Faculty of Engineering

Department of Textile Engineering

REPORT ON

"Study on Industrial Engineering in Knit 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

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Department of Textile Engineering

Approval Sheet

This research entitled 'Study on Industrial Engineering on Knit Garments' is prepared and submitted by **Diptaraj Datta (ID:143-23-4022)** & **Mahadi hasan (ID:131-23-3309)** 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 Knit 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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This Work is dedicated to our beloved Mothers, who always support us to make us a future engineer. And our fathers who is the real hero we ever seen.

ABSTRACT

This project is on “Study on Industrial Engineering in Knit garments Production” in a garments factory. Actually, managements of garment industries are facing more problems like low productivity, longer production lead time, high rework and rejection, Bad line balancing, low flexibility of style changeover ,bottle neck etc.Although, automatic machineries are present in almost every industry, But motion of the operators is one of the most urgent factors to increase production. Lowskill Operator and faulty Machines are responsible for production. There is lot of project or survey has been done on Man and Method, two key factors of productivity. But Production has been always left out. This project is mainly shows the importance of Industrial Engineering department in any industry.

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CHAPTER-1: INTRODUCTION

1.1. Aim of the Report:

Productivity is more important for a Garments industry for profit. For this, it is very need to proper utilization of machine, manpower and method. Proper utilization of raw material by decrease of wastage, it can be more profitable for a garments industries. Decrease the lead time and lost time, Proper use of time can make much profit for a garments industry. Industrial engineer team can make much profit for a garments industry by decrease lost time, lead time and proper balancing of worker. That's why we select our topic as our research. By this topic we try to show how industrial engineer increasing productivity and profit for a garments industry

1.2. Objectives of the Study:

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

1. first objective is to highlight industrial engineer's work on any garments industry .
2. Second objective is to study about the various formulas and methods which is required for an industrial engineer to develop a Garments industry.
3. Third objective is to analyzing different method to increasing productivity.

1.3. Importance & Scope:

1. To know about the different method and technique & how its work to increase 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 apply method.

1.4. Limitations:

We tried our best to explain and complete this report with some limitations. Unfortunately due to the company's some limitations (business secrecy and confidentiality), We were unable to collect some sufficient information. As this is our first report about garments sector, we had face some difficulties to complete this report. Time was also limited for us to complete this report. Because in this short time it is impossible to get accurate information about any industry.

CHAPTER – 2: LITERATURE REVIEW

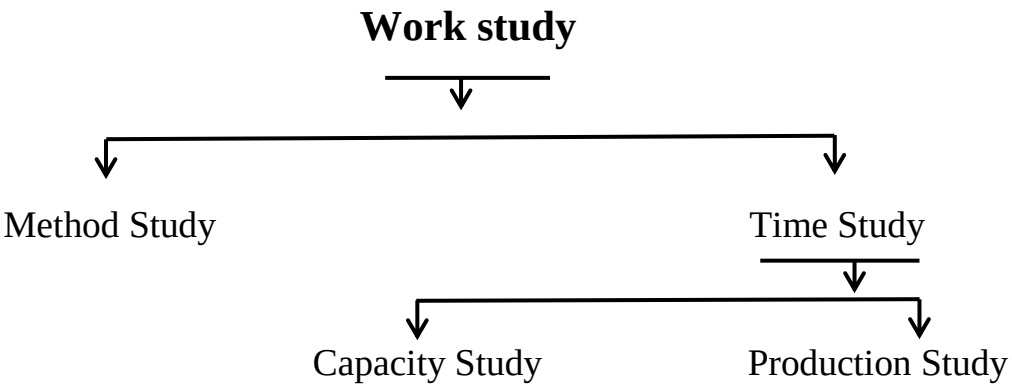
2.1 About Industrial Engineering department:

Industrial Engineering is a profession by which it is possible to optimization of complex processes, systems, or organizations by developing, improving and implementing integrated systems of people, money, knowledge, information, equipment, energy and materials. On the other hand, we can said in one sentence that, industrial engineering is the mid point of connector of management and the production department.

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

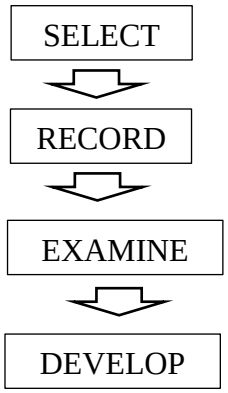


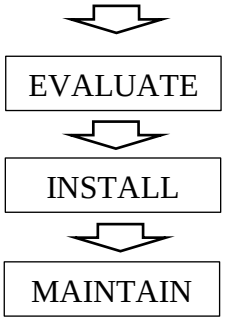
2.2.1 Method Study :

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 consists on Method study. Which are following :





1. **Select :** work which is target to studied 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
6. **Install :** select that improved method and arrange that method and implement for a better solution
7. **Maintain :** verifying the regular intervals which is improved in use

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.

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

2.5.2 Basic Time:

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

$$\text{Basic Time} = \text{Observed Time} \times \text{Rating}$$

Here, Rating indicates operators handling motion

2.5.3 Target:

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

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

2.5.4. Standard Allocated Hour (SAH): If we divided multifing of Total output of a line and SMV with 60, then we found SAH

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

2.5.5 Line efficiency: If we divided SAH with Working hour, then we found ine efficiency

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

Or,

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

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

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

Lost time = Produced time – Working time

2.5.7 Theoretical loading: theoretical loading indicated how much manpower need for a product production. If we divided maximum target for any process by 100% target of that process. Then we found theoretical loading

$$\text{Theoretical loading} = \frac{\text{maximum target in any process}}{100\% \text{ target of that process}}$$

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

2.6.1: Bottle neck Process: bottleneck process is a process is determined by ratio of two processes output pieces. If the previous processes output is much then the next processes input.

Here bottleneck process is occurred. Industrial engineer give method how to decrease bottleneck process. Sometime balancing in needed to reduced bottleneck process. Flow of production in every process is needed to proper output.

2.6.2: Line Balancing : Balancing a line is reduce 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 ,then it is easy to get extra pieces from the same resources in defined time. Higher productivity brings higher profit in a business. And increment in Productivity level reduces 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 found capacity graph. And easily select the weak operators who have failed 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 need 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 accessories is need for produced that amount of ordered product. Which is monitoring and fixed by an industrial engineer.

2.6.7: Zero feeding : when the last piece of running style pass the 1st process, if the next style is feeding on the line. Then it called zero feeding. Zero feeding is an important point of the responsibility of Industrial Engineer. If zero feeding can be done, then it is possible to make a success production. Production time also not wasted by zero feeding process. For zero feeding process, an industrial engineer work hard. Confirmation of accessories, input, thread and other important things need to be ready for feeding line

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 need 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

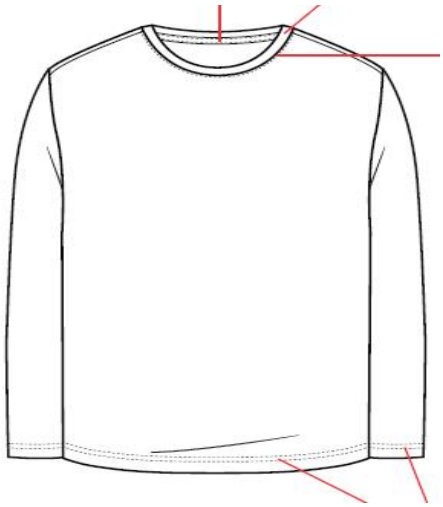
We can manage WIP by,

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

Chapter -3: Methodology

3.1 Item: Men’s R-Neck Long Sleeve

DESIGN REF	
STYLE	753 Men’s R-Neck Long Sleeve
DESCRIPTION	
BUYER	H & M
MERCHANDISER	
RANGE	



3.1.1 Measurement sheet of neck sleeve long:

Description	Measurement
Neck seam to seam	21 cm
Front neck drop	19 cm
Rib	2 cm
Shoulder to shoulder	47 cm
Shoulder join	14.5 cm
½ chest	22 cm
Armhole	26 cm
Sleeve	66 cm

Sleeve opening	10 cm
Body length	74 cm
Body hem	55.5 cm

3.1.2 Operation breakdown of neck sleeve long:

Operation	Operation Description	Machine Type	SMV.	Capacity
	PREPERATION			
1	CARE LABEL MAKE	SN	0.21	285.71
2	SLEEVE HEM	FL(3.2)	0.20	300.00
3	SLEEVE PAIR	MANUAL	0.15	400.00
4	NECK RIB MAKE	SN	0.22	272.73
	ASSSEMBLY			
5	BACK & FRONT PART MATCH	MANUAL	0.22	272.73
6	SHOULDER JOIN	4OL	0.25	240.00
7	THREAD CUT & FOLD	MANUAL	0.18	333.33
8	NECK RIB ATTACHING	4OL	0.25	240.00
9	THREAD CUT & FOLD	MANUAL	0.18	333.33
10	SHOULDER TO SHOULDER BACK TAPE	FOA	0.24	250.00
11	THREAD CUT & FOLD	MANUAL	0.21	285.71
12	SHOULDER SCISSORING	MANUAL	0.20	300.00
13	SLEEVE MATCH	MANUAL	0.23	260.87
14	SLEEVE ATTACH WITH BODY	4OL	0.47	127.66
15	THREAD CUT & FOLD	MANUAL	0.21	285.71
16	SIDE SEAM WITH CARE LBL ATTACH	4OL	0.60	100.00
17	THREAD CUT & FOLD	MANUAL	0.21	285.71
18	BODY SCISSORE	MANUAL	0.20	300.00
19	BODY HEM	FL(3.2)	0.25	240.00
20	THREAD CUT & FOLD	MANUAL	0.17	352.94
21	SLEEVE OPENING POINT TUCK & TOP-STITCH	SN	0.26	230.77
	Total		5.26	

3.1.3 Machine Layout for neck sleeve long :

SUBTEX

MACHINERY LAYOUT

Style No	78
Total SMV	5.26
No. of Op	24

INDUSTRIAL ENGINEERING DEPT

12	13	SLEEVE MATCH	274	##	63	261
			274	-		
			274	-		
Machine	Manual			Mins utilized		63
Attach:	0					
Skill				OPTR NAME		

12	3	SLEEVE PAIR	274	##	41	400
			274	-		
			274	-		
Machine	Manual			Mins utilized		41
Attach:	0					
Skill				OPTR NAME		

10	2	SLEEVE HEM	274	##	55	300
			274	-		
			274	-		
Machine	Flat Lock (3.2)			Mins utilized		55
Attach:	0					
Skill				OPTR NAME		(1)

	7	THREAD CUT & FOLD	274	##	49	333
			274	-		
			274	-		
Machine	Manual			Mins utilized		49
Attach:	0					
Skill				OPTR NAME		(1)

2	9	SHOULDER JOIN	274	##	68	240
			274	-		
			274	-		
Machine	4 Thread Overlock			Mins utilized		68
Attach:	0					
Skill				OPTR NAME		(2)

1	5	BACK & FRONT PART MATCH	274	##	60	273
			274	-		
			274	-		
Machine	Manual			Mins utilized		60
Attach:	0					
Skill				OPTR NAME		(1)

.22

9	12	SHOULDER SCISSORING	274	0.20	55	300
			274	-		
			274	-		
Machine	Manual			Mins utilized		55
Attach:	0					
Skill				OPTR NAME		

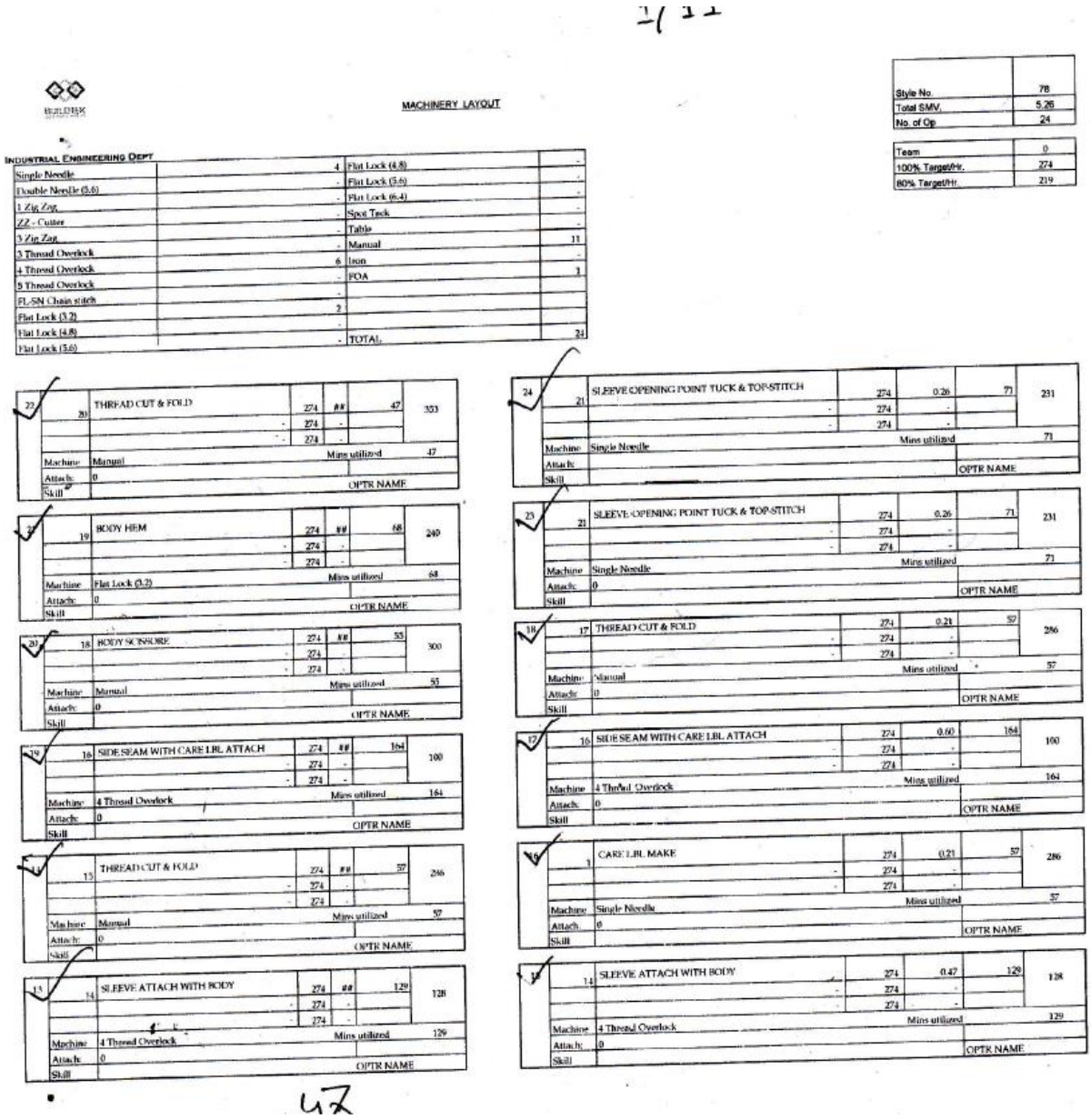
6	11	THREAD CUT & FOLD	274	0.21	57	286
			274	-		
			274	-		
Machine	Manual			Mins utilized		57
Attach:	0					
Skill				OPTR NAME		(1)

7	10	SHOULDER TO SHOULDER BACK TAPE	274	0.24	66	250
			274	-		
			274	-		
Machine	FOA			Mins utilized		66
Attach:	0					
Skill				OPTR NAME		(1)

6	6	THREAD CUT & FOLD	274	0.18	49	333
			274	-		
			274	-		
Machine	Manual			Mins utilized		49
Attach:	0					
Skill				OPTR NAME		(1)

5	8	NECK RIB ATTACHING	274	0.25	68	240
			274	-		
			274	-		
Machine	4 Thread Overlock			Mins utilized		68
Attach:	0					
Skill				OPTR NAME		(1)

4	4	NECK RIB MAKE	274	0.22	60	273
			274	-		
			274	-		
Machine	Single Needle			Mins utilized		60
Attach:	0					
Skill				OPTR NAME		(1)



MACHINERY LAYOUT

INDUSTRIAL ENGINEERING DEPT

Single Needle	4	Flat Lock (4.8)	-
Double Needle (3.6)	-	Flat Lock (5.6)	-
1 Zig Zag	-	Flat Lock (6.4)	-
ZZ - Cutter	-	Spot Tack	-
3 Zig Zag	-	Table	-
3 Thread Overlock	-	Manual	11
4 Thread Overlock	6	Iron	-
5 Thread Overlock	-	FOA	1
FL/SN Chain stitch	-		
Flat Lock (3.2)	2		
Flat Lock (4.8)	-		
Flat Lock (5.6)	-	TOTAL	24

Style No.	78
Total SMV.	5.26
No. of Op	24

Team	0
100% Target/Hr.	274
80% Target/Hr.	219

22	20	THREAD CUT & FOLD	274	##	47	353
			274	-		
			274	-		
		Machine: Manual	Mins utilized			47
		Attach: 0	OPTR NAME			
		Skill				
21	19	BODY HEM	274	##	68	240
			274	-		
			274	-		
		Machine: Flat Lock (3.2)	Mins utilized			68
		Attach: 0	OPTR NAME			
		Skill				
20	18	BODY SOS/SIDE	274	##	55	300
			274	-		
			274	-		
		Machine: Manual	Mins utilized			55
		Attach: 0	OPTR NAME			
		Skill				
19	16	SIDE SEAM WITH CARE LBL ATTACH	274	##	164	100
			274	-		
			274	-		
		Machine: 4 Thread Overlock	Mins utilized			164
		Attach: 0	OPTR NAME			
		Skill				
18	15	THREAD CUT & FOLD	274	##	57	286
			274	-		
			274	-		
		Machine: Manual	Mins utilized			57
		Attach: 0	OPTR NAME			
		Skill				
17	14	SLEEVE ATTACH WITH BODY	274	##	129	128
			274	-		
			274	-		
		Machine: 4 Thread Overlock	Mins utilized			129
		Attach: 0	OPTR NAME			
		Skill				

24	21	SLEEVE OPENING POINT TUCK & TOP-STITCH	274	0.26	71	231
			274	-		
			274	-		
		Machine: Single Needle	Mins utilized			71
		Attach:	OPTR NAME			
		Skill				
23	21	SLEEVE OPENING POINT TUCK & TOP-STITCH	274	0.26	71	231
			274	-		
			274	-		
		Machine: Single Needle	Mins utilized			71
		Attach: 0	OPTR NAME			
		Skill				
18	17	THREAD CUT & FOLD	274	0.21	57	286
			274	-		
			274	-		
		Machine: Manual	Mins utilized			57
		Attach: 0	OPTR NAME			
		Skill				
17	16	SIDE SEAM WITH CARE LBL ATTACH	274	0.60	164	100
			274	-		
			274	-		
		Machine: 4 Thread Overlock	Mins utilized			164
		Attach: 0	OPTR NAME			
		Skill				
16	1	CARE LBL MAKE	274	0.21	57	286
			274	-		
			274	-		
		Machine: Single Needle	Mins utilized			57
		Attach: 0	OPTR NAME			
		Skill				
15	14	SLEEVE ATTACH WITH BODY	274	0.47	129	128
			274	-		
			274	-		
		Machine: 4 Thread Overlock	Mins utilized			129
		Attach: 0	OPTR NAME			
		Skill				

3.2 Item: Boxer

Buyer :	Franco Bettoni
Description :	Boxer
Color :	Black
Version :	Costing
P. Category :	M1

3.2.1 Measurement sheet for Boxer :

Description	M	L	XL	XXL	XXXL
1/2 waist	35	37	39	42	45
½ hip 5 cm above gusset	43	45	47	50	53
½ leg opening	20	21	22	23	24
½ in seem	8	9	10	11	12
Side length include WB	26	27	28	29	30
Front rise folded incl. WB to front	24.5	25.5	26.5	28	28
Back rise incl. WB to front	24.5	25.5	26.5	28	29
Waist band height	3.5	3.5	3.5	3.5	3.5
At waist	11	12	12	12	13
At crotch straight	5	6	6	6	7
Middle	11	12	12	12	13

3.2.2 Operation breakdown of Boxer :

SMV :	**3.62**	
Carder :	**22**	**16**

No	Machine Type	Operation Description	SMV	Operation Status	Attachment	OP Target @100%	Minimum TGT To Achieve
1	4T O/L	Front Seam	0.48			125	94
2	SND/LS	Front side seam busting	0.46			130	98
3	FLS	Front side seam with trimming	0.48	**Critical**		125	94
4	4T O/L	Side Seam	0.52			115	87
5	FLS	Inseam with trimming	0.24			250	188
6	2ND F/L-LC	Leg hem	0.32	**Critical**		188	141
8	3stp/ZZ	Elastic make & mark	0.30			200	150
9	3ND F/L-RAT	Waist elastic join	0.30	**Critical**		200	150
10	SND/LS	Label make(2 part)	0.16			375	281
11	SND/LS	Label join with thread cut	0.18			333	250
SEWING SMV =			**3.44**	**SEWING MO :**			

Operation Description	Theoretical Loading	Actual MO	Layout MCN	MC(+/-)
Elastic measure & cut	0.7	1.0	1	

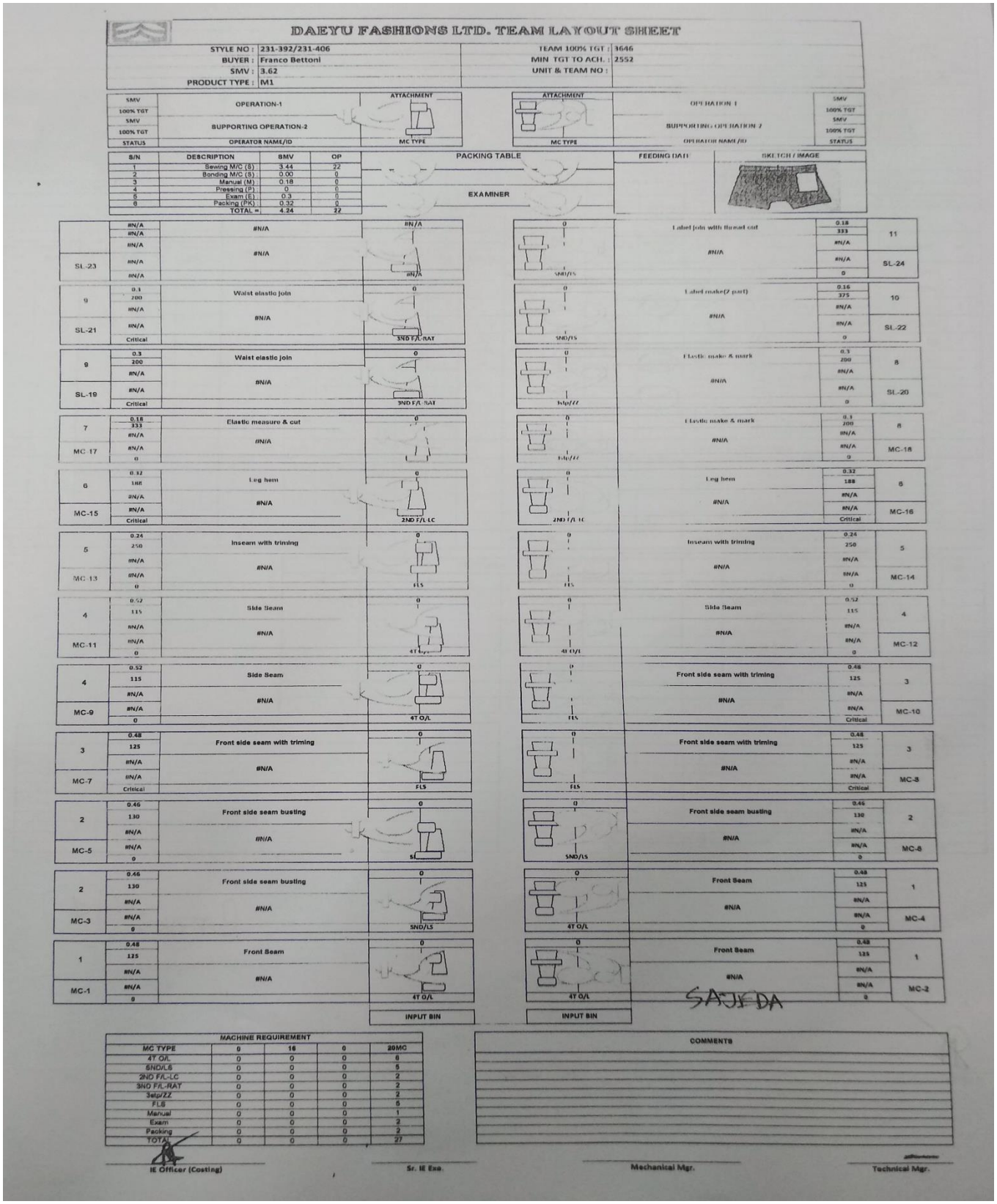
Front Seam	2.0	2.0	2	
Front side seam busting	1.9	2.0	2	
Front side seam with trimming	2.0	2.0	2	
Side Seam	2.1	2.0	2	
Inseam with trimming	1.0	1.0	1	
Leg hem	1.3	2.0	2	
Elastic make & mark	1.2	1.0	1	
Waist elastic join	1.2	2.0	2	
Label make(2 part)	0.7	1.0	1	
Label join with thread cut	0.7	1.0	1	

SERIAL NO	DESCRIPTION	SMV	MANPOWER	
			16 m/c	22 m/c
1	Total Sewing (S) :	3.44	16	22
1	Total Bonding (B) :			
2	Total Manual (M) :	0.18	1	1
3	Total Pressing (P) :			
4	Total Exam (E) :	0.30	2	2
5	Total Packing (PK) :	0.32	2	2
TOTAL SEWING & MANUAL =		**3.62**	**16**	**22**
GRAND TOTAL =		**4.24**	**21**	**27**

MACHINE REQUIREMENT				
MC TYPE	0	16	0	20MC
4T O/L		4		6

SND/LS		4		5
2ND F/L-LC		2		2
3ND F/L-RAT		2		2
3stp/ZZ		1		2
FLS		3		5
Manual		1		1
Exam		2		2
Packing		2		2
TOTAL M/C =		**16**		**22**
GRAND TOTAL =		**21**		**27**

3.2.3 Machine Layout for Boxer:



DAEYU FASHIONS LTD. TEAM LAYOUT SHEET

STYLE NO : 231-392/231-406
BUYER : Franco Bettoni
SMV : 3.62
PRODUCT TYPE : M1

TEAM 100% TGT : 3646
MIN TGT TO ACH. : 2552
UNIT & TEAM NO :

SMV	OPERATION-1	ATTACHMENT	ATTACHMENT	OPERATION-1	SMV
100% TGT					100% TGT
SMV	SUPPORTING OPERATION-2			SUPPORTING OPERATION-2	SMV
100% TGT					100% TGT
STATUS	OPERATOR NAME/ID	MC TYPE	MC TYPE	OPERATOR NAME/ID	STATUS

S/N	DESCRIPTION	SMV	OP
1	Sewing M/C (S)	3.44	22
2	Bonding M/C (S)	0.00	0
3	Manual (M)	0.18	0
4	Pressing (P)	0	0
5	Exam (E)	0.3	0
6	Packing (PK)	0.32	0
	TOTAL =	4.24	22

PACKING TABLE

EXAMINER

FEEDING DATE

SKETCH / IMAGE

SL-23	#N/A #N/A #N/A #N/A #N/A #N/A	#N/A	#N/A	Label join with thread cut	0.18 333 #N/A #N/A 0	11 SL-24
9 SL-21	0.3 200 #N/A #N/A Critical	Waist elastic join #N/A	3ND F/L-RAT	Label make(2 part) #N/A	0.16 375 #N/A #N/A 0	10 SL-22
9 SL-19	0.3 200 #N/A #N/A Critical	Waist elastic join #N/A	3ND F/L-RAT	Elastic make & mark #N/A	0.3 200 #N/A #N/A 0	8 SL-20
7 MC-17	0.18 333 #N/A #N/A 0	Elastic measure & cut #N/A		Elastic make & mark #N/A	0.3 200 #N/A #N/A 0	8 MC-18
6 MC-15	0.32 188 #N/A #N/A Critical	Leg hem #N/A	2ND F/L-LC	Leg hem #N/A	0.32 188 #N/A #N/A Critical	6 MC-16
5 MC-13	0.24 250 #N/A #N/A 0	Inseam with triming #N/A	FLS	Inseam with triming #N/A	0.24 250 #N/A #N/A 0	5 MC-14
4 MC-11	0.52 115 #N/A #N/A 0	Side Seam #N/A	4T O/L	Side Seam #N/A	0.52 115 #N/A #N/A 0	4 MC-12
4 MC-9	0.52 115 #N/A #N/A 0	Side Seam #N/A	4T O/L	Front side seam with triming #N/A	0.48 125 #N/A #N/A Critical	3 MC-10
3 MC-7	0.48 125 #N/A #N/A Critical	Front side seam with triming #N/A	FLS	Front side seam with triming #N/A	0.48 125 #N/A #N/A Critical	3 MC-8
2 MC-5	0.46 130 #N/A #N/A 0	Front side seam busting #N/A	SND/LS	Front side seam busting #N/A	0.46 130 #N/A #N/A 0	2 MC-6
2 MC-3	0.46 130 #N/A #N/A 0	Front side seam busting #N/A	SND/LS	Front Seam #N/A	0.48 125 #N/A #N/A 0	1 MC-4
1 MC-1	0.48 125 #N/A #N/A 0	Front Seam #N/A	4T O/L	Front Seam #N/A	0.48 125 #N/A #N/A 0	1 MC-2

INPUT BIN

INPUT BIN

SAJEDA

MACHINE REQUIREMENT

MC TYPE	0	16	0	20MC
4T O/L	0	0	0	6
SND/LS	0	0	0	5
2ND F/L-LC	0	0	0	2
3ND F/L-RAT	0	0	0	2
Selp/ZZ	0	0	0	2
FLS	0	0	0	5
Manual	0	0	0	1
Exam	0	0	0	2
Packing	0	0	0	2
TOTAL	0	0	0	27

COMMENTS

IE Officer (Costing) | Sr. IE Exe. | Mechanical Mgr. | Technical Mgr.

3.3 Capacity study for Boxer :

Capacity study is a process by which, we can understand actual line capacity for a continuous flow of production. Generally 5 or 10 cycle time collect for each operator to measure capacity of that operator. after collect the capacity of that operators, draw a capacity curve. Then originally line

DEAYU FASHIONS Ltd		
CAPACITY SHEET	Issue No : 01	1
	Document no : DFL/IE/18/001/R1	

Date	9/11/2018	Manpower	22	Style	231-406
Team	Sewing/BRA 02	SMV	3.62	Check By	DIPTARAJ DATTA

SL NO	M/C Name	Name	Operation	SMV	TGT	1	2	3	4	5	Ave.	Cap.	Actual prod.	Remark
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														
11														
12														
13														
14														
15														
16														
17														
18														
19														
20														
21														
22														

DFL-Industrial Engineering Department

So, when we collect the cycle times for every operator, then we found like this:

DEAYU FASHIONS Ltd		
CAPACITY SHEET	Issue No : 01	1
	Document no : DFL/IE/18/001/R1	

Date	29/10/2018	Manpower	22	Style	231-406
Team	Sewing/BRA 02	SMV	3.62	Check By	DIPTARAJ DATTA

SL NO	M/C Name	Name	Operation	SMV	TGT	1	2	3	4	5	Ave.	Cap.	Actual prod.	Remark
1	O/L	BITHI	FRONT SEAM	0.48	125	46	46	54	49	49	49	74	204	
2	O/L	ROWSON ARA	FRONT SEAM	0.48	125	51	54	52	46	51	51	71		
3	O/L	MASUMA	FRONT SEAM	0.48	125	68	49	74	50	60	60	60		
4	SND	FULURA	FRONT SIDE SEAM BUSTING	0.46	130	74	76	76	90	93	82	44	156	
5	SND	SAHIDA	FRONT SIDE SEAM BUSTING	0.46	130	70	53	55	58	54	58	62		
6	SND	SAHANA	FRONT SIDE SEAM BUSTING	0.46	130	75	80	60	71	78	73	49		
7	FLS	ISMOTARA	FRONT SIDE SEAM WITH TRIMING	0.48	125	57	55	54	52	68	57	63	207	
8	FLS	SAJEDA	FRONT SIDE SEAM WITH TRIMING	0.48	125	109	133	90	73	69	95	38		
9	FLS	SALMA	FRONT SIDE SEAM WITH TRIMING	0.48	125	37	41	29	33	30	34	106		
10	O/L	MAHFUJA	SIDE SEAM	0.52	115	60	76	73	75	77	72	50	161	
11	O/L	RASHIDA	SIDE SEAM	0.52	115	70	72	75	71	73	72	50		
12	O/L	MONJURA	SIDE SEAM	0.52	115	60	63	56	58	55	58	62		
13	FLS	SALMA	INSEAM WITH TRIMING	0.24	250	90	97	94	101	14	79	45	143	
14	FLS	KOMOLA	INSEAM WITH TRIMING	0.24	250	34	36	39	35	41	37	97		
15	F/L	NARGIS	LEG HEM	0.32	188	67	68	80	70	71	71	51	108	
16	F/L	SEFALI	LEG HEM	0.32	188	61	63	64	73	52	63	58		
17	SND	SHEULY	ELASTIC MEASURE AND CUT	0.3	200	47	52	45	47	52	49	74	134	
18	SND	SHAHNAZ	ELASTIC MAKE AND MARK	0.3	200	62	50	66	62	60	60	60	134	
19	F/L	SHARMIN	WAIST ELASTIC JOIN	0.3	200	103	89	94	75	72	87	42	181	
20	F/L	REKHA	WAIST ELASTIC JOIN	0.3	200	25	24	27	24	29	26	140		
21	SND	NILA	LABEL MAKE	0.16	375	26	23	17	19	15	20	180	180	
22	SND	AKLIMA	LABEL JOIN WITH TREAD	0.18	333	38	41	39	47	53	44	83	83	

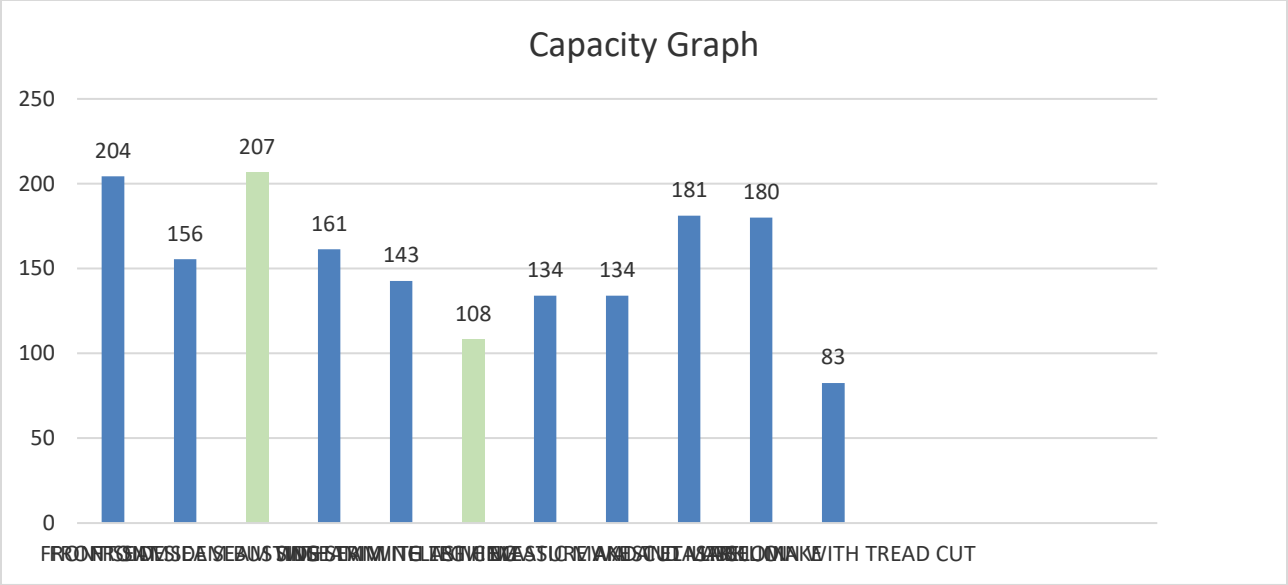
			CUT											

DFL-Industrial Engineering Department

3.4 : Capacity Graph :

TEAM # : BRA 02
100% Target: 166
Line capacity: 83
Capacity : 50%

EMP NO	OPE. DIS.	CPA TGT
	FRONT SEAM	204
	FRONT SIDE SEAM BUSTING	156
	FRONT SIDE SEAM WITH TRIMING	207
	SIDE SEAM	161
	INSEAM WITH TRIMING	143
	LEG HEM	108
	ELASTIC MEASURE AND CUT	134
	ELASTIC MAKE AND MARK	134
	WAIST ELASTIC JOIN	181
	LABEL MAKE	180
	LABEL JOIN WITH TREAD CUT	83
100% TARGET PER HOUR :		166
PLANED TGT PER HOUR :		
BALANCED TGT PER HOUR :		127



3.5 : Line Balancing :

line balancing is very essential points for continous flow of production. For line balancing, at first take a view to the capacity graph. Then line should be balance the high capacity with low capacity. Balancing should be two process or three process which is very near to each other

DES. OF BALANCE
1. Sticker removing is balanced by "front seam, side seam operators"
2. "label join with thread cut"operation is balanced by "label make" operation

3.6 : Production Study :

production study is done to recovery an operator who is fail to gain capacity fail to achieve his/her target. Generally before production study method and techniques are applied to change handling,

increase machine speed to flow the production smoothly. Production study duration at least 30 minutes. Here some points to be considers as a productive time and non productive time.

	DEAYU FASHIONS ltd	Page 1 Of 1
	PRODUCTION STUDY	Issue No : 01 / Issue Date 29/03/2018
		Document no : DFL/IE/18/002/R1

Team				Style	
SMV		Date		Operation	
TGT Hour		Start time		Name	
TGT Daily		End time		M/C	

CYCLE TIMES							Bundle handling	Thread breakage	Bobbin change	Checking	De-chaining	Own Repairs	Instructions	M/C Break down	Pieces moving	Other Defects		Others	Remarks
1																			
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			
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20																			
21																			
22																			
23																			
24																			
25																			

Observed time (min.)		Fastest Bundle		Ave. Cycle		TGT / Hr.	
Productive time		Fastest cycles					
Non-productive time		Slowest cycles		SMV		TGT / Day	
Size		Units Produce During study					
Colour							

Remarks .....

.....

Sig. (supervisor) Sig.(M/Operator) Sig. (I.E. Officer)

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After applying various method and change m/c speed, found these cycle times for that process at half an hour,

	DEAYU FASHIONS ltd		Page 1 Of 1
	PRODUCTION STUDY	Issue No : 01	Issue Date 29/03/2018
		Document no : DFL/IE/18/002/R1	

Team		Bra- 02			Style	231-406
SMV			Date	10/11/2018	Operation	1st side seam
TGT	Hour		Start time	11.30 a.m.	Name	Shahnaz
	Daily		End time	12.00 p.m.	M/C	Overlock m/c

	CYCLE TIMES						Bundle handling	Thread breakage	Bobbin change	Checking	De-chaining	Own Repairs	Instructions	M/C Break down	Pieces moving	Other Defects		Others	Remarks
1	11	16	17	15			12			5	23	27	22		7				
2	10	13	14	18							18								
3	18	15	15	16															
4	17	23	13	19															
5	20	19	16	21															
6	19	21	14	17															
7	18	22	16	14															
8	20	18	17	19															
9	16	15	12	18															
10	14	19	14	21															
11	17	17	11	17															
12	19	23	15	16															
13	21	20	13	19															
14	17	18	16	15															
15	18	16	17	18															
16	15	16	13	14															
17	17	13	14	19															
18	13	14	15	15															
19	16	15	16	19															
20	19	16	18	17															
21	14	17	20	21															
22	16	14	17	18															
23	14	15	19	16															
24	17	13	21	20															
25	13	15	18	17															

Observed time (min.)	1800 s	Fastest Bundle	12	Ave. Cycle	17.5 s	TGT / Hr.	206 pcs
Productive time	1751 s	Fastest cycles	10				
Non-productive time	49 s	Slowest cycles	23	SMV	0.291	TGT / Day	2060 pcs
Size		Units Produce During study	100 pcs				
Colour							

Remarks ....

Sig. (supervisor) | Sig.(M/Operator) | Sig. (I.E. Officer)

DFL-Industrial Engineering Department

In this study paper, some points are selected as productive time, some are non-productive time Productive times are

- Bundle handling
- Bobbin change
- Checking
- De-chaining
- Pieces moving

And, non-productive times are

- Thread breakage
- Own repairs
- Instructions
- m/c breakdown
- others defects

3.6.1 How to calculate SMV, Target per day :

1. collect the observed time, then non-productive time is less from observed time and get Productive time
2. then count the units of production on that observed time
3. then calculated average cycle time
4. then calculated SMV by $\frac{\text{average cycle time}}{60}$
5. then we can calculated target per hour by $\frac{60}{SMV}$
6. then target per hour is multifying by working hours in a day,then we will find target of an operator

Some mathematical problem and solution :

1. In a knit factory, in a line there are 23 m/c operator. In that line, a boxer is on processing which output per day 1500 pcs and SMV is 5.50. if the factory ran from 8 a.m. to 7 p.m. Lunch hour 1-2 p.m. after 5 p.m. if 5 operators leave factory, calculate the efficiency of that working day.

Solution :

total operator = 23

SMV = 5.50

Working hour= 10 hour

Efficiency = ?

We know,

Efficiency % = $\frac{\text{SAH}}{\text{Working hour}} \times 100$

So, SAH = $\frac{\text{total output} \times \text{SMV}}{60}$

= $\frac{1500 \times 5.50}{60}$

= 137.5

Total working hour = (23×8)+(18×2)

=220 hours

So, efficiency = $\frac{137.5}{220}$

= .62 × 100

= 62 %

2. If any line run in 75% efficiency and its manpower is 20. If the SMV of that running product is 3.20. than what will be the target for that line in 10 hours?

Solution:

Here, efficiency = 75%

Manpower = 20

SMV= 3.20

Working hour= 10 hours

Line target = ?

We know, efficiency = $\frac{\text{output} \times \text{smv}}{\text{working hour} \times \text{manpower}}$

So, output (target) = $\frac{\text{working hour} \times \text{manpower} \times \text{efficiency}}{\text{SMV}}$

= $\frac{10 \times 20 \times 75}{3.20}$

= 4687 pcs

CHAPTER -4: RESULT & DISCUSSION

4.1 Result & Discussion of Capacity study Data:

Result:

we found line capacity by lowest capacity of that curve, which is 83 pcs

Discussion:

Here we find line capacity for that style by taking capacity of different operator. By this, we can balancing line. And capacity curve shows the balancing system

4.2 Result & Discussion of Production study:

Result:

From production study we find target for that operator for that day is 2060 pcs, which in a hour is 206 pcs

Discussion:

By this study, a low capacity operator capable to give 206 pcs production per hour. Which is increase the productivity of the factory. And factory have much profit. Also, efficiency and the handling power of that operator also increase

4.3 Result & Discussion of efficiency calculation:

Result:

Here, we found efficiency for that line is 65%.

Discussion:

By formula of efficiency calculation, we can get efficiency of any line by calculation with efficiency formula. its help to select the highest efficiency line and low efficiency lines

4.4 Result & Discussion of Line target calculation:

Result:

Here, we found target of that line is 4687 pcs for one working day.

Discussion:

If we want to know the line target for any line. Then we should calculated by target calculation formula. By this formula we can calculate any line target which helps to improving the line runs smoothly and production also be increase

So here we loss more production. We work for 80% target if we reach 70/75% it is good, but here we loss 167 pcs garments per day. Here calculated efficiency is 60%.

CHAPTER-5: CONCLUSION

By this project we learn about working method and others responsibilities of an industrial engineer. We also learn various formula which are needed as an industrial engineer .
We also know about How to manage operator motivation, How to control WIP, How to balance a line, How to make a capacity sheet, How to make capacity curve, How to make operator skill by production study and How to improve any workplace.

REFFERENCE

1. www.wikipedia.com/industrialengineering
2. www.textilelearnerblogs.com