Faculty of Engineering
Department of TextileEngineering

REPORT ON

"Study on Industrial Engineering in Knit Garments Production"

Course Title: Project (Thesis)
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Submitted By

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This Report Presented in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science in Textile Engineering.

Advance in Apparel Manufacturing Technology

Fall, 2019

Declaration

We attest that this report is totally our own work, except where we have given fully documented references to the work of others and that the materials contained in this report have not previously been submitted for assessment in any formal course of study. If we do anything, which is going to breach the first declaration, the examiner/supervisor has the right to cancel our report at any point of time.

……..

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Approval Sheet

This research entitled "Study on Industrial Engineering in 'Knit garments production' at **Daffodil International University, Fall, 2019**'' prepared and submitted by **Foujia Alam Esha(ID:161-23-4552) &Shabihatul Zannat Misha(ID:161-23-4658)**in partial fulfillment of the requirement for the degree of BACHELOR OF SCIENCE IN TEXTILE ENGINEERING has been examined and hereby recommended for approval and acceptance.

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Acknowledgement

At first we would like to express our deep appreciation to Allah for providing the opportunity to complete our Thesis “Study on Industrial Engineering in Knit garments production.”

Then, our special thanks go to **Md. Abdullah Al Mamun**, Assistant Professor,DepartmentoftextileEngineering,DaffodilIntentionalUniversityforhisencourageme ntand valuablesuggestions.

We would like to thanks the management of the **“FAKHRUDDIN TEXTILE MILLS LTD.”**for giving us the opportunity to perform the thesis successfully.

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Dedication

At first we want to dedicate our thesis reports to almighty **Allah**.

Then we dedicate this report to our **Parents** who give us chance to study in Textile Engineering and support us all time.

We have also dedicate this report to **Md. Abdullah Al Mamun**, Assistant Professor of Daffodil International University who helped us a lot to complete our industrial training report.

Abstract

This project is on “Study on Industrial Engineering in knit garments production”. Traditionally operated garment industries are confronting issues like low productivity, low efficiency, longer production lead time, high remake, modify, and rejection, poor line
balancing,lowflexibilityofstylechangeoveretc.Theseproblemswereaddressedinthisstud
y by the using of Industrial Engineering. This paper introduces the various concepts utilizing method,
wastage. Work study took to record the actual individual capacity of each operator. We have recorded the actual cycle time to each operation for each and every operator and helper to discover the ideal number of worker, type of machines, and individual capacity. To find out the standard minute value (SMV) = 5.239, in additional to that we have calculated the target (100%) per day= 2288pcs,cycletime=.23 sec, efficiency= 48%,manpower= 22,capacity= 1832pcs.In this paper we discussed about ladies T-shirt measurement sheet, layout plan, and the operation breakdown, SMV calculation for each operation, Target calculation for each operation, cycle time, efficiency, process wise capacity has been calculated, and others tools and techniques which consist of different experimental details, experimental result and discussion.

Contents

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1. Introduction

Since the beginning of civilization, human beings by their nature, have been involved in continuous improvements and have had an unending thirst to raise living standards and improve the quality of life everyday! Industrial Engineering has played a vital role in achieving these objectives. Apparel Manufacturing has improved significantly from Industrial Engineering techniques. Engineering makes things helpful to man. Industrial engineering is the engineering in where applied to all factors, including the human factor, engaged with the product and allocation of goods and supplies.

1.1 Industrial Engineering:

We choose this topic because Industrial Engineering is an important part of garments producing. IE is a branch of engineering which is utilized to reduce waste of time, product cost, materials, machine time, working-hours, and different resources that are adding value. As like many other manufacturing industry, IE is now broadly used in textile and RMG sector. Textile and RMG sector have to face heavy Challenges because of different factors, including their global competition, product price increase, low productivity, labor corrosion and many more. For surviving in those difficulties work study sense and formulas are utilized in RMG sector.

1.2 Aim of the report:

Productivity is more important to a factory for profit, but for some un planning work. Productivity being reduce for proper planning, Its very much needed to use properly of every machine, operator, time& others equipment. So, for this purpose IE department works always & try to maintain any waste of those following things. They try to use those properly & also try to reduce cost & save time. Industrial Engineering are a department which are totally connected with factory profit, without this department factory profit will not increase anymore. So, for this reason we select this IE department as our thesis topic. Here we try to show the whole IE department work & also try to show how they work for increase factory profit with properly use of all following things within as possible as less time & also with as possible as low cost.

1.3Background of Industrial Engineering:

IE became a significant factor during the Industrial Revolution in Europe during the mid-eighteenth century, and one of the first Industries to apply its principles was the Textile Industry. Frederick Taylor is named as father of scientific management and industrial engineering. But before Frederick Taylor, Adam Smith gave concept of Division of Labor through his book The Wealth of Nations. Also James Watt, Bolting Mathew and Robinson obtained a place in the history of Industrial Engineering because of their work related with improvements in the performance of machines and industries.

Literature Review

2.1 Previous Work Study:

At first we collect a previous thesis report from library of our senior, Then we found some similarity with us because they also choose IE as a thesis topic like us. Then we study their report & collect some data from then, Which collected data are given below:

Data Collection:

Buyer: VORO MODA
Item: VMGAVA LS ROLL NECK DRESS
Fabric: S/J
GSM: 160
Order no: 10222085
Quantity: 2416
Color: Tortoise shell
S.M.V: 6.84
Line Target: 1297/ day
Efficiency: 51%

In this thesis report we also show that data about order & also try to given operation breakdown sheet with result like basic time, S.M.V, target, efficiency etc. And we also try to give operation break down sheet, different IE related term & also with their result.

2.2IndustrialEngineering:

A branch of engineering dealing with the design, development, and implement of integrate system of humans, machines, and information resources to provide products and services. Industrial engineering encompasses specialized knowledge and skills in the physical, social, engineering, and management sciences, computer system, and information technologies, manufacturing processes, operation researches, production and automation. The major activities of Industrial engineering stem from manufacturing industries and include work methods analysis and improvement.

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

2.3Objectives of Industrial Engineering:

- Improving process and method of working to increase factories overall performance and standardized garment manufacturing processes.
- Monitoring production floor and having better control over the production floor.

- Contribute to the success of companies throw effective problem solving.

2.4Role of Industrial Engineer:

- Safety
- Line Balancing
- Quality- operation control
- Training- how to train new employees
- Operator output- maintain high output and improves abilities of those with low output
- Loss control- minimize off- standard loss
- Waste control- in materials supplies and machinery
- Standard conditions- in the workplace, in sewing method, in the machines

2.5IE Department Working Procedure:

2.5.1 For Pre-Production of Development Step:

Merchandisers receive tack pack from buyer.

↓

Buyer co-ordinate (merchandiser)

↓

IE section

↓

Pre-sampling meeting comments (style analysis)

↓

Pattern section

↓

Pattern check according to style analysis

↓

Sample section

↓

Attachments and folder direction from IE section

2.5.2. For Pre-Production of Confirm Step:

Pre-sampling meeting comments check with the sample
↓
Simplifying the operation
↓
Costing productivity
↓
Confirmed style machine requirement/ Style evaluation report
↓
Operation bulletin making & SMV calculating
↓
SMV & learning curve entry to 1st react for planning

2.5.3For Production Step:

Collect the next style details
↓
Sample collect & folder attachment
↓
Process break down collect
↓
Primary layout & line fitting
↓
Method study
↓
After five days make the Time study for line balance
↓
After eight days target set according to five day analysis
↓
Final report

2.6 Working Field of IE:

Figure 2.1: Working Field of IE

2.7Obligations of an Industrial Engineer:

2.7.1 Primary obligations:

- Provide safety
- Plan and balance production lines
- Develop employees
- Control quality
- Follow up on low output employees
- Material utilization
- Discipline

2.7.2 Secondary obligations:

- Bundle handling and movements
- Adjustments to machines
- Distributes supplies
- Handle parts that need to reprocessing
- Samples
- Maintenance

2.8Target of an Industrial Engineer

- How to increase efficiency
- How to improve out going quality

- How to prepare for routine problems or problems that might arise

2.9Applications of Industrial Engineering:

The parts and duties of the Industrial Engineering office are not simply restricted to timing administrators and making task notices as it is just a piece of the activity. The I.E work can contribute essentially to change in working and efficiency of all the bureaus of clothing fabricating. Give us a chance to examine few of the exercises of different areas of clothing producing which can be related with mechanical designing.

2.10Merchandising

In merchandising Department the Industrial engineer can work closely in following:

Product Analysis-

- Determine the optimum method of construction to achieve required finished product Quality.
- Install the operation sequence.
- Specify the equipment system and work aim to beused.

When IE department contact with the Merchandising department they also think about following parameters:

- Target
- Efficiency
- Output (per day)
- Capacity
- Total no of workplaces
- Total standardtime

It can be extended to include-

- Hourly/ period targets for each operation
- Man power Requirements
- Equipment Requirements

2.12Fundamental tools:

When they need to complete a operation they have to use many fundamental tools for different functions, as like-

- Engineering Methods
- Planning Line
- Planning Capacity
- Measurement Performance
- Manpower Planning etc.

2.13ProductionPlanning:

Production planning is an essential prerequisite to production control. It involves management decisions on the resources that the firm will require for its manufacturing operations and selection of these resources to produce the desired goods at the appropriate time and at the least cost. Production planning is defined as, "the technique of foreseeing or picturing ahead, every step in a long series of separate operations, each step to be taken in the right place, of the right degree and at the right time, and each operation to be done at maximum efficiency."Production planning provide a line for effective, balanced flow of product, incorporating line and individual (operation) productivity standards. The end product of production planning efforts is the formulation of production plans. The plans are formulated in light of specified future period. The plans are to be implemented in the light of the estimated cost and agreed policies.

- Plant limit can be ascertained by I.E department with the goal that arranging can book arrange according to the accessible limit.
- I.Ecanaidbetterarrangingbyaidinginbetterstyledesignationtovariousunitsorlines.
- I.E can figure a proficiency/execution develop for a specific style in light of the work content or past execution. This can advise the arranging department that a specific line willtakehowlongtodeliveraparticularamountofastyle.Thiswillhelpthearranging department to design the accessibility of assets and material ahead oftime.

2.14Quality:

Quality is an advantage, which might be offered to the potential client of an item. There are two parts of value, which add to a definitive nature of the item. Nature of configuration is the primary viewpoint, which relies upon the kind of materials utilized, specs determined by the purchaser, technique for creation, information of the outline and expertise level of the individual. How much this quality is accomplished underway that is the nature of conformance is the second viewpoint.

2.15 Some Important Definition:

SMV:

SMV is a standard minute value to produce a complete garments.

SMV = basic time + (basic time * allowance)

Cycle Time:

The actual time taking by a worker at working pace to complete an operation from pick to dispose.

Observed time:

In industrial engineering, the standard time is the time required by an average skilled operator, working at a normal place, to perform a specified task using a prescribed method.

Basic time:

Basic time of a job is determined by multiplying rating factor to the observed time (cycle time) & then divided by 100. Basic time is also expressed as Normal time.

Allowance time:

It is the time permitted to an worker for non performing assignment, for example, going to research center, rest, evolving needle, taking guideline of boss and so on.

Relaxation allowance:

It is the time permitted to the worker to take care of individual need.

Standard time:

It is the time required by operator to complete a garment had she/he worked at 100% rating with allowance time.

Bottleneck:

Bottleneck means the extra time from one operator to next operator. One operator complete his work; now he/she passes the product to the next operator, the time of passing is called bottleneck. Bottleneck make for-

1. Improper arrangement
2. Wrong working method
3. Less skill operator
4. Unhealthy operator
5. Poor m/c capacity
6. If material not ok etc.

Rating:

Rating is a speed of work, which given from a operators work. Standard rating is 100%.

Capacity:

Capacity means the production of a operator or line per hr.

Capacity 2 types- 1. Line capacity.
2. Process capacity

Line Capacity:

Line capacity per hour.

Process Capacity:

Per operator production per hour.

WIP:

Work in Process, a garments body are waiting for sewing one operator to another operator. WIP are 2 types-

1. Process WIP: It occurs in specific process.
2. Line WIP: Settled body in every process.

Line Balancing:

Setting all m/c & worker properly for achieve target at specific line. Line balancing is necessary for-

1. To get easily output.
2. To get worker better performance.
3. To ensure proper use of time & manpower also m/c.
4. To get higher productivity.

2.16Different types of study:

2.16.1 Time Study:

Time study is a work of measurement technique to get a observation time & observation rating of a worker.

Use of Time Study-

- To record the observation time of a worker.
- To record the observation rating of a worker.

2.16.2 Method Study:

Method study is a systematic recording & critical examination to reduce cost of a product, which is going to set up developing& applying easier & more effective.

Use of Method Study:

- For better design of plant equipment & building.
- Improve layout of factory & office.
- Higher standard of safety & health.
- To improve the flow & work.
- To get the better quality.

- Effective material handling.
- To improve the proper utilization for resources.
- To get maximum output.
- To improve administration.
- Waste reduction.

2.16.3 Motion Study:

Motion study is a technique of analyzing of body motion of a worker & reduce the ineffective body movement & facilitates effective movement.

Use of Motion Study:

- To improve the operators work.
- To give better safety of a worker.

2.17Standard Minute Value (SMV):

SMV is One of the tasks done by the IE department is to calculate the time taken to make a specific garment. This is usually called a SAM (Standard Allowed Minute), although some factories call this the Standard Minute Value (SMV).

Standard Allowed Minute or Standard Minute Value (SAM or SMV) is an important factor in garments manufacturing industry. Production rate can be calculated by usingit.

2.18Calculation of SMV:

SMV = basic time + (basic time * allowance)

Basic time = observed time * rating/100

Observed time = total cycle time

If time for sewing a side seam of a ladies t-shirt is 20, 20, 18, 22 and 20 seconds Observed time = (20+20+18+22+20)/5 = 20

If workers rating is 0.80

Basic Time = Observed Time* Rating

SMV= Basic Time + (Basic Time*Allowance)

2.19Useful Formulas for Industrial Engineers:

Formula 1:

Basic Time = Rating * Observation Time / 100

Formula 2:

S.M.V = Basic Time * (Basic times allowance)

Formula 3:

Daily Line Target = (Man power* working hr* 60)/Garment SMV.

Formula 4:

Individual operator target = (Man power* working hr* 60)/Operation SMV.

Formula 5:

Line Efficiency% = (produced minute) / (Spent minute)

Produced minute = Production *SMV

Spent minute = Man power* working hr

2.20Why Industrial Engineering is Need in Apparel Industry?

Industrial way of garment production needs a thorough preparation of production because in the same time, it is necessary to combine a few factors: people, time, machines and place of production, organization and material in a coordinated and rational system. Technological system of garment production must enable expected quality of product, necessary scope of production, delivery of ready-made garments in the expected time, maximum use of capacity with minimum expenses. An Industrial Engineer can perform several activities to fulfill their task, processes and Procedures of manufacturing or service activities can be examined through Process Analysis. Industrial engineers can use Work Study comprehending Method Study and Time Study. The mentioned activities are also called operations Management. Furthermore can Industrial Engineering involve inventory management to make a manufacturing process more feasible and efficient. Industrial Engineers used to increase efficiencies and cost-effectiveness of operations by the products strategies like High-volume production, long-runs and minimal variations.

3. Methodology

3.1 Data collection:

We have collected our experiment data from sewing section, of a knit garments factory; where Industrial Engineering department are working for better production. We also collect data from line where we work with the line supervisor and with the operator directly.

And we have also collected information from IE manager of this knit garments factory.

3.2 Product information:

Buyer: M&S

Item: Ladies t-shirt

Style: 3040

Total no of machine: 21

Total no of operation: 15

Total no of operator:

25Total SMV: 5.239

Target: 2288pcs

Capacity: 1832pcs

3.3 Product Sketch:

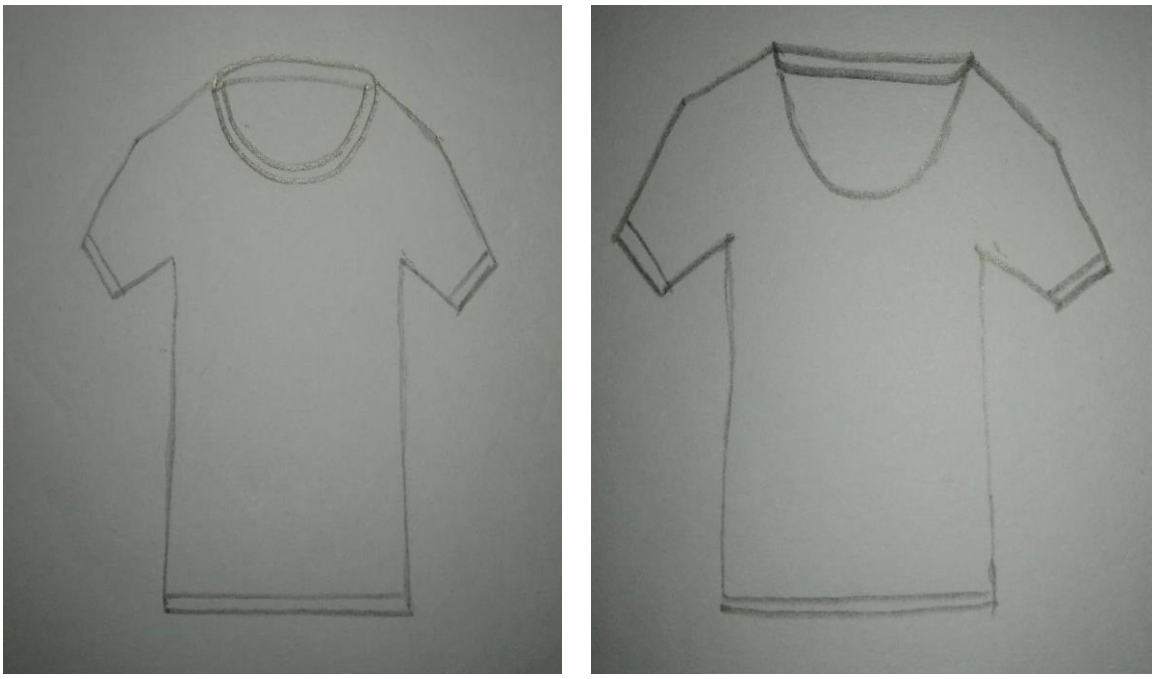


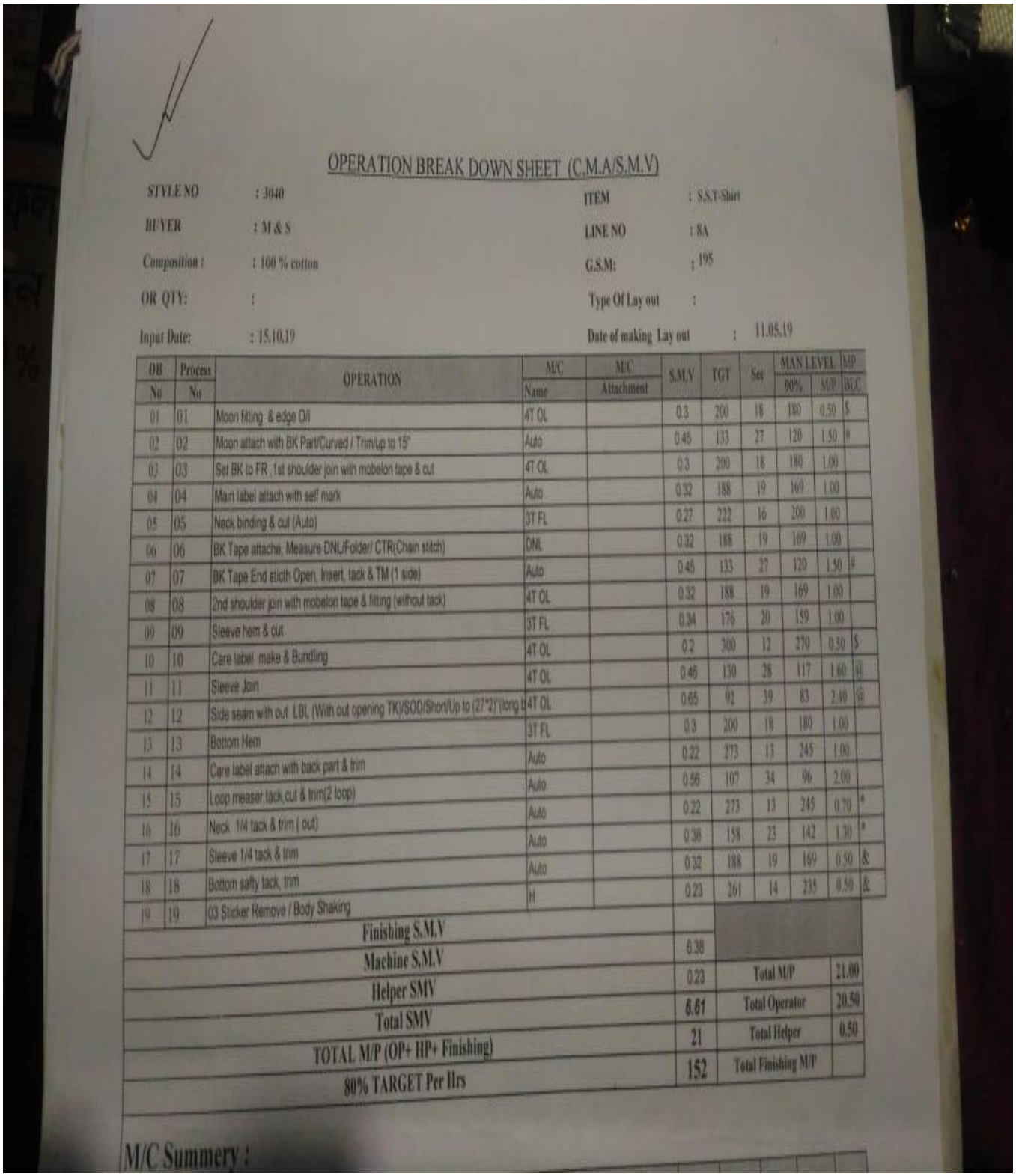
Fig 3.1: Ladies t-shirt (front & back part)

3.4Measurement sheet:

Parts name:	TOL (+,-)	S *	M	L	XL
Shoulders width	**0.2**	**10**	**0.3**	**0.3**	**0.3**
Front width	**0.5**	**33.5**	**1**	**1**	**1**
½ Chest circumference	**1**	**44**	**2**	**2**	**2**
Waist height from HPS	**0.7**	**38**	**1.5**	**1.5**	**1.5**
½ Waist circumference	**1**	**37.5**	**2**	**2**	**2**
½ Bottom circumference	**1**	**46**	**2**	**2**	**2**
Full length at front	**1**	**61.5**	**2**	**2**	**2**
Front neck drop	**0.3**	**10.5**	**0.5**	**0**	**0.5**
Armhole	**0.4**	**18**	**0.6**	**0.6**	**0.6**
½ Sleeves opening	**0.3**	**14.5**	**0.5**	**0.5**	**0.5**
Sleeves length	**0.3**	**13.5**	**0.5**	**0.5**	**0.5**
Width across shoulders at back	**0.5**	**36.5**	**1**	**1**	**1**
Back width	**0.5**	**34.5**	**1**	**1**	**1**

Table 3.1: Measurement sheet

3.5 Operation Breakdown sheet from factory:



OPERATION BREAK DOWN SHEET (C.M.A/S.M.V)

STYLE NO : 3040 ITEM : S.S.T-Shirt

BUYER : M & S LINE NO : 8A

Composition : : 100 % cotton G.S.M: : 195

OR QTY: : Type Of Lay out :

Input Date: : 15.10.19 Date of making Lay out : 11.05.19

DB No	Process No	OPERATION	M/C Name	M/C Attachment	S.M.V	TGT	Sec	MAN LEVEL 90%	MAN LEVEL SUP	M/P B/C
01	01	Moon fitting & edge Oil	4T OL		0.3	200	18	180	0.50	$
02	02	Moon attach with BK Part/Curved / Trim/up to 15"	Auto		0.45	133	27	120	1.50	#
03	03	Set BK to FR ,1st shoulder join with mobelon tape & cut	4T OL		0.3	200	18	180	1.00	
04	04	Main label attach with self mark	Auto		0.32	188	19	169	1.00	
05	05	Neck binding & cut (Auto)	3T FL		0.27	222	16	200	1.00	
06	06	BK Tape attache, Measure DNL/Folder/ CTR(Chain stitch)	ONL		0.32	188	19	169	1.00	
07	07	BK Tape End sioth Open, Insert, tack & TM (1 side)	Auto		0.45	133	27	120	1.50	#
08	08	2nd shoulder join with mobelon tape & fitting (without tack)	4T OL		0.32	188	19	169	1.00	
09	09	Sleeve hem & cut	3T FL		0.34	176	20	159	1.00	
10	10	Care label make & Bundling	4T OL		0.2	300	12	270	0.50	$
11	11	Sleeve Join	4T OL		0.46	130	28	117	1.60	@
12	12	Side seam with out LBL (With out opening TKJ/SOD/Short/Up to (27"2")long t	4T OL		0.65	92	39	83	2.40	@
13	13	Bottom Hem	3T FL		0.3	200	18	180	1.00	
14	14	Care label attach with back part & trim	Auto		0.22	273	13	245	1.00	
15	15	Loop measer,tack,cut & trim(2 loop)	Auto		0.56	107	34	96	2.00	
16	16	Neck 1/4 tack & trim (out)	Auto		0.22	273	13	245	0.70	*
17	17	Sleeve 1/4 tack & trim	Auto		0.38	158	23	142	1.30	*
18	18	Bottom safty tack, trim	Auto		0.32	188	19	169	0.50	&
19	19	03 Sticker Remove / Body Shaking	H		0.23	261	14	235	0.50	&

Finishing S.M.V	6.38		
Machine S.M.V	0.23	Total M/P	21.00
Helper SMV	6.61	Total Operator	20.50
Total SMV	21	Total Helper	0.50
TOTAL M/P (OP+ HP+ Finishing)	152	Total Finishing M/P	
80% TARGET Per Hrs			

M/C Summery :

Table 3.2: Operation Breakdown sheet

3.6Operation Breakdown sheet from our own experiment:

Process no.	Operation	M/C name	Basic time	S.M.V	Target
1	Care label make	4T OL	7.455 sec	0.143 sec	280pcs
2	Moon servicing	4T OL	3.75 sec	0.071 sec	280pcs
3	Sleeve hem	3T FL	7.48 sec	0.14 sec	428pcs
4	Moon join	Auto	25.631 sec	0.491 sec	122pcs
5	1st shoulder join	4T OL	10.84 sec	0.207 sec	289pcs
6	Main label attach	Auto	10.26 sec	0.196 sec	306pcs
7	Neck binding	3T FL	12.03 sec	0.23 sec	260pcs
8	Back tape join	DNLS	8.11 sec	0.155 sec	387pcs
9	Back tape end stitch open, cut	Auto	11.44 sec	0.219 sec	273pcs
10	Back tape tuck	Auto	13.14 sec	13.14 sec	239pcs
11	2nd shoulder join	4T OL	8.46 sec	0.162 sec	370pcs
12	Sleeve join	4T OL	13.65 sec	0.26 sec	230pcs
13	Side seam with label	4T OL	35.87 sec	0.68 sec	88pcs
14	Bottom hem	3T FL	15.52 sec	0.297 sec	202pcs
15	Loop join then tuck	Auto	25.84 sec	0.49 sec	122pcs.
16	Neck, sleeve & bottom tuck	Auto	13.77 sec	0.26 sec	75pcs
17	Sleeve tuck	Auto	13.77 sec	0.26 sec	75pcs
18	Bottom tuck	Auto	13.77 sec	0.26 sec	75pcs

Table 3.3: Operation Breakdown sheet own experiment

N.B (Here, we can see 18 operations but in their factory operation breakdown sheet they given 19 operation but we saw there they don't follow this sheet properly; some operation they work as combined. This table given to follow only our own experiment, that's why 18 operations are exit)

Full name of machine:

4TOL- 4 thread over lock

3TFL- 3 thread flat lock

DNLS- Double needle lock stitch.

3.7Operation Breakdown:

3.7.1Operation Breakdown Procedure:

Industrial Engineering team, Production team leader, technician and Lean project officer must sit together to make break down. Technician breaks the garments in to parts a gathered the parts one after another by operation/process Then work study section and production section leader fix up the SMV of those operation by preceding this technique when all process completed need to summarize all process SMV and the total will be called as respective garments SMV.

3.8 Line Balancing:

Line balance means the better parceling of the necessary tasks between the worker, which reduces waiting time.

For line balancing we have to focus some data & information, those are given below:

1. Number of Operation
2. Operation name
3. Operation S.M.V

In that following operation breakdown sheet we can see that there is 15 operation but 25 operator. Because, in that 15 operation they used 25 workers for line balancing.

For example-We saw there for moon joint S.M.V was 0.491 &for 1st shoulder join S.M.V was 0.20. That's why for moon joint 2 operators works there for balance

theirwork with the next operation 1st shoulder join. So, for that reason they got better production & also save their time easily.

3.9 Line balancing table:

Number of Operation:	Operation name:	Machine name:
01	**Care label make+ Moon joint**	**4TOL**
02	**Sleeve hem**	**3TFL**
	Sleeve hem	
03	**Moon attach**	**Auto**
	Moon attach	
	Moon attach	
04	**1st shoulder joint**	**4TOL**
05	**Main label attach**	**Auto**
06	**Neck binding**	**3TFL**
	Neck binding	
07	**Back tape join**	**DNL**
08	**Back tape end stitch open & cut**	**Auto**
09	**Back top tack**	**Auto**
10	**2nd shoulder join**	**4TOL**
11	**Sleeve join**	**4TOL**
	Sleeve join	
12	**Side seam**	**4TOL**
	Side seam	
	Side seam	
13	**Bottom hem**	**3TFL**
	Bottom hem	
14	**Loop join then tack**	**Auto**
	Loop join then tack	
15	**Neck+ Sleeve+ Bottom tack**	**Auto**
	Neck+ Sleeve+ Bottom	

Table 3.4: Line Balancing

3.10 Production, Productivity & Non-Productivity:

3.10.1 Production:

After sewing all garments are known as product, which fulfill their requirement or not doesn't matter. All are called their product.

3.10.2Productivity:

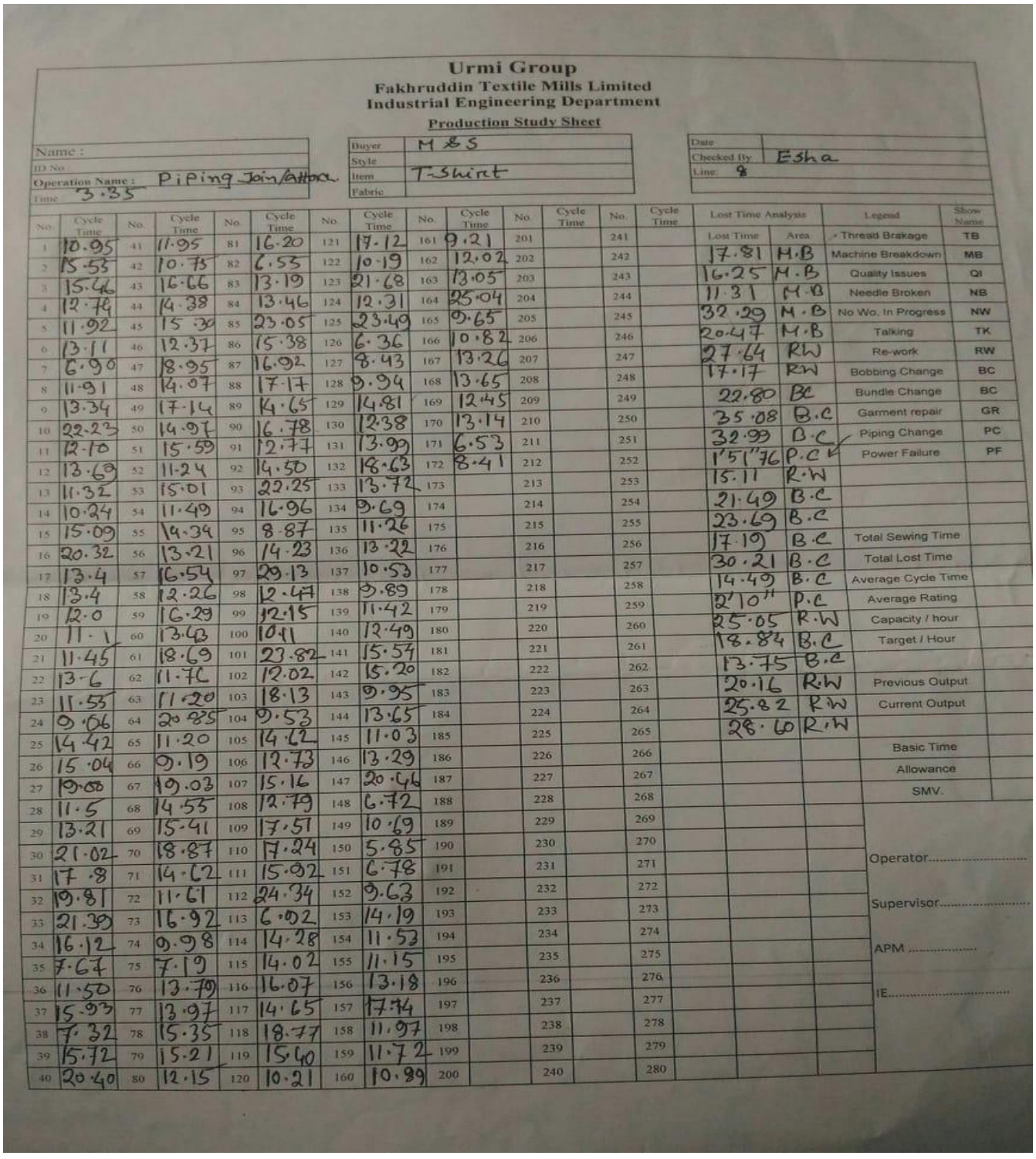
After sewing which garments are fulfill all the requirement only those garments are known as productivity. In productivity there 1st objective is fulfill their all requirement & these product have to pass their QC board.

3.10.3 Non- Productivity:

After sewing which garments are not fulfill all the requirement only those garments are known as non-productivity. In non- productivity there 1st objective is breaktheir at least one requirement & these product have not pass their QC board.

If those non-productivity products are possible to rectify then those will be product after rectify but if any rectify is not possible there then those product are permanently convert into non-productivity.

3.11 Production Study Sheet for a specific operation of a t-shirt with loss time:



Urmi Group
Fakhruddin Textile Mills Limited
Industrial Engineering Department
Production Study Sheet

Name :
ID No :
Operation Name : Piping Join/Attach
Time 3.35

Buyer M&S
Style
Item T-Shirt
Fabric

Date
Checked By Esha
Line 8

No	Cycle Time	No	Cycle Time	No	Cycle Time	No	Cycle Time	No	Cycle Time	No	Cycle Time	No	Cycle Time
1	10.95	41	11.95	81	16.20	121	17.12	161	9.21	201		241	
2	15.53	42	10.75	82	6.55	122	10.19	162	12.02	202		242	
3	15.46	43	16.66	83	13.19	123	21.68	163	13.05	203		243	
4	12.74	44	14.38	84	13.46	124	12.31	164	25.04	204		244	
5	11.92	45	15.30	85	23.05	125	23.49	165	9.65	205		245	
6	13.11	46	12.37	86	15.38	126	6.36	166	10.82	206		246	
7	6.90	47	18.95	87	16.92	127	8.43	167	13.26	207		247	
8	11.91	48	14.07	88	17.17	128	9.94	168	13.65	208		248	
9	13.34	49	17.14	89	14.65	129	14.81	169	12.45	209		249	
10	22.23	50	14.97	90	16.78	130	12.38	170	13.14	210		250	
11	12.10	51	15.59	91	12.77	131	13.99	171	6.53	211		251	
12	13.69	52	11.24	92	14.50	132	18.63	172	8.41	212		252	
13	11.32	53	15.01	93	22.25	133	13.72	173		213		253	
14	10.24	54	11.49	94	16.96	134	9.69	174		214		254	
15	15.09	55	14.34	95	8.87	135	11.26	175		215		255	
16	20.32	56	13.21	96	14.23	136	13.22	176		216		256	
17	13.4	57	16.54	97	29.13	137	10.53	177		217		257	
18	13.4	58	12.26	98	12.47	138	9.89	178		218		258	
19	12.0	59	16.29	99	12.15	139	11.42	179		219		259	
20	11.1	60	13.43	100	10.11	140	12.49	180		220		260	
21	11.45	61	18.69	101	23.82	141	15.54	181		221		261	
22	13.6	62	11.76	102	12.02	142	15.20	182		222		262	
23	11.55	63	11.20	103	18.13	143	9.95	183		223		263	
24	9.06	64	20.85	104	9.53	144	13.65	184		224		264	
25	14.42	65	11.20	105	14.62	145	11.03	185		225		265	
26	15.04	66	9.19	106	12.73	146	13.29	186		226		266	
27	19.00	67	19.03	107	15.16	147	20.46	187		227		267	
28	11.5	68	14.55	108	12.79	148	6.72	188		228		268	
29	13.21	69	15.41	109	17.51	149	10.69	189		229		269	
30	21.02	70	18.87	110	17.24	150	5.85	190		230		270	
31	17.8	71	14.62	111	15.02	151	6.78	191		231		271	
32	19.81	72	11.61	112	24.34	152	9.63	192		232		272	
33	21.39	73	16.92	113	6.02	153	14.19	193		233		273	
34	16.12	74	9.98	114	14.28	154	11.53	194		234		274	
35	7.67	75	7.19	115	14.02	155	11.15	195		235		275	
36	11.50	76	13.79	116	16.07	156	13.18	196		236		276	
37	15.93	77	13.97	117	14.65	157	17.74	197		237		277	
38	7.32	78	15.35	118	18.77	158	11.97	198		238		278	
39	15.72	79	15.21	119	15.40	159	11.72	199		239		279	
40	20.40	80	12.15	120	10.21	160	10.89	200		240		280	

Lost Time Analysis	
Lost Time	Area
17.81	M.B
16.25	M.B
11.31	M.B
32.29	M.B
20.47	M.B
27.64	RW
17.17	RW
22.80	BC
35.08	B.C
32.99	B.C
1'51"76	P.C
15.11	R.W
21.49	B.C
23.69	B.C
17.19	B.C
30.21	B.C
14.49	B.C
2'10"	P.C
25.05	R.W
18.84	B.C
13.75	B.C
20.16	R.W
25.82	R.W
28.60	R.W

Legend	Show Name
Thread Brakage	TB
Machine Breakdown	MB
Quality Issues	QI
Needle Broken	NB
No Wo. In Progress	NW
Talking	TK
Re-work	RW
Bobbing Change	BC
Bundle Change	BC
Garment repair	GR
Piping Change	PC
Power Failure	PF
Total Sewing Time	
Total Lost Time	
Average Cycle Time	
Average Rating	
Capacity / hour	
Target / Hour	
Previous Output	
Current Output	
Basic Time	
Allowance	
SMV.	

Operator.....
Supervisor.....
APM .....
IE.....

Table 3.5: Production study with loss time

3.12 Production Study sheet for a specific operation with loss time in word as example for understand:

Buyer: M&S
Item: T-shirt
Operation name: Piping joint
Line: 08
Checked by: Esha

Cycle time:	Lose time area:	Lose time:
10.95sec	Machine breakdown	17.81sec
15.55sec		16.25sec
15.46sec		11.31sec
12.74sec		32.29sec
11.92sec	Re-work	27.64sec
13.11sec		17.17sec
6.90sec		15.11sec
11.91sec		25.05sec
13.34sec		20.16sec
22.23sec		25.82sec
12.10sec	Bundle change	22.80sec
13.69sec		35.08sec
11.32sec		32.99sec
10.24sec		21.49sec
15.09sec		23.63sec
20.32sec		17.19sec
13.4sec		30.21sec
13.4sec		14.49sec
12.0sec		18.84sec
11.1sec	Piping change	1 min 51sec
11.45sec		2 min 10sec

Table 3.6: Production study with loss time in word

When we prepared this production study sheet in that time we took 172cycle times. For 172 cycle time we got those types to loss time. But here in word we show 21cycle time as example for understand.

3.13Calculation:

Target Hourly = 60/ S.M.V

Hourly Line Target=60 * No. of Worker / Total S.M.V

Line Daily Target= 60 * No. of worker * Working hr / Total S.M.V

3.14Calculation process of each operation of a garment:

Here, given a specific operation calculation for example:

Sleeve hem:

Basic Time = Rating * Observation / 100
=90* 8.318 / 100
= 7.48 sec

S.M.V = Basic Time + (Basic Time Allowance)
= 7.48 + (7.48* 15/100)
= 8.602/60
=0.14

Target = Manpower * working hr * 60 / S.M.V
= 1*1 *60 / 0.14
= 428 PCS

3.15 Calculation Process of per line:

Total line S.M.V = 5.293 (Calculate individual operator S.M.V then calculate the average)
Total Man Power = 25
Line Target Per hr. = Total man power * Total working hr * 60 / Total S.M.V
=25 * 1* 60 /5.239
= 286pcs
100% Line Target per day = 25 * 8 * 60 / 5.239
= 2290pcs
Produced minute = Production * S.M.V
=1832 * 5.239

=9597.848

Spent minute = Man power * Working hr

=25 * 8

=200

So, Efficiency%= Produced minute / Spent minute

= 48 %

3.16Bellow analysis is subjected to following assumptions:

1.	**No. Of workers (Operator and Helper)**	**25**
2.	**Efficiency**	**48%**
3.	**No Of Working Hours**	**8**
4.	**Total garments S.M.V**	**5.239**

Day Line Target = 2290pcs

Target Per Hour = 286pcs

3.17EfficiencyCalculation:

Here,

Work hour =8

SMV = 5.239

Manpower = 25

Output = 1820pcs.

Line Efficiency % = production per day * S.M.V / Manpower * W/H * 60

= 0.7998 * 100

= 80%

4. Result and discussion

4.1. Operation breakdown

4.1.1. Result:

In this thesis we collect all kind of data for our experiment. In the floor our working line number was 7(A). And there was 15 operations.

4.1.2. Discussion:

Here the product is long ladies t-shirt and it is a normal process that's why operation breakdown is not more high. In the other product like pant, trouser, joggers, ladies tang-top etc. here operation breakdown is higher than long ladies t-shirt, because those are critical process.

4.2. Manpower:

4.2.1. Result:

Manpower is 25 with helper and in this line input was 2288 pieces per day (8 hours) and output was 1832 pieces per day (8 hours).

4.2.2. Discussion:

There are some unskilled operator and helper, that's why line efficiency was decrease and they did not complete their target. And there also some machinery problems are exist that's the others reason for not achieve their target properly.

4.3. Required Machine:

4.3.1. Result:

Total number of machine = 21

From line balancing we have seen that they used 21 machines

4.3.2 Machine Types:

Name Of Machine	Number of Machine
Auto	**12**
Double needle lock stitch	**1**
Flat lock (3 thread)	**4**
Over lock (4 thread)	**6**

Table 4.1: Types of Machine

4.4. Time Study:

4.4.1. Result:

By using stopwatch we took cycle time then calculated its average. After adding rating we got basic time. Then with basic we add allowance (15%) then we got 5.239 SMV.

Then we calculated Total line target = 286 pcs/hr & Total line target = 2288 pcs/day(for 100% target) &
1832 pcs for 80% target.

And we also calculated the line efficiency = 48%

4.4.2 Discussion:

The SMV of long ladies t-shirt is 5.293 that mean the lines take 5.293 minutes to complete a full garment.

Their target 286 pcs per hr &2288 pcs per day. But they achieve almost 80% target which was 1832 pcs per day.

Their productivity was 97% & non-productivity was 1% and rectify product was 2% per day.

4.5 Line target:

4.5.1 Result:

By considering 80% target and SMV= 5.239the line target was almost 230pieces per hour and 1832 pieces per day.

4.5.2 Discussion:

From the line we collect data, here line efficiency as 48% then we calculated target in actual line efficiency and we got the target very low than their productivity. But we saw the production was 1832 pieces per day.

4.6Production capacity:

4.6.1 Result:

Production capacity per day 1832 pieces (8 hour duty without lunch). Here working hour is 8 but when shipment date is knocking the door and the shipment target are not completed they extend 2 hours overtime and then working hours will 10.

5. CONCLUSION

5.1 CONCLUSION:

Industrial engineering is now most important and essential part of any apparel industry. By doing this experiment we learn many procedure and important thing about Industrial engineering. We found many problems in Industrial engineering, by doing this experiment we also know how to solve problems and how to arrange all the work of Industrial Engineering. Before IE there was many problems in garment industry such as production capacity, daily line target capacity, layout, delivery problem. After this experiment we find out this calculation, the standard minute value (SMV) = 5.239, in additional to that we have calculated the target= 2288pcs, efficiency = 48%, man power = 25, capacity = 1832. After IE and planning there is implementation in line balancing, daily line target, production capacity increase. Additionally gives us a chance to extend our insight into material organization, generation arranging, acquisition framework, creation process, and apparatuses and encourage us to modify with the modern life.