Faculty of Engineering
Department of Textile Engineering

Thesis Report On

"COMPARATIVE STUDY ON UNIT PRODUCTION SYSTEM LINE AND PROGRESSIVE BUNDLE SYSTEM LINE"

Course code: TE-4214 Course Title: Project (Thesis)

Submitted By:

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Supervised By:

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Associate Professor
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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

LETTER OF APPROVAL

February 1,2023

To
The Head
Department of Textile Engineering
Daffodil International University
Daffodil Smart City, Asuliya, Savar

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

Dear Sir
I'm just writing to let you know that this Thesis titled "**Comparative study on Unit Production System Line and Progressive Bundle System Line**" has been prepared by the student bearing ID: 191-23-617 is completed for final evaluation. The whole report is designed based on the factory data with required belongings. The student is directly involved in his industrial attachment activities, and the message becomes vital to spark much valuable information for the readers.

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

Yours Sincerely,

Md. Abdullah Al Mamun

Associate Professor

Department of Textile Engineering

Faculty of Engineering

Daffodil International University

Faculty of Engineering
Department of Textile Engineering

DECLARATION

I declared that, this thesis report on "Comparative study on Unit Production System Line and Progressive Bundle System Line" is totally my own work. The material which are presented in this report is never presented in any thesis report of any other university. I also declared that our supervisor has the right to cancel this report.

Anamul Hasan

Md. Anamul Hasan, ID:191-23-617

ACKNOWLEDGEMENT

"In the name of ALLAH, the Most Merciful and Beneficent."

At first, I would like to thank almighty **ALLAH** for allowing me to complete my internship. I also want to thank all the people who have given their support and assistance and are incredibly grateful to all of them for the complete report successfully**. Daffodil International University** and **Aman Graphics & Desingns Ltd.** provided me with enormous support and guidance for my internship program to be completed successfully. For the First Time, I have gathered real-life experience working on a comparison report.

I would like to thank especially our honorable teacher **Md. Mominur Rahman,** Assistant Professor & Head (In-Charge), Department of Textile Engineering, whose direction & instruction has taken me to my destination. I also like to express my most profound sense of gratitude to my supervisor, professor **Md. Abdullah Al Mamun,** Associate Professor, Department of Textile Engineering, for his continuous advice, encouragement, and guide to make the industrial attachment.

I want to thank the management of the Aman Graphics & Desingns Ltd. for allowing me to do the industrial training successfully and for their valuable suggestion. My profound appreciation goes to **Niloy Parvez**- IEM, **Md. Mahfuj Rahman-**Sr.IE, **Md. Sohel**- PM, for their permission to conduct my industrial training without which it would be uncompleted. My gratitude also goes to the employees of **Aman Graphics & Desingns Ltd.** for their sincere co-operation, support, and valuable advice. Last but not least, thanks go to my precious family for their never-ending love and inspiration at every stage of our life. Without their continuous, I realize that I would not be the person I am now.

-The Author

Dedication to My
Respected Parents & Beloved Teacher.

ABSTRACT

A production system may be described as the mechanism by which we convert inputs of resources into outputs of useful goods and services. On the factory floor, several production systems are accessible, such as the bundle production system, the progressive line production system, the Straight line System, and the unit production system, among others. Each method of manufacturing has its own distinct operating features. The Unit Production System (UPS) is a mechanical system in which the unit of production is a single garment and not bundles, the garment components are automatically transported from workstation to workstation according to a predetermined sequence, and the work stations are designed so that the components are presented as close as possible to the operator's left hand to reduce the amount of movement required to grasp them. This technology eliminates all handling of bundles, reduces the time required for pick-up and disposal, automatically logs output, and allows for simultaneous production of many styles. Unit Production System (UPS) offer significant benefits over other human and mechanical technologies utilized for large apparel manufacture. In this study I provided 3 days data and analiysis it and, present it by table chart and graph. I found these benefits over Progressive Bundle System (PBS) line SMV Variation 14%, Capacity Variation 16%, Manpower Variation 16%, Output Variation 3%, Defected Goods Variation 46%. But Unit Production System (UPS) installation is very expensive . 22 Station full setup installation cost was 2400,000 Taka.

Table of Contents

LIST OF FIGURES

LIST OF TABLES

CHAPTER- I

INTRODUCTION

1.1 Introduction:

A production system is the mechanism through which inputs of resources are transformed into outputs of usable goods and services. On the manufacturing floor, several production systems are accessible, including the bundle production system, the progressive line production system, the Straight line System, and the unit production system, among others. Each method of manufacturing has its own unique operating features.

Most garment indusries use the progressive bundle manufacturing system – batch system. This system bundles garments and eventually assembles them by sub- and major assembly procedures. Its principles are: The sections are arranged by primary operation order, with each section having a layout that matches the procedures needed to make a component.

The Unit Production System (UPS) is a mechanical system. The essential characteristics of this type of system are that the unit of production is a single garment and not bundles, that the garment components are automatically transported from workstation to workstation according to a predetermined sequence, and that the work stations are constructed so that the components are presented as close as possible to the operator's left hand to reduce the amount of movement required to grasp and position a component to be sewn.

1.2 Objective of the project:

- ✓ To know about the different types of garment production systems.
- ✓ To identify the difference and benefits of these garment production systems.
- ✓ To compare and findout which one is better.
- ✓ To improve productivity and quality .

1.3 Importance of the project:

This report gives the knowledge necessary to understand the garment production systems that are used in the sewing department. This report has offered some useful information that is

highly relevant for textile students in general, particularly those whose primary focus is on apparel related studies.

1.4 Aim of this project:

The aim of this project is to find out the benefits of Unit Production system (UPS) line over Progressive Bundle System (PBS) line.

1.5 Scope of this Project:

- ✓ Identifying and assessing Alternative Garment Production System
- ✓ With the aim of maximizing Output
- ✓ Minimizing travel and waiting time
- ✓ In order to get over WIP

1.5 Limitation of this project:

- ✓ Lack of proper technical knowledge
- ✓ Lack of proper tranning
- ✓ Lack of skill operator

CHAPTER- II

LITERATURE REVIEW

2.1 Previous Study:

Previously, Md. Atikul Islam presented the research. The title of his research was "Benefits of Utilizing Unit Production System (UPS) Line Over Conventional Line in the Sewing Section of the Garment Industry." Financial Benefits on Point of Production, $2822.40 per month, Financial Benefits in terms of Human Resources $3697.40 per month." was the conclusion he drew from the research.

2.2 Garment Production System:

The production system is the environment in which the operations of production are carried out. A production system is made up of components that have the capability to change the inputs into the outputs that are wanted and projected. The characteristics might be human labor, machine work, or tool labor. Within the context of the garment business, "an integration of material handling, manufacturing processes, staff, and equipment" is the definition of a production system.

The term "garment production system" refers to the collection of production processes, materials handling, workers, and equipment that work together to drive workflow and generate completed garments. It is a system that illustrates how a two-dimensional cloth may be converted into a three-dimensional garment using a manufacturing method. The names given to the various production systems are determined by a number of different factors. These factors include the total number of operators involved in the production of a garment, the number of pieces that move along a production line while a garment is being made, the number of machines that are used to assemble a garment, and the layout of the machines.

Each method of producing garments has to have a management philosophy that is appropriate, as well as processes for managing resources, a plant structure that allows garments to be spread out, and staff training. The garment business might use a single production system or a mix of numerous production systems for a single product style, for example, to meet the unique garments' manufacturing demands. The development of a production system enables the coordination of the many different production operations. It is true that there is no one production method that is widely acknowledged; nevertheless, as will be shown in the next

section, many organizations do use a variety of production methods, which are described further on.

2.2.1 Goals of Production System:

The goals of Garment Production systems are as follows:

- ✓ Analyze the characteristics of various garment production systems
- ✓ Contrast and compare the various production systems
- ✓ Evaluate and critically compare the advantages and disadvantages of using various production systems under varying conditions.

2.2.2 Principles of Choosing a Production System in Apparel Industry:

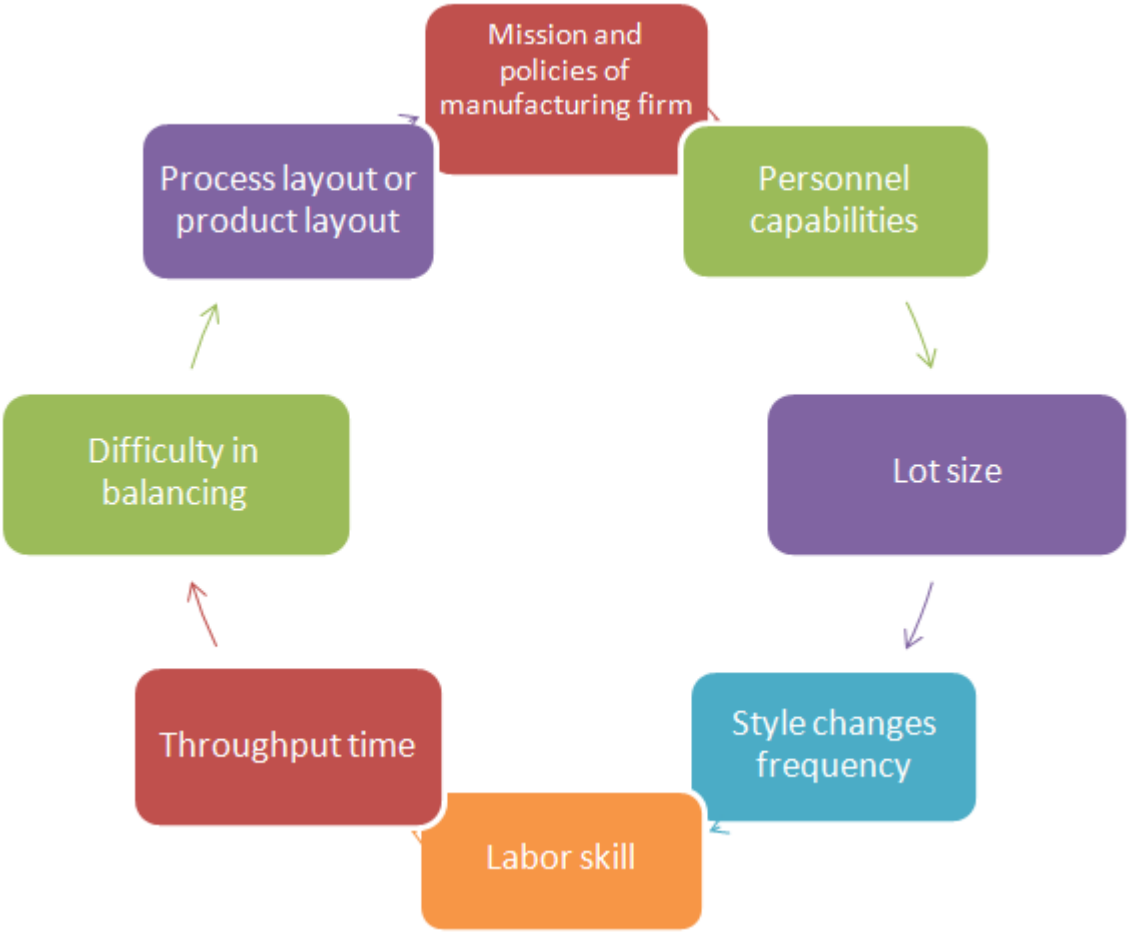

Figure 1:Principles of Apparel production system

2.3 Types of Garment Production System:

Different garment production system demand unique working conditions. They should fulfill the final product's specifications and be cost-effective, nevertheless. Any manufacturing system seeks to minimize production time. The most commonly used types of production systems in the garment industry are:

2.3.1 Progressive Bundle System (PBS):

The progressive bundle method is a conventional manufacturing technique that has been and continues to be extensively employed in the clothing industry for many decades. Bundles of garment pieces are passed sequentially from one sewing machine operator to the next in this method. Each worker is given a bundle of unfinished clothes and is assigned a single operation to complete on each garment in the bundle. When an operator has completed his or her work on a bundle, it is re-tied and sent on to the next operator. Each PBS job is assigned a time limit, or "SAM" (Standard Allowed Minutes). PBS's success is determined on how the production system is set up and employed in a facility.

Figure 2: Progressive Bundle System(PBS)

2.3.2 Modular Production System:

In modular manufacturing, operators neither stitch the whole garment nor do a single operation; rather, they conduct a series of procedures and work in teams. Each operator is multiskilled, which allows them to transfer between workstations and sew, work as a team, and share the effort.

Figure 3:Modular Production System

2.3.3 Single piece Flow:

In a manufacturing method known as "single piece flow," cut components are placed into the sewing line one at a time rather than all together in a bundle. Additionally, in this method, a single operator is responsible for performing a single operation before passing the piece on to the subsequent operator.

Figure 4:Single piece flow

2.3.4 Unit Production System:

Unit production systems (UPS) employ overhead transporters to carry garment components from work station to work station for assembly. A hanging carrier on an overhead conveyor transports all garment pieces through the manufacturing line. The primary conveyor and garment workstation collecting rails make up the overhead rail garment manufacturing system. The overhead conveyor works like a railroad. The primary conveyor moves carriers to an accumulating rail at the work station. After each procedure, the operator punches a button to advance the carrier.

Most garment unit production systems are connected to a computer control center that routes and monitors production and provides management with real-time data. Automatic work flow control sorts, balances, and minimizes partiality in garment bundle distribution. Payroll, inventory, style, costing, and performance data are collected electronically for quick judgments.

Staging starts in the clothing sewing room. Grouped cut components for one style are loaded straight from the staging area to a hanging carrier. Loading is meticulously arranged to deliver garment components in their stitched sequence with little manipulation. When feasible, garment procedures are conducted without removing pieces from the carrier. Various clothing have different hanging carriers. Automated garment handling eliminates bundling, tying, and

manually moving garment pieces. Unit manufacturing methods reduce bundle and garment component lifting and turning.

Figure 5:Unit Production System (UPS)

CHAPTER- III

METHODOLOGY

3.1 Data Collection:

In My project I present some data and these data was collected from Aman Graphics & Designs Ltd. where I have done my internship.

3.1.1 Unit Production System (UPS) Line Capacity Study:

Item	Buyer	SMV	Line
Shirt	Target	22.83	7

3.1.1.1 Day 1 :

Capacity Study Sheet : 24/12/2022

AMAN GRAPHICS & DESIGNS LTD.
Najimnagar, Hemayetpur, Savar, Dhaka
CAPACITY STUDY SHEET

DATE :	24/12/22	BUYER :	Target	S.M.V:	22.83
LINE NO :	07	STYLE :	25912	CAPACITY:	

S/L NO	OPERATION DESCRIPTION	NAME	ID NO.	MCN. DESC.	CYCLE TIME (Sec) 1	2	3	4	5	AVG. Time in (Sec)	Time with Allowance (Sec)	Capacity Per Hour
1	Shoulder Join				21	20	19	19	20	20	22	163
2	Shoulder TLS				25	23	24	24	23	24	26	138
3	Collar ATT				23	24	23	21	22	23	25	144
4	Collar close				35	34	36	35	34	35	38	95
5	Sleave attach				37	36	35	37	36	36	40	90
6	Armhole TLS				36	35	35	37	36	36	40	90
7	Side Seam close				55	53	54	57	57	55	60	60
8	Button runstitch				21	20	20	22	23	21	23	156
9	Bottom Hem				37	36	39	40	38	38	42	86
10	Cuff attach				41	42	40	39	40	40	44	82
11	Cuff TLS				22	23	21	21	20	22	24	150
12	Sea Hole * 10				35	34	33	34	34	34	37	97
13	Button ATT				40	43	42	41	41	41	45	80
14	Bartack Placket				15	14	13	14	14	14	15	240
15												
16												
17												
18												
19												
20												

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Figure 6:Capacity Study Sheet

3.1.1.2 Day 2 :

Capacity Study Sheet : 26/12/2022

AMAN GRAPHICS & DESIGNS LTD.
Najimnagar, Hemayetpur, Savar, Dhaka
CAPACITY STUDY SHEET

DATE :		BUYER :	Target	S.M.V:	22.83
LINE NO :	07	STYLE :	25912	CAPACITY:	

S/L NO	OPERATION DESCRIPTION	NAME	ID NO.	MCN. DESC.	CYCLE TIME (Sec) 1	2	3	4	5	AVG. Time in (Sec)	Time with Allowance (Sec)	Capacity Per Hour
1	Shoulder Join				20	19	19	20	21	20	22	163
2	Shoulder TLS				23	24	23	24	25	24	26	138
3	Collar ATT				22	23	21	24	23	23	25	144
4	Collar close				35	34	36	34	35	35	38	95
5	Sleave ATT				36	35	37	37	36	36	40	90
6	Arm Hole TLS				35	35	36	36	37	36	40	90
7	Side Seam close				53	54	57	56	55	55	60	60
8	Button runstitch				21	22	23	20	20	21	23	156
9	Bottom Hem				39	40	38	36	37	38	42	86
10	Cuff ATT				40	40	39	42	41	40	44	82
11	Cuff TLS				23	21	21	22	22	22	24	150
12	Sea Hole * 10				34	33	34	34	35	34	37	97
13	Button ATT				42	41	41	42	40	41	45	80
14	Bartack Placket				15	14	13	14	14	14	15	240
15												
16												
17												
18												
19												
20												

Figure 7:Capacity Study Sheet

3.1.1.3 Day 3 :

Capacity Study Sheet : 27/12/2022

AMAN GRAPHICS & DESIGNS LTD.
Najimnagar, Hemayetpur, Savar, Dhaka
CAPACITY STUDY SHEET

DATE :		BUYER :	Target	S.M.V:	22.83
LINE NO :	07	STYLE :	25912	CAPACITY:	

S/L NO	OPERATION DESCRIPTION	NAME	ID NO.	MCN. DESC.	CYCLE TIME (Sec) 1	2	3	4	5	AVG. Time in (Sec)	Time with Allowance (Sec)	Capacity Per Hour
1	Shoulder join				20	19	19	20	21	20	22	163
2	Shoulder TLS				23	24	23	24	25	24	26	138
3	Collar ATT				22	23	21	24	23	23	25	144
4	Collar close				35	34	36	34	35	35	38	95
5	Sleeve ATT				36	35	37	37	36	36	40	90
6	Arm Hole TLS				35	35	36	36	37	36	40	90
7	Side seam close				53	54	52	56	55	55	60	60
8	Button run stitch				21	22	23	20	20	21	23	156
9	Bottom Hem				39	40	38	36	37	38	42	86
10	Cuff ATT				40	40	39	42	41	40	44	82
11	Cuff TLS				23	21	21	22	22	22	24	150
12	Sew hole * 10				34	33	34	34	35	34	37	97
13	Button ATT				43	41	41	42	40	41	45	80
14	Bartack placket				15	14	13	14	14	14	15	240
15												
16												
17												
18												
19												
20												

Figure 8:Capacity Study Sheet

3.1.2 Progressive Bundle System (PBS) Line Capacity Study:

Item	Buyer	SMV	Line
Shirt	K-mart	22.83	4

3.1.2.1 Day 1 :

Capacity Study Sheet : 24/12/2022

AMAN GRAPHICS & DESIGNS LTD.
Najimnagar, Hemayetpur, Savar, Dhaka
CAPACITY STUDY SHEET

DATE :	24/12/22	BUYER :	K-Mart	S.M.V:	22.83
LINE NO :	04	STYLE :	16W23WL6003	CAPACITY:	

S/L NO	OPERATION DESCRIPTION	NAME	ID NO.	MCN. DESC.	CYCLE TIME (Sec) 1	2	3	4	5	AVG. Time in (Sec)	Time with Allowance (Sec)	Capacity Per Hour
1	Shoulder join				25	24	24	23	24	24	26	138
2	Shoulder TLS				29	30	30	28	27	29	32	113
3	Collar Attatch				25	27	28	25	28	27	30	120
4	Collar close				44	40	43	43	39	42	46	78
5	Sleeve attatch				42	40	43	40	41	41	45	80
6	Armhole TLS				40	38	37	39	37	38	42	86
7	Side seam close				58	57	60	62	61	60	66	55
8	Button run Atch				23	24	25	23	24	24	26	138
9	Bottom Hem				40	38	39	40	40	39	43	84
10	Cuff attatch				44	42	44	43	43	43	47	77
11	Cuff TLS				25	26	24	24	23	24	26	138
12	Sew hole * 10				40	41	40	42	40	41	45	80
13	Button attatch				46	47	45	47	46	46	50	72
14	Bartack placket				18	17	20	21	20	19	21	171
15												
16												
17												
18												
19												
20												

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Figure 9:Capacity Study Sheet

3.1.2.2 Day 2

Capacity Study Sheet : : 26/12/2022

AMAN GRAPHICS & DESIGNS LTD.
Najimnagar, Hemayetpur, Savar, Dhaka
CAPACITY STUDY SHEET

DATE :	26/12/22	BUYER :	H&M	S.M.V:	22.83
LINE NO :	04	STYLE :	19003	CAPACITY:	

S/L NO	OPERATION DESCRIPTION	NAME	ID NO.	MCN. DESC.	CYCLE TIME (Sec) 1	2	3	4	5	AVG. Time in (Sec)	Time with Allowance (Sec)	Capacity Per Hour
1	Shoulder join				25	26	26	25	26	25	27	133
2	Shoulder TIS				30	29	31	28	31	30	33	109
3	Collar attch				27	28	26	25	28	27	30	120
4	Collar close				45	46	44	43	44	44	48	75
5	Sleave ATT				40	42	44	43	41	43	47	77
6	Arm Hole TIS				41	39	40	38	38	39	43	84
7	Side seam close				60	59	58	58	63	60	66	55
8	Bottom run Stitch				25	24	23	25	24	24	26	138
9	Bottom Hem				39	37	40	38	37	38	42	86
10	Cuff ATT				43	42	41	44	44	43	47	77
11	~~Sea Hole #10~~ Cuff TIS				27	25	24	25	25	25	27	133
12	~~Button ATT~~ Seas Hole #10				42	41	40	41	39	41	45	80
13	~~Boxtack placket~~ Button ATT				44	47	46	45	45	45	50	72
14	Boxtack placket				20	18	18	19	17	18	20	180
15												
16												
17												
18												
19												
20												

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Figure 10:Capacity Study Sheet

3.1.2.3 Day 3 :

Capacity Study Sheet : 27/12/2022

AMAN GRAPHICS & DESIGNS LTD.
Najimnagar, Hemayetpur, Savar, Dhaka
CAPACITY STUDY SHEET

DATE :	27/12/22	BUYER :	H&M	S.M.V:	22.83
LINE NO :	04	STYLE :	19003	CAPACITY:	

S/L NO	OPERATION DESCRIPTION	NAME	ID NO.	MCN. DESC.	CYCLE TIME (Sec) 1	2	3	4	5	AVG. Time in (Sec)	Time with Allowance (Sec)	Capacity Per Hour
1	Shoulder Join				25	24	26	23	26	25	27	133
2	Shoulder TIS				30	29	31	31	29	30	33	109
3	Collar att				27	28	26	25	28	27	30	120
4	Collar close				45	46	44	43	44	44	48	75
5	Sleeve att				44	43	41	41	43	42	45	80
6	Armhole TIS				40	39	38	38	42	39	43	84
7	Side seam close				59	62	61	63	60	61	67	54
8	Bottom run Stitch				26	25	23	23	24	24	26	138
9	Bottom Hem				37	39	40	42	38	39	43	84
10	Cuff att				44	41	40	44	43	42	45	80
11	Cuff TIS				27	26	25	26	24	26	28	129
12	Sea Hle #10				41	43	42	42	40	42	45	80
13	Button att				44	45	44	47	46	45	50	72
14	Boxtack placket				17	18	19	20	19	19	21	171
15												
16												
17												
18												
19												
20												

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Figure 11:Capacity Study Sheet

3.1.2 UPS And PBS Line Hourly Output:

All of the information shown here comes from Aman Graphics & Designs Line Hourly Report.

3.1.2.1 Day 1:

Date: 24/12/2022

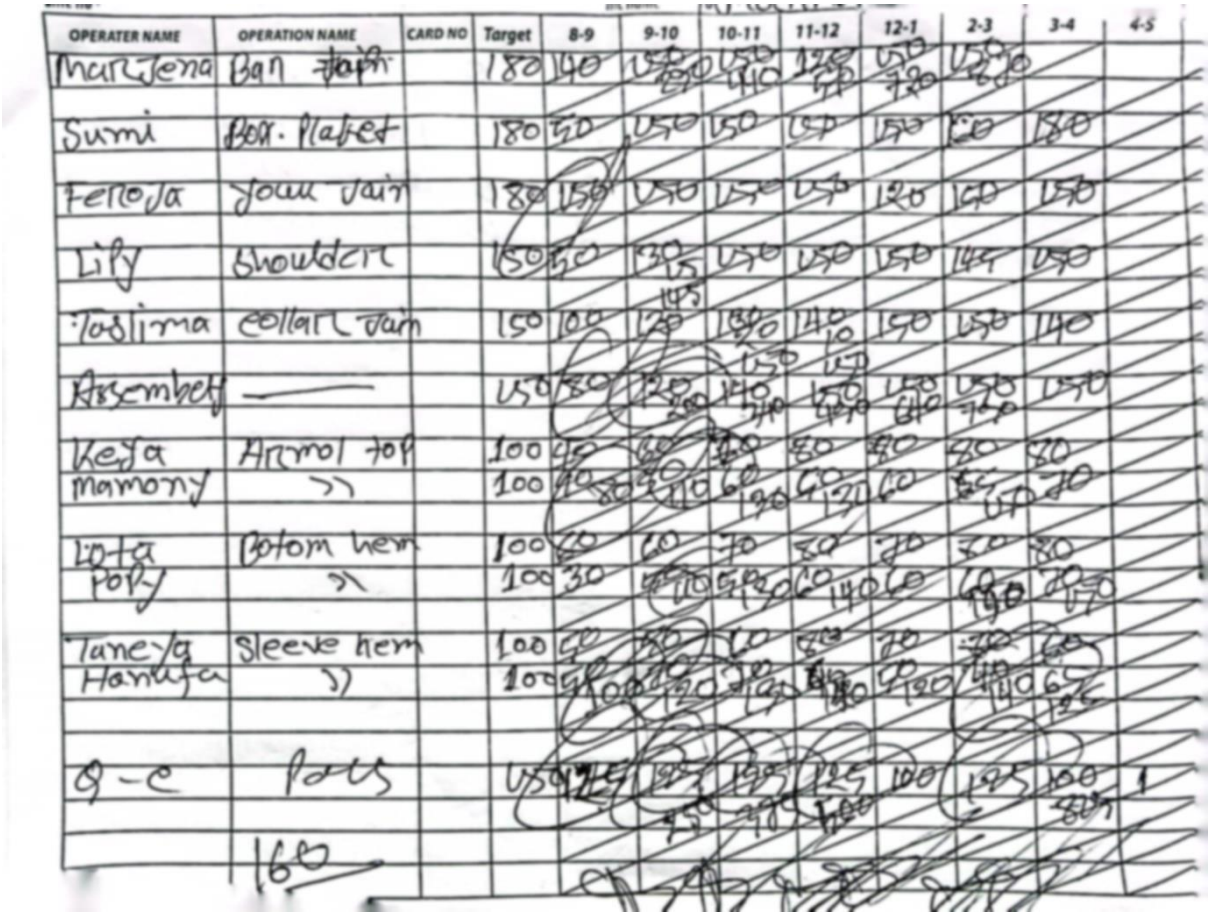


Figure 12: Hourly Report

	Target	1st Hr	2nd Hr	3rd Hr	4th Hr	5th Hr	6th Hr	7th Hr	8th Hr	9th Hr	10th Hr	Total
UPS	**110**	105	110	110	112	110	115	115	114	112	115	1118
PBS	**110**	85	100	120	107	116	115	120	112	104	116	1095

Table 1: Table of Day 1 Hourly Line Output

3.1.2.2 Day 2:

Date: 26/12/2022

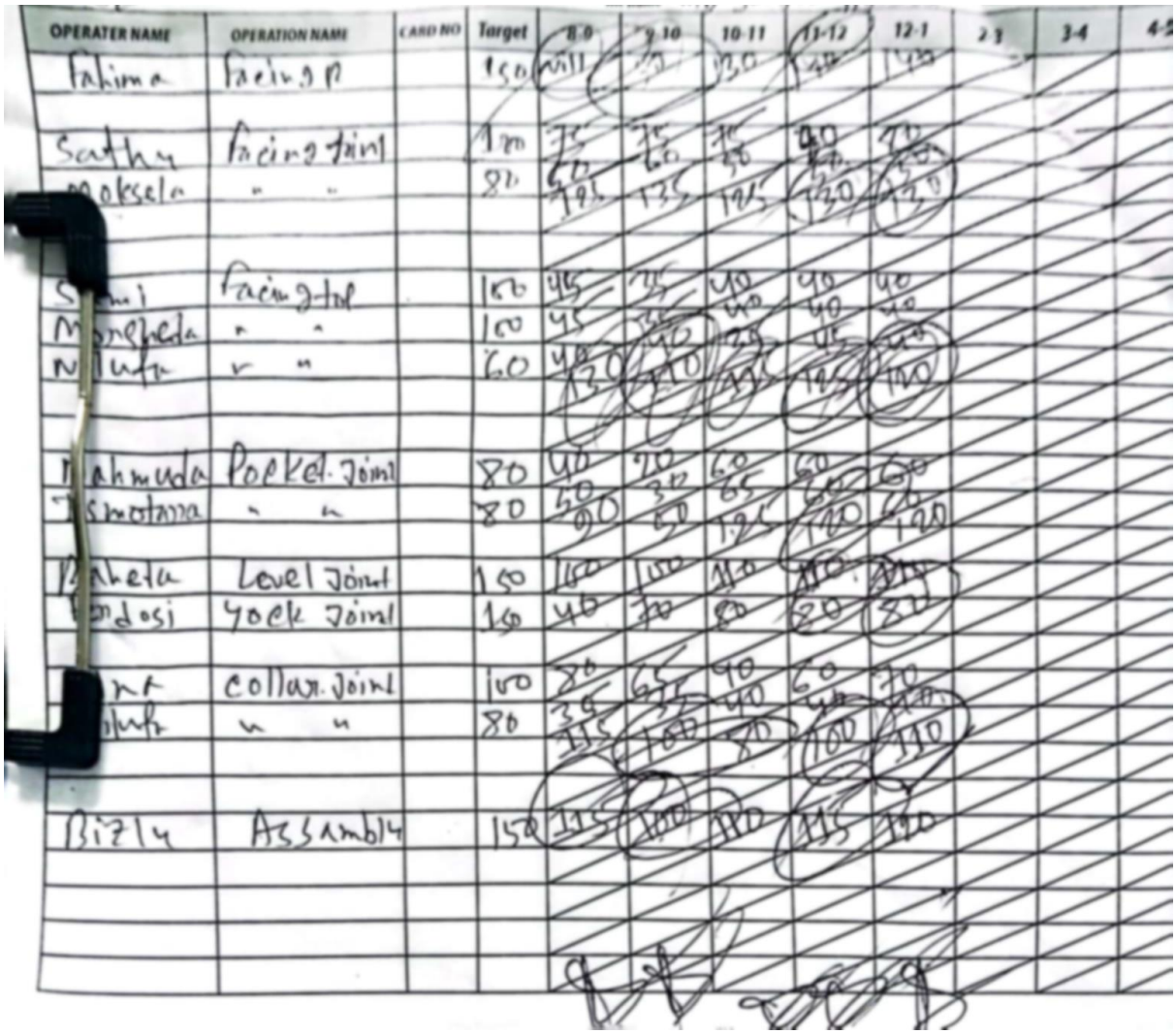


Figure 13: Hourly Report

	Target	1st Hr	2nd Hr	3rd Hr	4th Hr	5th Hr	6th Hr	7th Hr	8th Hr	9th Hr	10th Hr	Total
UPS	**110**	108	110	109	112	114	112	115	115	114	116	1125
PBS	**110**	98	106	118	104	116	110	103	117	120	102	1094

Table 2: Table Of Day 2 Line Hourly Output

3.1.2.3 Day 3:

27/12/2022

Figure 14: Hourly Report

	Target	1st Hr	2nd Hr	3rd Hr	4th Hr	5th Hr	6th Hr	7th Hr	8th Hr	9th Hr	10th Hr	Total
UPS	**110**	104	108	110	113	115	115	114	113	115	112	1119
PBS	**110**	103	110	115	105	120	100	102	118	110	106	1089

Table 3: Table Of Day 3 Line Hourly Output

3.1.3 End Line Final Inspection Report:

3.1.3.1 UPS Line Report:

HOUR	Day 1		Day 2		Day 3	
	Inspected	Defected	Inspected	Defected	Inspected	Defected
1st	105	4	108	2	104	3
2nd	110	2	110	3	108	2
3rd	110	3	109	3	110	1
4th	112	1	112	2	113	3
5th	110	5	114	4	115	4
6th	115	2	112	3	115	4
7th	115	4	115	4	114	2
8th	114	3	115	5	113	3
9th	112	3	114	3	115	2
10th	115	5	116	5	112	1
Total	**1118**	**32**	**1125**	**34**	**1119**	**25**

Table 4: Table of UPS line Inspestion Report

3.1.3.2 PBS Line Report:

HOUR	Day 1		Day 2		Day 3	
	Inspected	Defected	Inspected	Defected	Inspected	Defected
1st	85	4	98	5	103	8
2nd	100	6	106	3	110	2
3rd	120	9	118	3	115	5
4th	107	3	104	2	105	3
5th	116	7	116	4	120	9
6th	115	2	110	3	100	4
7th	120	8	103	4	102	2
8th	112	3	117	5	118	7
9th	104	4	120	6	110	2
10th	116	7	102	9	106	6
Total	**1095**	**53**	**1094**	**44**	**1089**	**48**

Table 5: Table of PBS line Inspection Report

3.2 Summary Table:

3.2.1 Avg. SMV And Avg. Capacity Per Hour:

SL NO	Operation Name	Avg. SMV			Avg. Capacity per Hour		
		Bulletin	UPS	PBS	Bulletin	UPS	PBS
1	**Shoulder Join**	0.40	0.30	0.37	150	163	135
2	**Shoulder T/S**	0.46	0.35	0.44	130	138	110
3	**Collar ATT**	0.46	0.33	0.40	140	144	120
4	**Collar Close**	0.43	0.52	0.64	86	95	76
5	**Sleeve ATT**	0.70	0.53	0.62	86	90	79
6	**Armhole T/S**	0.70	0.53	0.57	86	90	85
7	**Side Seam Close**	1.00	0.80	0.88	60	60	55
8	**Bottom Run Stitch**	0.40	0.32	0.35	150	156	138
9	**Bottom Hem**	0.68	0.55	0.57	88	86	85
10	**Cuff ATT**	0.80	0.58	0.62	75	82	78
11	**Cuff T/S**	0.45	0.33	0.37	133	150	133
12	**Sew Hole**	1.00	0.50	0.61	60	97	80
13	**Button ATT**	0.80	0.60	0.66	75	80	72
14	**Bartack Placket**	0.20	0.20	0.28	300	240	174

Table 6: Data Summary Table

UPS = Unit Production System

PBS = Progressive Bundle System

3.2.2 Hourly Production And Defect:

Hr.	UPS LINE						PBS LINE					
	Day 1		Day 2		Day 3		Day 1		Day 2		Day 3	
	P	D	P	D	P	D	P	D	P	D	P	D
1st	105	4	108	2	104	3	85	4	98	5	103	8
2nd	110	2	110	3	108	2	100	6	106	3	110	2
3rd	110	3	109	3	110	1	120	9	118	3	115	5
4th	112	1	112	2	113	3	107	3	104	2	105	3
5th	110	5	114	4	115	4	116	7	116	4	120	9
6th	115	2	112	3	115	4	115	2	110	3	100	4
7th	115	4	115	4	114	2	120	8	103	4	102	2
8th	114	3	115	5	113	3	112	3	117	5	118	7
9th	112	3	114	3	115	2	104	4	120	6	110	2
10th	115	5	116	5	112	1	116	7	102	9	106	6
Total	1118	32	1125	34	1119	25	1095	53	1094	44	1089	48

Table 7: Table of hourly production and Defect

Hr. = Hour
P = Production
D = Defective Goods

3.3 Operational Principle:

3.3.1 Unit Production System (UPS):

A unique workstation loads all the garment components onto a container. Each carrier part has a quick-release clip to prevent components from slipping out during system movement. After loading clothing onto carriers, a mechanical or electronic device registers the carrier number and addresses it to its initial destination. Some clever systems notify carriers of all their destinations.

The hand-pushed carriers are fed into the main powered line. Junctions immediately open when work on a carrier is directed to a workstation on this main, or head, line. The station's carriers wait on the operator's left. After finishing a carrier, the operator presses a button on the sewing machine to return it to the main line. One carrier departs the station, another immediately enters. The data gathering system records and addresses the carrier after it leaves the station.

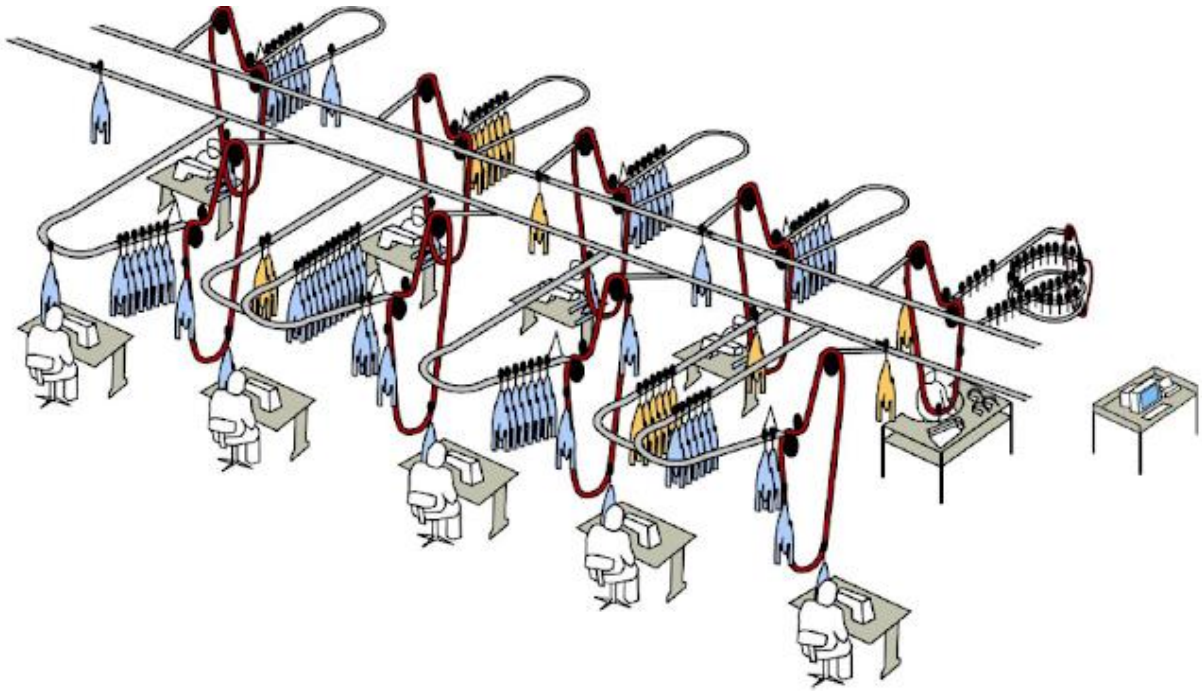


Figure 15:Unit Prodution System (UPS) Layout

3.3.2 Progressive Bundle System (PBS) :

In the cutting stage, uniformly sized and shaped components are bundled using ties and clubbed. Depending on the needs of the manufacturing facility, the number of items per bundle might range from two to one hundred. Each bundle only includes items of the same design and size. A ticket number will be assigned to each bundle, which will indicate the style, size, color, and quantity of cut pieces, among other details.

The bundles of cut pieces are transferred to the sewing area and distributed to the operators who are scheduled to complete the operation. Thus, bundles may be transferred from one sewing station to another in a variety of forms, including knotted bundles, bags, pocketed bags, bundle trucks, boxes, and baskets, etc.

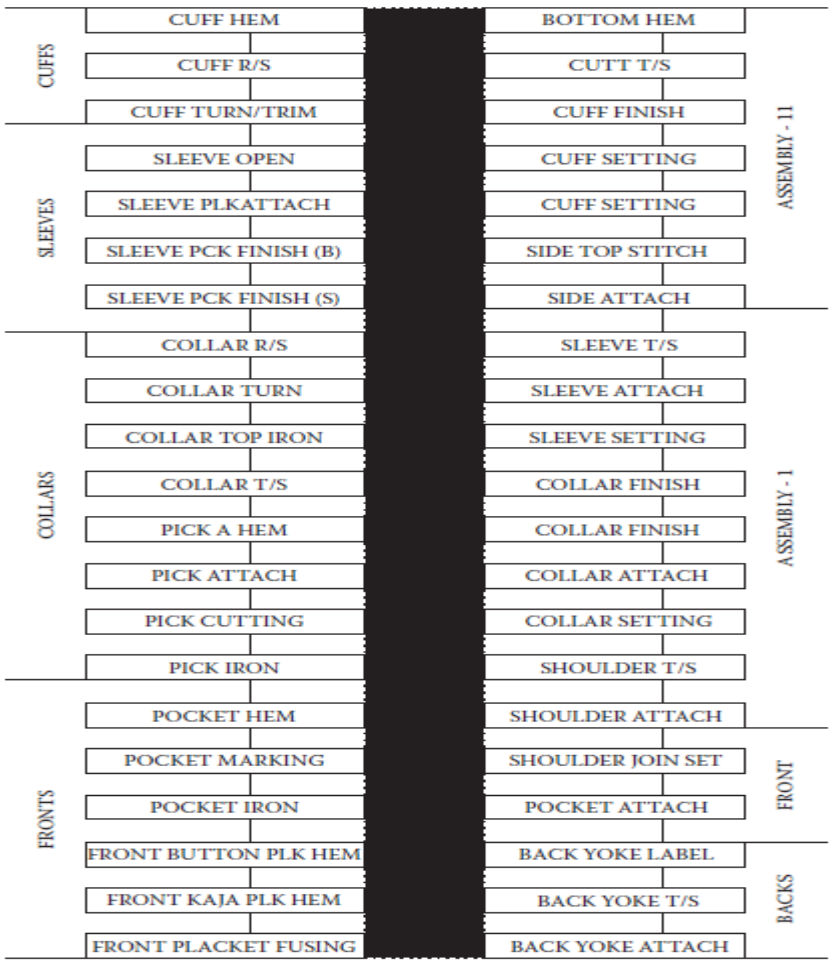


Figure 16:Unit Prodution System (UPS) Layout

CHAPTER- IV

DISCUSSION & RESULTS

4.1 Report Analysis:

4.1.1 Installation Cost Comparison:

The unit production system requires an initial installation cost, which is expensive, while the progressive bundle system does not require any installation cost. The initial cost of a 22-station full setup installation at Aman Graphics & Designs Ltd. was 2400,000 taka.

4.1.2 Operation Wise Avg. SMV:

4.1.2.1 Avg. SMV Variation:

SL NO	Operation Name	Avg. SMV		Avg. SMV Variance	Variance (%)
		UPS	PBS		
1	**Shoulder Join**	0.30	0.37	0.07	21%
2	**Shoulder T/S**	0.35	0.44	0.09	23%
3	**Collar ATT**	0.33	0.40	0.07	19%
4	**Collar Close**	0.52	0.64	0.12	21%
5	**Sleeve ATT**	0.53	0.62	0.09	16%
6	**Armhole T/S**	0.53	0.57	0.04	7%
7	**Side Seam Close**	0.80	0.88	0.08	10%
8	**Bottom Run Stitch**	0.32	0.35	0.03	9%
9	**Bottom Hem**	0.55	0.57	0.02	4%
10	**Cuff ATT**	0.58	0.62	0.04	7%
11	**Cuff T/S**	0.33	0.37	0.04	11%
12	**Sew Hole**	0.50	0.61	0.11	20%
13	**Button ATT**	0.60	0.66	0.06	10%
14	**Bartack Placket**	0.20	0.28	0.08	33%
	Total	6.44	7.38	0.94	**14%**

Table 8:Avg. SMV Variation Table

Description: In every operation, the Unit Production System Line (Line 07) has a lower SMV than the Prograssive Bundle System Line (Line 04). Total SMV variation is 14%.

Cause:

- ✓ System for sewing quickly.
- ✓ Eliminated all handling of bundles.
- ✓ The time it takes to pick up and get rid of the trash is cut to a minimum.
- ✓ Layout for sewing quickly.
- ✓ No chance of getting things out of order.
- ✓ Better way to handle clothes without touching the floor.
- ✓ Better monitoring environment.

✓ Nothing is wrong with WIP. Because steady production helps keep WIP under control.

4.1.2.2 Avg. SMV Comparison Chart:

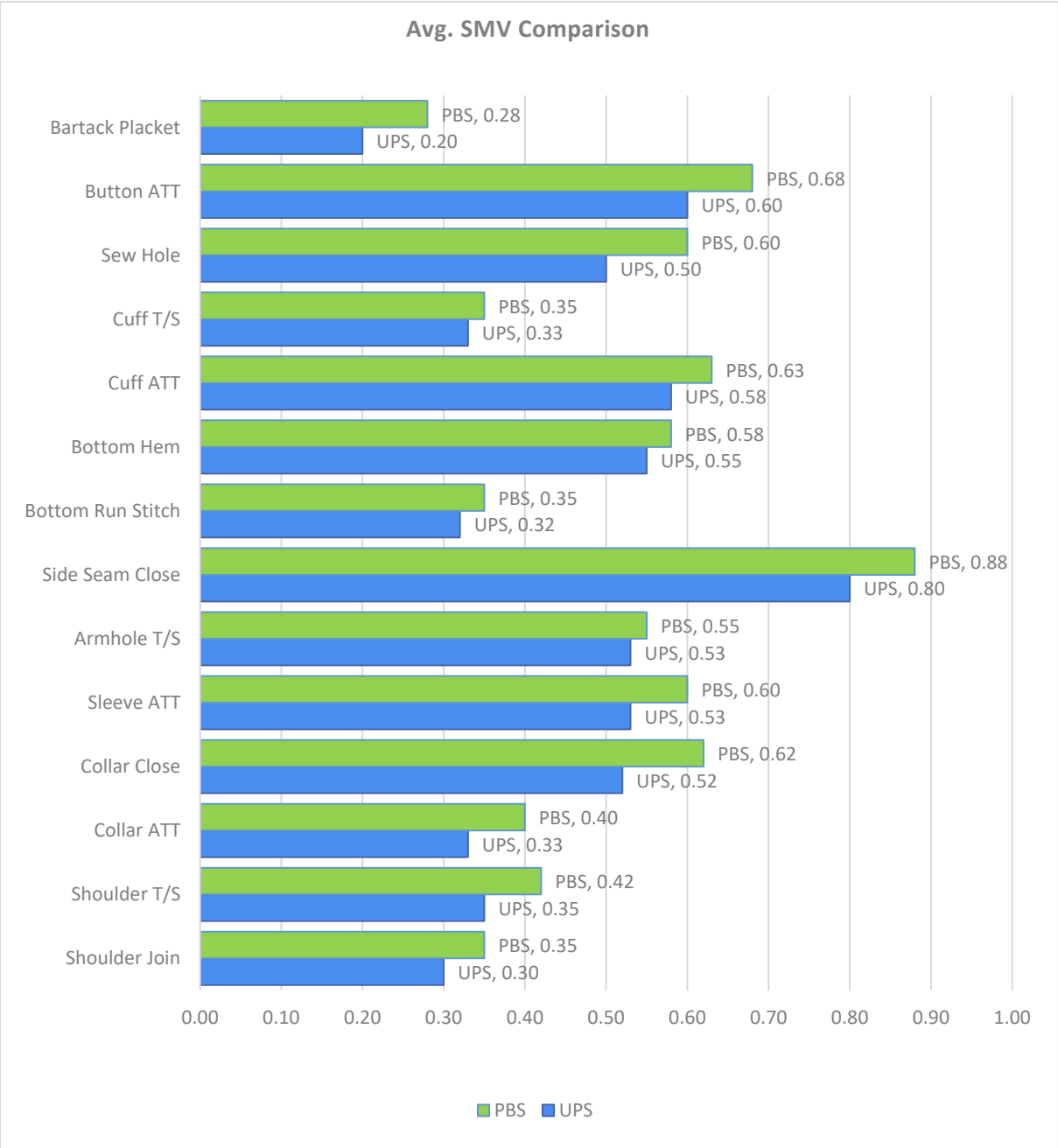


Figure 17:Avg. SMV Comparison Chart

UPS = Unit Production System

PBS = Progressive Bundle System

4.1.3 Operation Wise Avg. Capacity:

4.1.3.1 Avg. Capacity Variation Per Hour:

SL NO	Operation Name	Avg. Capacity per Hour		Avg. Piece Varition per Hour	Variance (%)
		UPS	PBS		
1	**Shoulder Join**	163	135	28	19%
2	**Shoulder T/S**	138	110	28	23%
3	**Collar ATT**	144	120	24	18%
4	**Collar Close**	95	76	19	22%
5	**Sleeve ATT**	90	79	11	13%
6	**Armhole T/S**	90	85	5	6%
7	**Side Seam Close**	60	55	5	9%
8	**Bottom Run Stitch**	156	138	18	12%
9	**Bottom Hem**	86	85	1	1%
10	**Cuff ATT**	82	78	4	5%
11	**Cuff T/S**	150	133	17	12%
12	**Sew Hole**	97	80	17	19%
13	**Button ATT**	80	72	8	11%
14	**Bartack Placket**	240	174	66	32%
	Total	1671	1420	251	**16%**

Table 9:Capacity Variation Table

Description : In every operation, the Unit Production System Line (Line 07) has a higher output capacity than the Prograssive Bundle System Line (Line 04). Total capacity variation is 16%.

Cause :

- ✓ Bundle handling removed.
- ✓ UPS boosts productivity 15-30%.
- ✓ The solution reduces WIP, improves space use, and boosts productivity.
- ✓ Accelerate production.
- ✓ Increase needle movement time, machine utilization, and handling reduction.
- ✓ Real-time performance report.
- ✓ Clean your workplace.
- ✓ Staff assignment with little resources.
- ✓ Improved lead timeless process.
- ✓ Space optimization.
- ✓ Better garment handling without floor contact.

- ✓ No serial/sequence errors.
- ✓ Automatic output recording avoids operator work registration.
- ✓ Easy rework.
- ✓ Automatic product counting and reduced rejection.

4.1.3.2 Avg. Capacity Comparison Chart:

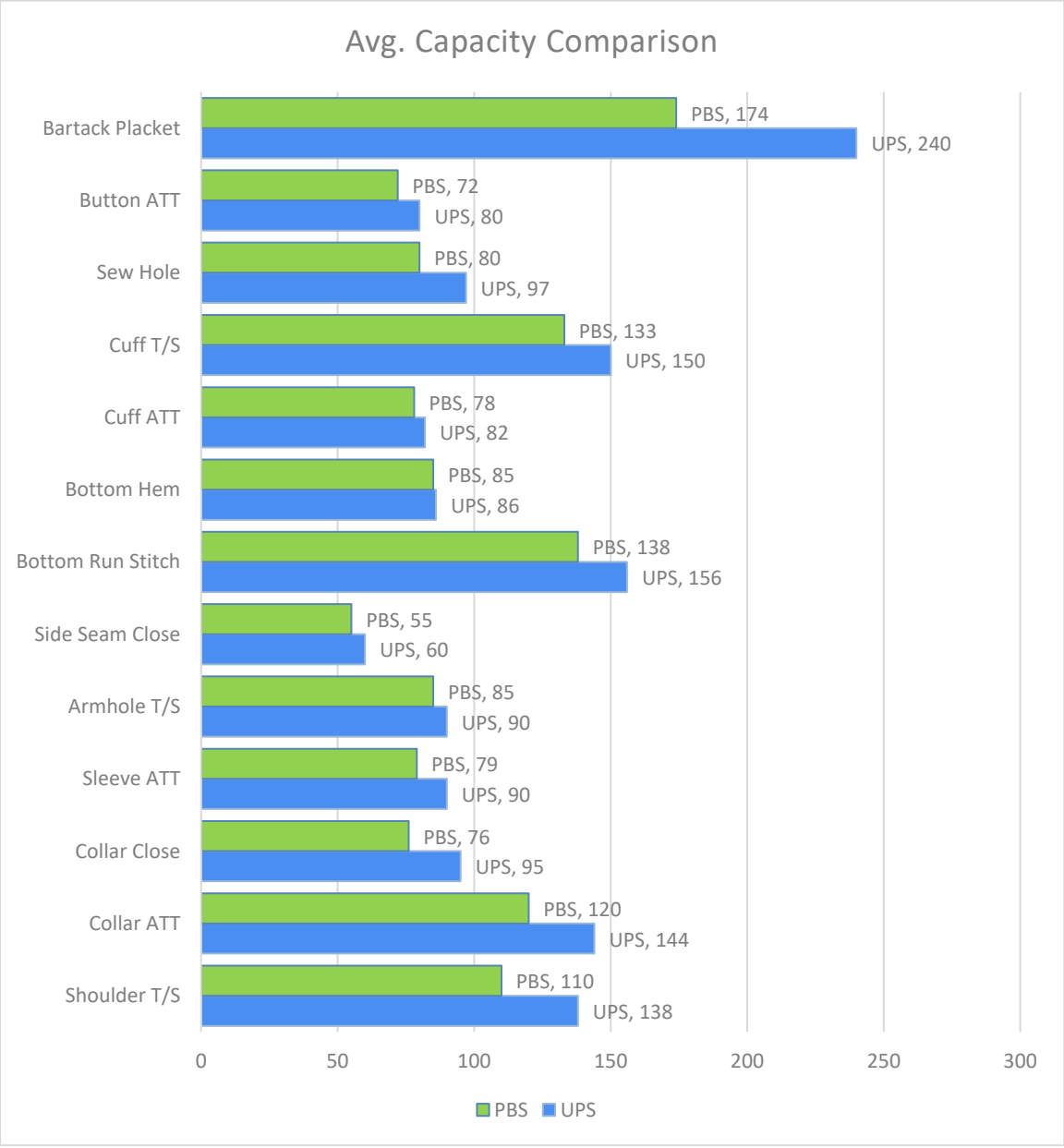


Figure 18:Avg. Capacity Comparison Chart

UPS = Unit Production System
PBS = Progressive Bundle System

4.1.4 Operation Wise Required Operator:

4.1.4.1 Required Operator :

SL NO	Operation Name	SMV		Target/Hour	Manpower Required		Manpower Saving
		UPS	PBS		UPS	PBS	
1	**Shoulder Join**	0.30	0.37	150	1.0	1.2	
2	**Shoulder T/S**	0.35	0.44	130	1.0	1.3	
3	**Collar ATT**	0.33	0.4	140	1.0	1.2	
4	**Collar Close**	0.52	0.64	86	1.0	1.2	
5	**Sleeve ATT**	0.53	0.62	86	1.0	1.2	
6	**Armhole T/S**	0.53	0.57	86	1.0	1.1	
7	**Side Seam Close**	0.80	0.88	60	1.1	1.2	
8	**Bottom Run Stitch**	0.32	0.35	150	1.1	1.2	
9	**Bottom Hem**	0.55	0.57	88	1.1	1.1	
10	**Cuff ATT**	0.58	0.62	75	1.0	1.0	
11	**Cuff T/S**	0.33	0.37	133	1.0	1.1	
12	**Sew Hole**	0.50	0.61	60	0.7	0.8	
13	**Button ATT**	0.60	0.66	75	1.0	1.1	
14	**Bartack Placket**	0.20	0.28	300	1.3	1.9	
	Total				**14.2**	**16.6**	**2.4 (16%)**

Table 10: Table of Required Operator

Description : The Unit Production System (UPS) line requires 16% fewer manpower than the Progressive Bundle System (PBS).

Cause:

- ✓ Transportation labor is not needed.
- ✓ No need to deal with bundles.

4.1.4.2 Manpower Comparison:

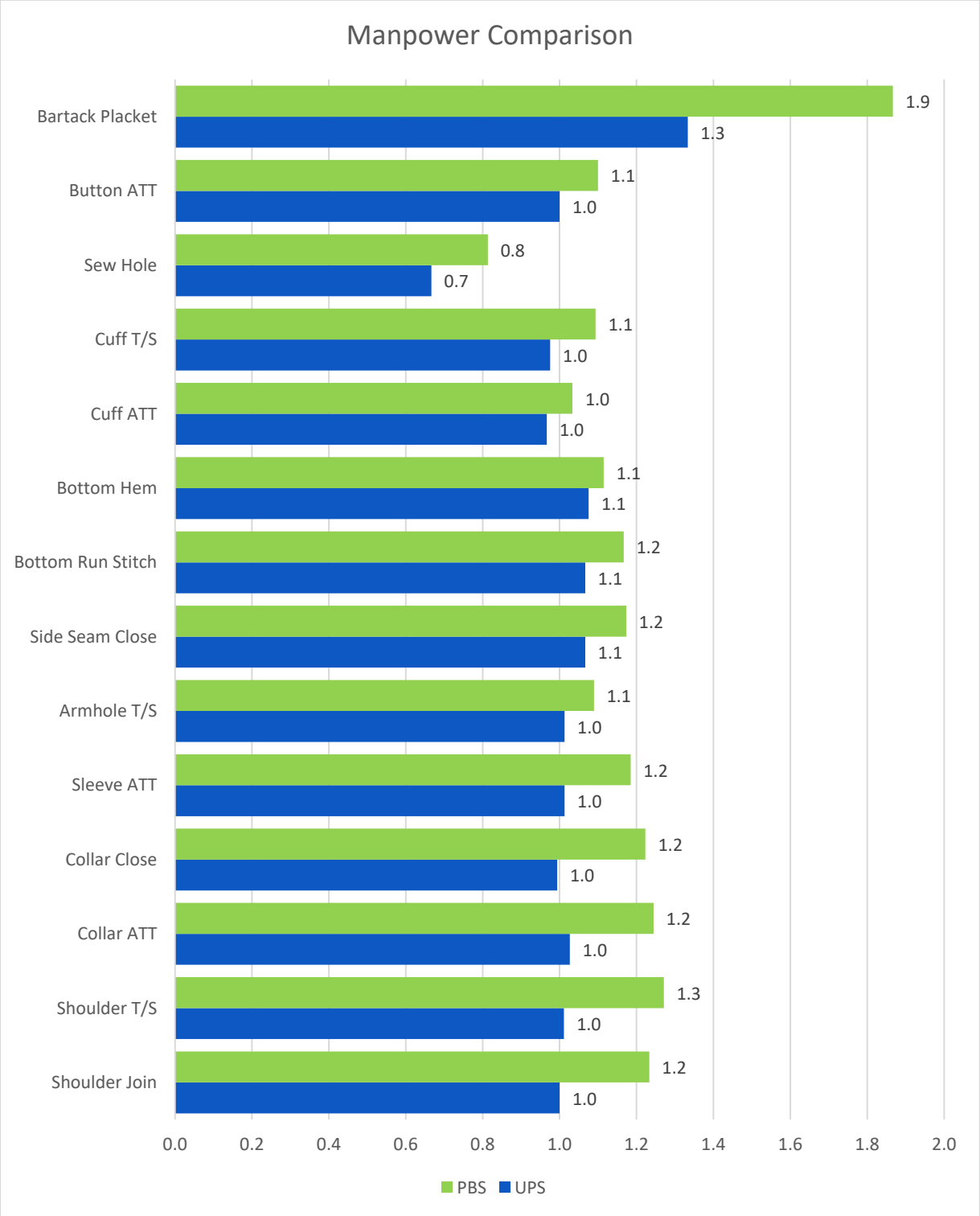
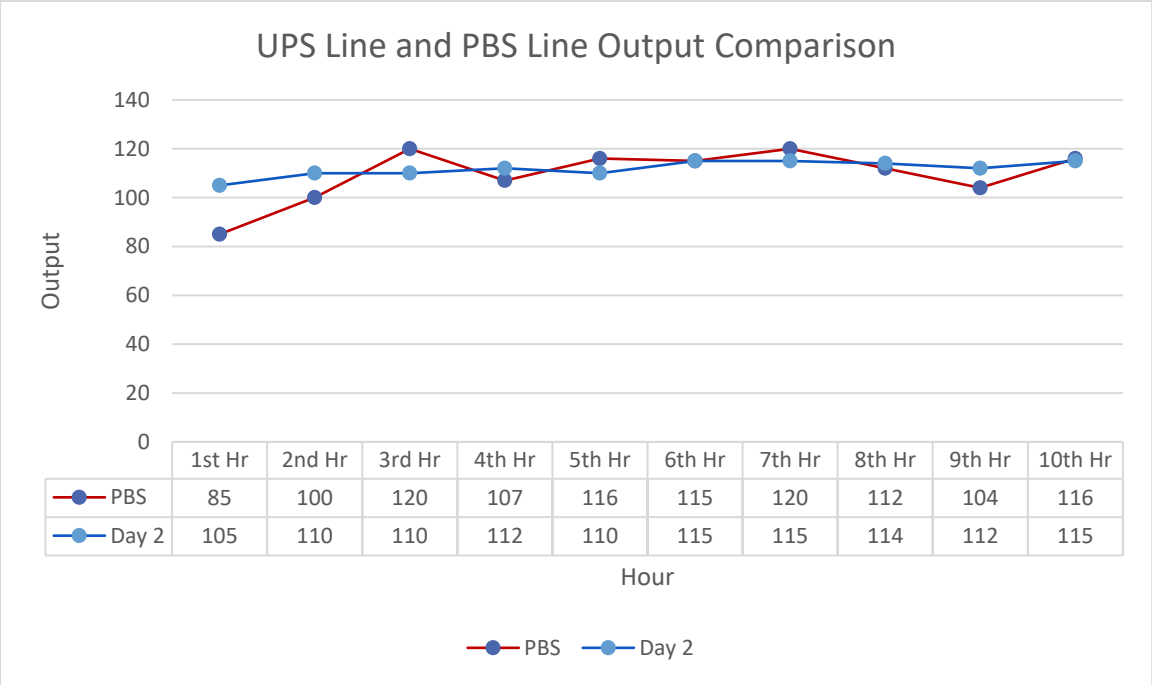


Figure 19:Manpower Comparison Chart

4.1.5 Hourly Output Comparison:

4.1.5.1 UPS line And PBS Line Hourly Output:

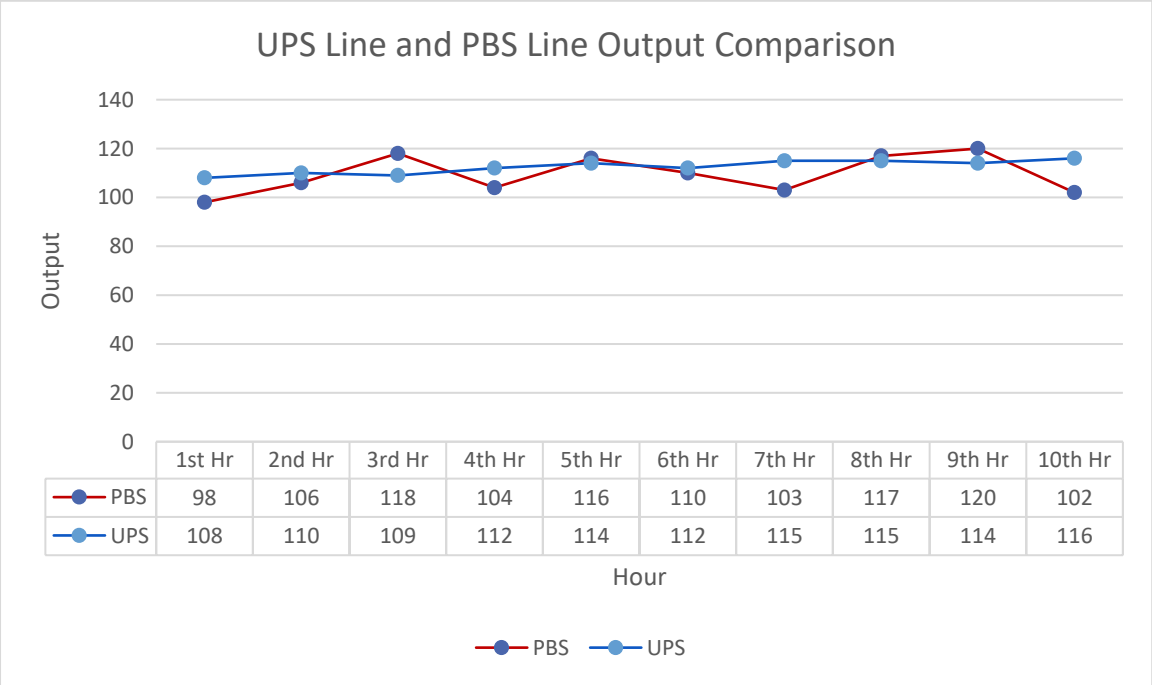
Day 1: 24/12/2022



	1st Hr	2nd Hr	3rd Hr	4th Hr	5th Hr	6th Hr	7th Hr	8th Hr	9th Hr	10th Hr
PBS	85	100	120	107	116	115	120	112	104	116
Day 2	105	110	110	112	110	115	115	114	112	115

Figure 20: Day 1 Output Comparison Graph

Day 2: 26/12/2022



	1st Hr	2nd Hr	3rd Hr	4th Hr	5th Hr	6th Hr	7th Hr	8th Hr	9th Hr	10th Hr
PBS	98	106	118	104	116	110	103	117	120	102
UPS	108	110	109	112	114	112	115	115	114	116

Figure 21: Day 2 Output Comparison Graph

Day 3: 27/12/2022

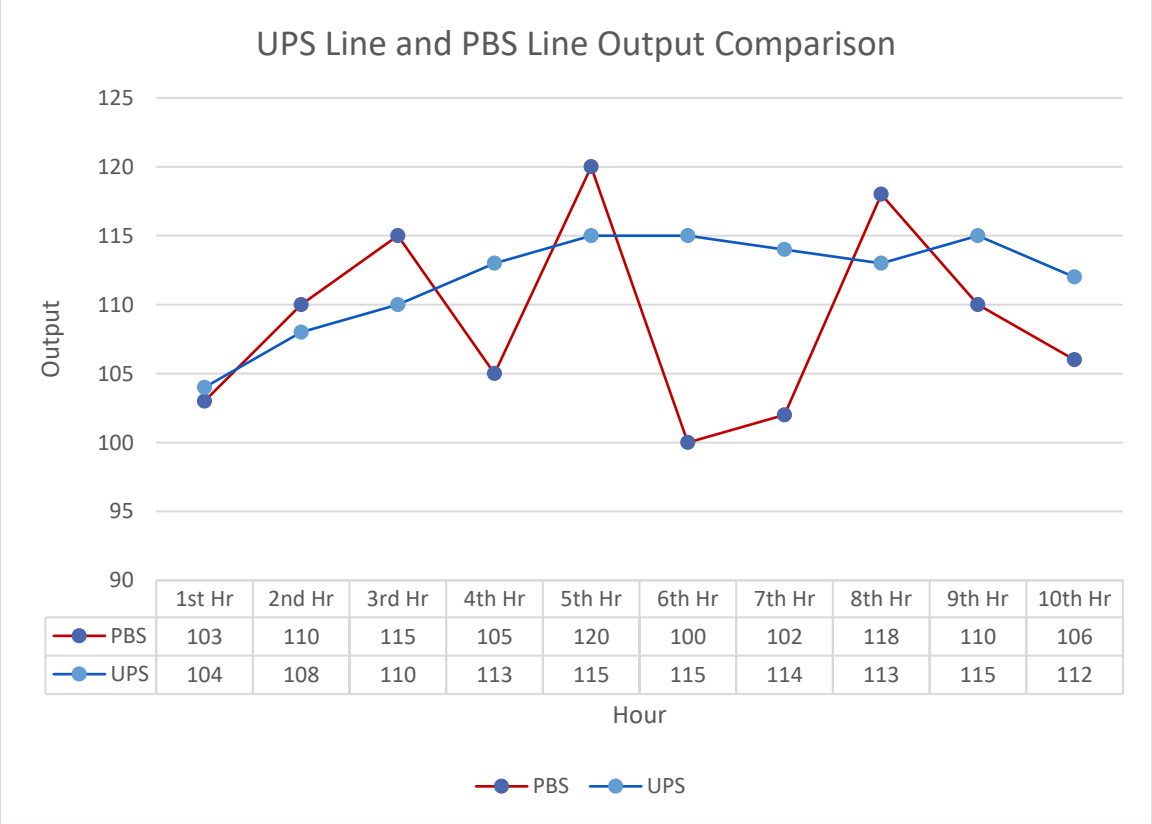


Figure 22: Day 3 Output Comparison Graph

Description: During the first hour of the PBS line, output is rather low. In addition, the output of this line is not fluent or smoother, and it has a poor level of consistency. But UPS line is far more fluent, constant, and smooth.

4.1.6 Avg. Hourly Output Progress And Consistancy:

4.1.6.2 Avg. Output Variation:

Hour	Avg. Hourly Output		Variance	Variance %
	UPS	PBS		
1st	106	95		
2nd	109	105		
3rd	110	118		
4th	112	105		
5th	113	117		
6th	114	108		
7th	115	108		
8th	114	116		
9th	114	111		
10th	114	108		
Total	1121	1093	28	**3%**

Table 11: Table of Avg. Output Variation

4.1.6.2 UPS And PBS Line Avg. Hourly Progress:

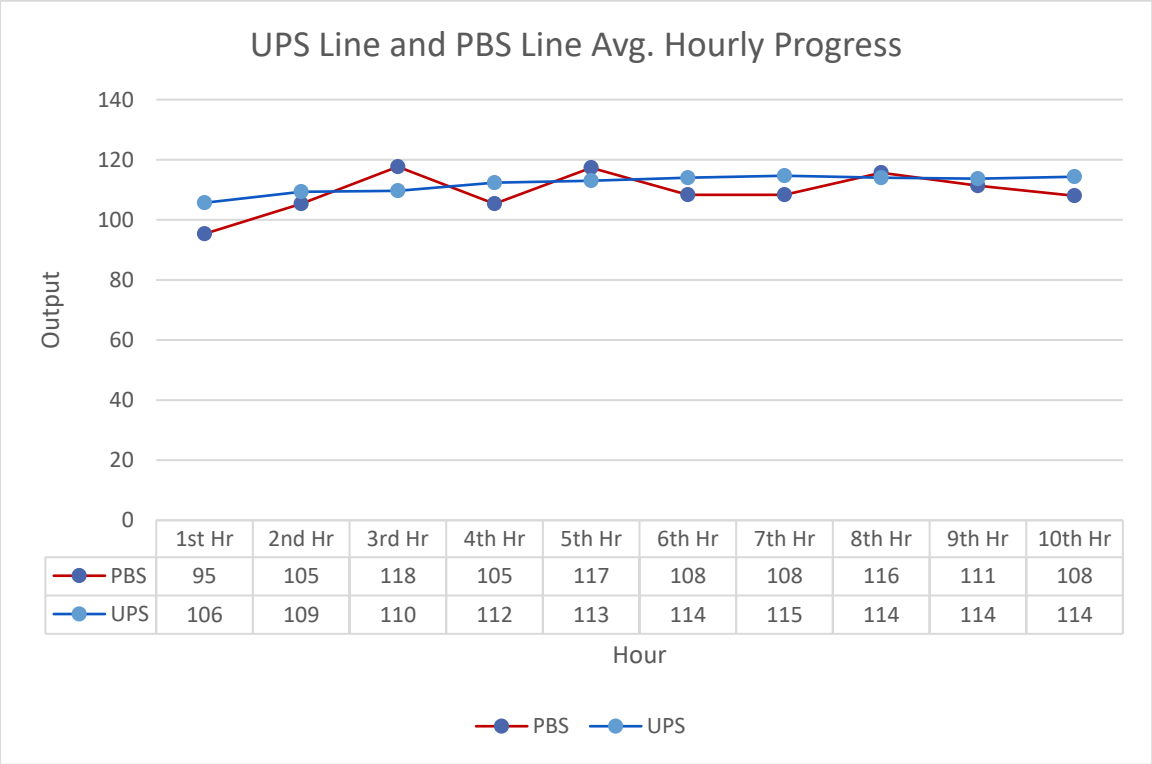


Figure 23: UPS and PBS line Hourly Progress graph

Description: When compared to PBS line, the UPS line's hourly production progress is 3% higher and considerably more practical. Hourly production Progress is constant and smooth.

4.1.7 Avg. Hourly Defect Comparison:

4.1.7.1 Avg. Defect Variation:

Hour	Avg. Defect		Variance	Variance %
	UPS	PBS		
1st	9	17	8	62%
2nd	7	11	4	44%
3rd	7	17	10	83%
4th	6	8	2	29%
5th	13	20	7	42%
6th	9	9	0	0%
7th	10	14	4	33%
8th	11	15	4	31%
9th	8	12	4	40%
10th	11	22	11	67%
Total	91	145	54	**46%**

Table 12: Table Of defective goods variation

4.1.7.2 Avg. Decfect Comparison:

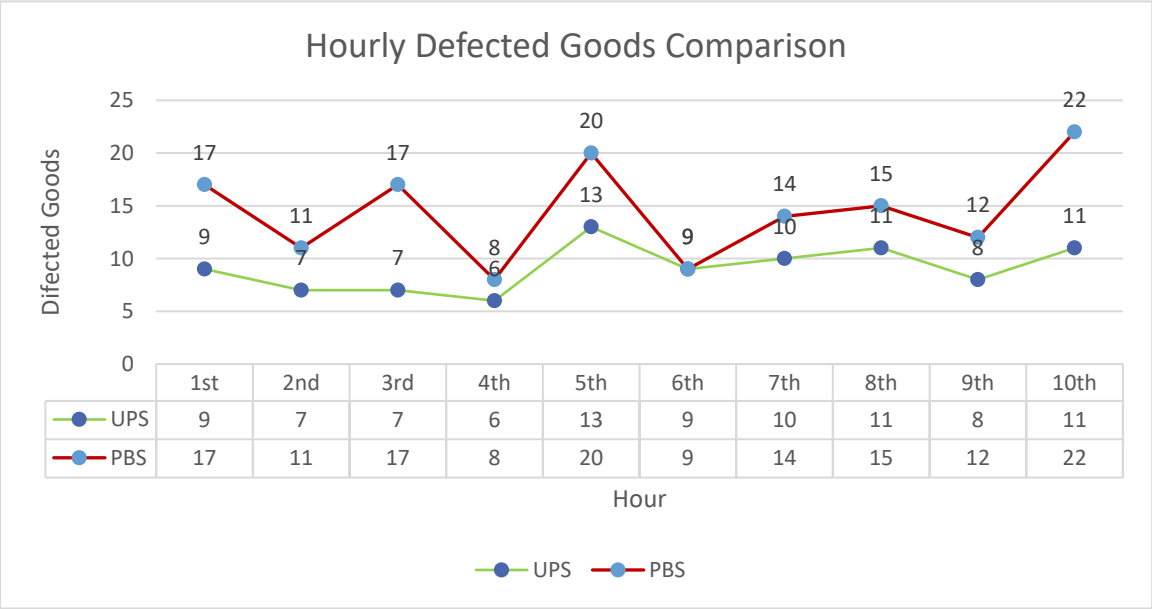


Figure 24: Hourly Defected goods comparison graph

Description: When compared to the PBS line, the UPS line's hourly defective goods rate is 46% less. That's why UPS line's production and fluency are smoother than PBS line.

4.2 Comaprison Based On Daily Observation:

SL	Perameter	UPS Line	PBS Line	Remarks
1	**Production Development**	Performed Target 25915 UPS line achieved 82% Efficiency	Performed on same style but manual line achieved 75% Efficiency	UPS Achieved more efficiency than PBS line
2	**Process Simplification**	Cuff Join & Bottom Hem can do without take down from hanger	To pick and align the garment take more time	In UPS increase the capacity
3	**Transportation - Sewing**	Must be reduce	Await for bundle quantity	Unit production system gives more and fast output than PBS line
4	**Transportation of Defect garments (Quality)**	Totally can autometic system	Need to collect and carry manually	In PBS line, every hour Supervisor received defect GMT then distribute to individual operators for repair. It tooks too much time and don't maintain the exact repair quantity. But when Quality team used rework code then automatically arrived defect garment.After repair that garment QC received automecally.
5	**Change Over Time**	It's a single piece flow system and within short time with one piece system new layout can complete with best quality	With bundle system its more time required.	So Style change over in UPS line need less time.
6	**Line leader & Supervisor Follow up**	Get more time to follow up because of every production data is visual.	Can not find easily and more time required.	In UPS line, Line leader/supervisor only follow up on Real time data (RTD) and get the whole scenery of the each operator production status. But in the PBS line supervisor not get like this. That's why in the UPS line supervisor get more time to follow up comparative with PBS line

SL	Perameter	UPS Line	PBS Line	Remarks
6	**Line leader & Supervisor Follow up**	Get more time to follow up because of every production data is visual.	Can not find easily and more time required.	In UPS line, Line leader/supervisor only follow up on Real time data (RTD) and get the whole scenery of the each operator production status. But in the PBS line supervisor not get like this. That's why in the UPS line supervisor get more time to follow up comparative with PBS line
7	**Hourly Monitoring**	No need to write,in software can get every operator hourly production by RFID technology	Don't get exact data and having scope for hide production	In the Real Time Hourly (RTH), we can get hourly sheet with the process and operator name where in the manual line it is not possible.
8	**Bottleneck Analysis**	Easily can find out by software	Cannot find easily	By the software easily can find that which proces occurred bottleneck and can possible to take immediate action.
9	**Operation Balancing**	By Dispatching Hanger	Do manually	By the dispatch hanger option, we can move hanger automatic one station to another station. But in manual line can't possible
10	**Order Details**	Easily find out	Not possible	By the hanger software, we get full details of running order that how much loaded, how much completed, required to finish etc. but in the manual line not get accurate quantity
12	**Quality Report**	Get DHU% report	Can not possible	"From the system, automatically we can get every operator
13	**Line WIP**	Very less and equivalent of 1st hour target production	So much cut pannels about 400-500 pcs	Easily can find out in Softwere where in maual line it's difficult to maintain

SL	Perameter	UPS Line	PBS Line	Remarks
14	**Individual Process WIP**	Accurately showing the process wip in software	Quantity totally unknown	Easily can find out in Softwere where in PBS line is totally unknown
15	**Yamazumi chart**	Get automatically	Not possible	In hanger system Potential Production report automecally generate "Yamazumi chart"
16	**5S**	Automecally maintain after installation	So difficult to maintain	In UPS line we can easily maintain and sustain.
17	**Attarction**	Easily attract to buyer		UPS line is a aumation system and unit production system it's look too much good.That's why anyone attract on that.

Table 13: Table of comparison Data

4.3 UPS Line Benefits Over PBS Line:

The benefits of a unit production system is dependent on the efficiency with which a production system is employed and the management that is in place. When compared to the progressive bundle system for the manufacturing of clothes, the throughput time in the sewing room may be significantly decreased by lowering the number of works in process at any one moment. Increase in the productivity of garment operators The removal of bundle processing and the use of prepositioned pieces in the carriers both contribute to a reduction in direct labor expenses. It may be possible to save indirect labor expenses by doing away with the practice of handling bundles and employing fewer supervisors. The quick exposure of issues, which are no longer hidden away in bundles for lengthy periods of time, contributes to an improvement in quality. This improvement is made possible by the responsibility of all clothing operators. The central control system that is used in the manufacture of garments makes it possible to promptly trace a quality issue back to the operator who was responsible for completing the operation. Increased staff attendance and retention, as well as decreased space consumption, are a few other advantages that are gained.

4.4 Limitations Of Unit Production System (UPS):

In My two month observation I found these limitations :

- ✓ High investments are needed for a system of unit production. In Aman Graphics & Designs Ltd. 22 station full setup installation cost was 2400,000 taka.
- ✓ It will take a long time for the investment to pay off.
- ✓ To be successful, you need to plan well.
- ✓ First, operators need to get trained.
- ✓ Balancing the line is hard, but a good supervisor can figure out how to do it.
- ✓ Equipment and machinery need to be kept in good shape.
- ✓ For each batch and each style, proper planning is needed, which takes a lot of time.
- ✓ Poor planning leads to worker turnover, low quality, less production, and other problems.
- ✓ For the system to work, i.e. for materials to flow smoothly, it needs to be well-planned and laid out.
- ✓ In this system, it doesn't work to have a lot of different styles and less of them.
- ✓ For the line to work well, each batch needed shuttle operators and utility operators.

CHAPTER-IV
CONCLUSION

Conclusion:

Various kinds of sewing systems are deployed in garment manufacturing businesses. The owner of a garment manufacturing facility purchases these systems based on production volume, product diversity, and the costs associated with purchasing and maintaining these equipment. Among them, the PBS has been the most widely deployed sewing system to date. The bundles of chopped pieces are transported manually along the feeding line in this technique. The operators pull the bundles on their own, complete their assigned task, and then move on to the next operator. With technological development, mechanical material transport systems are acquired. UPS is the automated system that carries cut parts hung on hangers (one hanger per piece) through an overhead transport system. In comparison to the PBS, it minimizes the amount of physical transport and handling and offers several additional advantages.

The initial expenditure in this mechanically automated Unit Production System(UPS) line is significant. In Aman Graphics & Designs Ltd. 22 station full setup installation cost was 2400,000 taka. But, if we are successful in putting it into practice, we may be able to get superior results if we make it completely automated by using a vacuum or vapor compressor. The output is quite even and consistent throughout. It takes new operators working in a UPS line a significant amount of time to learn how to handle the equipment, but once they do, the line produces more items per hour than a normal line does. I found these benefits over Progressive Bundle System (PBS) line SMV Variation 14%, Capacity Variation 16%, Manpower Variation 16%, Output Variation 3%, Defected Goods Variation 46%.

References:

https://textilelearner.net/garment-production-system/

https://textilestudycenter.com/garment-production-system/

https://leanstitch.com/types-of-garment-production-systems/

https://textilestudycenter.com/unit-production-systems/

https://fibres2fabrics.blogspot.com/2012/09/unit-production-system-of-garments.html

https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjzp4KwrPT8AhU-7XMBHUeEAhQ4ChAWegQICBAB&url=https%3A%2F%2Fwww.slideshare.net%2Famnapervaiz14%2Fgarments-production-system&usg=AOvVaw3HVuZYvMr5FM5zfelGtSLD

https://www.cottonmonk.com/blog/what-are-the-types-of-garment-production/

https://slideplayer.com/slide/13704695/

https://www.taylorfrancis.com/chapters/mono/10.1201/9781315367507-22/garment-production-systems-karthik-ganesan-gopalakrishnan

Comparative study on UPS and PBS

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