Faculty of Engineering

Department of Textile Engineering

REPORT ON

"Study on Industrial Engineering in Woven garments production"

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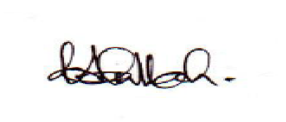
This Report Presented in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science in Textile Engineering.

Advance in Apparel Manufacturing
Duration Time: 18 January to 18 March 2020

LETTER OF APPROVAL

This research allowed ‘Study on Industrial Engineering on Woven Garments’ is prepared and submitted by **Md. Sazzad Hossain(ID:172-23-5057)** 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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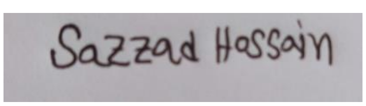
DECLARATION

We hereby declare that the work which is being presented in this thesis entitled, "**Study on Industrial Engineering in Woven Garments production"** is original work of our 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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We would like to thanks the management of the “**AL-MUSLIM GROUP LIMITED**”, for giving us the opportunity to perform the thesis successfully.

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DEDICATION

We dedicate this report to our Parents who give us chance to study in Textile Engineering and support us all time

Specially dedicate this report to our teachers and all the people who have helped us to complete this report.

ABSTRACT

This project is on "Study on Industrial Engineering in Woven 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, low flexibility of style change over etc. These problems were addressed in this study by the using of Industrial Engineering. This paper introduces the various concepts utilizing method, time, limit and production study, it is conceivable to enhance productivity while reducing 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) = 23.44, in additional to that we have calculated the target= 1536 pcs, pitch time= 0.46, upper control limit=0.61, lower control limit= 0.31, efficiency= 100%, manpower = 60, capacity = 1077 pcs, labor productivity. In this paper we discussed about sleeve less ladies tops measurement sheet, layout plan, and the operation breakdown, SMV calculation for each operation, Target calculation for each operation, pitch time, upper control limit, lower control limit, efficiency, process wise capacity has been calculated, and others tools and techniques which consist of different experimental details, experimental result and discussion

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CHAPTER-1: INTRODUCTION

1.1. Aim of the Report:

For a Garments industry, efficiency is more essential to sales. A proper consumption of machine, manpower and system is very much required for this. Proper use of raw material by waste reduction can be more efficient for a garment industry. Reduce the lead time and the time wasted. Good use of time will bring a lot of benefit for a garment industry. The team of industrial engineers will make a lot of.

1.2. Objectives of the Study:

The objective of this report is specific; we have work with some objectives. These are:

1. To gets some answers concerning proper quality organization structure .
2. Applying specific response for clear or diminishing deformation.
3. To know the purposes behind string distortions and its fixes.
4. To design new methodology for quality control.

1.3. Importance & Scope:

1. To know about the changed method and performance & how its work to growth the production of Garment Industry.
2. To know about the activities of industrial engineer department in the garments sector.
3. To know the impact of industrial engineer department on the production. To know Productivity, Capacity, Efficiency gained by applies method.

1.4. Limitations of the study:

- Limitation of time to research this topic.
- Limitation of primary data sources.
- Input and output problem.
- Changing the style and arrangement.

CHAPTER – 2: LITERATURE REVIEW

2.1 Industrial Engineer:

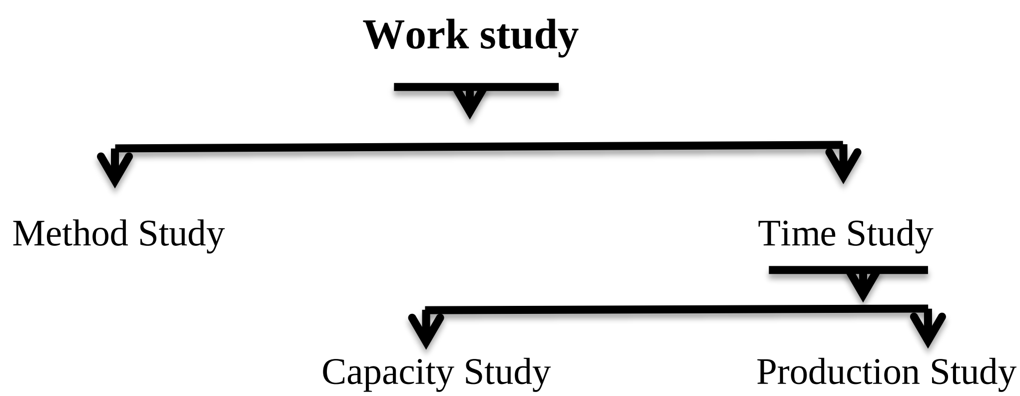
The main function of this department is to re- engineering the garment from the sampling stage so that it would be production friendly for the production as well helps to increase the productivity through machine layout, time and motion study.
In the sewn products industries we must continually ensure that we remain competitive and profitable whilst also striving to improve our personal and community's standard of living.

Productivity improvements may be achieved through.

2.2 Steps of Work Study:

Work study is the main part of Industrial Engineering. Work study divided into two parts

1. Method study
2. Time study



2.2.1 Method Study:

Method study is a process which is works to systematic, critical to make works more effective. It is the main key to achieving productivity improvement. Method study is mainly used to finding better ways of doing work and for cost reduction.

2.2.1.1. Procedure involved in Method Study:

Generally eight steps consist on Method study. Which are following:

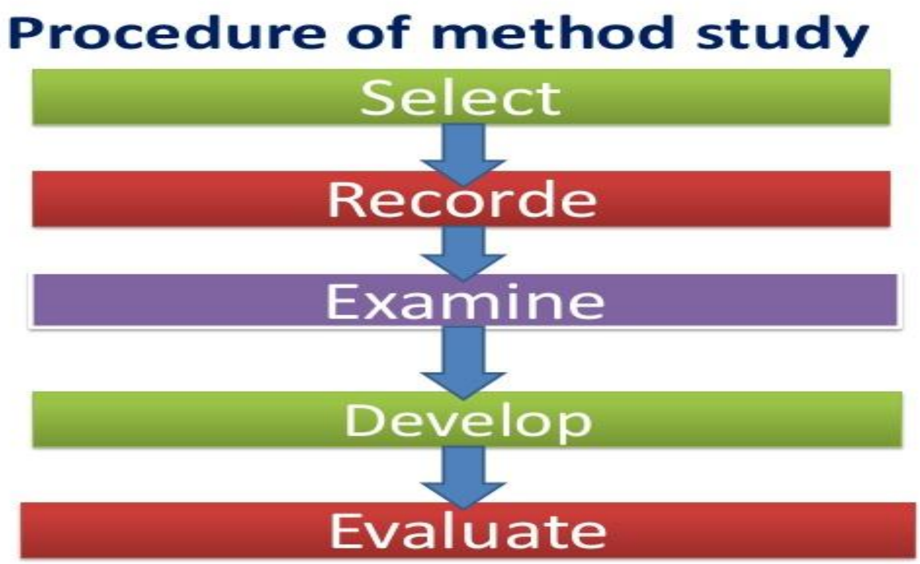


Figure 2.1: Method Study

1. **Select:** work which is target to study for economic advantages. It is the first step, when any idea is conceived for orientation
2. **Record:** mention all facts about that work or operation. Collect some additional data as needed from appropriate sources. Here, a clear and precise record is necessary to be effective method study.
3. **Examine:** change or combine or eliminate the operation critically. Which job is being performed, apply those place sequence and methods of performance.
4. **Develop:** record the improved method for reexamine for best method.
5. **Evaluate :** evaluate different alternative methods to developing a new improved method, which is compairisonly cost-effectiveness

2.2.1.2. Advantages of Work Study:

1. It helps to achieve smooth production flow
2. It helps to reduce the cost of product by eliminating wastages and unnecessary operations
3. It helps to make better workplace layout

4. It helps to establish the standard time for an operation

5. It reduce rejections and utilizing resources of an organization

6. It meets the delivery commitment

2.2.2. Time Study:

Time study is a work measurement technique for recording the times and rates of working foe specified job which carried out under specified conditions and for analyzing the data to obtain the time.

2.2.2.1. Steps for Time Study:

1. Observe the job to determine the element and analysis
2. Rate each element to compare with accepted standard
3. Use the stopwatch to time each element
4. Average the selected time
5. Add basic time for all the element
6. Add allowances

2.2.3. Capacity Study:

It is actually shows the capability of any operator. Achieving the performance of any operator measured by the study. The main aim of capacity study is to motivate operator and to measure the productions. Supervisors can determine the overall capacity of their section.

2.2.3.1. Procedure of a Capacity Study:

1. Use a stop watch to collect time cycle
2. Measure the time study
3. Average the time cycle

2.2.3.2. Benefits of a Capacity Study:

1. Check targets for any operator
2. Motivate operator based on their capacity

3. Measure section production capability against on the target

2.3. Roles of Industrial Engineering in Garments Industry:

- Safety
- Line Balancing
- Quality & operation control
- Training- how to train a operator
- Operator output- maintains high output and improves abilities of low capacity operators
- Waste control- materials, supplies and machines

2.4. Responsibilities and duties of an Industrial Engineering:

- Method study
- Time study
- Production study
- Follow up study
- Bundle system follow up
- Removing Bottle neck process
- List out low efficiency operators and monitoring how to improve them
- Measuring line lost time due to various reasons in floor
- Balancing line according to capacity graph
- Monitoring and balancing WIP (Works In Processing) in line
- Helping supervisors in line balancing when high absenteeism of operator is occurred

2.5. Some important formula using by Industrial Engineer:

2.5.1. Observed Time:

If we divided the Total production time by how many pieces produced in that time, then we found observed time.

Observed time = $\frac{\text{Total Time}}{\text{pcs}}$

2.5.2. Basic Time:

If we mutinying Rating with Observed time, then we found Basic Time.

Basic Time = Observed Time × Rating

2.5.3. Target:

If we divided (mutinying of machine operator, working hour, and efficiency) with SMV, then we found Line Target

Target = $\frac{\text{Machine Operator} \times \text{Working hour} \times 60 \times \text{efficiency\%}}{\text{SMV}}$

2.5.4. Standard Allocated Hour (SAH):

If we divided multiline of Total output of a line and SMV with 60, then we found SAH

SAH = $\frac{\text{SMV} \times \text{Output pcs}}{60}$

2.5.5 Line efficiency:

If we divided SAH with Working hour, then we found in efficiency

Line Efficiency = $\frac{\text{SAH}}{\text{Work Hour}}$

Or,

If we divided (mutating of total output and SMV) with (mutating of manpower and working hour), then we found line efficiency.

Line efficiency = $\frac{\text{Total Output} \times \text{SMV}}{\text{Manpower} \times \text{Working hour}}$

2.5.6 Lost time:

If we minus working time from produced time, then we found Lost time

Lost time = Produced time – Working time

2.6: Some important terms which are works by Industrial Engineers:

2.6.1: Working Field of IE:

Figure 2.2: Working Field of IE

2.6.2: Line Balancing:

Balancing a line is reducing operator's loss time. It is important for increase production. A balanced line produced more products with smoothly. At the time of line setting, select skill operators for the operation matching operator skill history. Following this method, select high skilled operators for higher work content operations. Once line is set conduct capacity study at a regular interval. Use capacity graph to find bottlenecks inside the line. Then it is need to control WIP in the line. Once start increasing operator utilization through line balancing and then it is easy to get extra pieces from the same resources in defined time. Higher productivity brings higher profit in a business. And increments in Productivity level decreases garment manufacturing cost and make much profit.

2.6.3: Capacity Study:

Capacity study is a process, by which get capacity of operators in a line. Here 5 or 10 cycle time record and calculated capacity and actual capacity for each operator in a single process. stopwatch is used to record 5 or 10 cycle time. By this method create capacity graph. And easily select the weak operators who have unsuccessful to give required efficiency.

2.6.4: Production Study:

Production study is needed to improve any operator, who failed to give his/her required production. Here half an hour time count. Before that, if any method needs to apply then it should be applied. Then selected the time, and count the cycle time for per piece production. And in half an hour, how much piece produced. Then the selected time is divided by total amount. Then calculate SMV and Target per hour.

2.6.5: Line layout set up:

Before any production, it is essential job for an industrial engineer to set up layout for that product produce procedure. For this, how many machine required and how many manpower needed for that layout is fixed by an industrial engineer. A perfect Layout can give about fifty percent successful and quality product.

2.6.6: Thread consumption:

Another important term for a continuous production is consumed amount of thread and other necessary accessory is need for produced that amount of ordered product. This is monitoring and fixed by an industrial engineer.

2.6.7: Zero feeding:

If the next style feeds on the line, when the last piece of running style passes the 1st method. Then it called feeding to zero. Zero feeding is an essential item of Industrial Engineer's duty. If zero feeding can be achieved then a good output can be produced. Even zero feeding process doesn't waste output time.

2.6.8 Follow up:

It means to check procedure and stays with something until targeted result not achieved.

Benefits of Operator follow ups:

- Improve performance
- Prove job quotas
- Spot troubles

2.6.9 Control WIP:

Semi-finished or finished goods which transported from one work station to another are called Work in process.

WIP is needed to be control. Because,

- Low inventory between operations, garments have less waiting time
- Production cycle in less time
- Put time permits can be better co-ordinations between both sales and productions
- Clients are looking for those factories that can meet production schedules and handle multiple styles

We can manage WIP by,

1. Production planning
2. Trims control
3. Production build-up
4. Balancing
5. Cut flow control

CHAPTER -3: METHODOLOGY

3.1. Data Collection:

We collect our experiment data from different section of a woven garment factory.

Frist we collect data from Industrial engineering section then we collect data from merchandising section and sample section. We also collect data from line where we work our research. And we get information from production manager.

3.2. Product information:

Buyer: C&A

Item: BASIC 5 PKT SHORT

Style: 2089119

Total no of machine: 55

Total no of operation: 51

Total no of operator: 60

Total SMV: 23.44

Target: 1536 pcs

Capacity: 1077 pcs

3.2.1 Product Sketch:

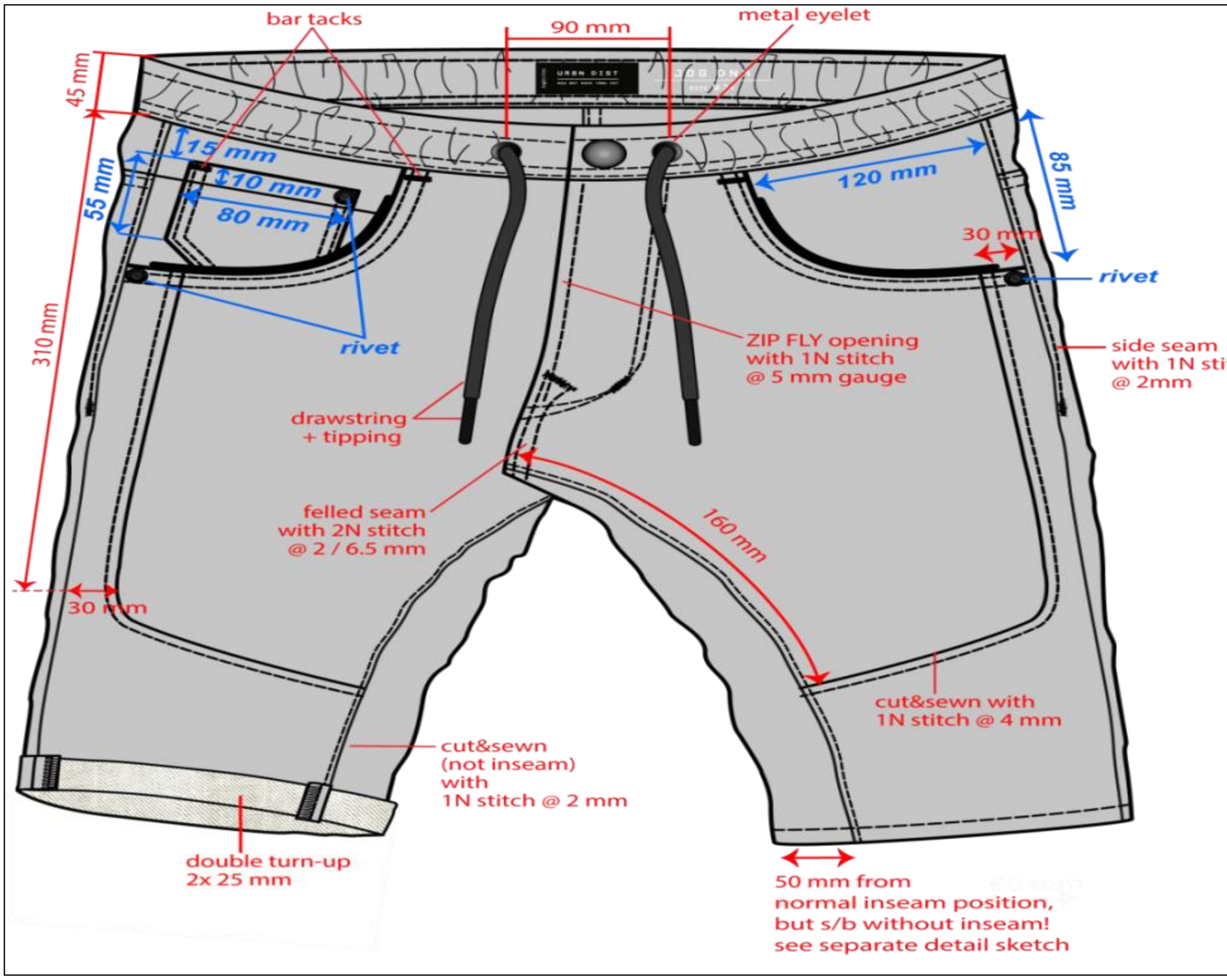


Fig 3.1. : Product Sketch

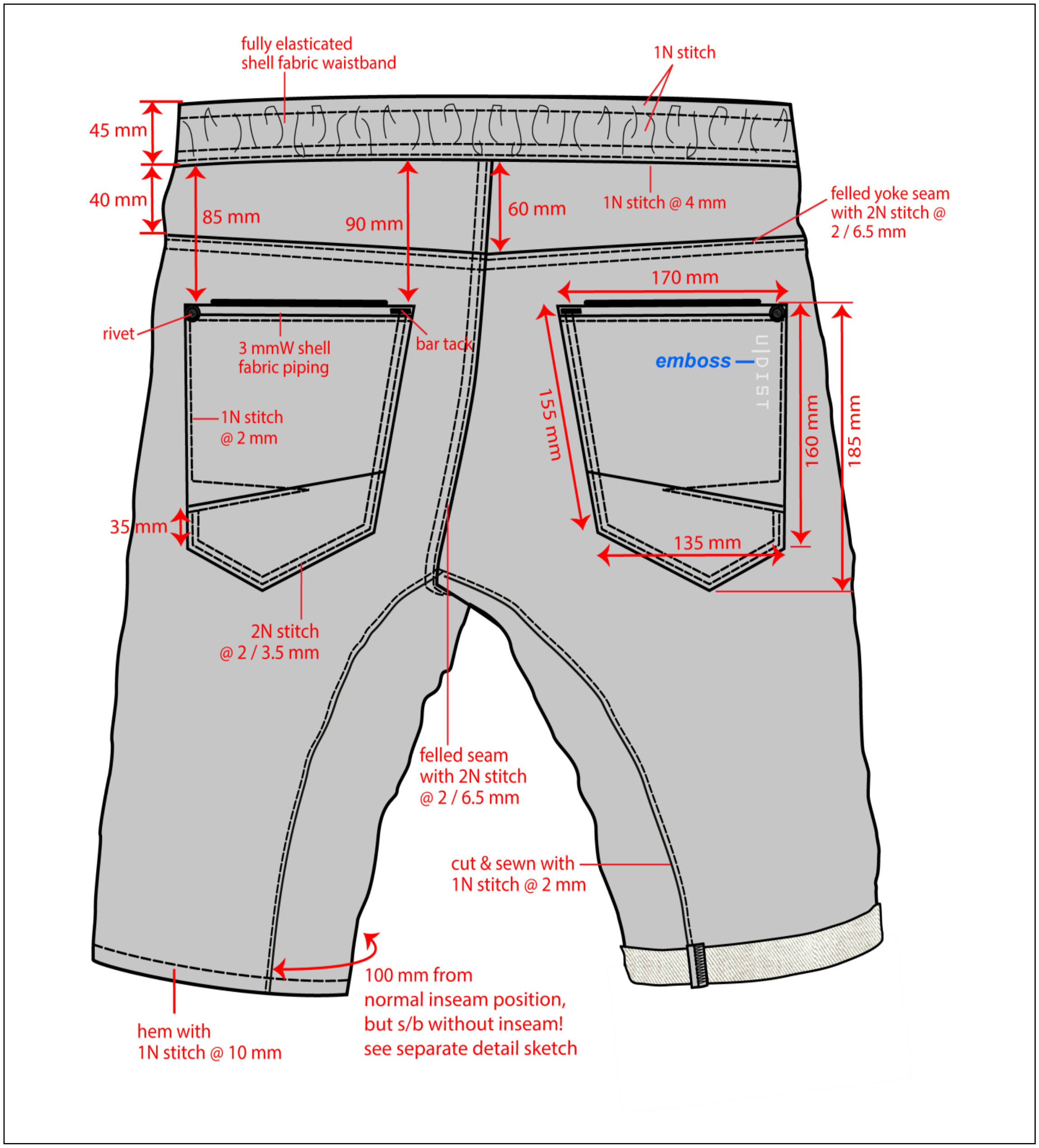


Fig 3.2: Product Sketch

3.3. Measurement Sheet:

POM #	Name	32	33	34	35	36	38	40	44	48
H1	1/2 Waist extended	39.50	40.80	**42.00**	43.20	44.50	47.00	49.50	54.50	59.50
H02	1/2 Waist Extended at Top Edge	47.50	48.80	**50.00**	51.20	52.50	55.00	57.50	62.50	67.50
dist.H11	Low Hip Height from Top Edge @ Side	22.50	22.80	**23.00**	23.20	23.50	24.00	24.50	25.50	26.50
H11	1/2 Low Hip	50.50	51.80	**53.00**	54.20	55.50	58.00	60.50	65.50	70.50
J1	1/2 Thigh	30.00	30.80	**31.50**	32.20	33.00	34.50	36.00	39.00	42.00
J3	Inseam	35.00	35.00	**35.00**	35.00	35.00	35.00	35.00	35.00	35.00
J06e	1/2 Leg Opening Short above knee	23.20	23.60	**24.00**	24.40	24.80	25.60	26.40	28.00	29.60
I2	Front Rise from Top Edge	27.20	27.60	**28.00**	28.40	28.80	29.60	30.40	32.00	33.60
I4	Back Rise from Top Edge	41.00	41.50	**42.00**	42.60	43.20	44.40	45.60	48.60	51.60
L1	Fly Opening up to bartack	12.50	12.80	**13.00**	13.20	13.50	14.00	14.50	15.50	16.50
H7	Waistband Height	5.00	5.00	**5.00**	5.00	5.00	5.00	5.00	5.00	5.00
K15	Pocket Opening at Waistseam	11.00	12.00	**12.00**	12.00	12.00	12.50	12.50	13.00	13.50
K16	Pocket Opening at Sideseam	8.50	9.00	**9.00**	9.00	9.00	9.50	9.50	10.00	10.50
K15a	Coin Pocket Opening at Waistseam	8.00	8.50	**8.50**	8.50	8.50	8.50	8.50	8.50	9.00
K7a	Patch Pocket Width	16.00	17.00	**17.00**	17.00	17.00	18.00	18.00	18.00	18.50
K7	Patch Pocket Length	18.00	19.00	**19.00**	19.00	19.00	20.00	20.00	20.00	20.50
K4	Back Pocket Placement from Centre Back	4.50	5.00	**5.00**	5.00	5.50	6.00	6.50	7.50	8.00
K17	Pocket Placement Below Waistband Inside	9.50	9.50	**9.50**	9.50	9.50	10.00	10.00	10.50	11.00
K18	Pocket Placement Below Waistband – Outside	9.00	9.00	**9.00**	9.00	9.00	9.50	9.50	10.00	10.50
K13	Back Yoke Height(Centre Back)below Waistband	6.50	6.50	**6.50**	6.50	6.50	7.00	7.00	7.50	8.00

Fig 3.3: Measurement Sheet

3.4. Operation Breakdown:

3.4.1. Operation Breakdown procedure:

APM, Technician Chief & Work-Study officer must sit together to make breakdown. Technician breaks the garments into parts and gathered the parts one after another by operation/Process. Then Work-Study officer & APM fix up the SMV of that operation by preceding this technique when all process completed need to summarize all process SMV and the total will be called as respective garment's SMV.

3.4.2. Operation Breakdown Chart:

Operation Breakdown table consists of operation name and machine name:

SL No	Operation	M/C
1	Big facing panel sewing use cut mark	S/N
2	D-fly tack & turnover	S/N
3	Coin pct. join to big facing with mark	ANG
4	Big & small facing joint to pkting	COVER STC
5	Front panel close	5 O/L
6	Front panel top stc	S/N
7	Front pct. bag close	S/N(E/C)
8	Front pct. ¼ top stc	S/N
9	Front pct. joint to body	S/N(E/N)
10	Front pct. mouth rolling	D/N
11	Front pct. side &waist tack	S/N
12	Front rises/fly, D/fly, edge O/L with loop tack	4 O/L
13	S/fly joint & top stc with zipper joint	S/N
14	J round stc with mark	S/N
15	D/fly joint top stc with 2nd stc	S/N
16	Front part side edge o/l	4 O/L
17	Front pct. back wash tack	S/N
18	Press bk & coin pct. mouth facing	IRON
19	Bk & coin pct. mouth facing joint	5 O/L
20	Bk pct. mouth facing top stc	CHAIN STC
21	Bk pct. middle panel close with dart mark	S/N
22	Bk pct. middle dart top stc	S/N
23	Bk pct. & coin pct. side edge o/l	3 O/L
24	Press Bk & coin pct.	IRON
25	Bk yoke joint to body	CHAIN STC
26	Inseam panel close	5 O/L
27	Inseam panel top stc	FOA
28	Set front & bk part	Helper
29	Inseam close	5 O/L

30	Inseam top stc	FOA
31	Front to bk rise joint	FOA
32	Front rise diamond make	S/N
33	Bk pct. joint to body with pattern	S/N
34	Bk pkt ¼ top stc	S/N
35	Bk part side edge o/l	4 O/L
36	Side seam close	CHAIN STC
37	Side seam card stc	S/N
38	Care & main, Size label make & joint	S/N
39	Waist psn sharing	CHAIN STC
40	Elastic mark, cut & supporting join	S/N
41	Waist belt two part tack	S/N
42	Brand label join to waist belt with mark	S/N
43	Elastic false tack to waist belt	S/N
44	Waist belt mark & set to body with yoke psn mark	Helper
45	Waist belt joint to body	K/S
46	Waist belt psn ounch 2 nos	PUNCH
47	Btn attach on waist belt	S/B
48	Mouth close Btm with ¼ top stc	S/N
49	Mouth close Top with ¼ top stc	S/N
50	Btm rolling	S/N
51	Gmts Btk	BTK

Table 3.1: Operation Bulletin

3.5. Actual SMV in Line:

Sl. No	Operation	Guide	SAM
1	Big facing panel sewing use cut mark	PLAIN FEED	0.15
2	D-fly tack & turnover	PLAIN FEED	0.24
3	Coin pkt join to big facing with mark	CR-1/4	0.45
4	Big & small facing joint to pkting	PLAIN FEED	0.70
5	Front panel close	PLAIN FEED	0.80
6	Front panel top stc	CR-1/4	0.70
7	Front pkt bag close	PLAIN FEED	0.40
8	Front pkt ¼ top stc	CR-1/16	0.45
9	Front pkt joint to body	PLAIN FEED	0.40
10	Front pkt mouth rolling	CR-1/4	0.40
11	Front pkt side & waist tack	PLAIN FEED	0.40

12	Front rise, S/fly, D/fly edge O/L with loop tack	PLAIN FEED	0.45
13	S/fly joint & top stc with zipper join	CR-1/16	0.40
14	J round stc with mark	PLAIN FEED	0.50
15	D/fly joint top stc with 2nd stc	CR-1/16	0.45
16	Front part side edge O/L	PLAIN FEED	0.30
17	Front pct. bag wash tack	PLAIN FEED	0.24
18	Press bk & coin pct. mouth facing	*	0.40
19	Bk & coin pct. mouth facing join	PLAIN FEED	0.45
20	Bk pct. mouth facing top stc	CL-1/16	0.30
21	Bk pct. middle panel close with dart mark	PLAIN FEED	0.45
22	Bk pct. middle dart top stc	CL-1/16	0.40
23	Bk pct. & coin pct. side edge O/L	PLAIN FEED	0.45
24	Press Bk & coin pct.	*	0.45
25	Bk yoke joint to body	CR-1/4	0.35
26	Inseam panel close	PLAIN FEED	0.45
27	Inseam panel top stc	CL-1/16	0.40
28	Set front & bk part	*	0.40
29	Inseam close	PLAIN FEED	0.45
30	Inseam top stc	CL-1/16	0.40
31	Front to Bk rise close	FOLDER	0.45
32	Front rise diamond make	PLAIN FEED	0.30
33	Bk pct. joint to body with pattern	CR-1/16	0.80
34	Bk pct. ¼ top stc	PLAIN FEED	0.75
35	Bk part side edge O/L	PLAIN FEED	0.30
36	Side seam close	PLAIN FEED	0.60
37	Side seam card stc	CR-1/16	0.50
38	Care & main, size label make & join	PLAIN FEED	0.45
39	Waist psn sharing	PLAIN FEED	0.30
40	Elastic mark, cut & supporting join	PLAIN FEED	0.45
41	Waist belt two part tack	PLAIN FEED	0.60
42	Brand label join to waist belt with mark	PLAIN FEED	0.40
43	Elastic false tack to waist belt	PLAIN FEED	0.60
44	Waist belt mark & set to body with yoke psn mark	*	0.70
45	Waist belt joint to body	FOLDER	0.80
46	Waist belt psn punch 2nos	*	0.16
47	Btn attach on waist belt	*	0.20
48	Mouth close Btm with ¼ top stc	CL-1/16	0.80
49	Mouth close Top with ¼ top stc	CR-1/16	0.60
50	Btm rolling	CL-1/16	0.50
51	Gmts Btk(10Nos)	*	0.40

	TOTAL		23.44

Table 3.2: Actual SMV in Line

3.6 Calculation:

Target Hourly=$\frac{60}{SMV}$

Hourly Line Target= $\frac{60\times No\ of\ worker}{Total\ GMT\ SMV}$

Line Daily Target=$\frac{60\times No\ of\ worker\times W/H}{Total\ GMT\ SMV}$

3.6.1. Bellow analysis is subjected to following suppositions:

1	No. Of workers (Operator & Helper)	60
2	Factory Efficiency	100%
3	No of working Hours	10
4	Total GMT SMV	23.44

Day Line Target=$\frac{60\times No\ of\ worker\times W/H}{Total\ GMT\ SMV}$

=$\frac{60\times 60\times 10}{23.44}$×100%

=1536 pcs

Pcs day Target= 1536 pcs

Target per hour= 154 pcs

3.7 Basic Pitch Time Calculation:

Here,

No of operation=51

Total SMV=23.44

So,

Pitch Time= $\frac{Total\ GMT\ SMV}{No.of\ operation}$

$= \frac{23.44}{51}$

=0.46

Upper Control Limit= $\frac{Pitch\ Time}{Expected\ Efficiency}$

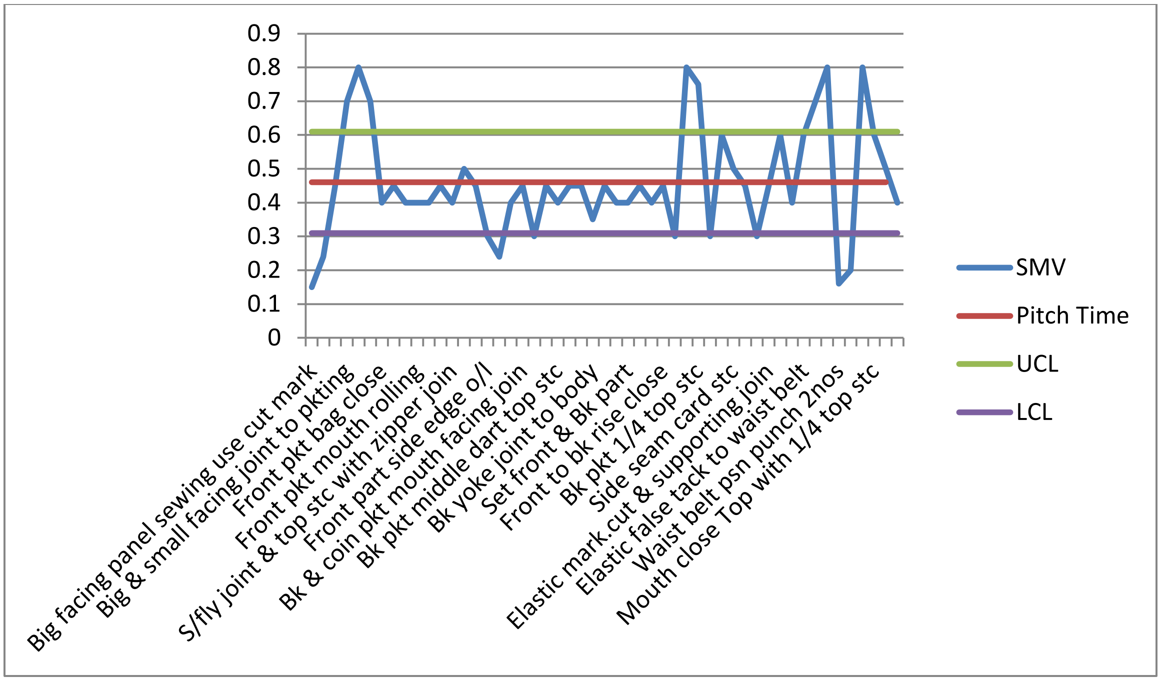
$= \frac{0.46}{75\%}$

=0.61

Lower Control Limit= (2×Pitch Time)- UCL

= (2×0.46) – 0.61

= 0.31



Graph Fig 3.1: Pitch Time

3.8 Layout Plan:

This layout plan is based on the standard operation breakdown & its prepared by using "Standard Group" own ERP software.

Operation	Machines	Guide
Big facing panel sewing use cut mark	S/N	PLAIN FEED
D-fly tack & turnover	S/N	PLAIN FEED
Coin pct. join to big facing with mark	ANG	CR-1/4
Big & small facing joint to pkting	COVER STC	PLAIN FEED
Front panel close	5 O/L	PLAIN FEED
Front panel top stc	S/N	CR-1/4
Front pct. bag close	S/N(E/C)	PLAIN FEED

Front pct. 1/4 top stc	S/N	CR-1/16
Front pct. joint to body	S/N(E/C)	PLAIN FEED
Front pkt mouth rolling	D/N	CR-1/4
Front pkt side & waist tack	S/N	PLAIN FEED
Front rise,S/fly,D/fly edge O/L with loop tack	4 O/L	PLAIN FEED
S/fly joint & top stc with zipper join	S/N	CR-1/16
J round stc with mark	S/N	PLAIN FEED
D/fly joint top stc with 2nd stc	S/N	CR-1/16
Front part side edge o/l	4 O/L	PLAIN FEED
Front pkt bag wash tack	S/N	PLAIN FEED
Pres bk & coin pkt mouth facing	IRON	*
Bk & coin pkt mouth facing join	5 O/L	PLAIN FEED
Bk pkt mouth facing top stc	CHAIN STC	CL-1/16
Bk pkt middle pannel close with dart mark	S/N	PLAIN FEED
Bk pkt middle dart top stc	S/N	CL-1/16
Bk pkt & coin pkt side edge o/l	3 O/L	PLAIN FEED
Press Bk & coin pkt	IRON	*
Bk yoke joint to body	CHAIN STC	CR-1/4
Inseam pannel close	5 O/L	PLAIN FEED
Inseam pannel top stc	FOA	CL-1/16
Set front & bk part	Helper	*
Inseam close	5 O/L	PLAIN FEED
Inseam top stc	FOA	CL-1/16

Front to Bk rise close	FOA	FOLDER
Front rise diamond make	S/N	PLAIN FEED
Bk pkt joint to body with pattern	S/N	CR-1/16
Bk pkt 1/4 top stc	S/N	PLAIN FEED
Bk part side edge o/l	4 O/L	PLAIN FEED
Side seam close	CHAIN STC	PLAIN FEED
Side seam card stc	S/N	CR-1/16
Care & main ,Size label make & joint	S/N	PLAIN FEED
Waist psn sharing	CHAIN STC	PLAIN FEED
Elastic mark,cut & supporting join	S/N	PLAIN FEED
Wasit belt two part tack	S/N	PLAIN FEED
Brand label join to waist belt with mark	S/N	PLAIN FEED
Elastic false tack to waist belt	S/N	PLAIN FEED
Waist belt mark & set to body with yoke psn mark	Helper	*
Waist belt joint to body	K/S	FOLDER
Waist belt psn punch 2nos	PUNCH	*
Btn attach on waist belt	S/B	*
Mouth close Btm with 1/4 top stc	S/N	CL-1/16
Mouth close Top with 1/4 top stc	S/N	CR-1/16
Btm rolling	S/N	CL-1/16
Gmts Btk (10Nos)	BTK	*

Table 3.3: Layout Plan

3.8.1 Bellow analysis is subjected to following assumptions:

1	No. of workers (Operator& Helper)	60
2	Factory Efficiency	85%
3	No of W/H	10
4	Total GMT SMV	28.40

Day Line Capacity=$\frac{60 \times No.Of\ Worker \times W/H}{TOTAL\ GMT}$×Efficiency%

$=\frac{60\times60\times10}{28.40}\times 85\%$

= 1077 pcs

Pcs Daily Capacity= 1077 pcs

Capacity per hour= 108 pcs

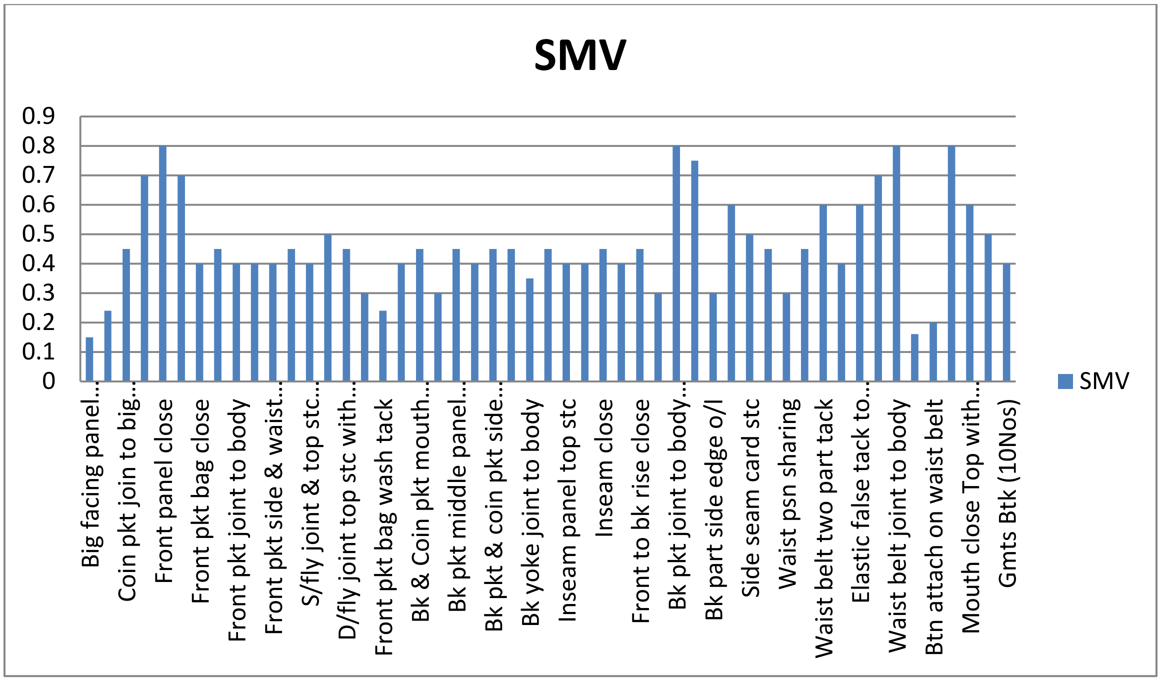
3.9 Line Balancing:

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

For line balance we have to focus some data & information those are follows:

1) Number of operators.
2) Operation name.
3) Operation SMV.

By bellow graph we can easily see where we should have to balance in this line.



Graph Fig 3.2: Line Balancing

3.9 Efficiency Calculation:

Here,

W/H=10

SMV=23.44

Manpower=60

Output=1077

So,

Line efficiency (%)= $\frac{production/Day \times SMV}{Total\ man\ power \times W/H \times 60} \times 100$

$= \frac{1077 \times 23.44}{60 \times 10 \times 60} \times 100$

=70%

CHAPTER – 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 G. And there is 51.

4.1.2. Discussion:

Here the product is Denim Short Blue Jeans and it is a critical process that's why operation breakdown is high.

4.2 Manpower:

Manpower is 60 and in this line input was 1536 pcs per day(10 hours) and output was 1077 pcs per day(10 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.

4.3. Required Machine:

4.3.1. Result:

Total number of machine= 55

From line balancing we have that day used 55 machines

4.3.2. Machine Types:

Name of Machine	Number of Machine
Single Needle (S/N)	28
Double Needle (D/N)	1
ANG(Angular M/C)	1
Cover Stc M/C	2
S/N(E/C)	2
Over lock (3 Thread)	1
Over lock (4 Thread)	3
Over lock (5 Thread)	5
Punch Machine	1
FOA machine (Fit off the Arm)	3
Chain stc	5
Kanchai m/c	2

BTK m/c	1

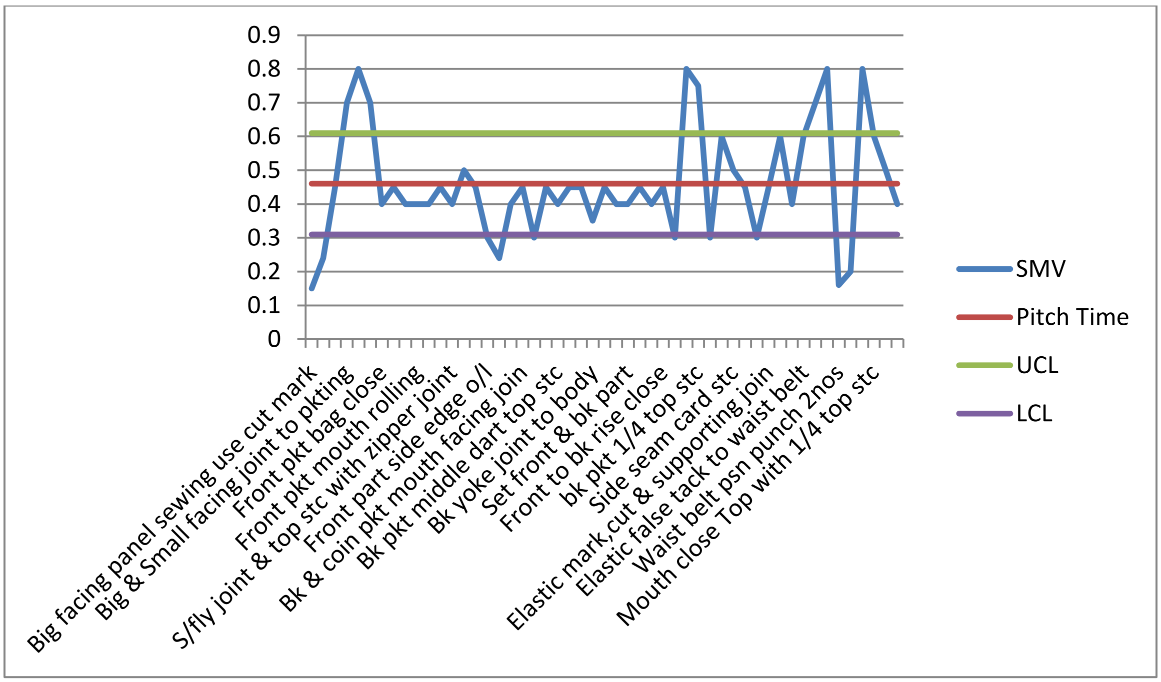
Table 4.1: Types of Machine

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 (10%) then got 23.44 SMV.

Then we calculated Pitch time= 0.46, upper control limit= 0.61, lower control limit= 0.31.



Graph Fig 4.1: Pitch Time

4.4.2. Discussion:

The SMV of BASIC 5 PKT SHORT 23.44 that mean the lines take 23.44 minutes to complete the garments.

Pitch time 0.46 means the average time of operation 0.46 and upper control limit is 0.61 means the highest time of an operation needed 0.61 and lower control limit is 0.31 means the lowest time of an operation needed 0.31.

4.5. Line Target:

4.5.1. Result:

By considering 100% efficiency and SMV=23.44 the line target was per hour 154 pieces per hour and per day 1536 pieces per day.

4.5.2. Discussion:

From the line we collect data, here line efficiency was 70% then we calculated target in actual line efficiency and we got the target is 1077 pcs per day. But we saw the production target is 1536 pcs per day.

4.6. Production Capacity:

4.6.1. Result:

Production capacity per day 1077 pcs (10 hours duty without lunch). Here working hour is 10 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 12 hours.

CHAPTER -5: CONCLUSION

5.0 CONCLUSION

Industrial engineering is now an integral and most relevant part of every apparel industry. We learn many procedures and interesting things about industrial engineering by doing this experiment. We find several problems in Industrial Engineering, we also know how to solve problems by doing this experiment, and how to organize al; Industrial Engineering work. Before IE there were many problems in the clothing industry such as manufacturing ability, daily target ability, layout, distribution problems. After this experiment we find out this calculation, the standard minute value (SMV)= 23.44, in additional to that we have calculated the target= 1536 pcs, pitch time=0.46, UCL=0.61, LCL=0.31, efficiency=70%, man power=60, capacity=1077. After IE and Planning there is implementation in line balancing, daily line target, production capacity increase. In addition, it gives us the opportunity to expand our insight into material organization, generation structure, acquisition system, method of development, and apparatuses and allow us to change with modern life.

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IE

by Sazzad Hossain

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