Faculty of Engineering

Department of Textile Engineering

Non-Productive Time in Garment Industry: A Comprehensive Analysis

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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

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LETTER OF APPROVAL

October 10, 2023

To

The Head

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Daffodil Smart City (DSC), Birulia, Savar, Dhaka –1216

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

Dear Sir

I am writing to let you know that this thesis titled as **"Non-Productive Time in Garment Industry: A Comprehensive Analysis"** has been prepared by Iffat Jahan Mila bearing ID 193-23-5730 and Rayhan Hossain bearing ID 193-2-3-5756 is completed for final evaluation. The whole report. is prepared based on the proper investigation through critical anaylsis of empirical data with required belongings. The student was directly involved in their project activities and the report become vital to spark of many valuable information for the readers.

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

Yours Sincerely,

Md. Mominur Rahman

Assistant Professor

Department of Textile Engineering

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DECLARATION

We hereby declare. that the work which is being presented. in this thesis entitled, **"Exploring the Causes and Consequences of Non-Productive Time in the Garment Industry: A Comprehensive Analysis"** is original work of our own, has not been presented for a degree of any other university and all the resour.ce of materials uses for this thesis have. been duly acknowledged.

_____

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

Supervisor: Md. Mominur Rahman

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ABSTRACT

In this research of NPT, rootcause identification methodology has been used to reduce the non-productivities activities in sewing operation in garment manufacturing. The rapidly changing economic conditions, such as global competition, diminishing profit margins, consumer demand for high-quality products, product diversity, and shorter lead times, among other aspects, have a significant influence on the garment manufacturing industry. For any garment industry, cost and time related to production and quality management or waste minimizations have significant impact on overall expenditure. In order to save time and minimize internal process time, steps have been taken to evaluate and eliminate non-productive time emphasizing on the sewing operations and also the other backward linkage departments. This research work focuses on observing the root causes of NPT of different types of garments in sewing operations and other related departments to analyze the reasons for loss time that results in loss pieces. The outcome of this research work is to highlight on improving productivity and recommend the steps to reduce the causes of NPT in garment production that would maximize the profit and minimize the cost of production.

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CHAPTER 1: INTRODUCTION

1.1 Background of the Study

This study sought to identify the elements that lead to NonProductive Time (NPT) in manufacturing garments. By using method related to time saving, its capacity and production study, it is possible to improve productivity while reducing loss pieces due to lost time. Two important attributes have been considered, one is possible standard method for each process and another is considerable time is consumed. Time study took to record the actual individual capacity of each worker and process line. The work measurement techniques were applied for recording the times and rates of working in the elements within specific conditions. The results of work measurement for analyzing the data so as to determine the time necessary for carrying out an operation at a defined level of performance taking into consideration of different types of allowance that is allowed in apparel production floor such as personal time allowance, delay allowance, fatigue allowance, etc. The NPT of different sewing lines and related departments were considered to determine the total lost hour for different types of garments to highlight on the root causes and remedies of NPT. NPT analysis of efficiency saves 28% losses and 54.67% improvement takes place in number of pieces produced and it saves 57.71% cost of production due to minimizations in machine break down, line setting and basic amenity.

1.2 Research Objectives

The following are the goals of this thesis work: -

1. Identify the primary causes of non-productive time (NPT).
2. To observe various forms of non-productive time (NPT).
3. To conduct a thorough analysis of the non-productive time (NPT) of three distinct types of clothing in order to identify loss pieces for each lost hour.

4. To observe the line wise non-productive time (NPT) for one month and determine the floor wise and date wise loss pieces.

5. To recommend the ways of minimizing non-productive time (NPT) based on the analysis.

1.3 Significance of the Study

Garment manufacturing units are now focusing on the improvement of overall efficiency to reduce NPT that increases their production cost. But several issues have arisen in the cutting, sewing and finishing sections of the garments industry. The production efficiency level is not remarkable which is between 40-50% and the reason behind it is practicing huge amount of non-productive activities. The problem is encountered in the initial processing of the sewing section. The capacity utilization of section is around 40% to 65% due to problems of nonvalue added time at each operational process. But, no root causes are identified as to why there is such a problem. So, this research work focuses on analyzing the root causes of NPT in the different operations involved for different types of garment production highlighting on the key contributory factors for the lower level of productivity. By the using the Standard Allowed Minutes (SAM), time study and work study method, production capacity is determined to analyze and calculate the total loss minutes due to NPT on different styles of garments based on weekly and monthly reports.

1.4 Limitations of the Research

The following are the limits of the thesis work: -

1. The factory deliberately restricts sharing some of the crucial information needed for analysis because of confidentiality.

2. There was lack of previous studies in the chosen area.

3. There might be confounding variables regarding the selection of samples taken for analysis.

4. The duration of the research work is limited.

CHAPTER 2: LITERATURE REVIEW

2.1 Non-Productive Time

Non-Productive Time (NPT) is a term used in Industrial Engineering. Non-productive time is defined as time spent by an operator without creating any output (standard minutes), such as'set up time'. Non-productive time is quantified in garment manufacturing to determine how much standard time is wasted due to machine downtime. The NPT Report is a report created by recording machine downtime or lost time. Lost time is documented to provide management with an explanation for poor productivity on a given day or decreased line efficiency. Here are few examples of lost time: -

- Line setting - time lost at the time of setting up the line for new styles
- Machine breakdown
- Cutting not available
- Stitching quality issue
- Cutting quality problem
- Power failure
- Change of feeding plan
- Basic amenity

2.2 Flow Chart of NPT

Investigate the NPT period

↓

Choose a manufacturing company to apply the findings

↓

Visual observation and industrial visits

↓

Choose an operating segment

↓

Create a data sheet tailored to a certain product style

↓

Value added and non-value added time calculations are used to analyse the present situation. ↓
Determining the Non-Productive Time Zone Prior to Root Cause Examination

↓

Finding the underlying reason of ineffective activity

↓

Using the root cause analysis method for ineffective activities

↓

Because of the lower costs and increased productivity after implementing this project

↓

Suggestions for conclusion

2.3 Procedure to Record NPT

A printed format containing different reasons of NPT is provided to each line. One person is made responsible (line feeder, work study officer or line supervisor) to record lost time in total man minutes in the format. During production hours whenever you see operators to sit idle, find the reasons of not having work (or not doing the task) and note down start time and stop time, as shown in the sample format. In case multiple operators are sitting idle for the same reason multiply lost time by number of operators to calculate total man-minutes lost and record on your NPT format. Lost time recorded under the category needs to be approved by supervisor or authorized person. At the end of the day calculate total lost time in each category.

2.4 Major Causes of NPT

The discrepancy between an employee's hourly compensation and the hours they actually work to generate income—expressed as lost hour—must be taken into account when calculating the burdened cost of labour. This has a major effect on lead times, profit margins, production costs, and consumer demand for high-quality products. The four main causes of nonproductive time (NPT) are covered here. Several factors have been shown to be the primary cause of NPT-

1. Waiting for work
2. Cutting del.ay
3. Alteration and re-work in production line
4. Line setting

1. Waiting for Work

- Because there has been no feeding from earlier operators, the sewing line operators are idle.
- Inadequate line balance;
- Absenteeism among operators;
- Quality problems
- Long wait times are experienced by the operator when trims are not approved.

2. Cutting Delay

- Some or all of the operators at the back may choose to remain idle in order to feed the following lay.
- Not enough fabric to load and cut;
- Fabric permission required before cutting;
- Cutting capacity reduced;
- Inadequate plan of cutting

3. Alteration or Re-work

- The stitch must be opened and restitched if the necessary stitch quality is not created the first time.

- The item was returned to the operator for adjustment after the operator sewed a flawed seam.
- Differences in shade in various portions of the same garment, necessitating the need to open thread and replace certain parts.
- Attached incorrect trims; need modification.
- Stitching of separate garment components from wrong bundle, therefore adjustment necessary.
- Because they are not being fed, operators are left idle and are assigned to repair or modify items of the same style.

4. Line Setting

- Frequent style changes caused by small order runs enhance efficiency losses.
- It has been found that in a month 3-6 styles are loaded to a line.
- Due to shipment demands or insufficient planning, line managers may be compelled to halt the line before the current style is finished, and a new style is loaded with no previous preparation or resources. As a result, there is a severe loss of standard time.
- Factories apply an end style to every line and a single style to every line on the floor on the same day. Line setting occurred at the same moment in this case, necessitating more setup time than usual.
- Insufficient fabric for styles - lines must be halted and another style loaded until fabric found.
- Improved planning and proactive line supervisors and engineers can reduce line setup time.

2.5 Productivity Improvement Techniques

This study is key to the garments industry to improve their work nature and the methods. The apparel industries are identified as buyer driven or costumer driven industry, so apparel production has become more intensified by global competition. To survive in this competitive world, the industry should work more efficiently. The concept which are outlined here are the most important factors to improve the productivity and efficiency of the industry and the application of industrial engineering methods like method engineering, work study, capacity

study, line plan, and other operation management system can ultimately lead the industry to timely delivery of goods, high profit, and develop the working environment.

We have included some of the fundamental productivity enhancement approaches that are commonly utilised in the clothing industry to increase garment output -

1. Based on Technology
2. Based on Employee
3. Based on Material
4. Based on Process
5. Based on Product
6. Based on Management

1. Based on Technology

The use of Computer Aided Manufacturing (CAM), Computer Integrated Manufacturing System (CIMS), and Computer Aided Design (CAD) is made.

Computer-aided design, or CAD, is the design of systems, processes, or products.

Because CAD has the following benefits, it has a considerable influence on productivity:

(a) Quick assessment of alternative designs;

(b) Reduced operating risk; and (c) Error reduction.

2. Based on Employee

(a) Rewards, both monetary and non-monetary, given to individuals and groups;

(b) Employee advancement;

(c) Job creation, growth, enhancement, and repetition;

(d) Employee participation in making decisions;

(e) Quality reviews (QC) and small collaborative endeavours (SGA)

(f) Personal development

3. Based on Material
a) Control & Planning of Material

b) Logistics Software Purchased

4. Based on Process
a) Engineering methods and task simplification

b) Work assessment, job design, and job safety

5. Based on Product
a) Value analysis and engineering;

b) Product diversification;

c) Standardisation and simplification;

d) Reliability engineering; and

e) Product mix and promotion.

6. Based on Management
(a) Style of management

(b) Organisational communication

(c) Motivation

CHAPTER 3: MATERIALS AND METHODS

This thesis report has been prepared based on both primary and secondary data.

- The primary data was NPT reports collected for analysis from the sewing lines and other departments of Millennim Textile (Southern) Ltd.
- The secondary data were collected from related journals on NPT of garment production.

The time study period for conducting the research work was from September 1, 2023 to September 30, 2023.

Material and Method: 1 long sleeve shirt, 1 short sleeve shirt, and 1 ladies midi dress are selected for this study for analyzing the NPT based on the weekly and monthly reports to identify the root cause of NPT during the production time. Several sewing lines and also the related other departments were brought into focus to make the NPT report that determined the lost minute during the operations which resulted in loss pieces.

3.1 Non-Productive Time (NPT) for Long Sleeve Shirt

A long sleeve shirt is chosen for analysis of NPT report which was running in 4 lines for 24 days to meet the quantity of bulk production of 60,500 pcs.

3.1.1 Details of the Product

- Buyer: M&S
- Order no.: OM7823489
- Style no.: 27WF
- Fabric - 100 % Cotton
- Wash: N/A
- GSM: 150

3.1.2 Complete Garment Picture

Figure 3.1.2.1 Long sleeve shirt

Here, the picture of the long sleeve shirt of M&S buyer that is chosen for analysis of NPT report is given above.

3.1.3 Graded Measurement Sheet

Graded Measurements(cm)

Code:	Ref:	Point of Measure:	Final Meas	XXS	XS	S	M	L	XL	XXL	XXXL	Tolerance (+)	(-)
10B		Chest circ at underarm	120	100	105	110	115	120	126	132	138	2	1
11A		Shoulder breadth (at fold -widest point)	49	44.2	45.4	46.6	47.8	49	50.5	52	53.5	1	1
11F		Shoulder drop from HPS	6	6	6	6	6	6	6	6	6	0.5	0.5
11H		Across front 17 cm from HPS	43	38.2	39.4	40.6	41.8	43	44.5	46	47.5	0.5	0.5
11J		Across back 17 cm from HPS	47	42.2	43.4	44.6	45.8	47	48.5	50	51.5	0.5	0.5
12C		Neck width seam to seam	17	14.6	15.2	15.8	16.4	17	17.6	18.2	18.8	0.5	0.5
13A - 0.5		Front neck drop from HPS - edge to edge	10	8	8.5	9	9.5	10	10.5	11	11.5	0.5	0.5
13H		Back neck drop from HPS to neck seam	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	0.3	0.3
14B		Collar width at cb	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	0	0
14C		Collar stand width at cb	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	0	0
14D		Collar peak length	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	0	0
14F		Collar length at top edge	44	36	38	40	42	44	46	48	50	1	1
14H		Collar button to centre buttonhole	43	35	37	39	41	43	45	47	49	1	1
16Q		Waist 20 cm below underarm	115	95	100	105	110	115	121	127	133	2	1
19E		Hem circ. above tail/shape	115	95	100	105	110	115	121	127	133	2	1
20C		Front tail length	5	5	5	5	5	5	5	5	5	0.5	0.5
20D		Back tail length	6	6	6	6	6	6	6	6	6	0.5	0.5
29F		Sleeve length from shld point - long	67	64.6	65.2	65.8	66.4	67	67.6	68.2	68.8	0.5	0.5
30A		Armhole circumference	58	50	52	54	56	58	60	62	64	1	1
31A		Upperarm girth	44	36	38	40	42	44	46	48	50	1	1
31E		Sleeve girth at 1/2 underarm (incl cuff)	34	29.2	30.4	31.6	32.8	34	35.2	36.4	37.6	1	1
32Q		Cuff opening buttoned	23.5	21.5	22	22.5	23	23.5	24	24.5	25	0.5	0.5
33A		Cuff width	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	0.3	0.3
33C		Sleeve placket length	15	15	15	15	15	15	15	15	15	0.5	0.5
33E		Sleeve placket width	2	2	2	2	2	2	2	2	2	0.5	0.5
35B		Front yoke depth from HPS	4	4	4	4	4	4	4	4	4	0.3	0.3
35F		Yoke depth at cb	8	8	8	8	8	8	8	8	8	0.3	0.3
36C		Placket width	3	3	3	3	3	3	3	3	3	0.3	0.3
39L		Front length from HPS	79	73	74.5	76	77.5	79	80.5	82	83.5	1	1
52E3		Chest pocket width	14	13.5	13.5	13.5	14	14	14	14.5	14.5	0.5	0.3
52E4		Chest pocket length including length	16	15.5	15.5	15.5	16	16	16	16.5	16.5	0.5	0.3

Table 3.1.3.1 Graded measurement of long sleeve shirt

Here, the graded measurement sheet of the long sleeve shirt is given. The different points of measurements for the different sizes XXS to XXXL are mentioned. The measurement guidelines are required for making the pattern that is used to make the marker for cutting to manufacture the garment according to the different sizes.

3.1.4 Operation Bulletin & SMV

MILLENNIUM TEXTILES (SOUTHERN) LTD.OPERATION BULLETIN

MENS LS RIF COTTON RICH

FLANNEL SHIRT

Buyer : M&S   Size: Order No: T-25_2470M,2471M,2472M,2474M   Style:

Style Description : Collar fuse with skin lining, Plain pocket at front, Sleeve join with fanci stitch, Side seam with FOA, Round cuff attach wi th single pleat. Button down collar.

Fabric Composition : Normal Fabric   Order Quantity: Pcs   Allotted Line: L-   DATE : 20-Feb-23

Efficiency at Target/hr: 70.0% **Operator:** 23.25 **Allowed Excess Manpower:** 0.00 Day-1 Day-2 Day-3 Day-4 Day-5 Day-6 **Hourly Target at Peak (pcs):** 58 **SMV: 20.85 Standard Manpower:** 28.55
Target During Learning Time: Learning Days: 3

Total Machine Requirement: 26   **Helper/Iron** 5.30   **Maximum Allowed Manpower:** 28.55   29   46   58   58   58   58

Sl.	Operation	SAM	SAS	Standard Pdn (Pcs/hr)	DescriptionMachine	MachineNo. of	Attachment/ Folder etc	OperatorNo.of	No. Of Helper (	Production Target Pcs/hr)	Note
	COLLAR										
1	INTERLINING TOUCH TO COLLAR	0.18	10.68	337	IRON				0.30	102	
2	INTERLINING TOUCH TO COLLAR BAND	0.18	10.68	337	IRON				0.30	102	
3	COLLAR MAKE	0.40	23.94	150	SNLS-VRT			0.45		67	
4	COLLAR POINT CUT & TURN	0.18	10.68	337							
5	COLLAR TOP STITCH	0.36	21.66	166	SNLS-UBT			0.45		75	
6	BAND ROLLING	0.22	13.38	269	SNLS-UBT			0.31		83	
7	BAND JOIN ROUND NOSE	0.40	24.18	149	SNLS-VRT	1		0.50		74	
8	BAND TOPSTITCH WITH NOSE TRIM	0.41	24.48	147	SNLS-UBT	1		0.50		74	
9	BAND EXCESS CUT	0.11	6.84	526							

10	COLLAR MARK FOR JOIN	0.10	6.00	600							
	CUFF										
11	INTERLINING TOUCH TO CUFF	0.23	13.80	261	IRON	1			0.39	102	
12	CUFF ROLLING	0.31	18.60	194	SNLS-UBT	1		0.43		83	
13	CUFF MAKE ROUND	0.49	29.64	121	SNLS-VRT	1		0.55		67	
14	CUFF DECHAIN & TURN	0.30	17.82	202	HLP				0.35	71	
15	CUFF TOPSTITCH	0.44	26.10	138	SNLS-UBT	1		0.55		75	
	FRONT PART										
16	CARE LABEL ATTACH (6 LABEL) 3 shade label	0.42	25.38	142	SNLS-UBT	1		0.53		75	
17	BOX PLACKET SERVICING	0.43	26.04	138	O/L-0TH	1		1.00		138	

18	SEW BOX PLACKET	0.40	23.94	150	KANSAI	1		0.50		75	SUPPORT 2 LINE
19	BUTTON PLACKET ROLLING	0.38	22.68	159	SNLS-UBT			0.47		75	
20	POCKET POSITION MARK & FRT FITTING	0.34	20.40	176	HLP				0.53	94	
21	PKT CHECK MRK & MATCH WITH FRONT	0.25	14.94	241	HLP				0.30	71	
22	POCKET SCISSORING	0.30	17.70	203	HLP				0.35	71	
23	POCKET ROLLING	0.19	11.40	316	SNLS-UBT			0.26		83	
24	DECORATIVE LABEL ATTACH AT POCKT	0.21	12.66	284	SNLS-UBT			0.28		80	
25	POCKET IRON	0.30	18.00	200	IRON	1			0.47	94	
26	POCKET ATTACH (Plain Pkt)	0.65	39.00	92	SNLS-UBT	1		1.00		92	
	BACK PART										
27	FIT & MAIN LABEL JOIN WITH SIZE LABEL	0.66	39.30	92	SNLS-UBT	1		1.00		92	
28	BACK PLEAT MAKE	0.28	16.80	214	SNLS-UBT	1		0.37		80	
29	BACK YOKE JOIN	0.39	23.28	155	SNLS-UBT			0.55		85	
30	BACK YOKE TOPSTITCH	0.32	19.26	187	SNLS-UBT	1		0.45		85	

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	SLEEVE									
31	SLEEVE OPENING CUT & GAMBLE ATTACH	0.37	22.26	162	SNLS-NOR	1	FOLDER	0.50		81	SUPPORT 2 LINE
32	SLEEVE GAMBLE TACK	0.26	15.60	231	SNLS-UBT			0.35		80	

33	ATTACH SLEEVE PLACKET	0.79	47.40	76	SNLS-UBT	1		1.00		76	
	ASSEMBLY									
34	SHOULDER JOIN	0.52	31.38	115	SNLS-UBT	1		0.59		68	
35	SHOULDER TOPSTITCH	0.36	21.42	168	SNLS-UBT			0.41		68	
36	ATTACH SLEEVE	0.64	38.10	94	SNCS	1		1.00		94	
37	ARMHOLE TOPSTITCH	0.70	41.82	86	SNCS	1		1.00		86	
38	COLLAR MATCH	0.25	14.76	244	HLP				0.30	73	
39	COLLAR ATTACH	0.39	23.16	155	SNLS-UBT	1		0.55		86	
40	PIPING MAKE	0.25	14.76	244	SNLS-UBT			0.29		71	
41	PIPING ATTACH	0.31	18.72	192	SNLS-UBT			0.45		86	
42	COLLAR CLOSE (ROUND NOSE)	0.60	35.88	100	SNLS-UBT	1		0.71		71	
43	SIDE SEAM	0.73	43.92	82	FOA	1		1.00		82	
44	CUFF MATCH WITH PLKT CUT	0.35	21.00	171	HLP				0.48	82	
45	CUFF ATTACH SINGLE PLEAT	0.64	38.52	93	SNLS-UBT	1		1.00		93	
46	BOTTOM HEM SCISSORING	0.27	16.44	219	HLP			0.38		83	
47	BOTTOM HEM	0.45	26.82	134	SNLS-UBT	1		0.62		83	
48	BODY BUTTON HOLE 9 HOLE	0.59	35.10	103	B-HOLE	1		0.92		94	
49	SLEEVE PLACKET & COLLAR POINT HOLE 4	0.36	21.72	166	B-HOLE	1		0.57		94	
50	MARK FOR BUTTON ATTACH	0.38	22.86	157	HLP				0.52	82	
51	BUTTON ATTACH - FULL BODY (10 BUTTONS) 1 CONTRAST	0.54	32.28	112	B-ATTACH	1		0.84		94	
52	MARK FOR DOWN BUTTON ATTACH	0.23	13.74	262	HLP				0.32	85	

53	SLEEVE PLACKET & DOWN BUTTON ATTACH 5	0.43	25.68	140	B-ATTACH	1		0.67		94	
54	POCKET BARTACK	0.16	9.42	382	BT	1		0.25		96	SUPPORT 4 LINE
55	STICKER REMOVE	0.31	18.78	192	HLP				0.44	85	
56	BUTTON CLOSE FOR WASH 2 BUTTON	0.17	9.96	361	HLP				0.23	85	
	TOTAL	**20.85**				**29**		**23**	**5**		

SEWING MACHINES REQUIRED:

Machine Description	M/C Name	TOTAL
Single Needle Lock Stitch - Normal	SNLS-NOR	1
Single Needle Lock Stitch - UBT	SNLS-UBT	14
Single Needle Lock Stitch - Vertical	SNLS-VRT	2
Kansai	KANSAI	1
FOA	FOA	1
Botton Hole	B-HOLE	2
Button Attach	B-ATTACH	2
Single Needle Chain Stitch	SNCS	2
Bartack	BT	1
Total Sewing Machines		**26**

Table 3.1.4.1 Operation bulletin of long sleeve shirt Here, the operation bulletin and SMV of the long sleeve shirt is given.

Operation bulletin is a document that summarizes the machines, processes, layout, SMV, manpower setting, SAM, process-wise production target, and other details required for sewing a garment. The sewing operations are described in details with total sewing machines of 26 per line and an hourly target of 58 pcs with an efficiency of 70%.

Standard Minute Value (SMV) is a measure used to calculate the time it takes to produce a specific garment or garment component. The SMV of the long sleeve shirt is 20.85 mins.

3.1.5 NPT Report of Sewing Section (1 Week)

SL. No	Category	Responsible Dept.	Day-Wise Non-Productive Minute							Lost Hour
			Code	1	2	3	4	5	6	
1	Supervision Problem	Sewing	SP	0	102	0	910	86	0	18.2
2	Re-Work	Sewing	RW	0	0	0	0	0	0	0
3	Manpower Crisis	Sewing	MC	1180	0	0	0	0	0	18
4	Style Change Delay	Sewing	SCD	0	0	0	0	0	0	0
5	Deduct Hour	Sewing	DH	0	0	0	0	0	0	0
	Total Lost Hour			19	1.67	0	16	1.3	0	36.2

Table 3.1.5.1 Day wise non-productive time of sewing section (1 week)

The table above shows the NPT for 6 consecutive days of sewing (1 week). The five key NonProductive Time (NPT) categories are monitored, and the total lost minutes for each of these difficulties are recorded. It is observed that supervision problem and manpower crisis are the major reasons of NPT in sewing section for this particular style of garment.
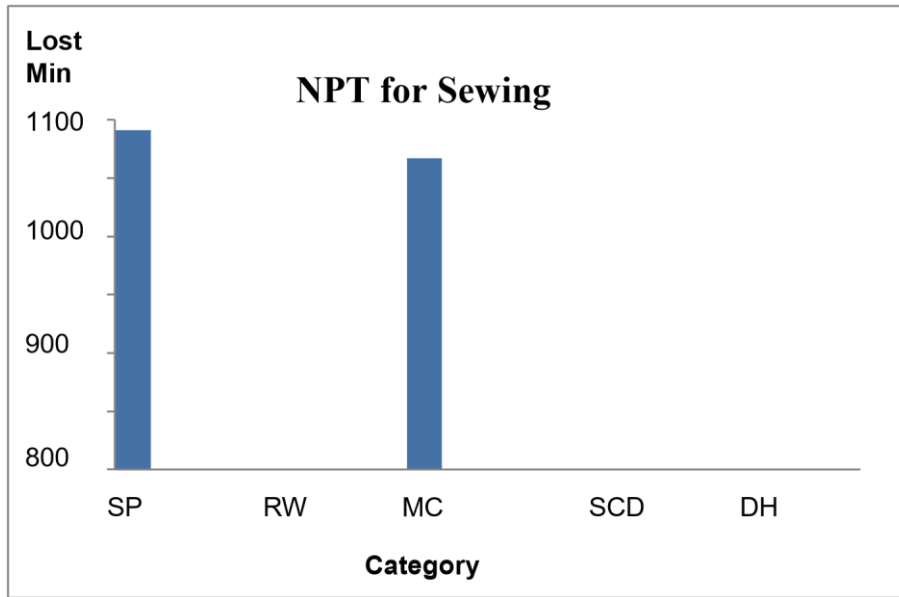
Graph 3.1.5.2 Code wise non-productive time of sewing section (1 week)

This graph is used to graphically represent the NPT of sewing section (1 week) according to the major categories of NPT causes. It is seen the total lost minutes due to supervision problem is 1086 mins and due to man-power crisis is 1080 mins.

3.1.6 NPT Report of Other Departments (1 Week)

SL.	Category	Responsible Dept.	Date Wise Non-Productive Second							Lost Minute
			Code	1	2	3	4	5	6	
1	Machine Break Down	Maintenance	MB	75	1840	884	456	170	551	66.23
2	Decision Making Delay	Quality	DMD	0	0	0	0	0	0	0
3	Quality Checking Delay	Quality	QCD	0	0	0	0	0	0	0
4	Machine Delay	Maintenance	MD	1640	0	540	1320	0	0	58.33
5	Cutting Mistake	Cutting	CM	0	0	0	0	0	0	0
6	Fabric Approval Delay	Quality	CD	0	0	0	0	0	0	0
7	Cutting Delay	Cutting	FAD	0	0	0	0	0	0	0
8	Fabric Delay	Store	FB	0	0	0	0	0	0	0

9	Color Shading	Quality	CS	0	0	0	0	0	0	**0**
10	Print Mistake	Printing	PM	0	0	0	0	0	0	**0**
11	Print Delay	Printing	PD	0	0	0	0	0	0	**0**
12	Print Approval Delay	Quality	PAD	0	0	0	0	0	0	**0**
13	Embroidery Delay	Embroidery	ED	0	0	0	0	0	0	**0**
14	Embroidery Mistake	Embroidery	EM	0	0	0	0	0	0	**0**
15	Accessories Delay	Supply Chain	ACD	2400	1440	1320	0	0	440	**93.33**
16	Input Supply Delay	Supply Chain	ISD	10680	0	3510	0	0	5400	**326.5**
17	Power Failure	Administration	PF	0	22554	406	51895	4460	0	**1321.91**
18	Salary Payment Effect	Administration	SPE	0	0	0	0	0	0	**0**
19	Approval Delay	Quality	APD	0	0	0	0	0	0	**0**
20	Technical problem	Technical	TP	0	0	0	0	0	0	**0**
21	Pattern Mistake	Technical	PTM	0	0	0	0	0	0	**0**
22	Re-Feeding	Planning	RF	0	0	0	0	0	0	**0**
23	Others	Other	OTS	0		0	40	0	250	**4.83**
Total Lost Hour				**4.09**	**7.17**	**1.85**	**18.91**	**1.28**	**1.84**	**31.10**

Table 3.1.6.1 Day wise non-productive time of other departments (1 week)

Here, the record of NPT for 6 consecutive days of other departments (1 week) is given. The primary types of NPT are noted, and the total loss minutes for each of these issues are recorded. It is observed that machine breakdown, machine delay, accessories delay, input supply delay, and power failure are the major reasons of NPT in the other departments for this particular style of garment.
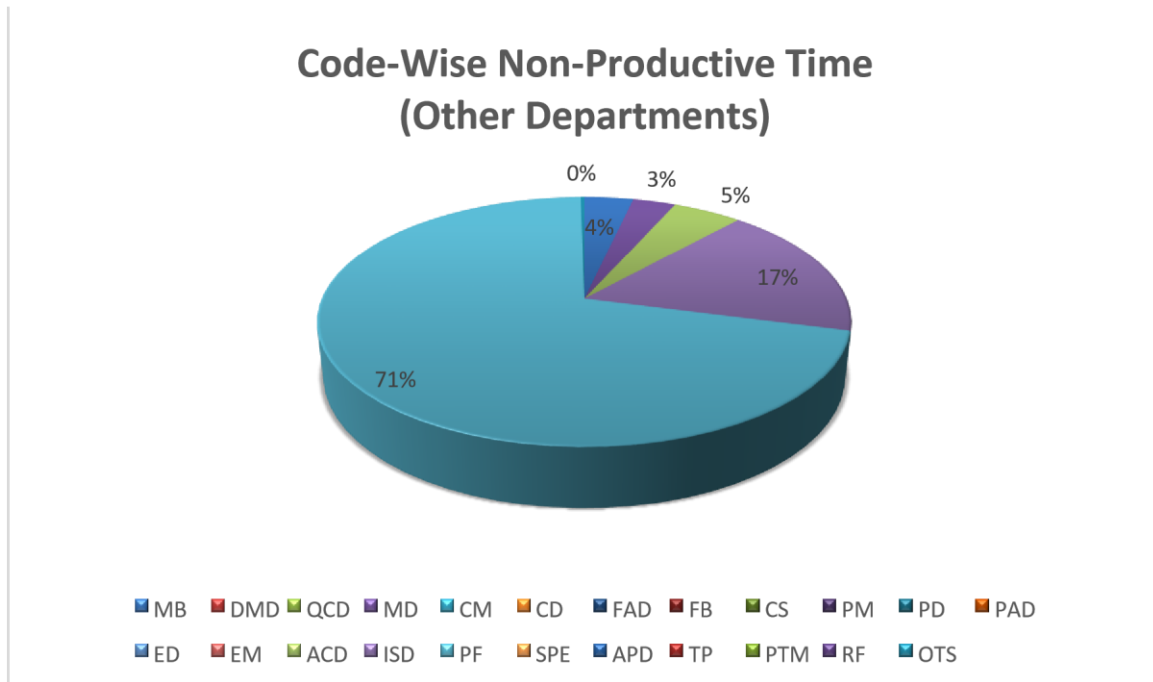
Pie-chart 3.1.6.2 Code wise non-productive time of other departments (1 week)

This pie-chart is used to represent the NPT of other departments (1 week) according to the major categories of NPT causes. It is seen the total lost hour percentage due to power failure is 71%, input supply delay is 17%, accessories delay is 5%, machine break down is 3%, and machine delay is 4% among all the causes of NPT.

3.2 Non-Productive Time (NPT) for Ladies Midi Dress

A ladies shirt is chosen for analysis of NPT report which was running in 5 lines for 27 days to meet the quantity of bulk production of 9,750 pcs.

3.2.1 Details of the Product
• Buyer: M&S

• Order no.: LD92384

• Style no.: Midi Dress 1786

- Fabric - 60% Cotton, 40% Viscose

- Wash: Garment wash

- GSM: 152

3.2.2 Complete Garment Picture

Figure 3.2.2.1 Midi dress

Here, the picture of the midi dress of M&S buyer that is chosen for analysis of NPT report is given above.

3.2.3 Graded Measurement Sheet

*=rev. m-ment	XS/P	S/P	M/P	L/P	XL/P	XXL/P
QC 1 CHEST straight	103.8	113.3	122.6	132.2	145.2	157.7
QC 2 BACK LENGTH top layer, cb *	32	32	31.9	31.8	31.9	32
QC 3 BOTTOM top layer, along hem	118	127.7	137.7	148.2	160.8	173.1
QC 4 BOTTOM along skirt hem	122.4	130.4	138.4	146.4	157.5	168.8
QC 5 FRONT WIDTH relaxed	20.5	23	25	27	30.3	33.1
6 SHOULDER ELASTIC relaxed *	31.3	32	32.8	33.7	34.7	35.4
QC 7 SLEEVE LENGTH *	34.8	35	35.2	35.4	35.6	35.8
8 BICEPS	59.3	61.6	63.9	66.2	69.2	72.2
9 BOTTOM SLEEVE	54.8	56.8	58.8	60.8	63.5	66.2
QC 10 SCYE DEPTH	7	8	9	10.1	11.2	12.4
QC 11 BACK WIDTH. relaxed	18.9	21	23.1	25.2	28.2	31.2
QC 12 BACK LENGTH cb *	66	66.5	67	67.5	68	68.5
13 FRONT LENGTH TO WAIST nursing layer only *	18.2	19	19.8	20.6	21.2	22.3
QC 14 WAIST relaxed	64	72	80	88	98	108

Table 3.2.3.1 Graded measurement of midi dress

Here, the graded measurement sheet of the midi dress is given. The different points of measurements for the different sizes XS/P to XXL/P are mentioned. The measurement guidelines are required for making the pattern that is used to make the marker for cutting to manufacture the garment according to the different sizes.

3.2.4 Operation Bulletin & SMV

OPERATION BULLETIN

Buyer :	LPP	Size:		Order No.:					Style:	Midi Dress With Puff Sleeves	
Style Description :											
Fabric Composition :								DATE :	26-Sep-20		

SLEEVE

Hourly Target at Peak (pcs):	72	SMV:	5.09	Standard Manpower:	12.00	Hourly Target During Learning Time Learning Days: 2
Efficiency at Target/hr:	50.9%	Operator:	9.00	Allowed Excess Manpower:		Day-1 Day-2 Day-3 Day-4 Day-5 Day-6
Total Machine Requirement:	9	Helper/Iron Man:	3.00	Maximum Allowed Manpower:	12.00	54 72 72 72 72 72

SEWING

Hourly Target at Peak (pcs):	0	SMV:	12.94	Standard Manpower:	37.00	Target During Learning Time: Learning Days: 3
Efficiency at Target/hr:	0.0%	Operator:	30.00	Allowed Excess Manpower:		Day-1 Day-2 Day-3 Day-4 Day-5 Day-6
Total Machine Requirement:	30	Helper/Iron Man:	7.00	Maximum Allowed Manpower:	37.00	0 0 0 0 0 0

Sl.	Operation	Code	Condition	SAM	SAS	Standard Pdn (pcs/hr)	Machine Description	No. of Machine	Attachments/ Folders etc.	No. of operator	No. of helper	Target Production (pcs)	Note
	SLEEVE												
1	ELASTIC CUT WITH MEASUREMENT			0.400	24.00	150					1.00	150	
2	ELASTIC MARK			0.600	36.00	100					1.00	100	
3	BODY MARK FOR ELASTIC ATTACH			0.600	36.00	100					1.00	100	
4	ELASTIC ATTACH WITH SLEEVE (SHOULDER AREA			0.717	43.02	84	O/L-3TH	2		2		167	
5	SLEEVE TACK WITH FOLD			0.700	42.00	86	SNLS-UBT	2		2		171	
6	SLEEVE ROLLING SHOULDER AREA			0.650	39.00	92	DNLS-NOR	2		2.0		185	
7	ELASTIC ATTACH AT SLEEVE OPENING			0.450	27.00	133	O/L-3TH	1		1		133	
8	SLEEVE OPENING TACK WITH FOLD			0.450	27.00	133	SNLS-UBT	1		1		133	
9	SLEEVE OPENING ROLLING			0.520	31.20	115	DNLS-NOR	1		1		115	
	FRONT PART												
10	INTERLINNING TOUCH ON FRONT FACING			0.150	9.00	400	IRON	1			1	400	
11	FRONT FACING ROLLING			0.200	12.00	300	SNLS-UBT	1		1.00		300	
12	MARK FRONT DART POSITION			0.280	16.80	214						0	
13	SEW FRONT DART			0.380	22.80	158						0	
14	FRT BOTTOM PNL SHARING			0.386	23.16	155	SNLS-UBT	1	SHARING GUIDE	1.00		155	
15	FRT SHARING PART JOIN WITH TOP PART			0.406	24.36	148	SNLS-UBT	1	Plain foot	1		148	
16	O/L PANEL JOIN ALLOWANCE		22.44	0.300	18.00	200	O/L-3TH	1	Plain foot	1.00		200	
17	FRONT FACING ATTACH			0.300	18.00	200	SNLS-UBT	1		1		200	
18	FRONT FACING TOPSTITCH FROM INSIDE			0.250	15.00	240	SNLS-UBT	1		1		240	
	BACK PART												
19	INTERLINNING TOUCH ON BACK FACING			0.150	9.00	400	IRON	1			1	400	
20	BACK FACING ROLLING			0.200	12.00	300	SNLS-UBT	1		1.00		300	
21	BACK BOTTOM PNL SHARING			0.386	23.16	155	SNLS-UBT	1	SHARING GUIDE	1.00		155	
22	BACK SHARING PART JOIN WITH TOP PART			0.406	24.36	148	SNLS-UBT	1	Plain foot	1		148	
23	O/L PANEL JOIN ALLOWANCE		22.44	0.300	18.00	200	O/L-3TH	1	Plain foot	1.00		200	
24	MAIN LABEL ATTACH			0.347	20.82	173	SNLS-UBT	1	Plain foot	1		173	
25	BACK FACING ATTACH			0.300	18.00	200	SNLS-UBT	1		1		200	
26	BACK FACING TOPSTITCH FROM INSIDE			0.250	15.00	240	SNLS-UBT	1		1		240	
27	CARE LABEL ATTACH LBL			0.210	12.60	286	SNLS-UBT	1		1		286	
	ASSEMBLY												
28	SLEEVE TACK FRONT & BACK		KOM2	0.800	48.00	75	SNLS-UBT	2		2		150	
29	SLEEVE JOIN		KOM3	0.800	48.00	75	O/L-5TH	2		2.00		150	
30	DBL FLY MAKE		KOM3	0.180	10.80	333	SNLS-UBT	1		1.00		333	
31	OVERLOCK ZIPPER JOIN AREA WITH DBL FLY		KOM3	0.530	31.80	113	O/L-3TH	2	Plain Foot	2.00		226	
32	SIDE MARK FOR ZIPPER JOIN		KOM3	0.380	22.80	158					1.00	158	
33	SIDE TACK FOR ZIPPER JOIN		KOM3	0.347	20.82	173	SNLS-UBT	1		1.00		173	
34	ZIPPER JOIN			0.649	38.94	92	SNLS-UBT	2	Zipper Guide	2.00		185	
35	DBLE FLY JOIN WITH ZIPPER			0.350	21.00	171	SNLS-UBT	2	Plain foot	2.00		343	
36	TACK FOR SIDE SEAM			0.400	24.00	150						0	
37	SIDE SEAM			0.900	54.00	67	O/L-5TH	2	Plain foot	2.00		133	
38	SAFETY TACK AT SLEEVE			0.247	14.82	243						0	
	BOTTOM HEM SCISSORING			0.290	17.40	207					1	207	
39	BOTTOM HEM			0.882	52.92	68	SNLS-UBT	2	CL-1/16	2.00		136	
40	STICKER REMOVE			0.252	15.12	238					1	238	
41	THREAD TRIMMING WITH TACK REMOVE			0.730	43.80	82					2	164	
	SUM			**18.03**				**41**		**39**	**10**		
										49			

SEWING MACHINES REQUIRED:

Description		Collar	Cuff	Sewing	Total
Single Needle Lock Stitch - Normal	SNLS-NOR				
Single Needle Lock Stitch - UBT	SNLS-UBT	3		22	25
Over Lock - 3 Thread	O/L-3TH	3		4	7
Over Lock - 5 Thread	O/L-5TH			4	4
Total Sewing Machines		**9**	**0**	**32**	**41**

Table 3.2.4.1 Operation bulletin of midi dress Here, the operation bulletin and SMV of the midi dress is given.

Operation bulletin is a document that summarizes the machines, processes, layout, SMV, manpower setting, SAM, process-wise production target, and other details required for sewing a garment. The sewing operations are described in details with total sewing machines of 30 per line and an hourly target of 72 pcs with an efficiency of 50.9%.

Standard Minute Value (SMV) is a measure used to calculate the time it takes to produce a specific garment or garment component. The SMV of the midi dress is 5.09 mins.

3.2.5 NPT Report of Sewing Section (1 Week)

SL. No	Category	Responsible Dept.	Day-Wise Non-Productive Minute							Lost Hour
			Code	1	2	3	4	5	6	
1	Supervision Problem	Sewing	SP	0	368	0	745	87	0	20
2	Re-Work	Sewing	RW	0	0	45	0	32	0	1.28
3	Manpower Crisis	Sewing	MC	400	0	0	0	0	0	6.67
4	Style Change Delay	Sewing	SCD	0	0	0	0	0	0	0
5	Deduct Hour	Sewing	DH	0	0	0	0	0	0	0
	Total Lost Hour			6.67	6.13	0.75	12.42	1.98	0	27.95

Table 3.2.5.1 Day wise non-productive time of sewing section (1 week)

The table above shows the NPT for 6 consecutive days of sewing (1 week). The five key Non-Productive Time (NPT) categories are monitored, and the total lost minutes for each of these difficulties are recorded. The key causes of NPT in the sewing department for this specific design of garment are seen to be supervision issues, rework, and a labour shortage.
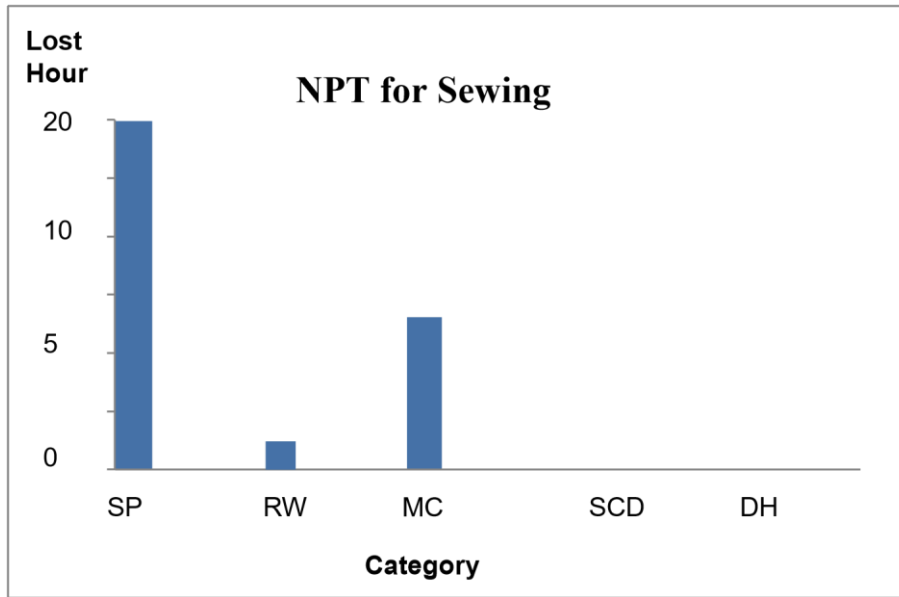
Graph 3.2.5.2 Code wise non-productive time of sewing section (1 week)

This graph is used to graphically represent the NPT of sewing section (1 week) according to the major categories of NPT causes. It is seen the total lost minutes due to supervision problem is 20 hours, due to man-power crisis is 6.67 hours and due to re-work is 1.28 hours.

3.2.6 NPT Report of Other Departments (1 Week)

SL. No	Category	Responsible Dept.	Code	Day Wise Non-Productive Second						Lost Min
				1	2	3	4	5	6	
1	Machine Break Down	Maintenance	MB	140	927	62	23	25	1096	37.88
2	Decision Making Delay	Quality	DMD	0	0	0	0	0	0	0
3	Quality Checking Delay	Quality	QCD	0	0	0	0	0	0	0
4	Machine Delay	Maintenance	MD	0	0	0	0	0	0	0
5	Cutting Mistake	Cutting	CM	0	0	0	0	0	0	0
6	Fabric Approval Delay	Quality	CD	0	0	0	0	0	0	0
7	Cutting Delay	Cutting	FAD	0	0	0	0	0	0	0

8	Fabric Delay	Store	FB	0	0	0	0	0	0	**0**
9	Color Shading	Quality	CS	0	0	0	0	0	0	**0**
10	Print Mistake	Printing	PM	0	0	0	0	0	0	**0**
11	Print Delay	Printing	PD	0	0	0	0	0	0	**0**
12	Print Approval Delay	Quality	PAD	0	0	0	0	0	0	**0**
13	Embroidery Delay	Embroidery	ED	0	0	0	0	0	0	**0**
14	Embroidery Mistake	Embroidery	EM	0	0	0	0	0	0	**0**
15	Accessories Delay	Supply Chain	ACD	0	0	0	0	0	0	**0**
16	Input Supply Delay	Supply Chain	ISD	3600	19560	4200	0	0	12120	**658**
17	Power Failure	Administration	PF	4368	0	0	0	7720	9732	**363.66**
18	Salary Payment Effect	Administration	SPE	0	0	0	0	0	0	**0**
19	Approval Delay	Quality	APD	0	2820	0	0	0	0	**47**
20	Technical problem	Technical	TP	0	0	0	0	0	0	**0**
21	Pattern Mistake	Technical	PTM	0	0	0	0	0	0	**0**
22	Re-Feeding	Planning	RF	0	0	0	0	0	0	**0**
23	Others	Other	OTS	0		0	0	0	0	**0**
	Total Lost Hour			**2.25**	**6.46**	**1.18**	**0**	**2.15**	**6.36**	**18.44**

Table 3.2.6.1 Day wise non-productive time of other departments (1 week)

Here, the record of NPT for 6 consecutive days of other departments (1 week) is given. The primary types of NPT are noted, and the total loss minutes for each of these issues are recorded. It is observed that machine break.down, machine delay, input s.upply delay, po.wer failure, and appr.oval delay are the major reasons of NPT in the other departments for this particular style of garment.
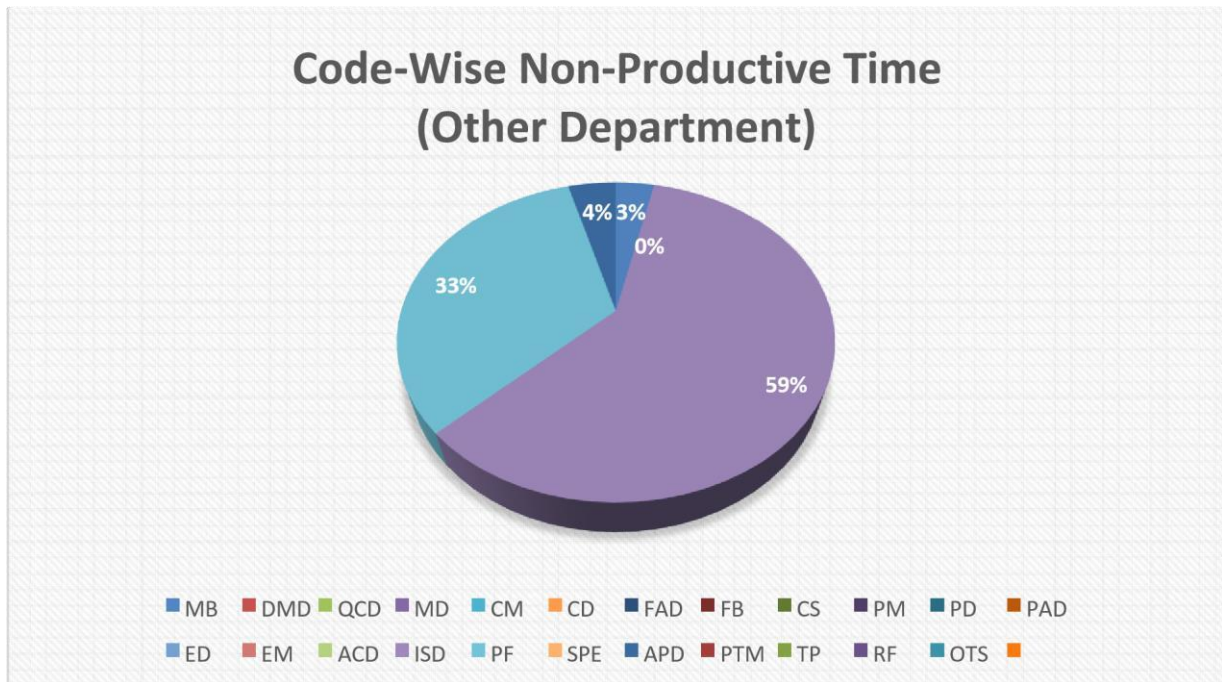
Pie-chart 3.2.6.2 Code wise non-productive time of other departments (1 week)

This pie-chart is used to represent the NPT of other departments (1 week) according to the major categories of NPT causes. It is seen the total lost hour percentage due to power failure is 59%, input supply delay is 33%, machine breakdown is 4%, and approval delay is 3% among all the causes of NPT.

3.3 Non-Productive Time (NPT) for Short Sleeve Shirt

A short sleeve shirt is chosen for analysis of NPT report which was running in 6 lines for 32 days to meet the quantity of bulk production of 28,750 pcs.

3.3.1 Details of the Product
- Buyer: M&S

- Order no.: 12958092589
- Style no.: SSS28328

- Fabric - 100% Cotton

- Wash: N/A

- GSM: 156

- Yarn count: 30/2

3.3.2 Complete Garment Picture

Figure 3.3.2.1 Short sleeve shirt

Here, the picture of the short sleeve shirt of M&S buyer that is chosen for analysis of NPT report is given above.

3.3.3 Graded Measurement Sheet

Table 3.3.3.1 Graded measurement of short sleeve shirt

Here, the graded measurement sheet of the short sleeve shirt is given. The different points of measurements for the different size 20 to size 32 are mentioned. The measurement guidelines are required for making the pattern that is used to make the marker for cutting to manufacture the garment according to the different sizes.

3.3.4 Operation Bulletin & SMV

COLLAR										
1	INTERLINING TOUCH TO COLLAR	0.19	11.52	313	IRON	1			1.00	313	
2	INTERLINING TOUCH TO COLLAR BAND	0.19	11.52	313	IRON	1			1.00	313	
3	COLLAR MAKE	0.45	27.18	132	SNLS-VRT	2		2.00		265	

4	COLLAR POINT CUT & TURN	0.18	10.68	337							
5	COLLAR TOPSTITCH	0.38	22.80	158	SNLS-UBT	2		2.00		316	
6	BAND ROLLING WITH IRON	0.31	18.60	194	IRON	1			1.00	194	
7	TWILL TAPE ATTACH WITH BAND	0.28	16.80	214	SNLS-UBT	1		1.00		214	
8	BAND JOIN ROUND NOSE	0.40	24.18	149	SNLS-VRT	2		2.00		298	
9	BAND SCISSORING TRIM & TURN BAND	0.28	16.80	214	HLP				1.00	214	
10	BAND TOPSTITCH	0.31	18.48	195	SNLS-UBT	1		1.00		195	
11	BAND EXCESS CUT	0.11	6.84	526							
12	COLLAR MARK FOR JOIN	0.12	7.14	504							
	FRONT PART										
13	SEW FRONT DART	0.40	24.00	150	SNLS-UBT	1		1.00		150	
14	SEW BOX PLACKET	0.45	27.00	133	KANSAI	2		2.00		267	
15	BUTTON PLACKET ROLLING	0.40	24.00	150	SNLS-UBT	2		2.00		300	
16	POCKET ROLLING	0.21	12.72	283	SNLS-UBT	1		1.00		283	
17	POCKET IRON	0.33	19.80	182	IRON	1			1.00	182	
18	POCKET ATTACH	0.65	39.00	92	SNLS-UBT	1		1.00		92	
19	PEN POCKET MAKE	0.22	13.20	273	SNLS-UBT	1		1.00		273	
20	FRONT FITTING	0.29	17.28	208	HLP				1.00	208	
	BACK PART										
21	CARE LABEL ATTACH	0.27	16.20	222	SNLS-UBT	1		1.00		222	
22	MARK BACK DART POSITION	0.30	18.00	200	HLP	1			1.00		
23	SEW BACK DART	0.40	24.00	150	SNLS-UBT	1		1.00		150	

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#	Operation									
24	BACK YOKE JOIN	0.48	28.80	125	SNLS-UBT	2		2.00		250
25	BACK YOKE TOPSTITCH	0.41	24.60	146	DNLS-NOR	1		1.00		146
	SLEEVE									
26	SLEEVE ROLLING	0.60	36.00	100	SNLS-UBT	2		2.00		200
	ASSEMBLY									
27	SHOULDER JOIN	0.51	30.60	118	SNLS-UBT	2		2.00		235
28	SHOULDER TOPSTITCH	0.45	27.00	133	SNLS-UBT	2		2.00		267
29	COLLAR MATCH WITH BODY	0.30	18.00	200	HLP				1.00	200
30	COLLAR ATTACH	0.39	23.16	155	SNLS-UBT	2		2.00		311
31	COLLAR CLOSE WITH MAIN LABEL	0.60	36.00	100	SNLS-UBT	3		2.00		200
32	ATTACH SLEEVE	0.65	39.00	92	O/L-5TH	2		2.00		185
33	ARMHOLE TOPSTITCH	0.68	40.80	88	SNCS	2		2.00		176
34	SIDE SEAM	0.68	40.80	88	FOA	2		2.00		176
35	SAFETY STITCH AT SLEEVE OPENING	0.35	21.00	171	SNLS-UBT	2		2.00		343
36	HEM SCISSORING	0.30	18.00	200	HLP				1.00	200
37	BOTTOM HEM	0.50	30.00	120	SNLS-UBT	2		2.00		240
38	BODY BUTTON HOLE (9 HOLE)	0.64	38.10	94	B-HOLE	2		2.00		189
39	MARK FOR BUTTON ATTACH	0.39	23.40	154	HLP				1.00	154
40	BUTTON ATTACH - FULL BODY (10 BTN)	0.51	30.66	117	B-ATTACH	2		2.00		235
41	BARTACK AT POCKET	0.20	12.00	300	BT	1		1.00		300
41	STICKER REMOVE	0.31	18.60	194	HLP				1.00	194
	TOTAL	**16.07**				**52**		**46**	**11**	

SEWING MACHINES REQUIRED:

Machine Description	M/C Name	TOTAL	
Single Needle Lock Stitch - UBT	SNLS-UBT	**29**	
Single Needle Lock Stitch - Vertical	SNLS-VRT	**4**	
Over Lock - 5 Thread	O/L-5TH	**2**	
Kansai	KANSAI	**2**	
FOA	FOA	**2**	
Botton Hole	B-HOLE	**2**	
Button Attach	B-ATTACH	**2**	
Total Sewing Machines		**47**	

Table 3.3.4.1 Operation bulletin of short sleeve shirt

Here, the operation bulletin and SMV of the short sleeve shirt is given.

Operation bulletin is a document that summarizes the machines, processes, layout, SMV, manpower setting, SAM, process-wise production target, and other details required for sewing a garment. The sewing operations are described in details with total sewing machines of 47 per line and an hourly target of 149 pcs with an efficiency of 70%.

Standard Minute Value (SMV) is a measure used to calculate the time it takes to produce a specific garment or garment component. The SMV of the short sleeve shirt is 16.07 mins.

3.3.5 NPT Report of Sewing Section (1 Week)

SL. No	Category	Responsible Dept.	Day-Wise Non-Productive Minute							Lost Hour
			Code	1	2	3	4	5	6	
1	Supervision Problem	Sewing	SP	0	134	0	64	73	0	4.52
2	Re-Work	Sewing	RW	0	0	580	0	0	0	9.67
3	Manpower Crisis	Sewing	MC	1550	0	0	0	0	0	25.8
4	Style Change Delay	Sewing	SCD	0	0	0	0	0	0	0
5	Deduct Hour	Sewing	DH	0	0	0	0	0	0	0
Total Lost Hour				25.8	2.23	9.67	1.06	1.21	0	39.9

Table 3.3.5.1 Day wise non-productive time of sewing section (1 week)

The table above shows the NPT for 6 consecutive days of sewing (1 week). The five key NonProductive Time (NPT) categories are monitored, and the total lost minutes for each of these difficulties are recorded. It is observed that supervision problem, rework and manpower crisis are the major reasons of NPT in sewing section for this particular style of garment.
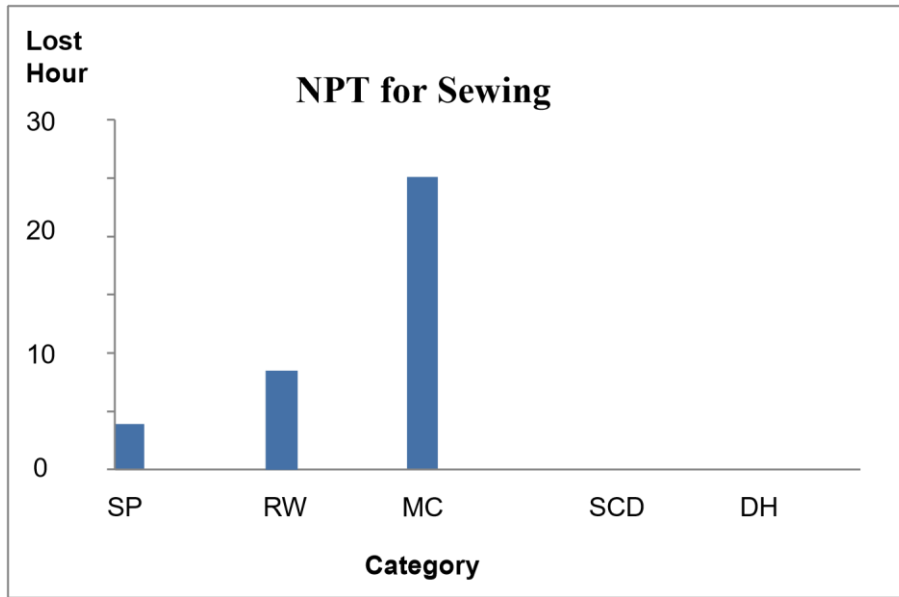
Graph 3.3.5.2 Code wise non-productive time of sewing section (1 week)

This graph is used to graphically represent the NPT of sewing section (1 week) according to the major categories of NPT causes. It is seen the total lost minutes due to supervision problem is 4.52 hours, due to man-power crisis is 25.8 hours and due to re-work is 9.67 hours.

3.3.6 NPT Report of Other Departments (1 Week)

SL	Category	Responsible Dept.	Code	Date-Wise Non-Productive Second						Lost Min
				1	2	3	4	5	6	
1	Machine Break Down	Maintenance	MB	0	0	0	0	86	0	1.43
2	Decision Making Delay	Quality	DMD	0	0	0	900	0	0	15
3	Quality Checking Delay	Quality	QCD	0	0	0	0	0	0	0
4	Machine Delay	Maintenance	MD	0	0	0	1320	0	0	22
5	Cutting Mistake	Cutting	CM	0	0	0	0	0	0	0
6	Fabric Approval Delay	Quality	CD	0	0	0	0	0	0	0
7	Cutting Delay	Cutting	FAD	0	0	0	0	0	0	0
8	Fabric Delay	Store	FB	0	0	0	0	0	0	0
9	Color Shading	Quality	CS	0	0	0	0	0	0	0
10	Print Mistake	Printing	PM	0	0	0	0	0	0	0
11	Print Delay	Printing	PD	0	0	0	0	0	0	0
12	Print Approval Delay	Quality	PAD	0	0	0	0	0	0	0
13	Embroidery Delay	Embroidery	ED	0	0	0	0	0	0	0
14	Embroidery Mistake	Embroidery	EM	0	0	0	0	0	0	0
15	Accessories Delay	Supply Chain	ACD	0	0	0	960	3600	0	76
16	Input Supply Delay	Supply Chain	ISD	6240	2640	0	55140	2250	13680	1332.5
17	Power Failure	Administration	PF	0	0	8040	5951	1048	0	250.65
18	Salary Payment Effect	Administration	SPE	0	0	0	0	0	0	0
19	Approval Delay	Quality	APD	0	0	0	0	0	0	0
20	Technical problem	Technical	TP	0	0	0	0	0	0	0
21	Pattern Mistake	Technical	PTM	0	0	0	0	0	0	0
22	Re-Feeding	Planning	RF	0	0	0	0	2880	0	48
23	Others	Other	OTS	0		0	0	0	0	0
	Total Lost Hour			1.73	0.73	2.23	17.85	2.74	4.8	29.09

Table 3.3.6.1 Day wise non-productive time of other departments (1 week)
Here, the record of NPT for 6 consecutive days of other departments (1 week) is given. The
primary types of NPT are noted, and the total loss minutes for each of these issues are recorded.

It is observed that machine breakdown, decision making delay, machine delay, accessories delay, input supply delay, power failure, and re-feeding are the major reasons of NPT in the other departments for this particular style of garment.
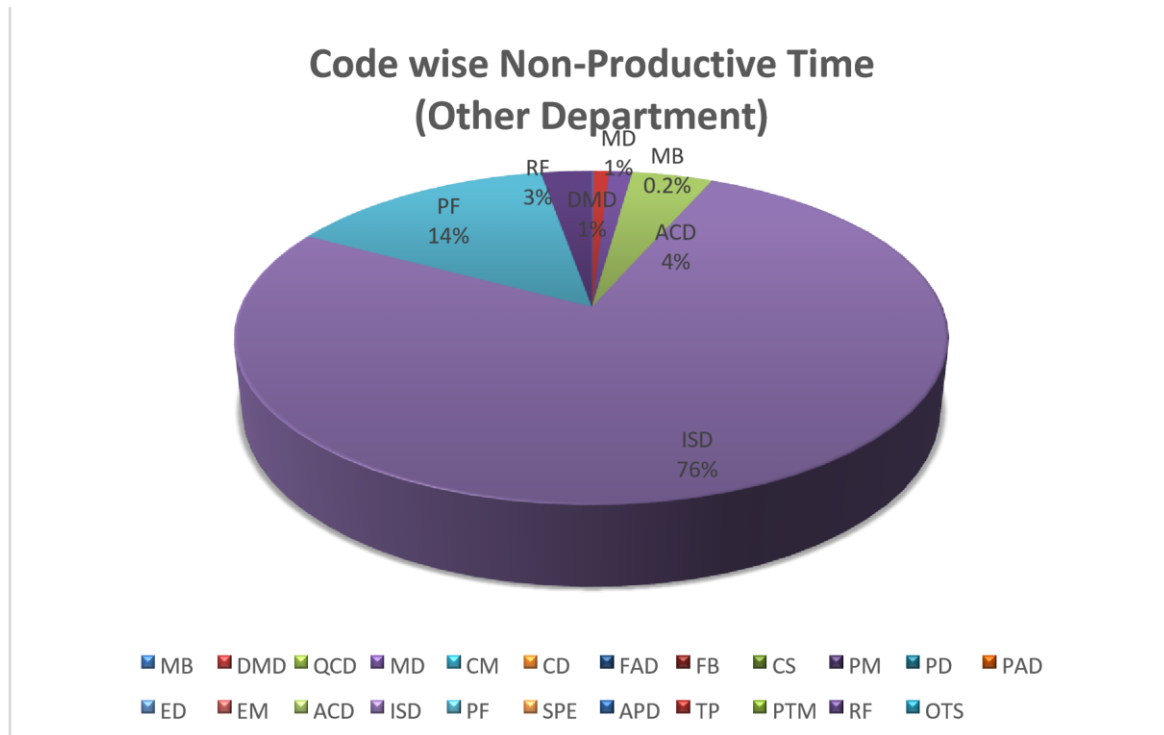
Pie-chart 3.3.6.2 Code wise non-productive time of other departments (1 week)

This pie-chart is used to represent the NPT of other departments (1 week) according to the major categories of NPT causes. It is seen the total lost hour percentage due to input supply delay is 76%, power failure is 14%, accessories delay is 4%, re-feeding mistake is 3%, machine delay is 1%, decision making delay is 1%, and machine breakdown is 0.2% among all the causes of NPT.

CHAPTER 4: DISCUSSION OF RESULTS

4.1 Comparison of NPT Report of Sewing Section (1 Week)

Style Description	Long Sleeve Shirt		Midi Dress		Short Sleeve Shirt	
SL. No	Problem Name	Total Hour	Problem Name	Total Hour	Problem Name	Total Hour
1	Supervision problem	45.7	Supervision problem	20	Supervision problem	15
2	Re-work	0	Re-work	1.28	Re-work	23.6
3	Man-power crisis	56	Man-power crisis	6.67	Man-power crisis	75.8
4	Style change delay	5.2	Style change delay	1.4	Style change delay	3.3
5	Machine breakdown	88.9	Machine breakdown	98.4	Machine breakdown	72.3
	Total Hour	**195.6**	**Total Hour**	**126.3**	**Total Hour**	**190**

Table 4.1.1 NPT of 1 week of sewing section for different products

Here, the NPT of sewing section for the 3 different products are compared for analysis to highlight on the number of hours lost due to NPT. It is observed supervision problem, rework, man-power crisis, and style change are the root causes of non-productive time in the sewing section for manufacturing these 3 styles of garments.

For 1 week in the month of September –

- The total lost hour for NPT in the sewing section is 195.6 hours for long sleeve shirt which means the total loss pcs is 202 pieces.

- The total lost hour for NPT in the sewing section is 126.3 hours for ladies midi dress which means the total loss pcs is 1488 pieces.

- The total lost hour for NPT in the sewing section is 190 hours for short sleeve shirt which means the total loss pcs is 709 pieces.

It can be derived from the above table that the major causes of NPT are same but their delaying hours of non-productive time are different for various reasons that results in varying numbers of total loss pieces for 1 week.

The root causes of NPT in sewing section along with their recommended solutions to overcome these major problems are explained below-

1. Supervision problem:

Supervisors unable to supervise operators correctly within the limited time frame.

Prevention methods -

- Supervisors should be amicable to the operators and helpers.
- Supervisors must help the operators overcome difficulties during operations.
- Supervisors must provide proper guidelines to workers.
- Supervisors must provide correct bundles to workers with no time delay in between process.

2. Man-power Crisis:

Shortage of workers causing NPT.

Prevention methods -

- Absenteeism of operators and helpers results in man power crisis which can be overcome by hiring 1-day contract-based workers to replace them.
- Line balancing done to reduce loss pieces due to man power crisis.
- Factory must pay all workers with the first week of the month to avoid workers absenteeism due to lack of payment on proper time.

3. Re-work:

Alteration or repeating operation due to defect causing NPT. Prevention methods -

- Factory must hire experienced operators with required skills.
- Factory must provide adequate training to all workers.

- The operators must be careful during sewing operations to reduce alter or re-work.

4. Style Change Delay:

Change of style in a line requires a new set of layout that causes NPT.   Prevent methods -

- Operation bulletin of new style must be done beforehand.
- Layout must be fixed with little to no time loss.
- Proper line balancing.
- Operators must not sit idle and must be assigned to other operations.
- Manual operations must be started with or without the change for new layout.

5. Machine Break Down:

Machine break down due to needle break, attachment problem, and faulty machine parts are major causes of NPT.

Prevention methods -

- Needle broken is a major cause that can be overcome by using correct size of needle required for sewing the garment component.
- Using proper attachments with sewing machine according to different operations.
- Setting the required rpm in the sewing machine.
- Use lubricating oil to reduce the tendency of needle break.
- Determine rating of operator and assign operations accordingly to reduce machine breakdown due to lack of worker's skill.

4.2 Comparison of NPT Report of Other Departments (1 Week)

Long Sleeve Shirt		Midi Dress		Short Sleeve shirt	
Problem Name	Total Minute	Problem Name	Total Minute	Problem Name	Total Minute
Machine Breakdown	66.23	Machine Breakdown	37.88	Machine Breakdown	14.43
Decision Making Delay	16	Decision Making Delay	0	Decision Making Delay	15
Quality Checking Delay	0	Quality Checking Delay	0	Quality Checking Delay	0
Machine Delay	58.33	Machine Delay	0	Machine Delay	22
Cutting Mistake	0	Cutting Mistake	0	Cutting Mistake	0
Cutting Delay	0	Cutting Delay	0	Cutting Delay	0
Fabric approval Delay	0	Fabric approval Delay	0	Fabric approval Delay	0
Fabric Delay	0	Fabric Delay	0	Fabric Delay	0
Color Shading	0	Color Shading	0	Color Shading	0
Print Mistake	0	Print Mistake	0	Print Mistake	0
Print Delay	0	Print Delay	0	Print Delay	0
Print Approval Delay	0	Print Approval Delay	0	Print Approval Delay	0
Embroidery Approval Delay	0	Embroidery Approval Delay	0	Embroidery Approval Delay	0
Embroidery Mistake	0	Embroidery Mistake	0	Embroidery Mistake	0
Accessories Delay	93.33	Accessories Delay	1318.5	Accessories Delay	76

Accessories Delay	93.33	Accessories Delay	1318.5	Accessories Delay	76
Input Supply Delay	326.5	Input Supply Delay	658	Input Supply Delay	1332.5
Power Failure	1321.91	Power Failure	363.66	Power Failure	250.65
Salary Payment Effect	0	Salary Payment Effect	0	Salary Payment Effect	0
Approval Delay	78	Approval Delay	47	Approval Delay	0
Technical Problem	0	Technical Problem	0	Technical Problem	0
Pattern Mistake	0	Pattern Mistake	0	Pattern Mistake	0
Re-feeding	0	Re-feeding	0	Re-feeding	48
Total Hour	**32.67**	**Total Hour**	**18.44**	**Total Hour**	**29.09**

Table 4.2.1 NPT of 1 week of other departments for different products

Here, the NPT of other departments for the 3 different products are compared for analysis to highlight on the number of hours lost due to NPT. It is observed that machine break.down, accessories. delay, approval. delay, input. supply delay, power. failure, and re-feeding .are the root causes of non-productive time in the other departments for manufacturing these 3 styles of garments.

For 1 week in the month of September –

- The total lost hour for NPT in the sewing section is 32.67 hours for long sleeve shirt which means the total loss pcs is 134 pieces.
- The total lost hour for NPT in the sewing section is 18.44 hours for ladies midi dress which means the total loss pcs is 217 pieces.
- The total lost hour for NPT in the sewing section is 29.09 hours for short sleeve shirt which means the total loss pcs is 109 pieces.

It can be derived from the above table that the major causes of NPT are same but their delaying hours of non-productive time are different for various reasons that results in varying numbers of total loss pieces for 1 week.

4.3 Line Wise NPT Report from 1st Sept to 23rd Sept

Line-wise Non-Productive Time (Minutes)
1st Sep to 23th Sep-2023

Line	Input supply delay	Cutting permission pending	Delay for CAD	Trim/Accessories/Fabric supply delay	Trim/Accessories/Fabric inhouse delay	Machine Breakdown	Machine arrange delay	Power failure/Electrical proble	Attahment delay	Quality Issue (Sewing)	Quality issue (Cutting)	Press/Fusing delay	Print/Embroidery/other subcon er subcon part del	Meeting/Training	Broken needle arrange delay	Late/absence	No Plan	Others	Implausible/Inconsistent Work	Approval Pending	Follow-up problem	Skill/Handling Issue	Style interruption delay	Total
U2-01	0	0	0	0	0	0	0	95	0	2730	2400	8540	0	1562	165	9160	0	190	480	0	1440	720	0	27482
U2-02	0	0	0	0	0	2100	0	815	300	0	3000	3540	0	1576	0	23207	0	0	0	0	0	5115	0	39653
U2-03	0	0	0	0	0	0	0	240	0	0	0	2680	0	132	0	6063	0	0	480	0	0	0	18420	28015
U2-04	960	0	0	0	0	4200	0	1825	0	645	5775	12730	0	793	0	11512	0	0	0	0	0	1320	0	39760
MTSL (U-2)-2nd Floor	960					6300		2975	300	3375	11175	27490		4063	165	49942		190	960		1440	7155	18420	134910
U2-05	0	0	0	0	0	7185	0	0	0	0	0	0	0	3060	0	15721	0	0	690	0	0	31072	0	57728
U2-06	6690	0	0	0	0	320	0	0	0	5005	2170	1050	0	140	0	19551	0	0	0	0	0	0	0	34926
U2-07	540	0	0	0	0	40	0	0	0	1115	4368	4200	0	2480	0	14588	0	0	690	0	0	0	0	28021
MTSL (U-2)-3rd Floor	7230					7545				6120	6538	5250		5680		49860			1380			31072		120675
U2-08	7890	0	0	1680	0	2540	0	0	0	8650	2880	0	0	2298	0	9930	0	0	690	0	240	0	0	36798
U2-09	0	0	0	1260	0	1430	0	0	0	2800	0	0	0	111	0	20500	0	0	0	0	1260	2740	1440	31541
U2-10	1080	0	0	320	0	320	0	0	0	7460	5630	0	0	132	0	13042	0	0	480	0	0	5798	2800	36742
U2-11	0	0	0	480	0	4050	0	560	0	840	0	0	0	2241	0	13390	0	0	900	0	0	420	1320	24201
MTSL (U-2)-4th Floor	8970			3420		8340		560		19750	8510			4782	0	56862			2070		1500	8958	5560	129282
U2-12	0	0	0	0	0	422	0	157	0	3270	540	1890	0	928	70	4546	0	0	0	0	5366	3060	1613	21862
U2-13	0	0	0	0	0	60	0	111	0	11669	840	0	0	1258	0	4547	0	0	540	0	6731	1400	0	27156
U2-14	240	0	0	0	0	505	0	88	0	1203	11379	0	0	381	0	1249	0	0	0	0	15772	214	0	31031
U2-15	180	0	0	0	0	720	0	85	0	8192	1440	0	0	581	40	5845	0	0	0	0	12073	750	2400	32306
MTSL (U-2)-5th Floor	420					1707		441		24334	14199	1890		3148	110	16187			540		39942	5424	4013	112355
MTSL (Unit-2) TTL	17580			3420	0	23892	0	3976	300	53579	40422	34630	0	17673	275	172851	0	190	4950	0	42882	52609	27993	497222
U1-16	0	0	0	0	0	6145	0	90	0	0	0	0	0	810	0	2285	0	0	0	0	0	5632	0	14962
U1-17	0	0	0	0	0	4645	0	447	120	0	0	0	0	800	0	3220	0	0	0	0	0	9607	0	18839
U1-18	0	0	0	0	0	630	0	100	0	1940	0	0	0	980	0	4995	0	0	0	0	0	3150	0	11795
U1-19	0	0	0	0	0	820	0	307	0	3585	0	0	0	2440	0	3465	0	0	1080	0	0	594	0	12291
U1-20	0	0	0	0	0	1340	0	110	0	460	0	0	0	2460	0	2390	0	0	1080	0	0	264	0	8104
FHSL-4th Floor						13580		1054	120	5985				7490		16355			2160			19247		65991
U1-21	0	0	0	0	0	1170	0	1134	0	0	450	0	0	60	0	1872	0	0	1380	0	0	14256	0	20322
U1-22	0	0	0	0	0	1370	0	913	0	2217	0	0	0	70	0	1855	0	0	0	0	0	8605	0	15030
U1-23	0	0	0	0	0	1648	0	808	0	0	0	0	0	70	0	1647	0	0	0	0	0	9789	1595	15557
U1-24	300	0	0	0	0	3530	0	764	0	5500	1950	0	0	40	0	1558	0	0	0	0	0	7331	0	20973
U1-25	0	0	0	0	0	2110	0	906	0	2610	840	0	0	60	0	1839	0	0	0	0	0	10884	0	19249
MTSL (U-1)-4th Floor	300					9828		4525		10327	3240			300		8771			1380			50865	1595	91131
U1-26	0	0	0	0	0	1045	0	466	0	0	0	0	0	67	0	3226	0	0	0	0	0	2271	0	7075
U1-27	0	0	0	0	0	0	0	400	0	80	0	0	0	64	0	4444	0	0	0	0	0	726	0	5714
U1-28	0	0	0	0	0	480	0	528	0	220	0	0	0	1082	0	3746	0	0	180	0	1120	1857	0	9213
U1-29	0	0	0	0	0	280	0	484	0	300	0	0	0	488	0	4413	0	0	60	0	0	0	1200	7225
U1-30	0	0	0	0	0	450	0	472	0	0	680	0	0	69	0	2242	0	0	0	0	0	1206	0	5119
U1-31	0	0	0	0	0	450	0	587	0	1870	680	0	0	69	0	2233	0	0	0	0	0	792	0	6681
MTSL (U-1)-3rd Floor						2705		2937		2470	1360			1839		20304			240		1120	6852	1200	41027
MTSL (Unit-1) TTL	300	0	0	0	0	26113	0	8516	120	18782	4600	0	0	9629	0	45430	0	0	3780	0	1120	76964	2795	198149
GRAND TOTAL	17880			3420		50005		12492	420	72361	45022	34630		27302	275	218281		190	8730		44002	129573	30788	695371
Upto 16th Sep-23	6570			480		36643		8550	300	45524	33821	29630		22542	205	159281		190	8730		7783	80332	29468	470049

Table 4.3.1 Line wise NPT of 1 month of all the sewing lines for different products
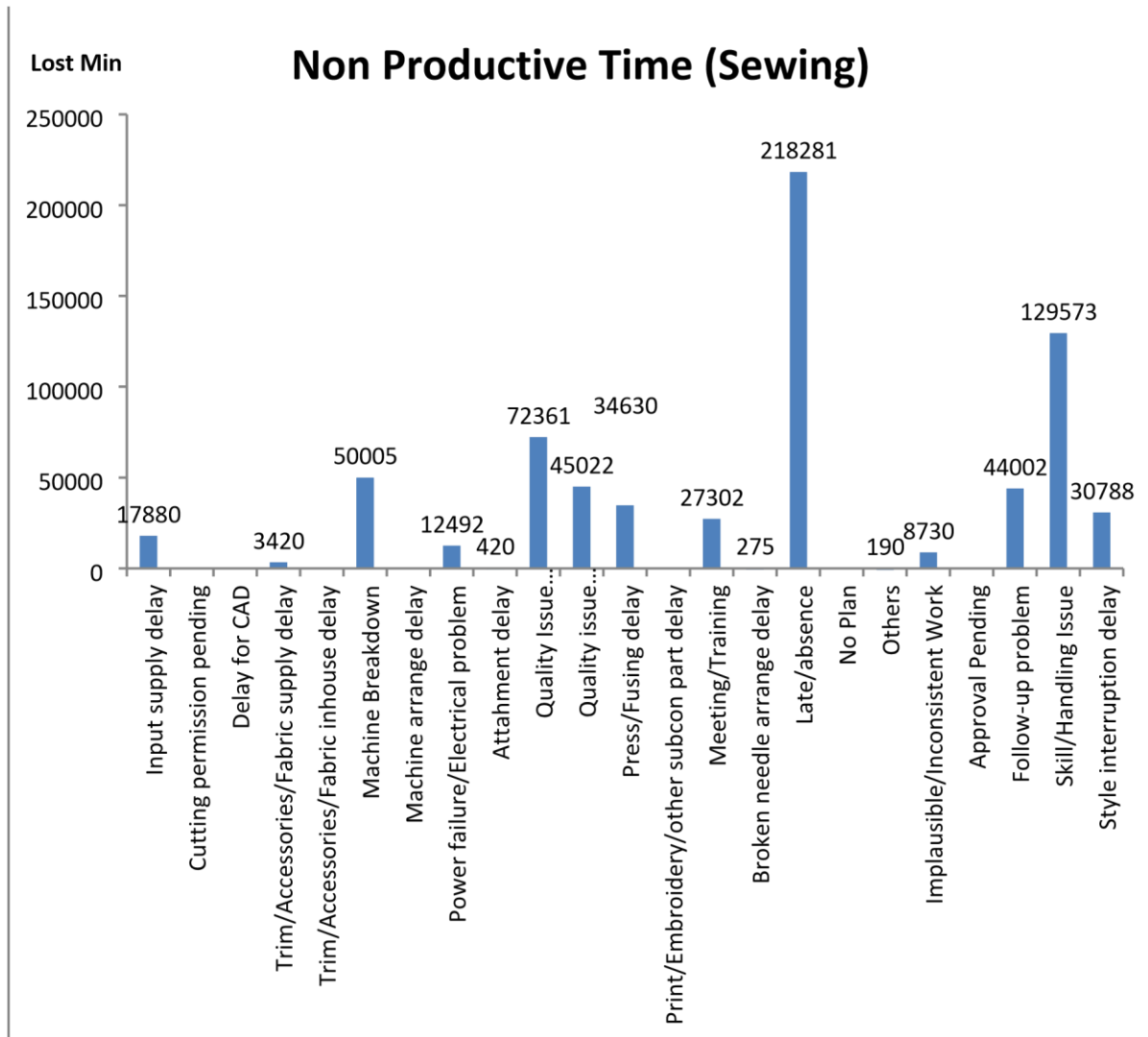
Here, the table above mentions all the roots causes of NPT in the sewing floors of Millennium Textile (Southern) Limited representing each category of NPT line-wise to highlight on the loss pieces due to lost time for each of the category in each sewing line. From 1st Sept to 23rd Sept, 2023 –

- Lost min for MTL (U-2) 2nd floor with 4 sewing lines is 134910 min which means the loss pcs are 6581 pcs.

- Lost min for MTL (U-2) 3rd floor with 3 sewing lines is 120675 min which means the loss pcs are 5746 pcs.

- Lost min for MTL (U-2) 4th floor with 4 sewing lines is 129282 min which means the loss pcs are 7182 pcs.

- Lost min for MTL (U-2) 5th floor with 4 sewing lines is 112355 min which means the loss pcs are 6241 pcs.

- Lost min for FHSL 4th floor with 5 sewing lines is 65991 min which means the loss pcs are 2639 pcs.

- Lost min for MTL (U-1) 4th floor with 5 sewing lines is 91131 min which means the loss pcs are 4,142 pcs.

- Lost min for MTL (U-1) 3rd floor with 6 sewing lines is 41024 min which means the lost pcs are 1953 pcs.

The grand total of lost time for NPT of all the sewing lines of Millennium Textile (Southern) ltd is 695371 min which means the total amount of loss pieces is 34,768 pcs. This data solidifies that non-productive time in sewing operations results in huge production losses that impacts the cost of production; produced mins where the workers are being paid for spent mins; affecting the capacity where the daily set-up targets are not met that might result in delayed deliveries due to higher lead-time of production.

Graph 4.3.2 Category wise NPT of 1 month for different products

Here, the bar chart above mentions all the roots causes of NPT in the concerning departments of Millennium Textile (Southern) Limited representing the lost time category-wise to highlight on the loss pieces due to each of the category of reasons of NPT for the duration of 1 month.

From 1st Sept to 23rd Sept, 2023 –

- Lost min due to input supply delay is 17880 min which means the loss pcs are 851 pcs.
- Lost min due to trims/accessories/fabric supply delay is 3420 min which means the loss pcs are 162 pcs.
- Lost min due to machine breakdown is 50005 min which means the loss pcs are 278 pcs.

- Lost min due to power failure is 12492 min which means the loss pcs are 694 pcs.

- Lost min due to attachment delay is 420 min which means the loss pcs are 23 pcs.

- Lost min due to quality issue (sewing) is 72361 min which means the loss pcs are 3445 pcs.

- Lost min due to quality issue (cutting) is 45022 min which means the loss pcs are 2143 pcs.

- Lost min due to printing/fusing delay is 34630 min which means the loss pcs are 1649 pcs.

- Lost min due to meeting/training is 27302 min which means the loss pcs are 1300 pcs. • Lost min due to broken needle arrange delay is 275 min which means the loss pcs are 13 pcs.

- Lost min due to late/absence is 218281 min which means the loss pcs are 12126 pcs.

- Lost min due to other problems is 190 min which means the loss pcs are 10 pcs.

- Lost min due to inconsistent work is 8730 min which means the loss pcs are 415 pcs.

- Lost min due to follow-up problem is 44002 min which means the loss pcs are 2445 pcs.

- Lost min due to skill/handling issue is 129573 min which means the loss pcs are 6478 pcs.

- Lost min due to style interruption delay is 30788 min which means the loss pcs are 1539 pcs.

The grand total of lost time for NPT of all the concerning departments of Millennium Textile (Southern) ltd is 734162 min which means the total amount of loss pieces is 52,286 pcs for all the categories of reasons for NPT. This data highlights on each of the root causes, and thus preventive measures must be taken to eliminate these reasons for NPT to achieve higher productivity and profitability of the factory.

4.4 Loss Pieces of NPT Report from 1st Sept to 23rd Sept

Floor-wise loss pcs

Floor Name	Line No	Loss Pcs
MTSL (Unit-2)-2nd Floor	U2-01	3562
	U2-02	3434
	U2-03	2682
	U2-04	4465
MTSL (Unit-2)-2nd Floor Total		14143
MTSL(Unit-2)-3rd Floor	U2-05	4300
	U2-06	3065
	U2-07	3130
MTSL(Unit-2)-3rd Floor Total		10495
MTSL (Unit-2)-4th Floor	U2-08	2680
	U2-09	4493
	U2-10	3838
	U2-11	1869
MTSL (Unit-2)-4th Floor Total		12880
MTSL (Unit-2)-5th Floor	U2-12	2326
	U2-13	2604
	U2-14	3610
	U2-15	2766
MTSL (Unit-2)-5th Floor Total		11306
FHSL-4th Floor	U1-16	2882
	U1-17	4172
	U1-18	3445
	U1-19	2626
	U1-20	1976
FHSL-4th Floor Total		15101
MTSL (Unit-1)-4th Floor	U1-21	1615
	U1-22	2088
	U1-23	2433
	U1-24	2750
	U1-25	2066
MTSL (Unit-1)-4th Floor Total		10952
MTSL (Unit-1)-3rd Floor	U1-26	2007
	U1-27	1741
	U1-28	2459
	U1-29	2573
	U1-30	1531
	U1-31	1866
MTSL (Unit-1)-3rd Floor Total		12177
Grand Total		87054

Date-wise loss pcs

S.Date( )	Loss Pcs
(blank)	0
1/Sep/23	0
2/Sep/23	4309
3/Sep/23	3503
4/Sep/23	3425
5/Sep/23	2842
6/Sep/23	3184
7/Sep/23	3965
8/Sep/23	0
9/Sep/23	5922
10/Sep/23	6773
11/Sep/23	3935
12/Sep/23	4186
13/Sep/23	4459
14/Sep/23	5144
15/Sep/23	0
16/Sep/23	4855
17/Sep/23	4128
18/Sep/23	4812
19/Sep/23	5746
20/Sep/23	5039
21/Sep/23	3728
22/Sep/23	0
23/Sep/23	3664
24/Sep/23	3435
25/Sep/23	0
26/Sep/23	0
27/Sep/23	0
28/Sep/23	0
29/Sep/23	0
30/Sep/23	0
1/Oct/23	0
2/Oct/23	0
3/Oct/23	0
4/Oct/23	0
5/Oct/23	0
Grand Total	87054

Table 4.4.1 Floor-wise and date-wise NPT of 1 month for different products

Here, the table above mentions the loss pieces due to NPT of 1 month, floor-wise and datewise, taking into consideration of all the sewing lines and the concerning departments of Millennium Textile (Southern) Limited. It is observed that the grand total of loss pieces due to non-

productive time is 87,054 pcs which concludes that 87,054 pcs have not been produced within the spent mins the workers are paid for, that directly impacts the factory's profitability,

also resulting in lower productivity which can hamper on-time deliveries for the significant increase of lead-time due to NPT. Thus, corrective steps must be taken to eliminate the root causes of NPT in the garment industry to raise the profit margins and increase productivity.

4.5 Initiatives to Eliminate NPT

The measures outlined below focus on tactics and methods for reducing NPT in the garment sector in order to boost production.

- Proper line balance and arrangement.
- Improving the operator's abilities through enhanced training.
- Carrying out motion studies, productivity studies, and hourly operator capacity checks.
- Target setting must be sustainable for workers in order for them to attain their goals and increase their output.
- Increase floor space use.
- Alteration or rework must be completely eliminated with competent fault-free work.
- Worker tiredness and personal allowance should be reduced.
- Work on increasing worker efficiency and meeting individual operation targets.
- A machine with low performance is not acceptable.
- Boost wages, ensure health and safety, and improve the factory environment.
- Provide incentives and prizes depending on job productivity.
- Verify the employee's compliance.
- Ensure superior and skilled maintenance
- Improved communication between worker and staff.
- Productivity of machine, downtime, and capacity planning must all be properly determined.
- Employee motivation.
- Make use of work aids, attachments, guidelines, proper pressure feet, and folders.

- Provide free of error and accurate cutting to each line.
- Use automatic sewing machines rather than manual sewing machines.

CHAPTER 5: ETHICAL SIGNIFICANCE OF RESEARCH

This research work is significant to reduce the loss pieces due to loss time of NPT in garment production that would result in profitability of the industry with minimization of cost of production.

This research work is ethically significant to the following personnel -

Researcher: We have included monthly NPT time in this thesis report, which a researcher may use as a guide to learn more about NPT for various styles of sewing lines and other departments that are linked.

Factory Employee: NPT is an integral part of operation for various types of garment production. A concerned employee of a garment industry can take the data for analysis to identify the root causes of NPT for different styles of garments to reduce the lost time that results in loss pieces to overcome NPT for higher production capacity.

Student: A student can learn from this research work in details about NPT; the main causes of NPT along with the steps to be taken to reduce these NPT; and the concerning departments of an industry where NPT frequently occurs (sample, cutting, sewing, printing, embroidery, and finishing).

CHAPTER 6: CONCLUSION

This study was focused on determining the root causes of NPT occurring in sewing lines and other departments. We were able to detect the major reasons of NPT category wise, date-wise, line-wise and floor-wise that caused lower productivity. The lost time was recorded to calculate the loss pieces according to each criteria of NPT. To minimize the higher cost of production and declining profitability due to NPT, preventive measures must be implemented with corrective actions.

Thus, from the thesis study, the analysis concludes –

- In the sewing section, the root causes of Non Productive Time for the 3 styles of products are supervision problem, man-power crisis, re-work, style change delay and machine breakdown that resulted in 2399 loss pcs of production due to lost time of 511.9 hours.

- In the other departments, the root causes of NPT for the 3 styles of products are decision making delay, input supply delay, accessories delay, machine delay, power failure, approval delay, re-feeding among all the other reasons of NPT that resulted in 3600 loss pcs of production due to lost time of 802.3 hours.

- For the month of September for all sewing lines and several different styles of products, due to NPT the overall lost hour was 695371 that resulted in 34,768 loss pcs of production.

- For the month of September for all the production related departments considering several different styles of products, due to NPT the overall lost hour was 734162 that resulted in 52,286 loss pcs of production.

- For the month of September, according to the criteria of floor-wise and date -wise loss pieces, it is observed that due to the lost time of NPT, 87045 pcs have not been produced.

Different non-productive root causes have different significant impact on productivity. Higher non–value added activities, higher standard minute value (SMV) leads to less final

time of each step involved. To survive in the highly competitive global market, the garments industry must remove non-productive time between the manufacturing processes, and also work towards improving the current capacity efficiently and effectively. Both for including and excluding non-productive activities, then current state of root causes had been analyzed and various improvement proposals are identified to reduce the non-value adding processes. After that effective suggestion and recommendations are made to reduce the non-productive time. This research work could be further studied by any concerned factory personnel or researchers on the basis of the data analyzed to minimize the amount of loss pieces of production due to NPT. It can be suggested to make weekly or monthly based NPT reports summarizing according to the various running styles in the factory to highlight further on the root causes of NPT and ways to reduce them.

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