divide the labor among the workers on the assembly line.

2.5.2 Perks of Line Balancing

• To obtain a consistent output rate.

• Less inventory management.

• Efficient man-to-machine ratio utilization.

• Simple control of production.

2.6 Bottleneck

The production bottleneck is the point at which production is impeded to the greatest degree. In production floor bottleneck, output was at its lowest, resulting in a loss of profit. In actuality, this word forms the bottle's neck, which resists anything from the bottle's widest to its narrowest portions.

2.6.1 Cause of the Impasse

• Erroneous employee selection.

• Incorrect allocation of work.

• Erroneous office layout.

• Wrong technique.

• Unskilled laborer.

Not acceptable material.

• Absenteeism.

• Worker unrest.

2.6.2 Get Rid of the Bottleneck

• Method enhancement • Operation allocation enhancement

• Improvements at work

• Work extra time

• Collaboration

2.7 SMV (Standard Minute value) (Standard Minute value)

The number of minutes required for an ideal worker to complete a task in an ideal environment is referred to as the SMV of the task.

SMV = Standard Time + (Allowance x Basic Time)

2.7.1 SMV Elements

Depending on operating conditions and fabric behavior, the SMV of the same operation or product may vary. Certain

• Using a separate machine. Similar to both an automatic and a manual machine for the same task.

• Sewing a larger component of the identical procedure.

• The operator sews striped or checkered/plaid cloth.

• Operator uses attachments and work aids to sew a garment.

• Movement and actions involved in executing a task are of the utmost importance.

2.7.2 SMV Application

• To determine the cost and lead time for garments; • To determine the required time for a specific task using SMV; • To determine the line target; • To determine the pitch time; • To determine the monthly capacity; • To determine the amount of manpower and machinery required.

2.8 Time to Basic Pitch

Basic pitch time (BPT) is a ratio of SMV of garment and number of workers to be specified for the style.

Pitch time is used to compute the individual time for each garment, as well as for balancing the line and determining the production goal for the line.

2.9 Work Study

Work-study is a systematic strategy for conducting experiments that aids in enhancing the manner in which tasks are carried out and the utilization of resources.

2.9.1 Work-Study Objectives

• Facilitates the task and aids in the reduction of extraneous work. • Contributes to the enhancement of production and productivity.

• Assists in establishing the optimal timing.

• Costs are reduced when inputs are utilized most efficiently.

• Aids in improving the condition.

• Contributes to the enhancement of the quality management system; • evaluates human labor.

2.9.2 Work Study Functions

After entering the garment sector, Work-Study plays a significant role in enhancing the level of production.

Line chiefs, supervisors, and production managers are typically occupied with production matters throughout the day. Their attention is solely on input, production, and delivery, and they are unable to prioritize productivity enhancement. To increase production, the garment sector need the work-study department. Without work-study, it is impossible to boost productivity.

2.9.3 Strategy for Work-Study

In work-study, there are two sorts of strategies:

1. Method Study and

2. Observational Study

3. Analysis of Work

2.9.3.1 Method Study

Method Study is a study that methodically evaluates all the specifics and criticisms in depth and so helps to improve the work in a simple and elegant way.

2.9.3.2 Workload Calculation

Work measurement refers to the employment of technology to measure work.

2.9.3.3 Time Study

Time Study is a method of measuring work in which the time spent on a task is recorded. A Time Study is an investigation of whether or not all components of a task are functioning properly to complete a particular activity or under specified conditions.

2.9.3.4 Studies of Capacity

Capacity Study is a study in which a comprehensive picture or concept of how much work a machine operator can perform per hour is available. Working on this capability greatly improves the circumstance.

2.10 Materials and Procedures

Operations management is a powerful tool for making management decisions on the factory floor and is widely used in today's production management practices. Many difficult challenges related to controlling and scheduling assemblies can be resolved with the help of these methods. One of the methods used to achieve this is the Assembly Line Balancing (ALB) system. In order to better understand the workload distribution and bottleneck related problem, a case study was conducted at Envoy Textile Limited in Savar. When compared to the current system, the experimental results demonstrate a notable increase in output and production line efficiency.

Researchers discovered that 12 different types of procedures were performed on a standard T- shirt sewing line.

A significant bottleneck developed in a sewing assembly line process. The efficiency of the process is being decreased by this bottleneck operation. Researchers used the line balancing

method to reduce bottleneck operations from sewing or production lines in order to increase efficiency.

2.10.1 ALB Technique

ALB (Assembly Line Balancing) is a common manufacturing method in which interchangeable components are successively added to a final product. Henry Ford and his engineers initially utilized the assembly line concept. According to Adeppa (2015), ALBs with diverse purposes are divided into three categories:

ALB-I reduces the number of workstations required for a given cycle time.

ALB-II: Reduces cycle time for a specified number of work stations.

2.10.2 Determination of Cycle time via Time research

Time study is the most common and widely employed strategy for line balancing and solving bottleneck issues. The Hawthorne Effect was a significant challenge for researchers during this investigation. They discovered that employees alter their behavior when aware that their actions are being monitored.

2.10.3 Bottleneck Evaluation

A bottleneck is a point of obstruction in a process or assembly line that happens when workloads arrive too rapidly for the operation to handle. In this investigation, researchers identified a few bottleneck points that were resolved via line balancing. [1]

CHAPTER-3
METHODOLOGY

Time study is a process which is help to find out the capacity of an operator. Is is also used to calculate the line balancing ratio. Again we can find bottleneck of a line by doing time study. We did 10 different time study for 10 different items. We found 10 bottleneck process of each time study. We can remove the bottleneck process by applying different types of techniques. By doing time study which bottleneck we found in line, we will remove that bottleneck process by applying different technique.

3.1 Methodology of T-Shirt

3.1.1 T-Shirt (Buyer: Signet)

Figure 1 : Time study of T-shirt

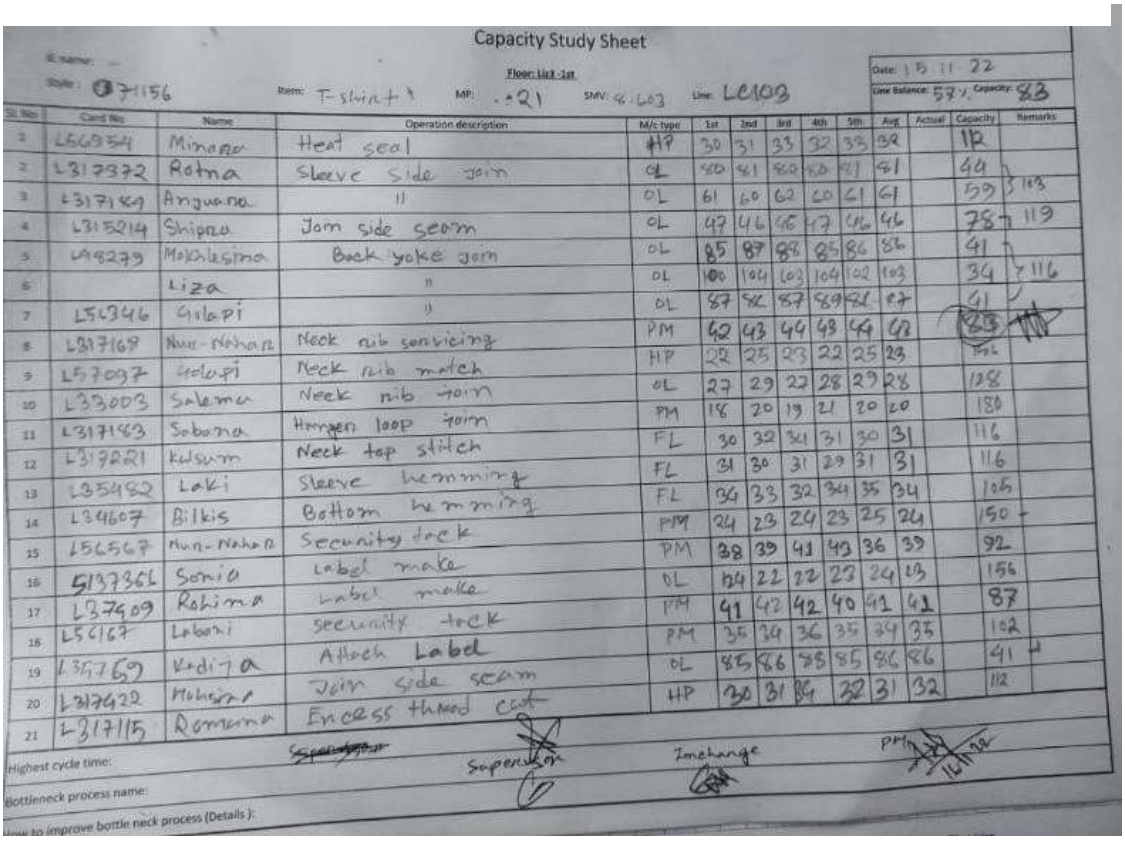


Table 1 Time study of T Shirt

Capacity Study Sheet

IE Name: Floor: liz

style:71156 Item: T-SHIRT MP:21 SMV: 8.603 Line: LC103 Date: 15/11/22 Line Balance: 57% Capacity: 83

SL No	Card no	Name	Operation description	M/C type	1st	2nd	3rd	4th	5th	AVG	Actule	Capacity	Remarks
1	L56954	Minara	Heat seal	HP	30	31	33	32	33	32		112	
2	L317372	Rotna	Sleeve side join	OL	80	81	82	80	81	81		44	103
3	L317184	Anjuara	Sleeve side join	OL	61	60	62	60	61	61		59	
4	L315214	Shipra	Join side seam	OL	47	46	46	47	46	46		78	119
5	L48279	Mokhlesina	Back yoke join	OL	85	87	88	85	86	86		41	116
6		Liza	Back yoke join	OL	100	104	103	104	102	103		34	
7	L56346	Golapi	Back yoke join	OL	87	86	87	89	86	87		41	
8	L317168	Nur-Nahar	Neck rib servicing	PM	42	43	44	43	44	43		83	
9	L57097	Golapi	Neck rib match	HP	22	25	23	22	25	23		156	
10	L33003	Salema	Neck rib join	OL	27	29	27	28	29	28		128	
11	L317183	Sabana	Neck rib join	PM	18	20	19	21	20	20		180	
12	L317221	Kulsum	Neck tap stitch	FL	30	32	34	31	30	31		116	
13	L35482	Laki	Sleeve hemming	FL	31	30	31	29	31	30		116	
14	L34607	Bilkis	Sleeve hemming	FL	34	33	32	34	35	34		105	
15	L56567	Nur-Nahar	Security tack	PM	24	23	24	23	25	24		150	
16	L137366	sonia	Lable make	PM	38	39	41	43	36	39		92	
17	L37409	Rohima	Lable make	OL	24	22	22	23	24	23		156	
18	L56167	Laboni	Security tack	PM	41	42	42	40	41	41		87	
19	L35759	kadija	Attatch label	PM	35	34	36	35	34	35		102	
20	L317422	Mohsina	Join side seam	OL	85	86	88	85	86	86		41	
21	L31715	Rumana	Encess threed cut	HP	30	31	34	32	31	32		112	
Highest cycle time:													
Bottleneck process name:													
How to improve bottle neck process (details):													

We collected the data from Liz 3 building of Liz Fashion Industry Limited. The line number was LC 103. The data was about time or capacity study of that line which is used to find out the initial balance percentages of the line. Here in the first column of the time study contains the serial number. The second column contains the card number of every operator. Again next row is about the name of the worker. After that, we can see the individual process name. We took five cycle times of each process. We did average and got average cycle time. Next portion is about the capacity of the worker. We calculated the capacity by 3600/ average cycle time. We found that 'Join side seam' process has lowest capacity (41). The output of the line will be 41. The Line Balance ratio was 29%. We can calculate the LBR by 60*SMV*Bottleneck process man power*100/ Total Manpower*Bottleneck process average cycle time.

3.1.2 T-Shirt (Buyer: Peak Performance)

Figure 2 Time study of T-shirt

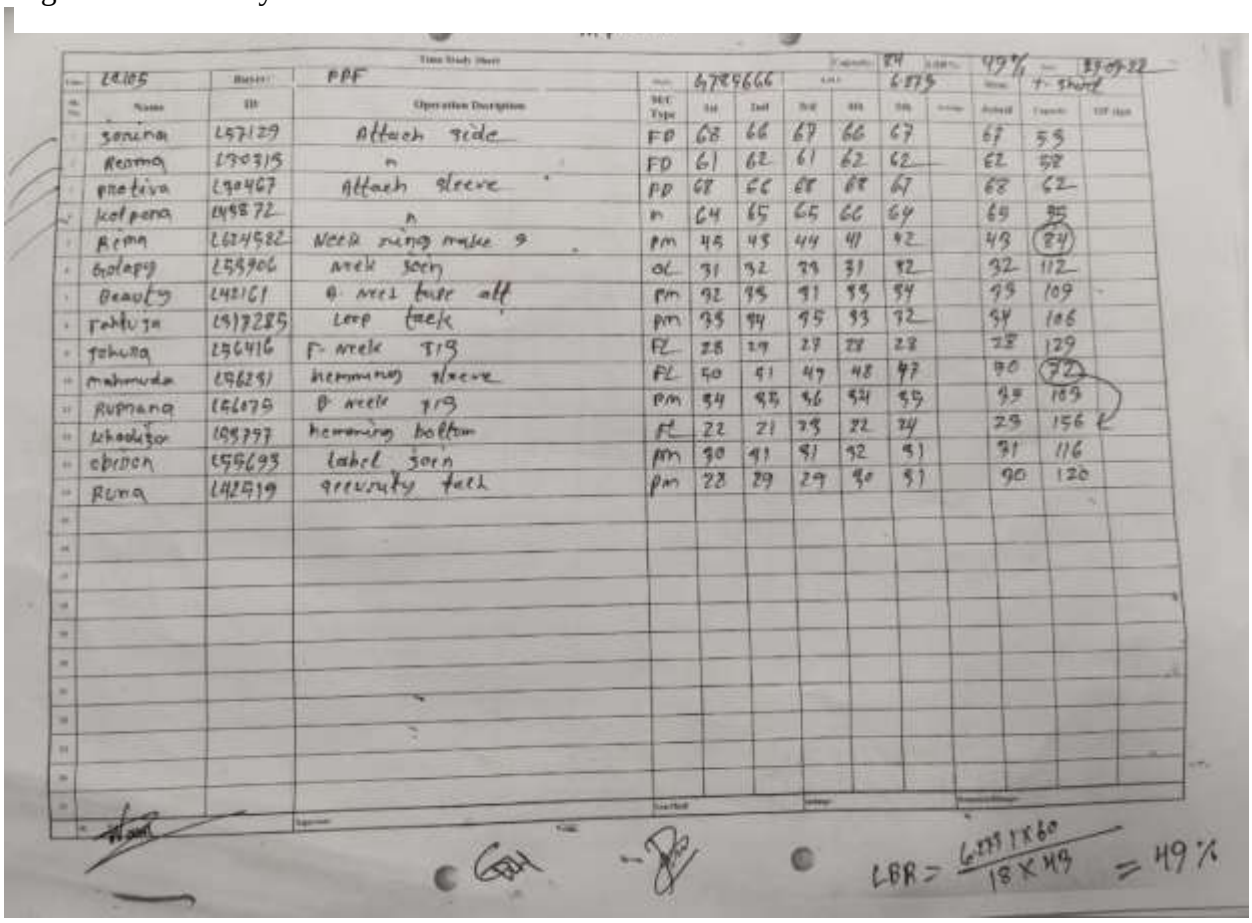


Table 2 Time study of T-shirt

Capacity Study Sheet

IE Name: Floor: liz

style: G785666 Item: T-shirt MP: 18 SMV: 6.273 Line: LC105 Date: 29-09-22 Line Balance: Capacity: 84

SL No	Card no	Name	Operation description	M/C type	1st	2nd	3rd	4th	5th	AVG	Actule	Capacity	Remarks
1	L57129	Jorina	Attatch side	FD	68	66	67	66	67	67		53	
2	L30313	Resma	Attatch side	FD	61	62	61	62	62	62		58	
3	L30467	Protiva	Attatch sleeves	FD	68	66	68	68	67	67		62	
4	L43872	Kolpona	Attatch sleeves	FD	64	65	65	66	64	65		35	
5	L624582	Rima	Neck ring make	PM	45	43	44	41	42	43		84	
6	L53906	Golapi	Neck join	OL	31	32	33	31	32	32		112	
7	L42161	Beauty	Attatch neck tape	PM	32	33	31	33	34	33		109	
8	L317285	Fahtuja	Loop tack	PM	33	34	35	33	32	33		106	
9	L56416	Tohura	front neck top stitch	FL	28	29	27	28	28	28		129	
10	L56231	Mahmuda	Hemming sleeve	FL	50	51	49	48	47	49		72	
11	L43562	Rumana	Back neck top stitch	PM	34	35	36	34	35	35		103	
12	L64572	Khadija	Hemming bottom	FL	22	21	23	22	24	22		156	
13	L65373	Obiron	label join	PM	30	31	31	31	31	31		116	
14	L64722	Runa	security tack	PM	28	29	29	31	31	30		120	
15													
16													
17													
18													
19													
20													
21													

Highest cycle time:

Bottleneck process name:

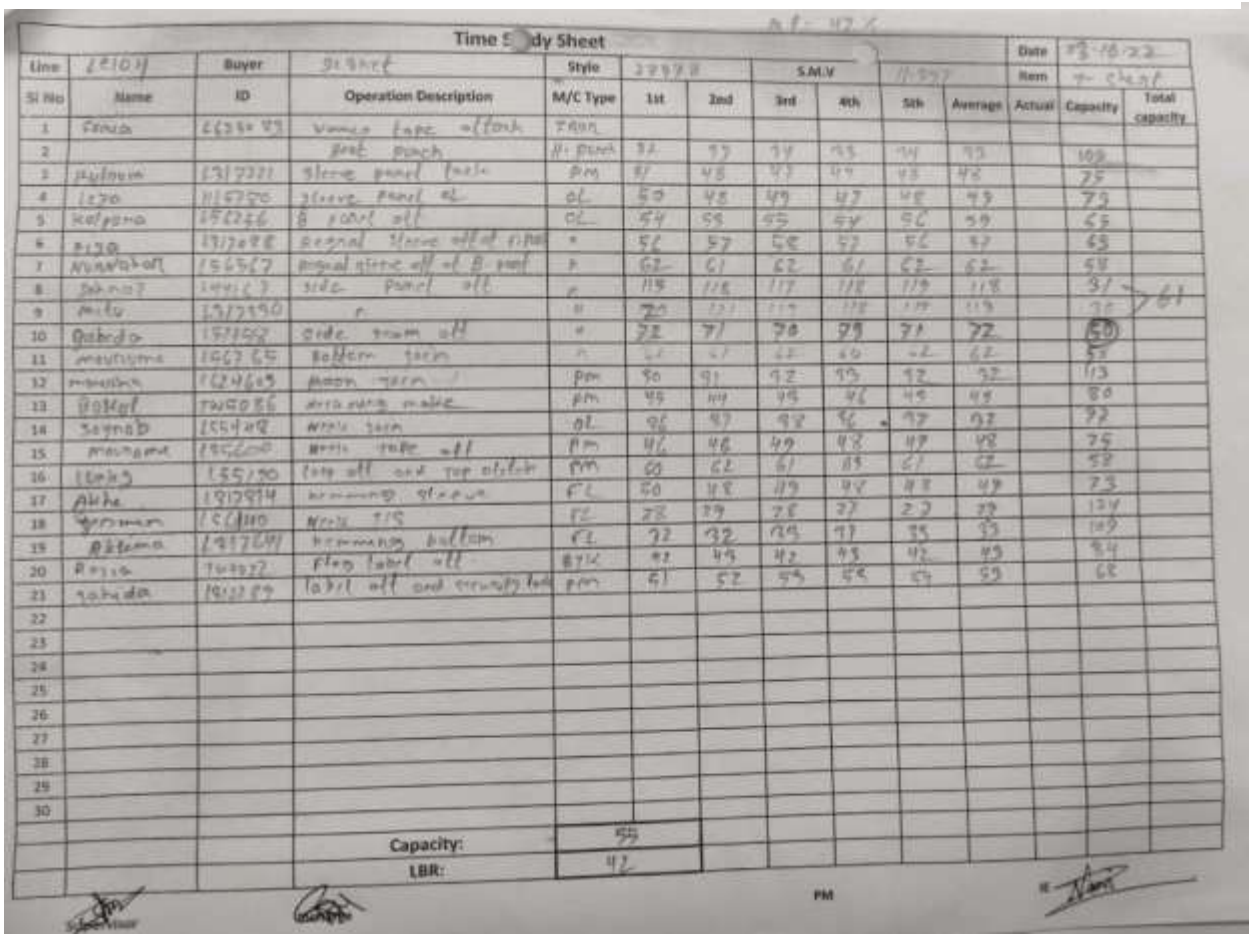
How to improve bottle neck process (details):

The Item was T-Shirt of Peak Performance Buyer. There were total 18 manpower worked for PPF. The SMV was 6.273 min. We took a time study for that line. After took the capacity of that line we saw that that lowest capacity of the line is 84 pcs. That means the line will give only 84 pcs per hour. During took the time cycle of an operator, we faced a lot of difficulties. The main difficulties was the unnecessary motion of an operator. We took 5 time cycle for each process.

Then we took the average of the time cycles. In this time study we found the lowest capacity average time was 43 sec. and that is why we made the capacity only 84 pcs. That was our bottleneck process. By that information we made the LBR%. The line balancing rate was 49% that was so low balance. The bottleneck process was neck ring make. The time cycle of the bottleneck process that means neck ring making process was 45, 43, 44, 41, 42 sec. The time should be less. We know the standard time for neck ring make is 10-15 sec. But the operator needed average 43 sec. Except the bottleneck process, other operator did their work by their achievable capacity. Their capacity didn't hampered in the line balance. So neck ring make process made the barricade for standard line balance.

3.1.3 T-Shirt (Buyer: Signet)

Figure 3 Time study of T-shirt



Time Study Sheet

Line		Buyer		Style		S.M.V				Date	
Sl No	Name	ID	Operation Description	M/C Type	1st	2nd	3rd	4th	5th	Average	Actual	Capacity	Total capacity
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
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24													
25													
26													
27													
28													
29													
30													
			Capacity:		55								
			LBR:		42								

PM

Table 3Time study of T-shirt

Capacity Study Sheet

IE Name: Floor: liz

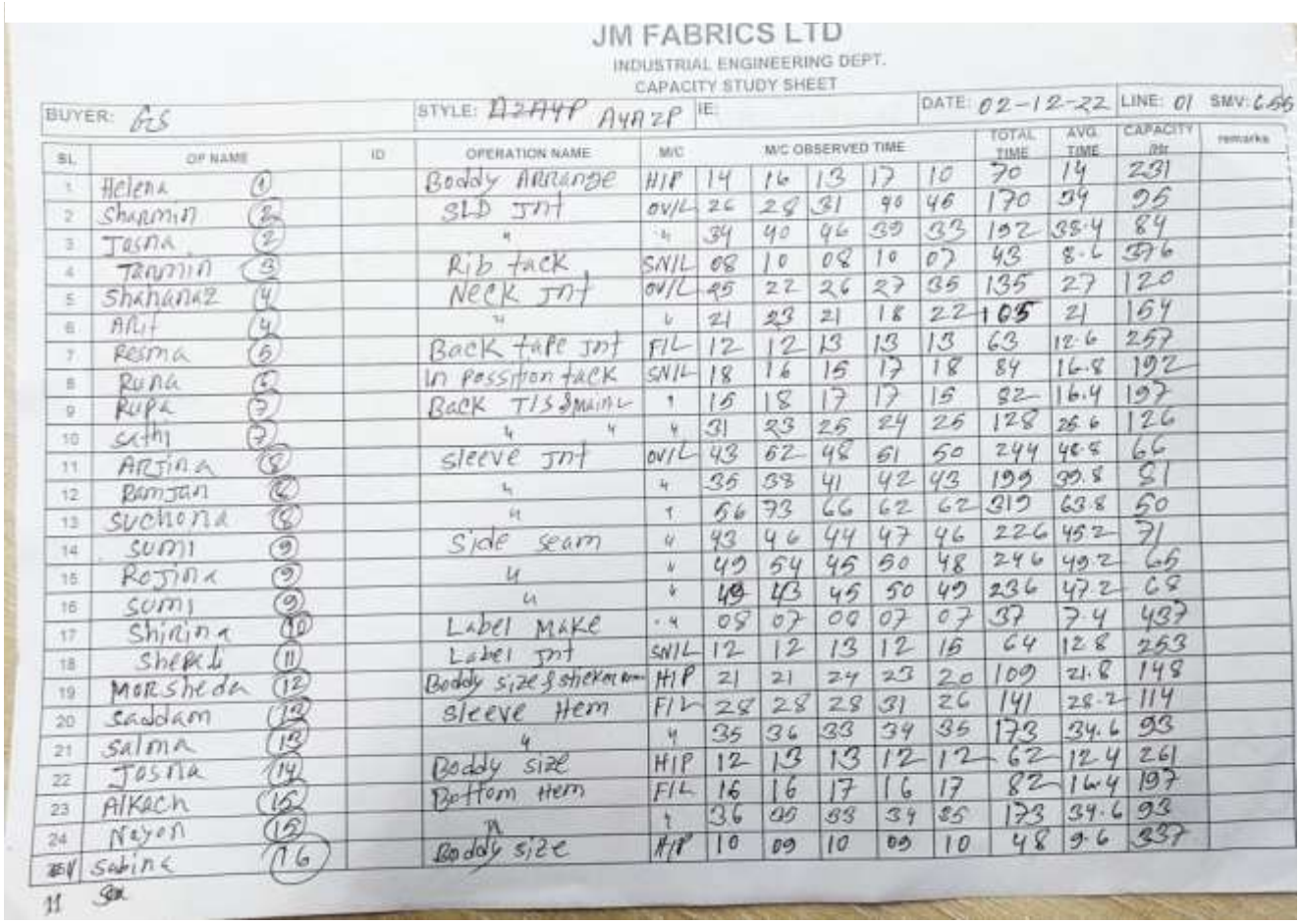
style: 28578 Item: T-shirt MP: 21 SMV: 11.397 Line: LC104 Date: 03-11-22 Line Balance: 42% Capacity: 50

SL No	Card no	Name	Operation description	M/C type	1st	2nd	3rd	4th	5th	AVG	Actule	Capacity	Remarks
1	L56954	Nirmola	Bemis tape attach	Iron	10	11	9	9	10	10		360	
2	L317372	Komola	Heat punch	HP	32	33	34	33	34	33		109	
3	L317184	Morium	Sleeve panel tack	PM	51	48	47	49	48	49		75	
4	L315214	Golopi	sleeve panel overlock	OL	50	48	49	47	48	48		73	
5	L48279	Tanzila	Back panel attach	OL	54	53	55	54	56	54		65	
6	L56346	Jannati	regnal sleeve attch front	OL	56	57	58	57	56	57		63	
7	L317168	Sunia	regnal sleeve attch back	OL	62	61	62	61	62	62		58	
8	L57097	Shimu	Side panel attach	OL	115	118	117	118	119	117		31	61
9	L33003	Sharifa	Side panel attach	OL	120	121	119	118	119	119		30	
10	L317183	Rumi	side seam	OL	72	71	70	73	71	71		50	
11	L317221	Shahida	Bottom join	OL	62	61	62	60	62	61		58	
12	L35482	Sonali	Moon join	PM	30	31	32	33	32	32		113	
13	L34607	Pervin	Neck ring make	PM	45	44	43	46	43	44		80	
14	L56567	Momtaz	Neck join	OL	36	37	38	36	37	37		97	
15	L137366	Ratna	Neck tape attach	PM	46	48	49	48	49	48		75	
16	L37409	Yasmin	loop attach & top stitch	PM	60	62	61	63	61	61		58	
17	L56167	Golezon	Hemming sleeve	FL	50	48	49	48	48	49		73	
18	L35759	Monika	Neck top stitch	FL	28	29	28	27	27	28		124	
19	L317422	Tahmina	Hemming bottom	FL	32	32	33	31	33	32		109	
20	L31715	Akhi	Patch label attach	BT	42	43	42	43	42	42		84	
21	L56167	Mahmuda	Label attach & security tack	PM	51	52	53	53	54	53		61	
Highest cycle time:													
Bottleneck process name:													
How to improve bottle neck process (details):													

This is another item we took the capacity. This is also a T-Shirt item. The buyer was Signet. The SMV was 11.397 min. We took the time study for this line. By the stopwatch we took the time for all the process. There were total 21 manpower for the total process. We took 21 time cycle for 21 process. We took 5 time for each process. We just checked the capacity and the LBR% of the line through the time study. After took the time study we saw that the capacity of that line was 50 pcs per hour. The time cycle of that process was 72, 71, 70, 73, 71 sec. Average time was 72 sec. The process was side seam process. This was our bottleneck process for that line. We then made the line balancing rate for that line. The LBR% was 45% only. That was very low for the signet buyer line.

3.1.4 T-shirt (Buyer: GS)

Figure 4 Time Study of T-shirt



JM FABRICS LTD

INDUSTRIAL ENGINEERING DEPT.

CAPACITY STUDY SHEET

BUYER: GS | STYLE: [illegible] | IE: | DATE: 02-12-22 | LINE: 01 | SMV: 6.56

SL.	OP NAME	ID	OPERATION NAME	M/C	M/C OBSERVED TIME					TOTAL TIME	AVG. TIME	CAPACITY /hr	remarks
1	Helena (1)		Body Arrange	HIP	14	16	13	17	10	70	14	231	
2	Sharmin (2)		SLD Jnt	OVL	26	29	31	40	46	170	34	95	
3	Tasna (3)		"	"	34	40	46	39	33	192	38.4	84	
4	Tasnim (4)		Rib tack	SNL	08	10	08	10	07	43	8.6	376	
5	Shahanaz (5)		Neck Jnt	OVL	25	22	26	27	35	135	27	120	
6	Arif (6)		"	"	21	23	21	18	22	105	21	164	
7	Resma (7)		Back tape Jnt	FL	12	12	13	13	13	63	12.6	257	
8	Runa (8)		In position tack	SNL	18	16	15	17	18	84	16.8	192	
9	Rupa (9)		Back TIS & Main L	"	15	18	17	17	15	82	16.4	197	
10	Sathi (10)		" "	"	31	23	25	24	25	128	25.6	126	
11	Arjina (11)		Sleeve Jnt	OVL	43	62	48	61	50	244	48.8	66	
12	Ramjan (12)		"	"	35	38	41	42	43	199	39.8	81	
13	Sychona (13)		"	"	56	73	66	62	62	319	63.8	50	
14	Sumi (14)		Side Seam	"	43	46	44	47	46	226	45.2	71	
15	Rojina (15)		"	"	49	54	45	50	48	246	49.2	66	
16	Sumi (16)		"	"	49	43	45	50	49	236	47.2	68	
17	Shirina (17)		Label Make	"	08	07	09	07	07	37	7.4	437	
18	Shefali (18)		Label Jnt	SNL	12	12	13	12	15	64	12.8	253	
19	Morsheda (19)		Body size & sticker m	HIP	21	21	24	23	20	109	21.8	148	
20	Saddam (20)		Sleeve Hem	FL	28	28	28	31	26	141	28.2	114	
21	Salma (21)		"	"	35	36	33	34	35	173	34.6	93	
22	Josna (22)		Body size	HIP	12	13	13	12	12	62	12.4	261	
23	Alkach (23)		Bottom Hem	FL	16	16	17	16	17	82	16.4	197	
24	Nayon (24)		"	"	36	09	33	34	35	173	34.6	93	
[illegible]	Sabina (25)		Body size	HIP	10	09	10	09	10	48	9.6	337	

11 [illegible]

Table 4 Time Study of T-Shirt

Capacity Study Sheet

IE Name: Floor: liz

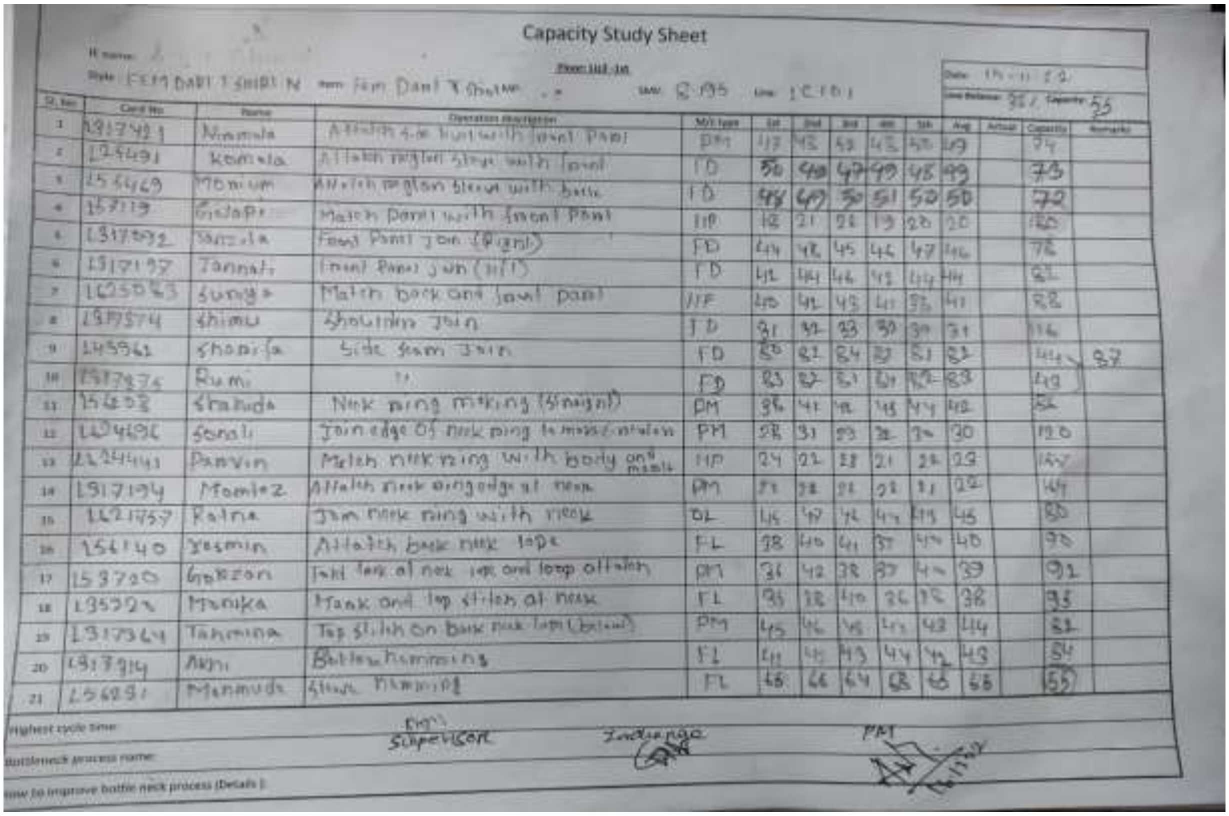
style: A4A2P Item: T-shirt MP: 22 SMV: 6.55 Line: 01 Date: 02-12-22 Line Balance: 24% Capacity: 197

SL No	Card no	Name	Operation description	M/C type	1st	2nd	3rd	4th	5th	AVG	Actule	Capacity	Remarks
1	Jm317421	Murshida	Match all cut parts	HP	14	16	13	17	10	14		231	
2	Jm317422	Rejina	Shoulder join	OL	26	28	31	40	45	34		95	179
3	Jm317423	Rojina	Shoulder join	OL	34	40	46	39	33	38		84	
4	Jm317424	Nisita	Rib tack	PM	8	10	8	10	7	9		376	
5	Jm317425	Mousimi	Neck join	OL	25	22	26	27	35	27		120	
6	Jm317426	Mim	Back tape join	FL	21	23	21	18	22	21		154	
7	Jm317427	Eti	In position tack	PM	12	12	13	13	13	13		257	
8	Jm317428	lily	Back top stitch and main label	PM	18	16	15	17	18	17		192	389
9	Jm317429	Nipa	Back top stitch and main label	PM	15	18	17	17	15	16		197	
10	Jm317430	Rajia	sleeve join	OL	31	23	25	24	25	26		126	
11	Jm317431	Setu	sleeve join	OL	43	52	48	51	50	49		66	273
12	Jm317432	Soniya	sleeve join	OL	35	38	41	42	43	40		81	
13	Jm317433	Roshida	Side seam	OL	56	73	66	62	62	64		50	
14	Jm317434	Sweety	Side seam	OL	43	46	44	47	46	45		71	
15	Jm317435	Hosneyara	Side seam	OL	49	54	45	50	48	49		65	186
16	Jm317436	Roksana	label make	OL	8	7	8	7	7	7		637	
17	Jm317437	Morium	label join	PM	12	12	13	12	15	13		253	
18	Jm317438	Purnima	Trim excess thread	HP	21	21	24	23	20	22		148	
19	Jm317439	Tahmina	Sleeve hem	FL	28	28	28	31	26	28		114	
20	Jm317440	Akhi	Sleeve hem	FL	35	36	33	34	35	35		93	207
21	Jm317441	Roksana	bottom hem	FL	16	16	17	16	17	16		197	
22	Jm317441	Mahmuda	Trim excess thread	HP	10	9	10	9	10	10		337	
Highest cycle time:													
Bottleneck process name:													
How to improve bottle neck process (details):													

This time study for JM Fabrics Ltd. The buyer was GS. Item was T-Shirt. Total manpower 25 person. We saw that total 25 manpower did the 16 processes. We took the time cycle for each process for each manpower. We found that the time cycle of the bottleneck process was 56, 73, 66, 62, 62 sec. Average time was 64 sec. And the capacity of that line was 50 pcs per hour. The process was sleeve join. This process was done by three manpower. But three manpower could not fulfill the line balancing capacity. They produced total 197 pcs per hour that was very less for the production. For that the daily efficiency was down. We calculated the line balancing rate for that line. The LBR% was 24% only.

3.1.5 Fem Dirt T-Shirt (Buyer: Peak Performance)

Figure 5 Time study of Fem dirt T-shirt



Capacity Study Sheet

Style: FEM DART T SHIRT N Item: Fem Dart T Shirt SMV: 8.195 Line: [illegible]

Date: [illegible] Line Balance: [illegible] Capacity: 55

Sl. No	Card No	Name	Operation description	M/C type	1st	2nd	3rd	4th	5th	Avg	Actual	Capacity	Remarks
1	1917491	Nirmala	Attach side ... with front panel	PM	47	45	53	45	50	49		74	
2	124491	Komola	Attach raglan sleeve with front	FD	50	49	47	49	48	49		73	
3	1556469	Momium	Attach raglan sleeve with back	FD	48	49	50	51	52	50		72	
4	157119	Golapi	Match panel with front panel	HP	18	21	22	19	20	20		[illegible]	
5	1317092	Sanzila	Front panel join (Right)	FD	44	48	45	46	47	46		78	
6	1317197	Jannati	Front panel join (left)	FD	42	44	46	43	44	44		82	
7	1625063	Sumya	Match back and front panel	HP	40	42	43	41	38	41		88	
8	1917574	Shimu	Shoulder join	FD	31	32	33	30	30	31		116	
9	145961	Shorifa	Side seam join	FD	80	81	84	82	81	82		44	87
10	1917876	Rumi	"	FD	83	82	81	84	[illegible]	83		43	
11	154608	Shahida	Neck ring making (Single needle)	PM	36	41	42	43	44	42		[illegible]	
12	1604696	Sonali	Join edge of neck ring [illegible]	PM	28	31	29	32	30	30		120	
13	1124441	Parvin	Match neck ring with body and mark	HP	24	22	22	21	24	23		[illegible]	
14	1917194	Momtez	Attach neck ring edge at neck	PM	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	22		[illegible]	
15	1621757	Ratna	Join neck ring with neck	DL	46	47	46	45	45	45		80	
16	156140	Yesmin	Attach back neck tape	FL	38	40	41	37	[illegible]	40		90	
17	153720	Gulzan	Tack [illegible] at neck and loop attach	PM	36	42	38	37	[illegible]	39		92	
18	135592	Monika	Mark and top stitch at neck	FL	35	38	40	36	[illegible]	38		95	
19	1317364	Tahmina	Top stitch on back neck tape (below)	PM	45	46	46	[illegible]	43	44		82	
20	1917914	Akhi	Bottom hemming	FL	41	45	43	44	[illegible]	43		84	
21	156851	Mahmuda	Sleeve hemming	FL	65	66	64	65	65	65		55	

Highest cycle time:

Bottleneck process name:

How to improve bottle neck process (Details):

Table 5 Time study of Fem dirt T shirt

Capacity Study Sheet

IE Name: Floor: liz

style: FEM DART T-SHIRT Item: Fem Dart T-shirt MP:18 SMV: 8.195 Line: LC101 Date: 15/11/22 Line Balance: 32% Capacity: 55

SL No	Card no	Name	Operation description	M/C type	1st	2nd	3rd	4th	5th	AVG	Actule	Capacity	Remarks
1	L317421	Nirmola	Attatch side level with front part	PM	117	48	52	48	50	63		74	
2	L25491	Komola	Attatch regian sleeve with front	FD	50	49	47	49	48	49		73	
3	L55469	Morium	Attatch regain sleeve with basic	FD	48	49	50	51	50	50		72	
4	L57119	Golopi	Match pane witth front part	HP	18	21	22	19	20	20		180	
5	L317092	Tanzila	Front panel join(right)	FD	44	48	45	46	47	46		78	
6	L317197	Jannati	Front panel join(left)	FD	42	44	46	42	44	44		82	
7	L625083	Sunia	Match back and front part	HP	40	42	43	41	38	41		88	
8	L317874	Shimu	Shoulder join	FD	33	32	33	32	30	32		116	
9	L43962	Sharifa	Side seam join	FD	80	82	84	82	81	82		44	
10	L317375	Rumi	Side seam join	FD	83	82	81	84	82	82		43	
11	L56208	Shahida	Neck ring making	PM	38	41	42	43	44	42		86	
12	L624696	Sonali	Join edge of neck ring to make circuler	PM	28	31	29	32	30	30		120	
13	L624441	Pervin	Match neck ring with body and mark	HP	24	22	23	21	22	22		157	
14	L317194	Momtaz	Attatch neck ring edge at neck	PM	21	22	23	22	21	22		164	
15	L621757	Ratna	join neck ring with neck	OL	45	47	46	44	43	45		80	
16	L56140	Yasmin	Attach back neck tape	FL	38	40	41	39	40	40		90	
17	L53720	Golezon	Fold tack at neck tape and loop attatch	PM	36	42	38	39	40	39		92	
18	L35920	Monika	Mark and top stitch at neck	FL	35	38	40	36	38	37		95	
19	L317364	Tahmina	Top stitch on back neck tape	PM	45	46	43	44	43	44		82	
20	L317314	Akhi	Bottom hemming	FL	41	42	43	44	42	42		84	
21	L56231	Mahmuda	Sleeve Hemming	FL	65	66	64	68	65	66		55	
Highest cycle time:													
Bottleneck process name:													
How to improve bottle neck process (details):													

This time study was taken from the buyer of Peak Performance. The item was Fem Dirt T-shirt. We did the time study of the line LC 101. By analysis this report, we found the bottleneck. The bottleneck process was sleeve hemming .The bottleneck process capacity was 55. The second bottleneck process was attach reglan sleeve and the capacity was 72. The SMV of this item was 8.195 and 21 man power was used in this item. Whenever we calculated the LBR we found that the LBR% was 32%. The LBR% is very low and there was a huge scope to develop this production line.

3.2 Methodology of Sewing vest

3.2.1 Sewing Vest (Buyer: George UK)

Figure 6 Time study of Sewing vest

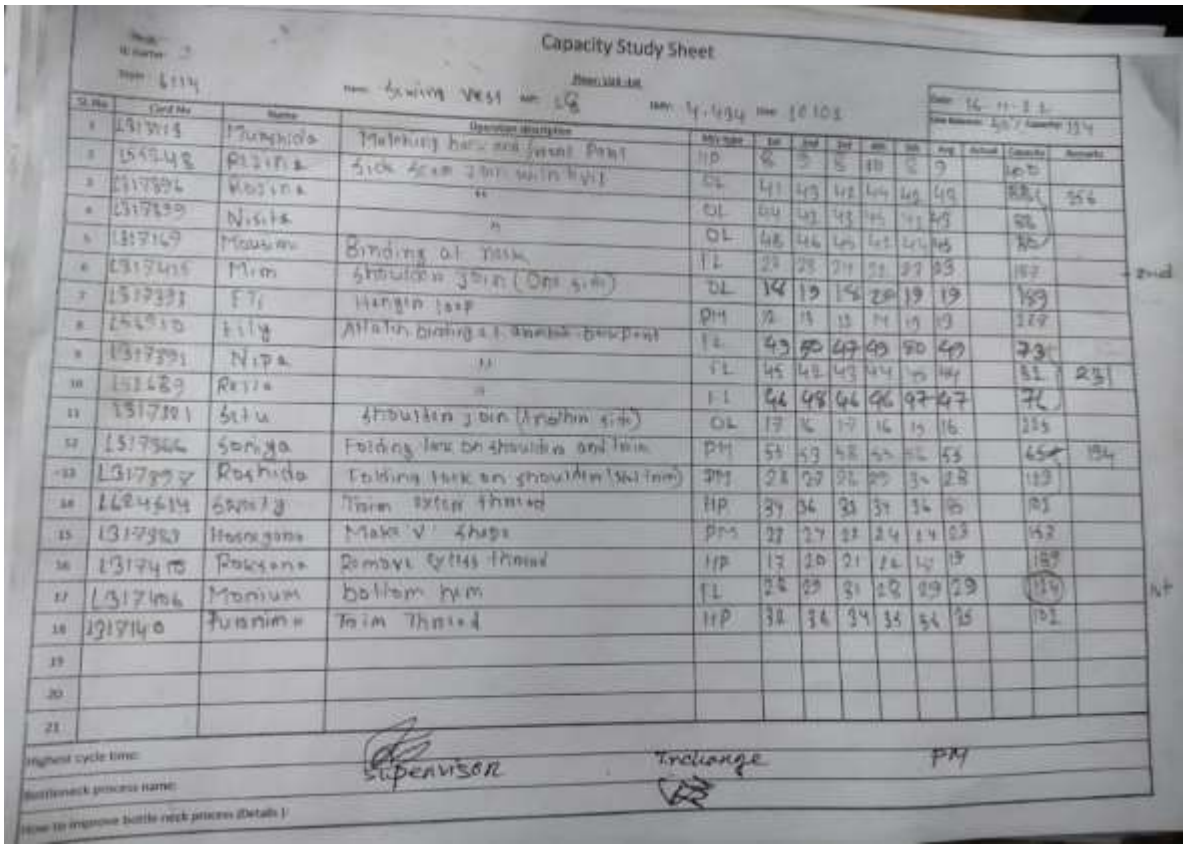


Table 6 Time study of Sewing vest

Capacity Study Sheet

IE Name: Floor: liz

style: 6114 Item: Swing vest MP:18 SMV: 4.434 Line: LC102 Date: 16/11/22 Line Balance: 50% Capacity: 124

SL No	Card no	Name	Operation description	M/C type	1st	2nd	3rd	4th	5th	AVG	Actule	Capacity	Remarks
1	L317113	Murshida	Matching front part and back part	HP	8	9	8	10	8	9		400	
2	L55248	Rejina	Side seam join with level	OL	41	43	42	44	42	42		88	
3	L317396	Rojina	Side seam join with level	OL	44	42	43	45	42	43		88	256
4	L317399	Nisita	Side seam join with level	OL	48	46	45	42	44	45		80	
5	L317169	Mousimi	Binding at neck	KL	22	23	24	22	23	23		157	
6	L317415	Mim	Shoulder join(one side)	OL	18	19	18	20	19	19		189	
7	L317393	Eti	Hanger loop	PM	12	13	12	14	13	13		277	
8	L56910	lily	Attatch binding at armhole,back part	FL	49	50	47	49	50	49		73	
9	L317391	Nipa	Attatch binding at armhole,back part	FL	45	42	43	44	45	44		82	231
10	L52689	Rajia	Attatch binding at armhole,back part	FL	46	48	46	46	47	47		76	
11	L317321	Setu	Shoulder join(another side)	OL	17	16	17	16	15	16		225	
12	L317366	Soniya	Foding tack on shoulder and trim	PM	55	53	58	55	56	55		65	
13	L317397	Roshida	Foding tack on shoulder(no trim)	PM	28	27	28	29	30	28		129	
14	L624614	Sweety	Trime excess thread	HP	34	36	33	34	36	35		103	
15	L317383	Hosneyara	Make V shape	PM	23	24	22	24	24	23		157	
16	L317410	Roksana	Remove excess thread	HP	17	20	21	22	17	19		189	
17	L317406	Morium	Bottom hem	FL	28	29	31	28	29	29		124	
18	L317140	Purnima	Trim thread	HP	32	36	34	35	36	35		102	
19													
20													
21													

Highest cycle time:

Bottleneck process name:

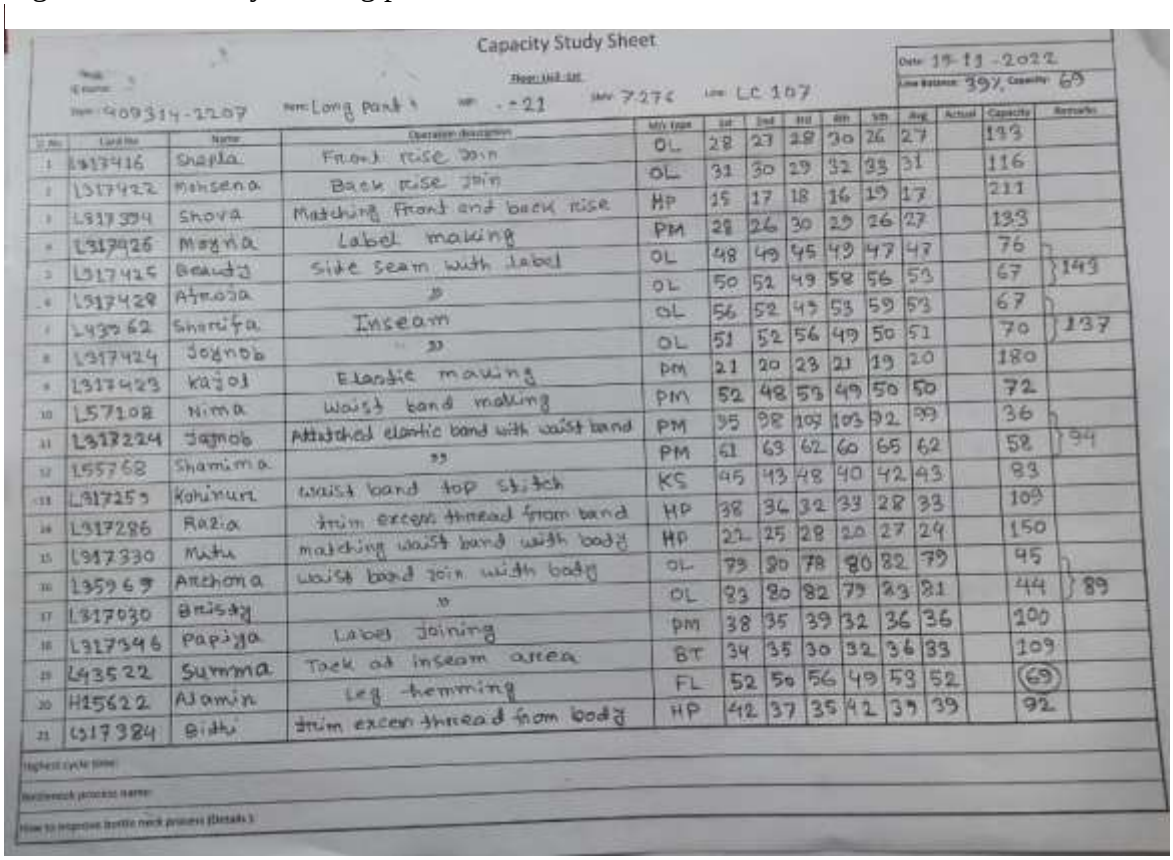
How to improve bottle neck process (details):

This capacity study data was taken from the line LC 101. We found that 18-man power was used in this process. We found first bottleneck, which was 124 pieces. The capacity of the line was 124 pieces. We found that bottom hem process took more time. The cycle time of this process is 32, 36, 34, 35, 36. The second bottleneck process was binding at neck. The cycle time of this second bottleneck process was 22, 23, 24, 22, 23. Here the maximum capacity of this line is 124 and LBR% is 50%. If we solve this the capacity of the line will be increased.

3.3 Methodology of Long Pant

3.3.1 Long Pant (Buyer: LIDL)

Figure 7 Time study of Long pant



Capacity Study Sheet

Date: 19-11-2022

Item: Long Pant | Style: -21 | SAM: 7.27 | Line: LC 107 | Line Balance: 39% | Capacity: 69

SL No	Card No	Name	Operation description	M/C type	1st	2nd	3rd	4th	5th	Avg	Actual	Capacity	Remarks
1	L317416	Shapla	Front rise join	OL	28	27	28	30	26	27		133	
2	L317422	Nahsena	Back rise join	OL	31	30	29	32	33	31		116	
3	L317394	Shova	Matching front and back rise	HP	15	17	18	16	19	17		211	
4	L317426	Moyna	Label making	PM	28	26	30	29	26	27		133	
5	L317425	Beauty	Side seam with label	OL	48	49	45	49	47	47		76	
6	L317428	Afroja	"	OL	50	52	49	58	56	53		67	143
7	L439262	Shanifa	Inseam	OL	56	52	49	53	59	53		67	
8	L317424	Joynob	"	OL	51	52	56	49	50	51		70	137
9	L317423	Kajol	Elastic making	PM	21	20	23	21	19	20		180	
10	L57108	Nima	Waist band making	PM	52	48	53	49	50	50		72	
11	L317224	Jannob	Attached elastic band with waist band	PM	35	38	109	103	92	99		36	
12	L55768	Shamima	"	PM	61	63	62	60	65	62		58	94
13	L317259	Kohinur	waist band top stitch	KS	45	43	48	40	42	43		83	
14	L317286	Razia	trim excess thread from band	HP	38	36	32	33	28	33		109	
15	L317330	Mutu	matching waist band with body	HP	22	25	28	20	27	24		150	
16	L35969	Archona	waist band join with body	OL	79	80	78	80	82	79		45	
17	L317030	Bristy	"	OL	83	80	82	79	83	81		44	89
18	L317346	Papiya	Label joining	PM	38	35	39	32	36	36		100	
19	L43522	Summa	Tack at inseam area	BT	34	35	30	32	36	33		109	
20	H15622	Alamin	Leg hemming	FL	52	50	56	49	53	52		(69)	
21	L317384	Bithi	trim excess thread from body	HP	42	37	35	42	39	39		92	

Highest cycle time:

Bottleneck process name:

How to improve bottle neck process (Details):

Table 7 Time study of long pant

Capacity Study Sheet

IE Name: Floor: liz

style: 409314-2207 Item: Long pant MP: 21 SMV: 7.276 Line: LC-107 Date: 19/11/22 Line Balance: 39% Capacity: 69

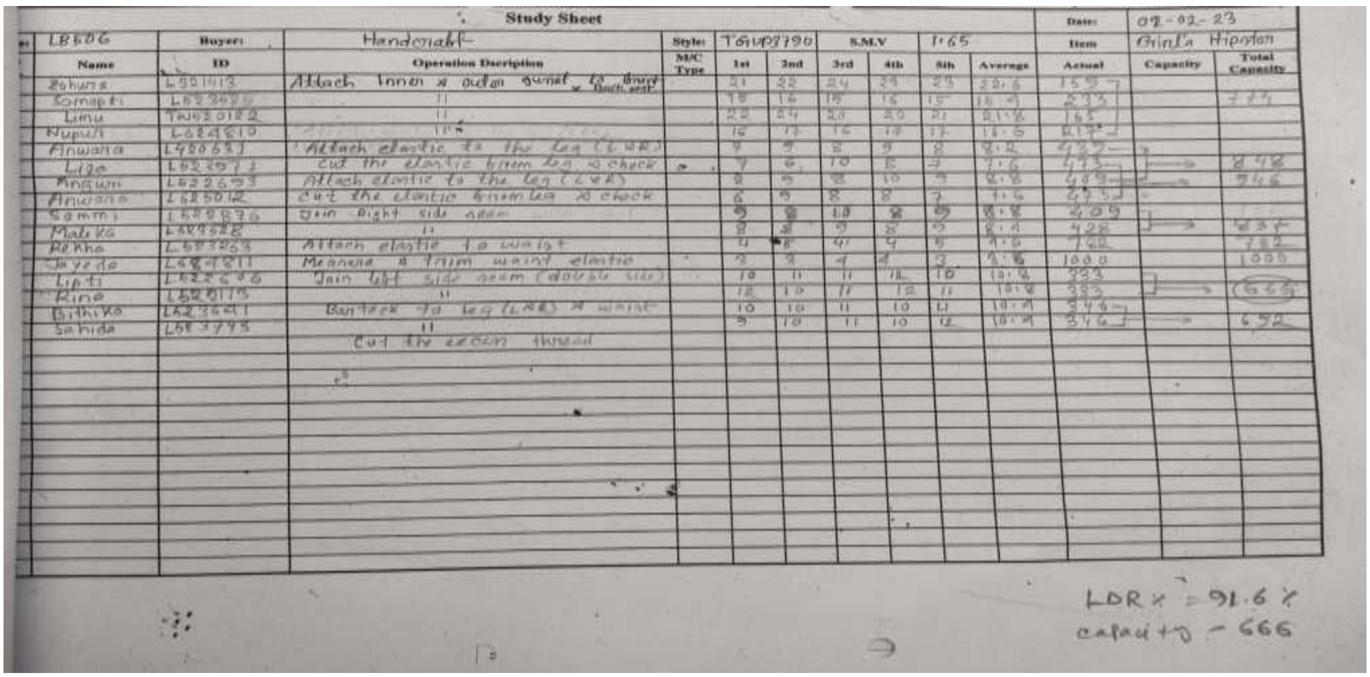
SL No	Card no	Name	Operation description	M/C type	1st	2nd	3rd	4th	5th	AVG	Actule	Capacity	Remarks
1	L317416	Shapla	Front rise join	OL	28	27	28	30	26	28		133	
2	L317422	Monesa	Back rise join	OL	31	30	29	32	33	31		116	
3	L317394	Shova	Matching front and back part	HP	15	17	18	16	19	17		211	
4	L317426	Moyna	Lable making	PM	28	26	30	29	26	28		133	
5	L317425	Beauty	Side seam with label	OL	48	49	45	49	47	48		76	143
6	L317428	Afruja	Side seam with label	OL	50	52	49	58	56	53		67	
7	L43962	Shorifa	Inseam	OL	56	52	49	53	59	54		67	137
8	L317424	Joynob	Inseam	OL	51	52	56	49	50	52		70	
9	L317423	Kajol	Elastic making	PM	21	20	23	21	19	21		180	
10	L57108	Nima	Waist band making	PM	52	48	53	49	50	50		72	
11	L317224	Jaynob	Attatch elastic band with waist band	PM	95	98	107	103	92	99		36	94
12	L55768	Shamima	Attatch elastic band with waist band	PM	61	63	62	60	65	62		58	
13	L317259	Kohinur	Waist band top stitch	KS	45	43	48	40	42	44		83	
14	L317286	Raziya	Trim excess thread from band	HP	38	36	32	33	28	33		109	
15	L317330	Mitu	Matching wast band with body	HP	22	25	28	20	27	24		150	
16	L35969	Archona	Waist band join with body	OL	79	80	78	80	82	80		45	89
17	L317030	Bristy	Waist band join with body	OL	83	80	82	79	83	81		44	
18	L317346	Papiya	Lable joining	PM	38	35	39	32	36	36		100	
19	L43522	Summa	Tack at inseam area	BT	34	35	30	32	36	33		109	
20	H15622	Alamin	Leg hemming	FL	52	50	56	49	53	52		69	
21	L317384	Bithi	Trim excess thread from band	HP	42	37	35	42	39	39		92	
Highest cycle time:													
Bottleneck process name:													
How to improve bottle neck process (details):													

The item was short pant and we did the capacity study of that production line. By time study, we found the bottleneck which hampering the production flow of that line. We found that several helper is used in particular process. Two operator was used for avoiding bottleneck but still bottleneck was the common scenario of sewing floor. We found that lowest capacity was leg hemming process and that process's average cycle time was 52 and capacity was 69. Again, we found that here 21 man power was used and whenever we calculate the Line Balancing Ratio we found that the ratio was 39%. If we work with this bottleneck, we sure that the capacity of the line will be more and we'll able to reduce the bottleneck. Here the item was long pant and it's SMV was 7.276

3.4 Methodology of Girl's Hipster

3.4.1 Girl's Hipster (Buyer: Handcraft)

Figure 8 Time study of Girl's hipster



Study Sheet

Line: LB606	Buyer:	Handcraft	Style:	T6UP3790	S.M.V	1.65				Date:	07-02-23	
Name	ID	Operation Description	M/C Type	1st	2nd	3rd	4th	5th	Average	Actual	Capacity	Total Capacity
Zohura	L501413	Attach inner & outer gusset to front & back part		21	22	24	29	23	22.6	159		
Somapti	L52[illegible]	"		18	16	15	16	15	16.4	233		777
Limu	T[illegible]	"		22	24	20	20	21	21.8	165		
Nupur	L624610	"		16	17	16	17	17	16.6	217		
Anwara	L480551	Attach elastic to the leg (LWR)		9	9	8	9	8	8.2	437		
Liza	L62[illegible]	Cut the elastic from leg & check		7	6	10	8	7	7.6	473		848
Anjum	L622653	Attach elastic to the leg (LWR)		8	9	8	10	9	8.8	409		746
Anwara	L625012	Cut the elastic from leg & check		6	9	8	8	7	7.6	473		
Sammi	L528876	Join right side seam		9	8	10	8	9	8.8	409		
Malika	L524528	"		8	8	9	8	9	8.4	428		837
Rekha	L583253	Attach elastic to waist		4	6	4	4	5	4.6	782		782
Jayeda	L524811	Measure & trim waist elastic		3	3	4	4	3	3.6	1000		1000
Lipti	L522[illegible]	Join left side seam (double side)		10	11	11	12	10	10.8	333		
Rina	L520175	"		12	10	11	12	11	10.8	333		666
Bithika	L623641	Bartack to leg (LWR) & waist		10	10	11	10	11	10.4	346		
Sahida	L583775	"		9	10	11	10	12	10.4	346		692
		Cut the excess thread										

LDR% = 91.6%
capacity = 666

Table 8 Time study of girl's hipster

SL No	Card no	Name	Operation description	M/C type	1st	2nd	3rd	4th	5th	AVG	Actule	Capacity	Remarks
1	L321413	Zohura	Attatch inner and outer gusset to front and bach part		21	22	16	23	23	21		774	
2	L523525	Somapti	Attatch inner and outer gusset to front and bach part		15	16	15	16	15	15			
3	TW520122	Limu	Attatch inner and outer gusset to front and bach part		22	24	20	22	21	22			
4	L624810	Nupur	Attatch inner and outer gusset to front and bach part		16	17	16	17	17	17			
5	L420631	Anwara	Attatch elastic to the leg(I&R)		7	9	8	9	8	8		848	
6	L523971	Liza	Attatch elastic to the leg(R&L)		7	6	10	8	7	8			
7	L522693	Anguri	Cut the elastic from the leg & check		8	9	8	10	9	9		946	
8	L6255012	Anwara	Cut the elastic from the leg & check		6	9	8	8	7	8			
9	L522876	Sammi	Join right side seam		9	8	10	8	9	9		837	
10	L523528	Maleka	Join right side seam		8	8	9	8	9	8			
11	L523263	Rekha	Attatch elastic to waist		4	5	4	4	5	4		782	
12	L684811	Jayeda	Measure & trim waist Elastic		3	3	4	4	3	3		1000	
13	L522606	lipti	Join left side seam		10	11	11	12	10	11		666	
14	L522113	Rina	Join left side seam		12	10	11	12	11	11			
15	L523641	Bithika	Bartack to leg and waist		10	10	11	10	12	11		692	
16	L523743	Sahida	Bartack to leg and waist		9	10	11	10	13	11			
17			cut the exces thread										
18													
19													
20													
21													
Highest cycle time:													
Bottleneck process name:													
How to improve bottle neck process (details):													

The buyer was handcraft and the time study was taken from the line of LB 506. The item was Girl's hipster. The SMV of this item was 1.65. By studying of this time study we find that join left side seam is the bottleneck process and capacity is 666. The LBR percentages is 91.6%. Here 17 man power is used. We can increase the capacity and minimize the bottleneck

3.5 Methodology of Men's Boxer

3.5.1 Men's Boxer (Buyer: GS)

Figure 9 Time study of Men's boxer

JM FABRICS LTD
INDUSTRIAL ENGINEERING DEPT.
CAPACITY STUDY SHEET

BUYER: GS | STYLE: A4A3T | IE: | DATE: 03-04-23 | LINE: 02 SMV: 6.38

SL	OP NAME	ID	OPERATION NAME	M/C	M/C OBSERVED TIME					TOTAL TIME	AVG. TIME	CAPACITY /Hr	remarks
1	Ashamoni	1	Back servicing	OVL	21	24	26	26	24	120	24	135	
2	Akhi	2	Security Tack	CNIL	08	07	08	09	10	42	8.4	385	
3	Anjuara	3	Panel Jnt	OVL	66	67	69	70	66	338	67.6	47	
4	Tanjila	3	"	"	64	63	70	52	72	321	64.2	50	
5	Anamul	4	Panel T/S	FIL	20	20	24	22	20	106	21.2	162	
6	Respna Shirina	5	Label MAKE	OVIL	07	08	08	07	08	38	7.6	426	
7	Resma	6	Label Jnt	SNIL	13	16	16	17	14	75	15	216	
8	Josna	7	Body Attach	HIP	12	13	15	12	14	66	13.2	245	
9	Rekha	8	Elastic cut	B/LT	07	08	07	08	07	37	7.4	437	
10	Rekha	9	Elastic Zigzag	Z/Z	12	13	12	12	13	62	12.4	~~43~~ 24	261
11	Halima	10	Waist Elastic Tack	SNIL	23	22	24	25	27	121	24.2	133	
12	Halima	10	"	"	23	22	25	26	24	120	24	135	
13	Humaon	11	Waist Elastic T/S	FIL	22	27	25	23	22	119	23.8	136	
14	Kabita	12	Guess Jnt	SNIL	35	37	32	30	33	167	33.4	97	
15	Dulali	13	Inseam T/S	F/D	30	32	30	32	33	157	31.4	103	
16	Kokila	14	Main Label Attach	SNIL	16	17	18	19	20	90	18	180	
17	Nur Islam	15	Leg Hem	FIL	30	28	28	30	28	144	28.8	112	
18	Nezmin Nahar	16	Tack open	HIP	14	15	12	14	15	70	14	231	
19	Mitu	17	Thread Trim	"	66	60	59	58	59	302	60.4	53	
20	Lili	17	"	"	54	60	61	63	64	302	60.4	53	
21	Rina	17	"	"	69	64	60	59	61	313	62.6	51	
22													
23													

Table 9 Time study of Men's boxer

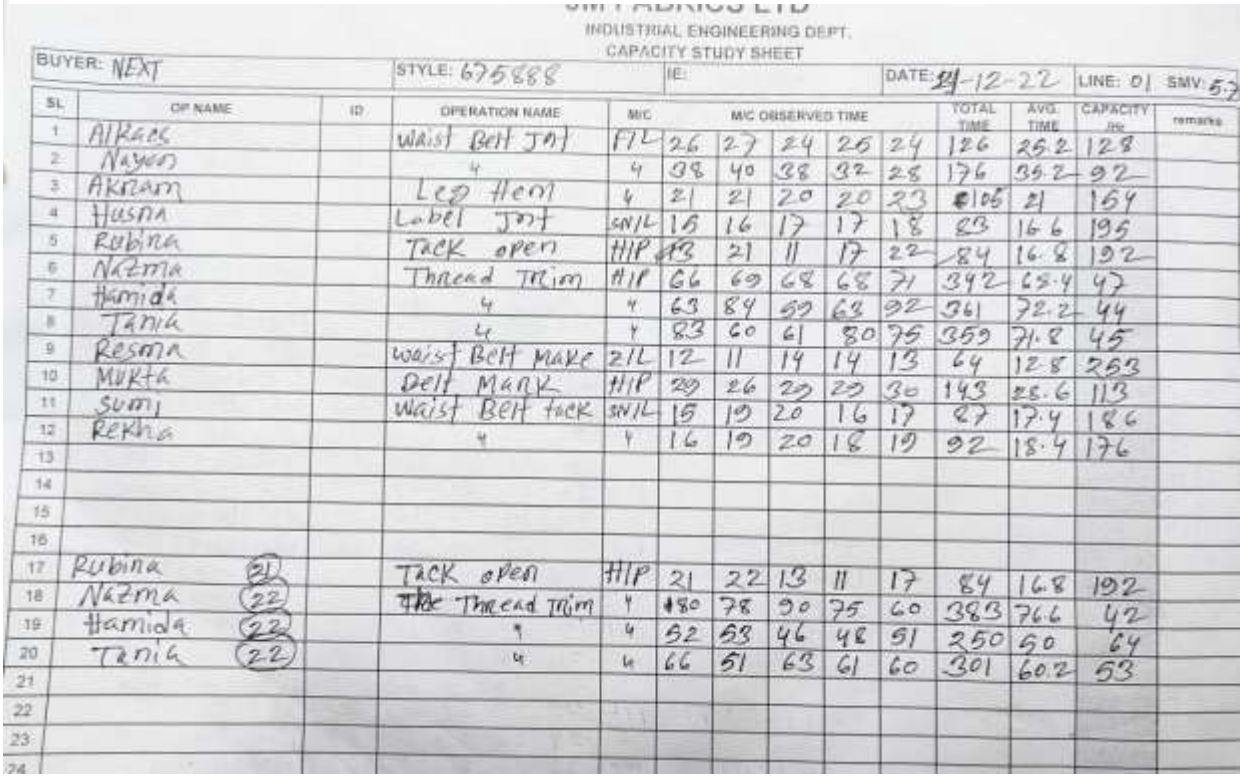
Capacity Study Sheet
IE Name: Floor: liz
style: A4A3T Item: Men's Boxer MP: 21 SMV: 6.35 Line: 02 Date: 03-11-22 Line Balance: 26% Capacity: 97

SL No	Card no	Name	Operation description	M/C type	1st	2nd	3rd	4th	5th	AVG	Actule	Capacity	Remarks
1	Jm317421	Murshida	dart servicing	OL	21	24	26	25	24	24		135	
2	Jm317422	Rejina	security tack	PM	8	7	8	9	10	8		385	
3	Jm317423	Rojina	panel join	OL	66	67	69	70	66	68		47	97
4	Jm317424	Nisita	panel join	OL	64	63	70	52	72	64		50	
5	Jm317425	Mousimi	panel top stitch	FL	20	20	24	22	20	21		152	
6	Jm317426	Mim	label make	OL	7	8	8	7	8	8		426	
7	Jm317427	Eti	label join	PM	13	15	16	17	14	15		216	
8	Jm317428	lily	match cut parts	HP	12	13	15	12	14	13		245	
9	Jm317429	Nipa	elastic cut	B/LT	7	8	7	8	7	7		437	
10	Jm317430	Rajia	elastic zigzag	ZZ	12	13	12	12	13	12		261	
11	Jm317431	Setu	waist elastic tack	PM	23	22	24	25	27	24		133	268
12	Jm317432	Soniya	waist elastic tack	PM	23	22	25	26	24	24		135	
13	Jm317433	Roshida	waist elastic top stitch	FL	22	27	25	23	22	24		136	
14	Jm317434	Sweety	Gusset join	PM	35	37	32	30	33	33		97	
15	Jm317435	Hosneyara	inseam T/S	FD	30	32	30	32	33	31		103	
16	Jm317436	Roksana	main label attach	PM	16	17	18	19	20	18		180	
17	Jm317437	Morium	leg hem	FL	30	28	28	30	28	29		112	
18	Jm317438	Purnima	tack open	HP	14	15	12	14	15	14		231	
19	Jm317439	Tahmina	thread trim	HP	66	60	59	58	59	60		60	
20	Jm317440	Akhi	thread trim	HP	54	60	61	63	64	60		60	171
21	Jm317441	Roksana	thread trim	HP	69	64	60	59	61	63		51	
Highest cycle time:													
Bottleneck process name:													
How to improve bottle neck process (details):													

This time study for GS buyer. The item was Men's boxer. SMV of the item was 6.35 min. There were 17 processes done by 21 manpower. We took the time study for the line. Around 5 time cycle we took for each process. Then we took the average time cycle and made the capacity of that line. We found that the capacity of the line was 47 pcs per hour that was so low capacity.
The time cycles were the bottleneck process was 66, 67, 69, 70, 66 sec. Average time was 68 sec. We noticed some unnecessary motion used by the bottleneck process operator. That is why the hourly production hampered by only that process. Then we checked the line balancing rate of that line. The line balancing rate was only 26% for that line.

3.5.2 Men's Boxer (Buyer: Next)

Figure 10 Time study of Men's boxer



INDUSTRIAL ENGINEERING DEPT.
CAPACITY STUDY SHEET

BUYER: NEXT | STYLE: 675888 | IE: | DATE: 21-12-22 | LINE: 01 | SMV: 5.7

SL	OP NAME	ID	OPERATION NAME	M/C	M/C OBSERVED TIME					TOTAL TIME	AVG. TIME	CAPACITY /hr.	remarks
1	AlRaes		Waist Belt Jnt	F/L	26	27	24	25	24	126	25.2	128	
2	Nayon		4	4	38	40	38	32	28	176	35.2	92	
3	Akram		Leg Hem	4	21	21	20	20	23	105	21	154	
4	Husna		Label Jnt	SN/L	16	16	17	17	18	83	16.6	195	
5	Rubina		Tack open	HIP	13	21	11	17	22	84	16.8	192	
6	Nazma		Thread Trim	H/P	66	69	68	68	71	342	68.4	47	
7	Hamida		4	4	63	84	59	63	92	361	72.2	44	
8	Tania		4	4	83	60	61	80	75	359	71.8	45	
9	Resma		Waist Belt Make	2/L	12	11	14	14	13	64	12.8	253	
10	Murta		Belt Mark	H/P	29	26	29	29	30	143	28.6	113	
11	Sumi		Waist Belt tack	SN/L	15	19	20	16	17	87	17.4	186	
12	Rekha		4	4	16	19	20	18	19	92	18.4	176	
13													
14													
15													
16													
17	Rubina	21	Tack open	H/P	21	22	13	11	17	84	16.8	192	
18	Nazma	22	~~The~~ Thread Trim	4	80	78	90	75	60	383	76.6	42	
19	Hamida	22	4	4	52	53	46	48	51	250	50	64	
20	Tania	22	4	4	66	51	63	61	60	301	60.2	53	
21													
22													
23													
24													

Table 10 Time study of Men's boxer

Capacity Study Sheet

IE Name: Floor: liz

style: 675888 Item: Men's Boxer MP: 12 SMV: 5.7 Line: 01 Date: 21-12-22 Line Balance: 27% Capacity: 119

SL No	Card no	Name	Operation description	M/C type	1st	2nd	3rd	4th	5th	AVG	Actule	Capacity	Remarks
1	Jm3176564	Jorina	Waist belt join	FL	26	27	24	25	24	25		128	
2	Jm3176565	Resma	Waist belt join	FL	38	40	38	32	28	35		92	220
3	Jm3176566	Protiva	leg hem	FL	21	21	20	20	23	21		154	
4	Jm3176567	Kolpona	label join	PM	15	16	17	17	18	17		195	
5	Jm3176568	Rima	tack open	HP	13	21	11	17	22	17		192	
6	Jm3176569	Golapi	thread trim	HP	66	69	68	68	71	68		47	
7	Jm3176570	Beauty	thread trim	HP	63	84	59	63	92	72		40	132
8	Jm3176571	Fahtuja	thread trim	HP	83	60	61	80	75	72		45	
9	Jm3176572	Tohura	waist belt make	ZL	12	11	14	14	13	13		253	
10	Jm3176573	Mahmuda	belt mark	Hp	29	26	29	29	30	29		119	
11	Jm3176574	Rumana	waist belt tack	PM	15	19	20	16	17	17		186	362
12	Jm3176575	Khadija	waist belt tack	PM	16	19	20	18	19	18		176	
Highest cycle time:													
Bottleneck process name:													
How to improve bottle neck process (details):													

We did another time study for NEXT buyer. The item was Men's boxer. SMV fix for the item was 5.7 min. We saw that there were only 10 processes done by 16 manpower. Then for making the capacity we took the time study for the line. We took around 5 time cycle we took for each process. Then we took the average time cycle and made the capacity of that line. We noticed that the line capacity was 42 pcs per hour. We identified that thread cut process was our bottleneck process. Time cycle for the bottleneck process was 80, 78, 90, 75, 60 sec. Average time was 77 sec. For thread cut process we saw that hourly production was. After that we calculated the line balancing rate of that line. The line balancing rate was only 27% for that line.

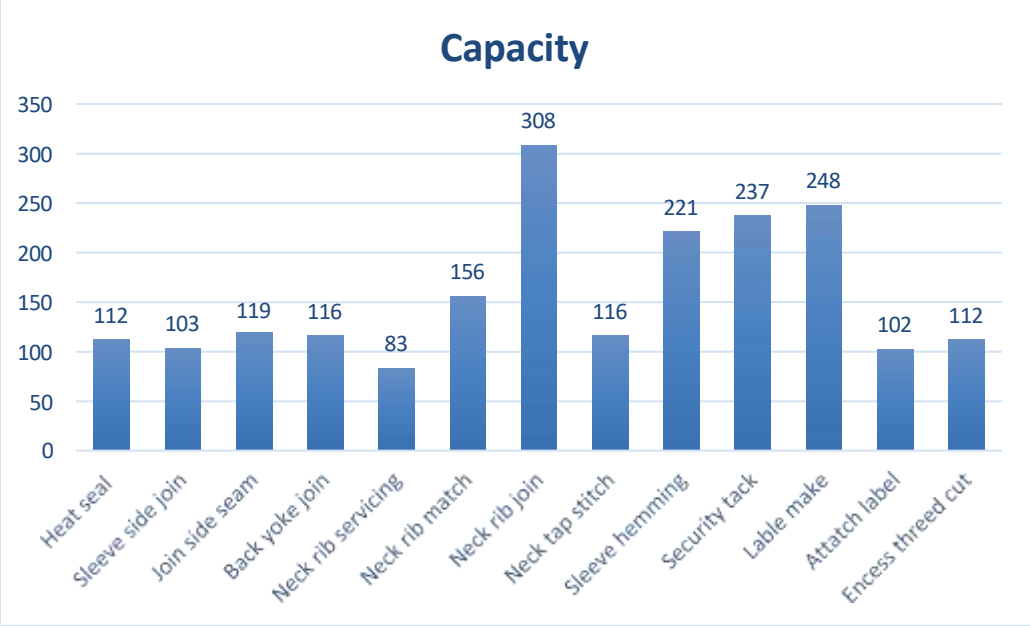
CHAPTER-4

RESULT & DISCUSSION

4.1 Result & Discussion of T-Shirt

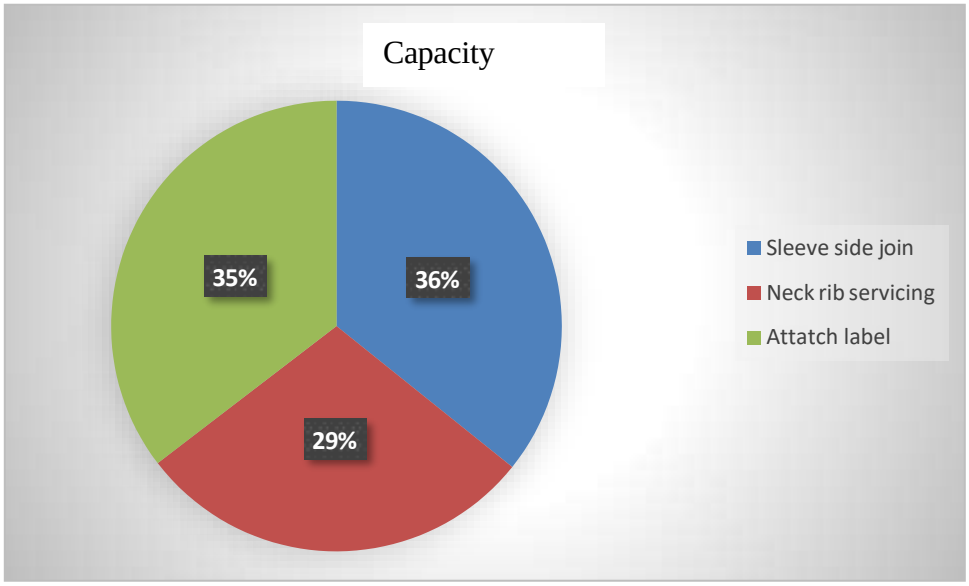
4.1.1 Analysis of capacity study of T-shirt

Figure 11 Analysis of capacity study to find bottleneck



In this chart we saw that, we found the lowest capacity as bottleneck process named neck rib servicing. We saw that this process output was only 83 pcs per hour. That was so less production of that line. There the operator took lot of unnecessary time for complete the process. If the operator took the standard time to complete then the operate maybe capable to give 100 over pcs and the line will be balanced. To complete the process the operator took 43 average second. There were another two bottleneck process we found that will be another curse of that line. That were Label attach & sleeve side join. The two process took 35 & (81+61) second. We used the data to make Line balancing rate and found the rate was 57%. So we should increase the LBR% of the line

Figure 12 Comparison of first three bottleneck process



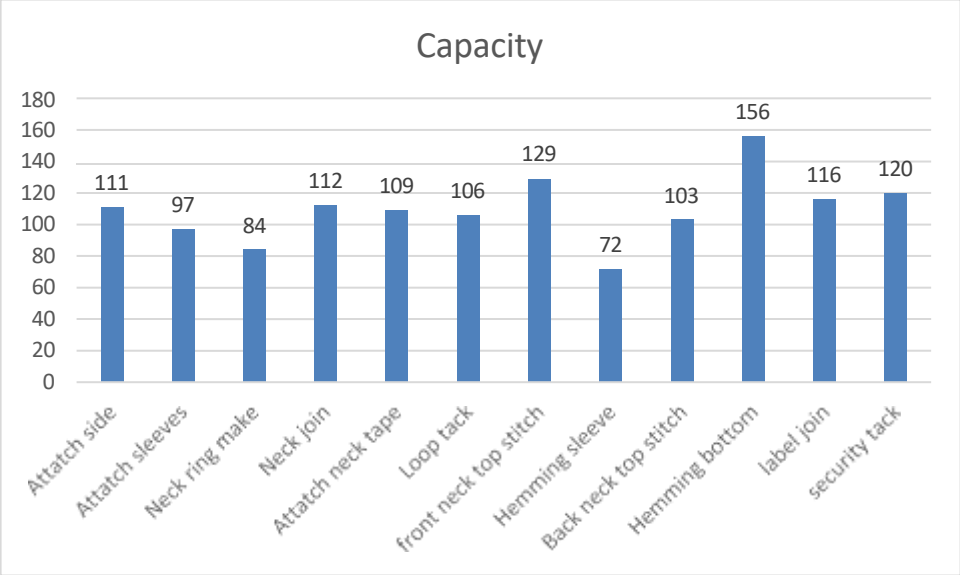
In this pie chart we saw that, Neck rib servicing process produced only 29% production that was so less for the line. The input was 112 pcs per hour. But for neck rib servicing process the output was 83 pcs per hour. So we can say that the percentages was so less than the input production percentages. The other bottleneck process that was attach label that was produced 35% production. The another bottleneck process was sleeve side join that was produced 36% production. Here we can solve the bottleneck process by using some techniques. The solution is given below:

4.1.1 Probable solution

We can solve the problem of Neck rib servicing process by process sharing method or method improvement process. We noticed that there were another process which capacity was very high like security tack & label make process. If we share the neck rib servicing process with security tack or label make process then we can increase the production. And if we add one operator extra for this process, we can increase the productivity of the line. This is how we can solve the bottleneck process.

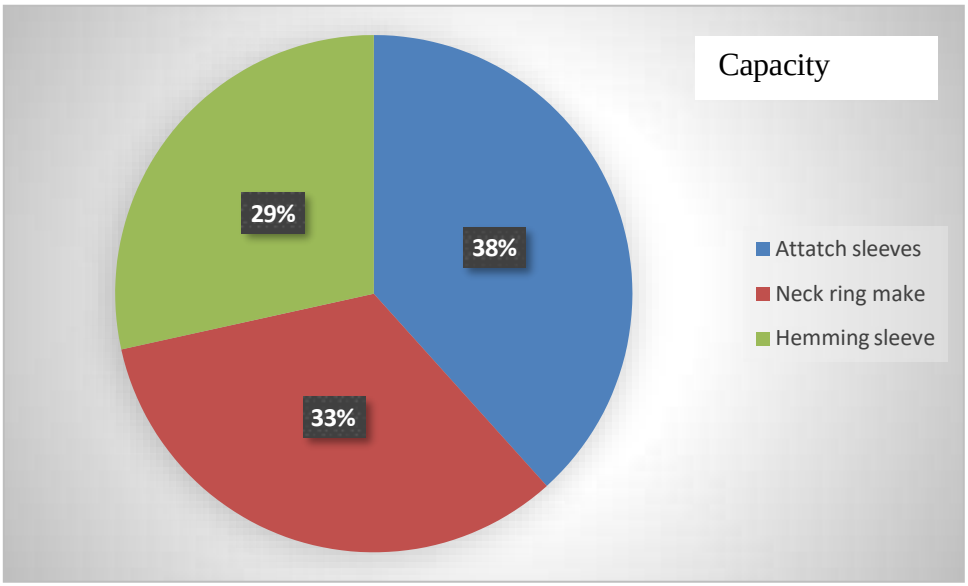
4.1.2 Analysis of capacity study of T-shirt

Figure 13 Analysis of capacity study to find bottleneck



Here we find that hemming sleeve has lower capacity, which is 72. Second lower capacity process name is neck ring make. It has 84 capacity. Third bottleneck process is back neck top stitch and it has 103 capacity. By analysis, we find this three bottleneck. We will describe how to solve this bottleneck.

Figure 14 Comparison of first three bottleneck process



4.1.2 Probable Solution

Here we see that 111 pieces input is inserted the line. The output is only 72 pieces though. All the capacity is over hundred. Only two are them are below hundred. So, if we take some necessary step, we can easily solve the bottleneck.

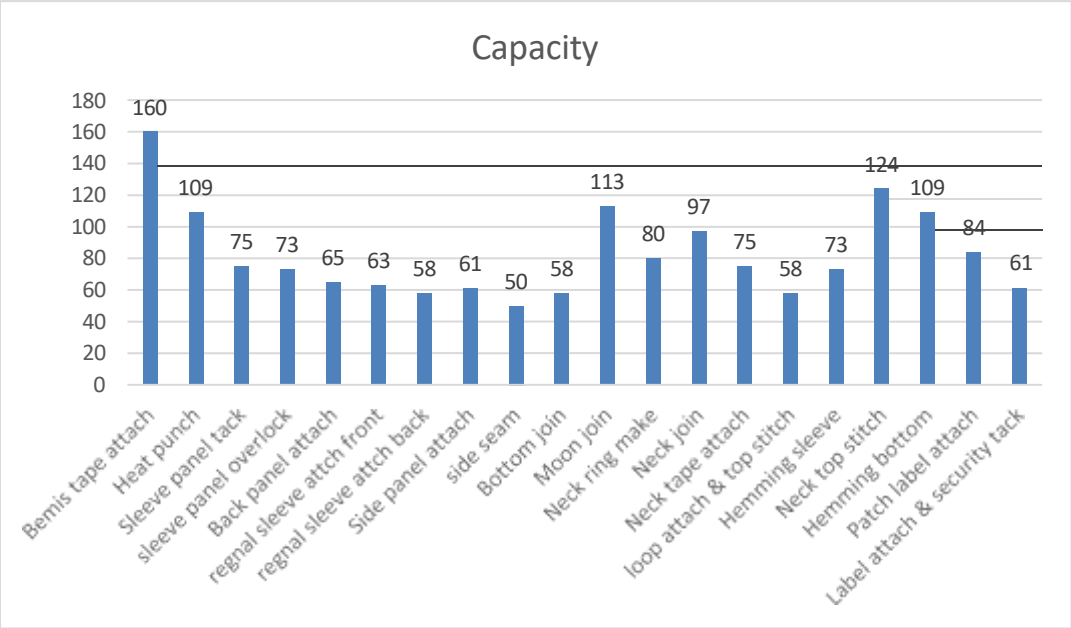
Process share: Here we see that hemming bottom has 156 pieces capacity and hemming sleeve has only 72 pieces capacity. If we share these two process, then bottleneck will be solve. After

doing 100 pieces of hemming bottom in an hour, the operator will do hemming sleeve rest of the time of that hour. This is called process sharing and by doing that we can easily solve that.

Motion and method study: By developing motion and method of bottleneck process we can increase the capacity and gradually remove the bottleneck.

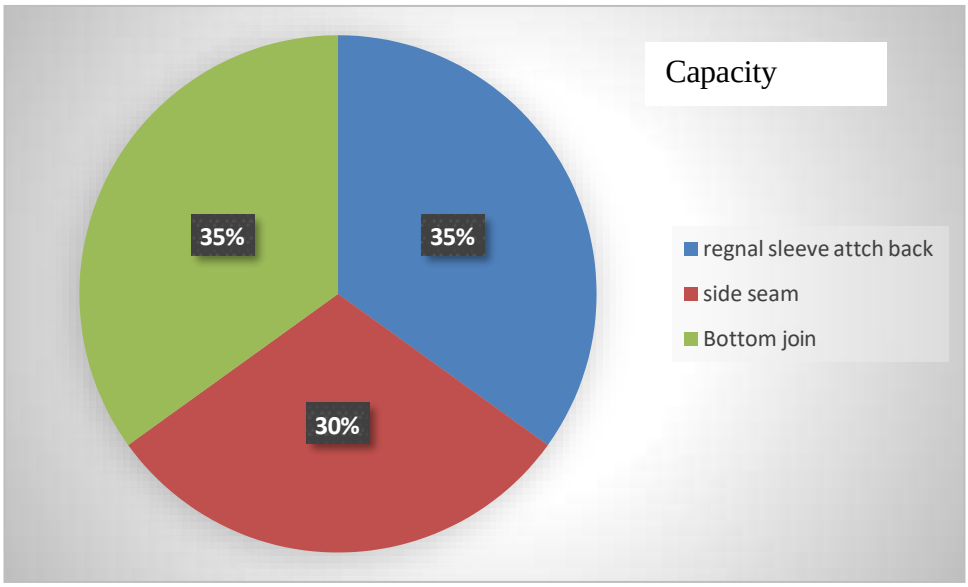
4.1.3 Analysis of capacity study of T-shirt

Figure 15 Analysis of capacity study to find bottleneck



In this chart we saw that, side seam join process produce less production of that line. So side seam join process was the bottleneck process of the line. We saw that side seam join process took highest average cycle time that was average 72 second. We also saw that the input entered in that line was 74 pieces. But at the end the production was only 55 pieces. Middle of the line delivered more then 50 pieces, and final check process output was 50 pieces for the side seam join process. So side seam join process was the bottleneck process we found. There the operator did the process and having also some unnecessary motion. That's why the production was so much less.

Figure 16 Comparison of first three bottleneck process



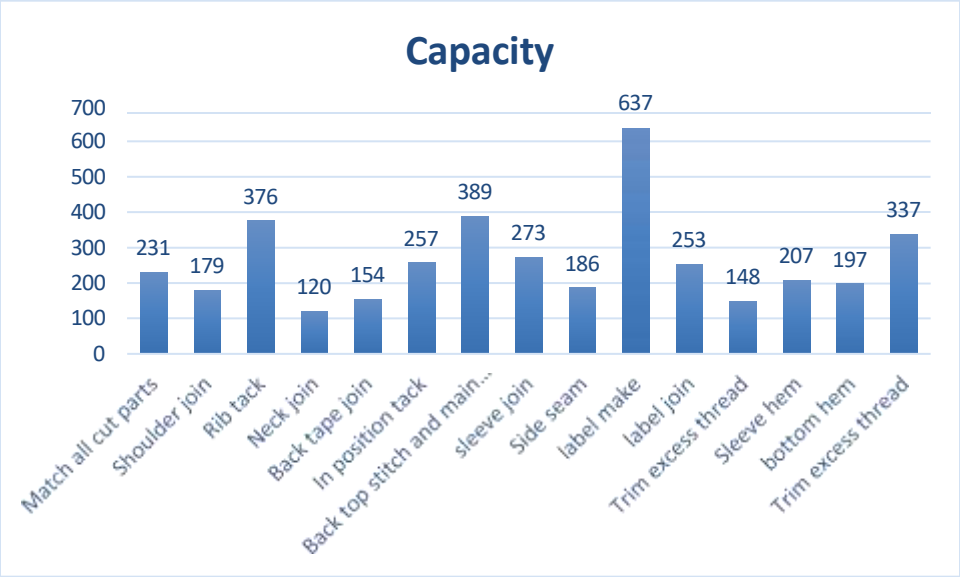
In this pie chart we saw that, side seam process produced only 30% production that was so less. This 30% production was so less than the input production. The other bottleneck process that was raglan sleeve join back part & bottom join produced 35% both. Here we can solve the bottleneck process by using some techniques. The solution is given below:

4.1.3 Probable solution

We can solve the problem of side seam join process by adding some improvement like motion improvement or method improvement or adding one machine. We also increase production by reduce the unnecessary motion of the side seam operator. If we reduce the unnecessary body movement of that operator we can reduce some time and production will increase. Besides we can share the process with bemis tape attach process. Because bemis tape attach process capacity was 160 pcs. per hour. That can be benefited for the line and line production will increase. This is how we can solve the bottleneck process.

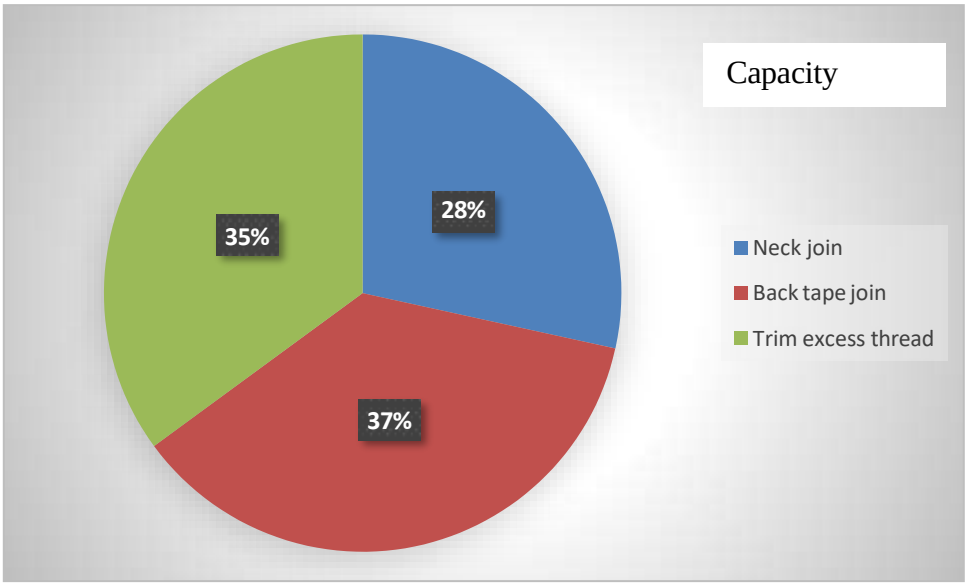
4.1.4 Analysis of capacity study of T-shirt

Figure 17 Analysis of capacity study to find bottleneck



Here we find that, neck join has less capacity. Here only 120 capacity is noticed. The second bottleneck is trim excess thread, third bottleneck is back tape join, and their capacity is 120 and 148 & 154 respectively. Here 231 pieces input is inserted to this line but only 120 pieces output can be possible. Here we notice that some process has over 400 capacity which is wastage. So we need to balance the line and minimize the bottleneck.

Figure 18 Comparison of first three bottleneck process



4.1.4 Probable Solution

4.1.4.1 Motion Improvement

We know that body motion is 6 types:

- Pick up
- Put under pressure foot
- Align
- Stitch
- Remove from pressure foot
- Dispose

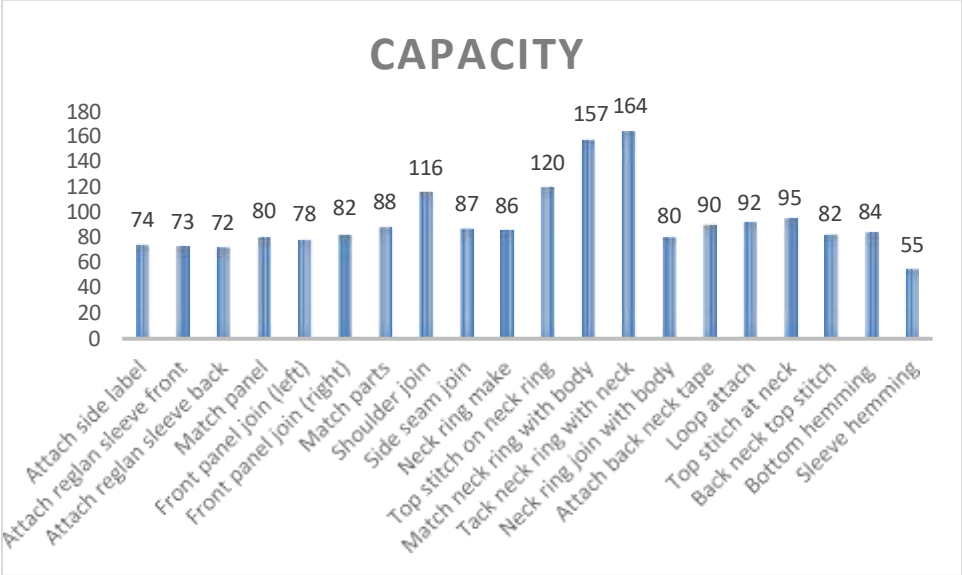
We can improve these motion of the bottleneck operator and increase the capacity of her. Here neck join process operator's motion can be developed.

4.1.4.2 Add machine with or without operator

We can add overlock machine with or without operator. We see that back tape top stitch has too much capacity. We give there a multi skill operator and asked her to do both neck join and neck tape top stitch by sharing the time of an hour.

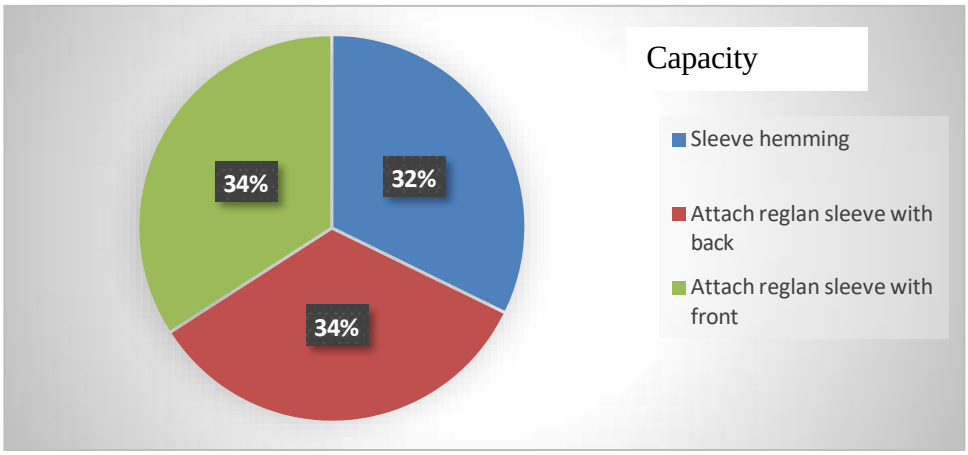
4.1.5 Analysis of capacity study of Fem dirt T-shirt

Figure 19 Analysis of capacity study to find bottleneck



Here we observed that sleeve hemming process has lower capacity. Only 55 pieces garments are output from here. On the other hand we observed that 74 pieces body is inserted to the line which is not sufficient. We must need to increase the line input from beginning. If we do so then sufficient body will be gathered near the operator .After that too much production will possible.

Figure 20 Comparison of first three bottleneck process



Here we see that sleeve hemming process has lower capacity and then attach reglan sleeve with back and attach reglan sleeve with front. This is the first three bottleneck. We need to solve this.

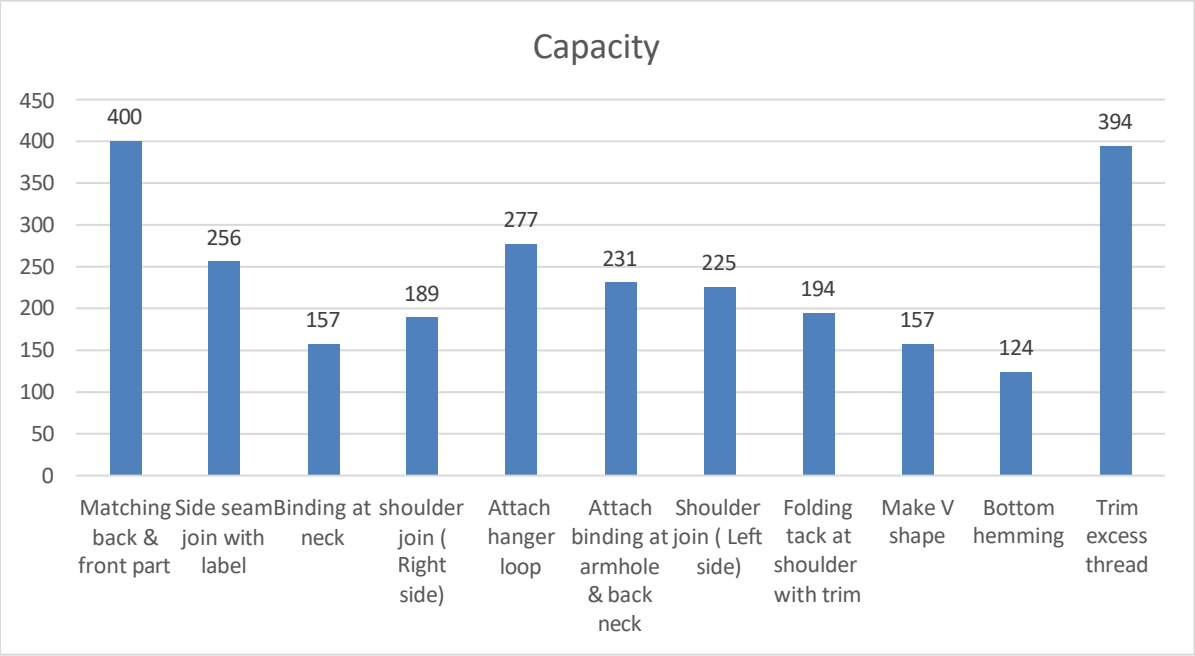
4.1.5 Probable solution:

Process share: Here sleeve hemming operator has 55 pieces capacity and bottom hemming operator has 84 pieces capacity. We can share these two process. Bottom hemming operator will do bottom hemming in 40 minutes and rest of the 20 minutes she'll do sleeve hemming. By this process, the final output will increased.

4.2 Result & Discussion of Sewing Vest

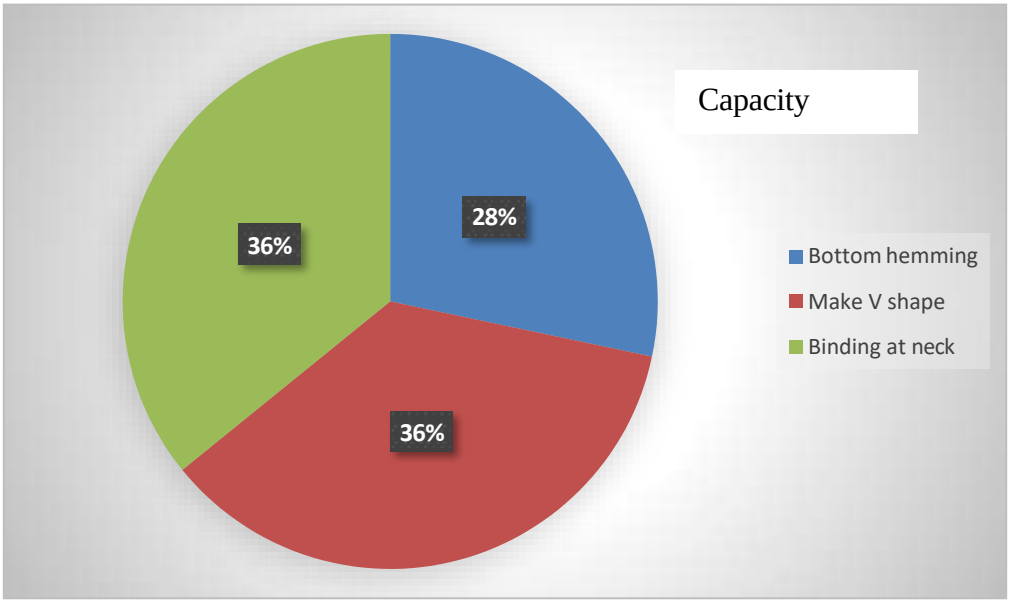
4.2.1 Analysis of capacity study of sewing vest

Figure 21 Analysis of capacity study to find bottleneck



In this chart we saw that, bottom hemming process produce less production of that line. So bottom hemming process was the bottleneck process of the line. We saw that bottom hemming process took highest average cycle time that was average 29 second. We also saw that the input entered in that line was 400 pieces. But at the end the production was only 124 pieces for bottom hemming process. Middle of the line delivered more then 150 pieces, and final check process output was 394 pieces capacity for trim excess thread process. So bottom hemming process was the bottleneck process we found. There the operator did the process and having also some unnecessary motion. That's why the production was so much less.

Figure 22 Comparison of first three bottleneck process



In this pie chart we saw that, bottom hemming process produced only 28% production that was so less. This 28% production was so less than the input production. The other bottleneck process that was Make V shape & binding at neck produced 36% both. Here we can solve the bottleneck process by using some techniques. The solution is given below:

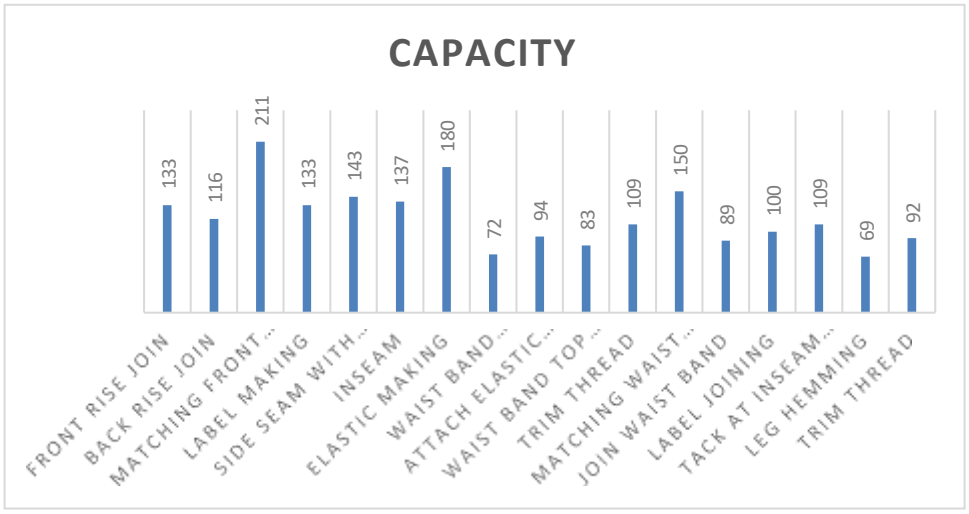
4.2.1 Probable solution

We can solve the problem of bottom hemming process by adding some improvement like motion improvement or method improvement or adding one machine. We also increase production by reduce the unnecessary motion of the side seam operator. If we reduce the unnecessary body movement of that operator we can reduce some time and production will increase. Besides we can share the process with attach hanger loop process because of over capacity. Because hanger loop attach process capacity was 277 pcs. per hour. That can be benefited for the line and line production will increase. This is how we can solve the bottleneck process

4.3 Result & Discussion of Long pant

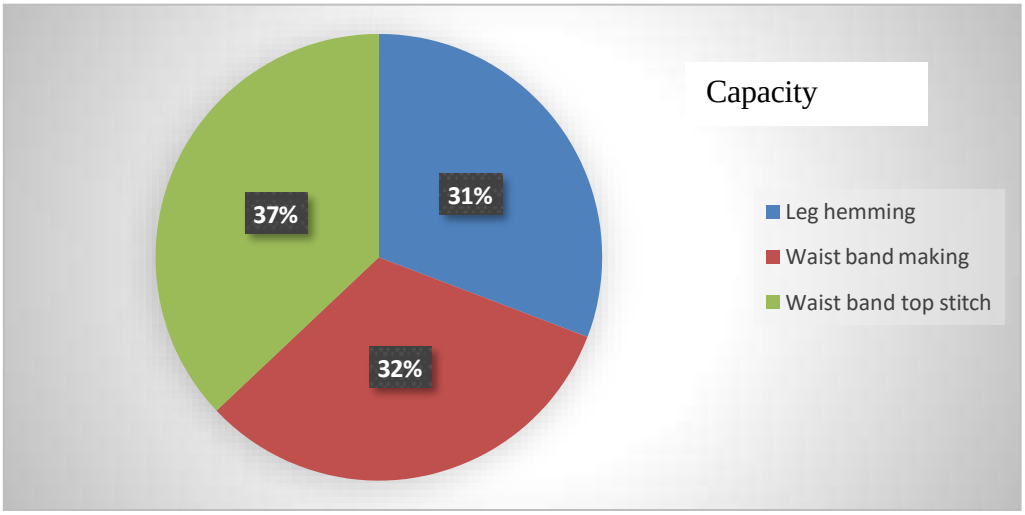
4.3.1 Analysis of capacity study of long pant

Figure 23 Analysis of capacity study to find bottleneck



Here we see that Leg hemming process has lower capacity (69). Here we see that 133 pieces is given to the line but the output is only 69 pieces. Something is wrong in the middle portion of the body. We observed three bottleneck and tried to solve these according to the various techniques of ours.

Figure 24 Comparison of first three bottleneck process



We observed here three bottleneck in this pie chart. We see that, Le hemming capacity is 31%, Waist band making capacity is 32% and waist band top stitch capacity is 37%. Here leg hemming is first bottleneck because it has lower capacity.

4.3.1 Probable solution:

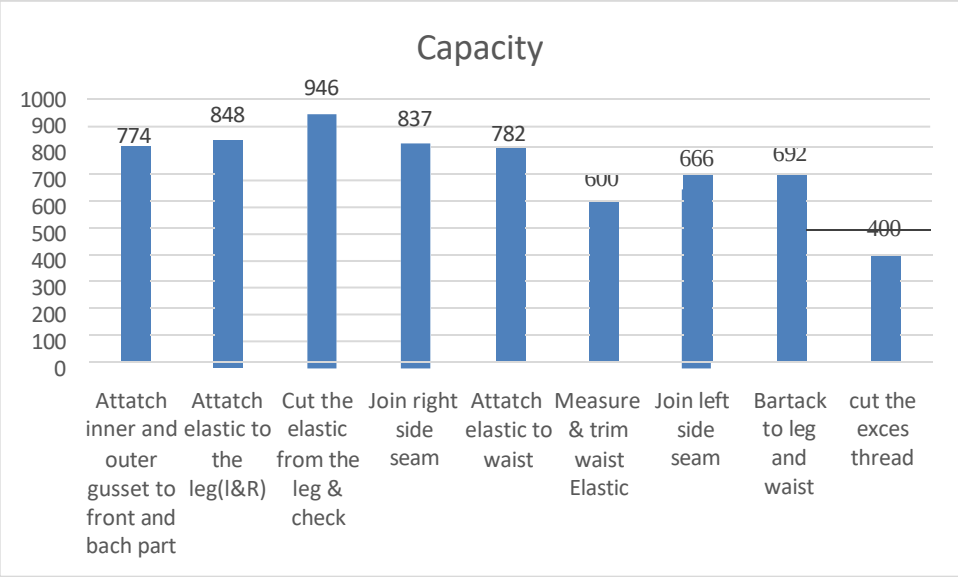
Motion improvement: We can improve the motion of hemming process operator. We know that hemming is done by Flat lock machine. So, we can improve her motion.

Add machine without operator: Here we see that Elastic making process has higher capacity (180). This too much capacity is no need. We add here multi skill operator who can bot able to make elastic ring and also can do hemming process

4.4 Result & Discussion of Girl's Hipster

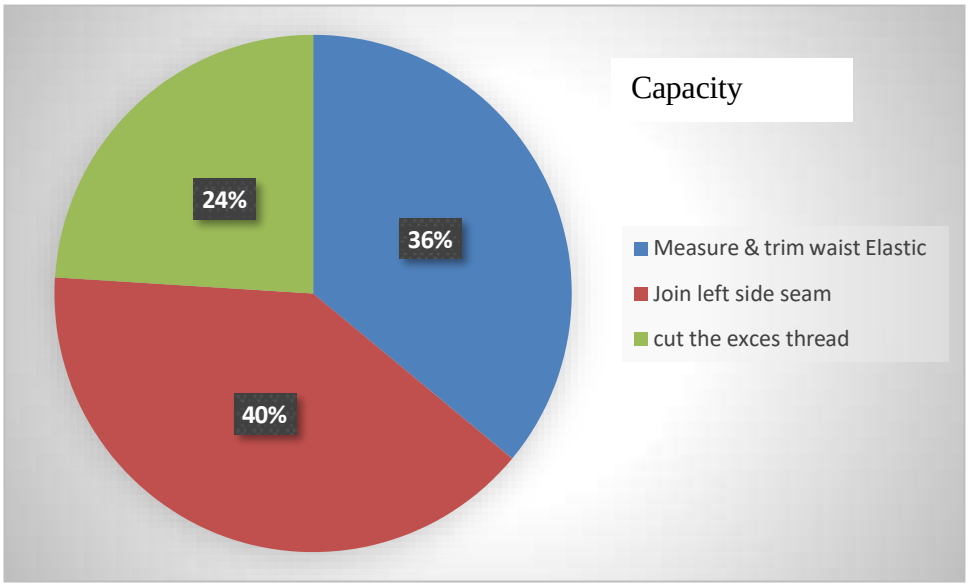
4.4.1 Analysis of capacity study of girl's hipster

Figure 25 Analysis of capacity study to find bottleneck



In this chart we saw that, cut the excess thread was the bottleneck process of the line. We saw that the input entered in that line was 774 pieces. But at the end the production was only 400 pieces. Middle of the line delivered more then 600 pieces, output was 400 pieces for the thread cut process process. We noticed something was happened in thread cut process. There only one operator did the process and having some unnecessary motion. That's why the production was so much less.

Figure 26 Comparison of first three bottleneck process



In this pie chart we saw that, the production of thread cut process was so less. Only 24% production achieved from thread cut process. The production of trim waist elastic & join left side seam 36% and 40% respectively. Here we can solve the bottleneck process by using some techniques. The solution is given below:

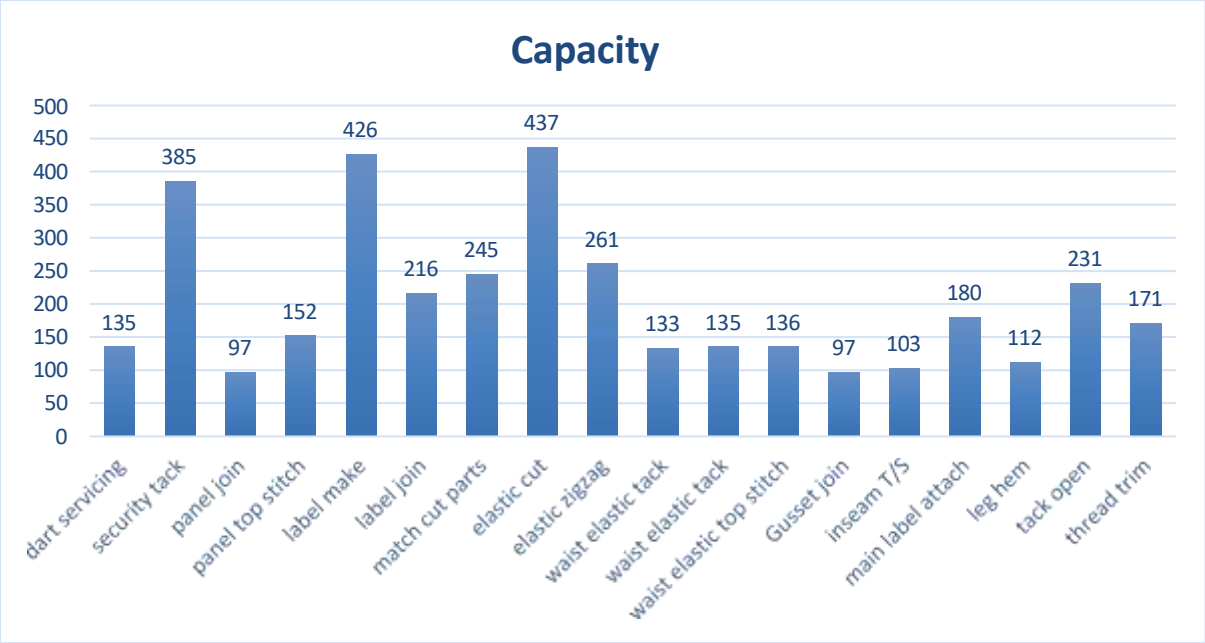
4.4.1 Probable solution

We can solve this problem by adding some improvement. It can be motion improvement or method improvement. If we reduce the unnecessary body movement of that operator we can reduce some time. Besides we can share the process with over capacity process. That can be benefited for the line and line production will increase. This is how we can solve the bottleneck process.

4.5 Result & Discussion of Men's Boxer

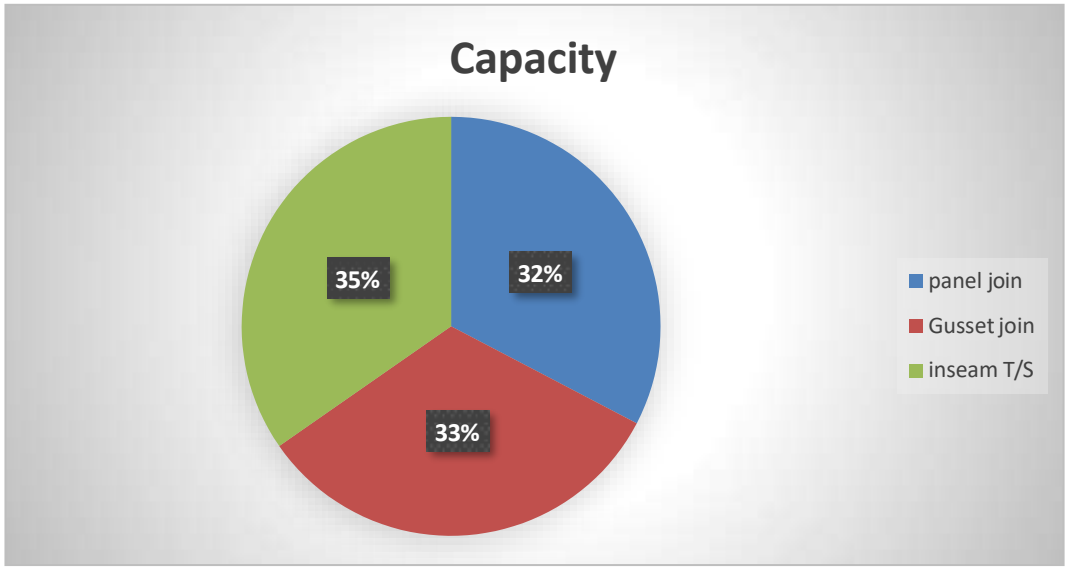
4.5.1 Analysis of capacity study of Men's boxer

Figure 27 Analysis of capacity study to find bottleneck



In this chart we saw that, two bottleneck process we found. One was panel join & another was gusset join. We noticed that in panel join process there were two operator did that process. Two operator produced 97 pcs per hour. Another process was gusset join. Here also production was 97 pcs per hour. In panel join process total time took 33.3 sec. Besides gusset join process also took 33.3 sec. So here the both process was the bottleneck process. First bottleneck process was panel join and second bottleneck process was gusset join.

Figure 28 Comparison of first three bottleneck process



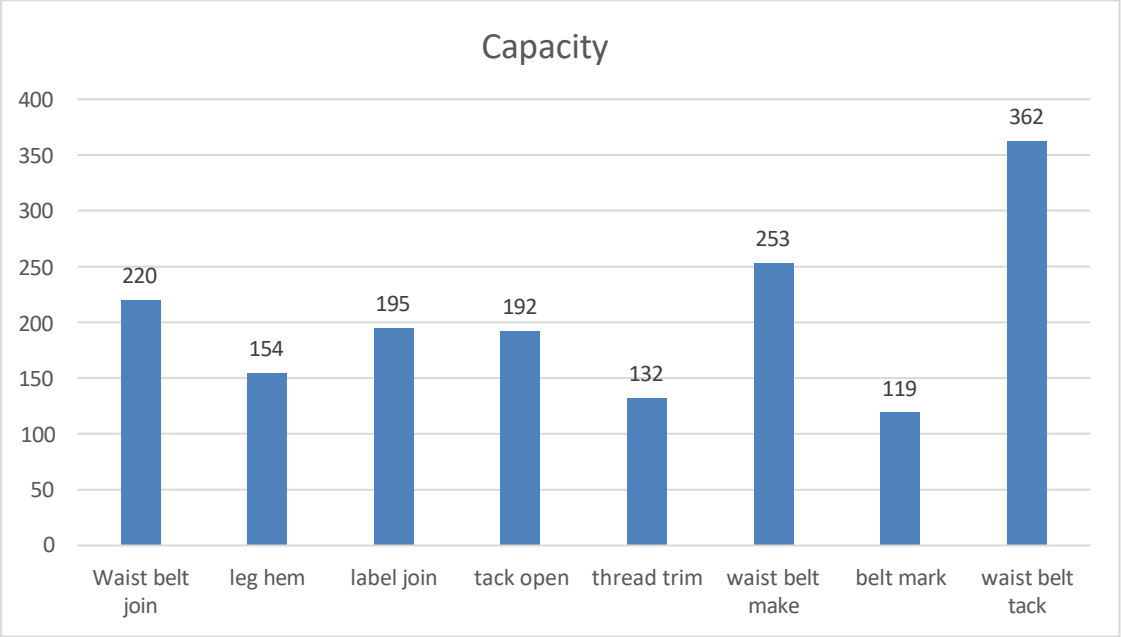
In this pie chart we saw that, Panel join process and gusset join process produced only 32% and 33% production that was so less. This percentages was so less than the input production. The other bottleneck process that was inseam top stitch that was produced 35% production. Here we can solve the bottleneck process by using some techniques. The solution is given below:

4.5.1 Probable solution

We can solve the problem of panel join process by body movement improvement like pick up, dispose, align etc. If we increase the production by reduce the unnecessary motion of the panel join operator then our first bottleneck process will be reduce. And If we increase the machine speed and balance the control of the operator then we will increase productivity. We also can share the panel join process with label make process and gusset join process can share with elastic cut process that can be benefited for the line and line production will increase. This is how we can solve the bottleneck process.

4.5.2 Analysis of capacity study of men's boxer

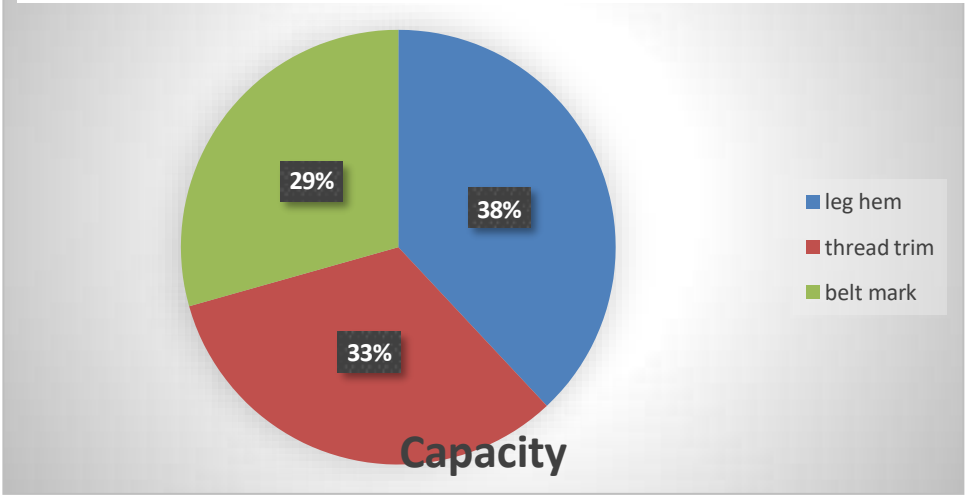
Figure 29 Analysis of capacity study to find bottleneck



In this chart we saw that, waist belt mark was the bottleneck process. We noticed that in waist belt marking process there were only one operator did that process. The operator took 29 second to completed the process. That is why the operator gave only 119 pcs production per hour. So here the bottleneck process was waist belt mark. The other process went on smoothly.

Figure 30 Comparison of first three bottleneck process

Figure 31 Comparison of first three bottleneck process



This pie chart we saw that, Waist belt marking process produced only 29% production that was so less for the line. This percentages was so less than the input production percentages. The other bottleneck process that was trim excess thread that was produced 33% production. The another bottleneck process was leg hemming that was produced 38% production. Here we can solve the bottleneck process by using some techniques. The solution is given below:

4.5.2 Probable solution

We can solve the problem of waist belt mark process by process sharing method. We saw that there were another process which capacity was very high like waist belt make process, waist belt tack process etc. If we share the waist belt marking process with waist belt tack or waist belt make process then we can increase the production. And if we add one operator extra for this process, we can increase the productivity of the line. This is how we can solve the bottleneck process.

CHAPTER-5

RESPONSIBILITIES, HEALTH, SAFETY, SOCIO-CULTURE AND ENVIRONMENTAL CONSIDERATION

Here, we will discuss if the work performed in our industries will have an adverse effect on the environment.
environment. And what features are enhanced if we uphold these Health, Safety, and social responsibilities.

5.1 Codes and standards used

Liz Fashion Industry Ltd. is one of Bangladesh's prominent garment industries. Most purchasers of this industry are internationally renowned and environmentally aware. Therefore, adherence to all international norms of behavior is a must for their order. BSCI and CSR regulations must be adhered to. Zero tolerance for kid work, in order to avoid unexpected difficulties. Additionally, uphold ISO 9001, the international standard for quality management. The ETP procedure must be maintained. So that, beginning with sample manufacturing and continuing through mass production, the amount of water required has no negative impact on the environment.

5.2 Ethical principles and professional commitment

This industry's guiding concept and commitment is to preserve the health of the environment for future generations. Make an effort to develop eco-friendly goods. There is a common practice of using organic cotton yarn to construct clothing. Utilizing high-quality, non-hazardous dye chemicals. During working hours, avoid abuse and harassment. After completing one's primary responsibilities, one is not need to work part-time for an extended period of time. It is necessary to abolish gender discrimination.
At least once a month, perform a fire drill. And to ensure that all personnel exit the factory within six minutes

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

Keeping to the standards set by international organizations benefits everyone involved.
Following BSCI guidelines is one example that guarantees worker advantages. After the end of a worker's shift, no additional hours can be worked. The BSCI standards include prompt payment of salaries, a ban on the employment of child labor, and stringent oversight of any instances of abuse or harassment of female employees. Most purchasers now insist that BSCI standards be met. This has a good social impact because it ensures that workers receive their correct benefits. Social responsibility initiatives are governed by the policies of yet another global body. Any imaginable societal problem is guaranteed to exist here. Women should be given paid time off and other benefits such as childcare subsidies, for instance. Build a mosque or a school near the manufacturing hub. Therefore, it contributes positively to society. Customers are receiving correct

quality items as a result of adhering to ISO standards. Social audits are used to keep an eye on the security conditions in various industries. Industries therefore have fire alarms built in strategic locations, emergency exits constructed, and personnel on hand at all times to put out any blazes that may break out. The social audit also takes into account the cleanliness of the workplace and the availability of clean restrooms for the employees. Assuring both the workers' and the environment's safety is a top priority here.

5.4 Impact on Environment

The term "ETP" has become widely used in the textile industry in recent years. We are aware that the textile industry consumes vast quantities of water. Furthermore, if these waters are discharged without any changes from their previous use, it might have a devastating effect on the ecosystem. We've implemented the ETP Process to do away with that.

The water is cleaned up before being released back into the environment, so there's no harm done. The environmental benefits of this ETP technique are substantial. However, businesses are making an effort to provide environmentally friendly goods. It's being put through a dry wash in an effort to make it serviceable. The use of all-natural yarn. All of these efforts are improving the natural world in significant ways.

CHAPTER-6
CONCLUSION

By collecting the Capacity study and bottleneck processes from Liz Fashion Industry Ltd and JM Fabrics Ltd, we concluded our project. This project enables us to comprehend the assembly, bottleneck analysis, time and motion study-related term and their suitable methodologies.

- After analysis, we find neck rib servicing is bottleneck process and we can share process with security tack and label make again, we can also by motion improvement.
- Sleeve hemming is bottleneck process. By sharing we made the to do bottom hemming in 40 minutes and rest of the 20 minutes sleeve hemming.
- We found that, side seam process produce less production of that line and we solve that by improving motion.
- Neck join is less capacity and reduced that by adding with or without operator.
- Here hemming sleeve was bottleneck and solved that by workload even distribution.
- We found that, bottom hemming process produce less production of that line and we solve that by improving motion of the operator also by sharing process with attach hanger loop.
- After analysis, we found that leg hemming operator has more work load that's why it is bottleneck process and we solve it by bottleneck solving method.
- Thread cut process was bottleneck because of extra motion of helper. Reduced that extra motion and solve that.
- We found panel and gusset join has lower capacity. We increased that by increasing the machine speed.
- We found waist-belt mark process was bottleneck and we did share belt mark process with waist belt mark process.

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