Faculty of Engineering

Department of Textile Engineering

REPORT ON

Analysis on idle time minimization through line balancing and time study.

Course Title: Project Thesis
Course Code: TE 4214

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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

April, 2018

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Declaration

We are declaring that this is a project thesis report is submitted for fulfillment of the requirement of B.Sc in Textile Engineering Degree of Daffodil International University .We completed the paper with the help of a knit composite industry .We collected all information, reports from the industry.All information in this paper is genuine & correct.We also declare that neither this report nor any part of this report has been submitted elsewhere for award of any courses.

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Acknowledgement

At the very beginning we acknowledge the infinite blessing and profound kindness of "Almighty Allah"- the supreme authority of the universe.

Sharmin Akter Lecturer, Department of Textile Engineering, Daffodil International University, our supervisor, to whom we are extremely grateful for her tremendous support and guidance throughout our project.Being working with her we have not only earned valuable knowledge but was also inspired by her innovativeness which helped to enrich our experience to a greater extent. Her ideas and way of working was truly remarkable. We believe this project could not be finished if she did not help us continuously.

We would like to thank **Professor Dr. Md, MahabubulHaque**, and Head of the Department of Textile Engineering, Daffodil International University, who has inspired us to take and continue this project.We would like to thank factory officers for giving important information on Industrial engineering Department in Textile sector.

Abstract

We are described that this thesis on line balancing system and how to minimize the IDLE time through the proper line balancing and time study. Line balancing is the most important stage in any garments industries. In this paper, we are briefly describing the line balancing system of a knit garments industry. Mainly we are analysis the real data about line balancing of a knit composite industries. From the analysis of the reports, we are trying to minimize the idle time of a line. The objective of our study about the line balancing is to reduce the idle time by proper use of time study, method study, capacity study and by proper line balancing. If we able to reduce the idle time it will help in some production stage like (It will increase the production, and proper use of man, material and machine).

Keywords: Line balancing, work station, UCL,LCL,BPT,SMV, Idle time, time study,Breakdown,GSM.

Approval Sheet

This research entitled ‘Analysis on idle time minimization through line balancing and time study’’at Daffodil International University, A. Y. 2018’’ prepared and submitted by S.A.M Ahsan habib (ID:142-23-142) MD.Zahidul Islam(ID: 142-23-145) MD.Zillur Rahman(ID:131-23-3338) in partial fulfillment of the requirement for the degree of BACHELOR OF SCIENCE IN TEXTILE ENGINEERING has been examined and hereby recommended for approval and acceptance.

Supervisor

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TABLE of CONTENTS

TABLE & GRAPH

LIST Of ABBREVIATION

- **UCL-**Upper Control Limit
- **LCL-**Lower Control Limit
- **SMV-**Standard Minute Value
- **SAM-**Standard Allowed Minutes
- **BPT-**Basic Piece Time
- **GSM-**Gram per Square Meter

1. Introduction

Line Balancing is leveling the workload across all processes in a line stream to remove bottlenecks and excess capacity. Line balancing is used to make production line more flexible to absorb external and internal irregularities. In the case of textile line balancing means the placement of sewing machine according to style and design of a specific product. It is done to increasing the productivity.

When you consider bulk production, garments are produced in lines or lot of machines instead of single machine. A line may be assembly line, modular line or section, a line set with online and offline finishing and packing. A line includes many work stations with different work contents. Production per hour is fluctuate depending on work content (standard minutes of particular task/operation), placement of total manpower to a particular operation, operator skill level and machine capacity. Operation with lowest production per hour is called as bottleneck operation for that line.

Garments factories those follow the line production system must have fall a situation where operators have to wait for the work between bundle. This waiting time is called idle time. This idle time is a non working time between working significantly between two bundle. Idle time reduce the efficiency of the production and efficiency of the worker also. This is why a factory must have engaged with a huge loss in many production hours in a day.

For an example, there are 50 machines in a line and 15 workers are not working without extra bundle but the bundle are working correctly .Assume that all of them wait 40 seconds for the next bundle. If they produce 500 pieces in a day then the total idle time for single operator will be 2000 seconds.

2. Literature Review

2.1 Line Balancing:

Line Balancing is leveling the workload across all processes in a line stream to remove bottlenecks and excess capacity. Line balancing is used to make production line more flexible to absorb external and internal irregularities. In the case of textile line balancing means the placement of sewing machine according to style and design of a specific product. It is done to increasing the productivity.

When you consider bulk production, garments are produced in lines or lot of machines instead of single machine. A line may be assembly line, modular line or section, a line set with online and offline finishing and packing. A line includes many work stations with different work contents. Production per hour is fluctuate depending on work content (standard minutes of particular task/operation), placement of total manpower to a particular operation, operator skill level and machine capacity. Operation with lowest production per hour is called as bottleneck operation for that line.

Objectives of line balancing:

- ✓ Regular material drift.
- ✓ Maximum uses of man power and machine.
- ✓ Minimum process time.
- ✓ Minimizing loose time.
- ✓ Minimizing workstation.
- ✓ Maximum output.
- ✓ Quality maintain of the garment.
- ✓ Reduce production cost.

Importance of Line Balancing

- ✓ Line balancing helps to know about new machine required for new style and design.
- ✓ It becomes easier to distribute particular job to each operator.
- ✓ It becomes possible to deliver goods at right time.
- ✓ Good line balancing increase production.
- ✓ Line balancing helps to compare the required machinery with the existing one and compare balance.
- ✓ It also helps in the determination of actual labor required.
- ✓ Reduces production time.
- ✓ Profit of a factory can be increased by proper line balancing.
- ✓ Proper line balancing ensured optimum production.
- ✓ It reduces faults in the finished garments.

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Steps to balance the line:

The method of line balancing can be changed from factory to factory and depends on the garments manufactured; but at any instance, line balancing concerns itself with two distinct applications: “Opening the line” and “Operating the line”.

- Calculation of labor requirements
- Operation breakdown
- Theoretical operation balance
- Initial balance

} – Opening the line

- Balance control – Operating the line

2.2 Idle Time:

Garments factories those follow the line production system must have fall a situation where operators have to wait for the work between bundle. This waiting time is called idle time. This idle time is a non working time between working significantly between two bundle. Idle time reduce the efficiency of the production and efficiency of the worker also.

Why idle time occurred:

- ✓ Line setting
- ✓ Machine problem
- ✓ Unavailable cutting bundle
- ✓ Sewing quality problem
- ✓ Cutting quality problem
- ✓ Load shedding
- ✓ Problem in planning
- ✓ More material handling time

Essentiality of recording of idle time:

Factories strive to improve their efficiency but sometimes they are unable in finding a way for efficiency improvement .For them working on reducing idle time is an opportunity for improving factory efficiency. Most of the garment factories overlook measuring the idle time. They just let it go. One reason might be management wants to hide their inefficiencies in not to have a balanced line with enough WIP at each workstation

2.3 SMV/SAM:

SMV means standard minute value which describes about the standard time required to complete a given task by best possible method.

Calculation of SAM through Time Study

Step 1: Select one operation for which you want to calculate SAM.

Step 2: Take one stop watch. Stand by side of the operator. Capture cycle time for that operation. (cycle time – total time taken to do all works needed to complete one operation, i.e. time from pick up part of first piece to next pick up of the next piece). Do time study for consecutive five cycles. Discard if found abnormal time in any cycle. Calculate average of the 5 cycles. Time you got from time study is called cycle time. To convert this cycle time into basic time you have to multiply cycle time with operator performance rating. [Basic Time = Cycle Time X performance Rating]

Step 3: Performance rating. Now you have to rate the operator at what performance level he was doing the job seeing his movement and work speed. Suppose that operator performance rating is 80%. Suppose cycle time is 0.60 minutes. Basic time = (0.60 X 80%) = 0.48 minutes

Step 4: Standard allowed minutes (SAM) = (Basic minute + Bundle allowances + machine and personal allowances). Add bundle allowances (10%) and machine and personal allowances (20%) to basic time. Now you got Standard Minute value (SMV) or SAM. SAM= (0.48+0.048+0.096) = 0.624 minutes.

The formula used for calculating available capacity of the sewing line has been given below. The available capacity of a line is presented in minutes or hours.

2.4 Time study:

Time study is the analysis of a specific job by a qualified worker to find the most economical method in terms of time and effort. The study count the time necessary for the job or given task by using best possible method.

2.5 Work study: Work study is the analyzing of a method of carrying activities.It measure the resources, standard set up performance an activity of a give work.Work study increases the productivity.

The objectives

- ✓ Lower cost.
- ✓ Increase productivity.
- ✓ Increase profitability.
- ✓ Increase job security.
- ✓ To make the work easier.
- ✓ Establish fair task for everyone.
- ✓ Check achievements against standard.

2.6: **Bottleneck:**

A bottleneck in a process occurs when input comes in faster than the next step can use it to create output.. we have identified the bottleneck processes named make and join care label, back neck elastic tape joint, match sleeve pair and sleeve and body,sleeve hem, hem raw edge cut, security tack and thread cut body turn in Annexure 3: marked with light brown color.Production has been blocked in these seven work stations and large work in process (WIP) has been stick in these bottleneck processes.

Bottleneck in Production:

Bottleneck before input in line:

- ✓ If cutting material is not supplied in time from other section and sub store.
- ✓ If material comes delay.
- ✓ Bundle serial number mistake.
- ✓ Bundling mistake.
- ✓ Wrong bundle supply.

Bottleneck in line:

- ✓ Worker selection wrong.
- ✓ Wrong works flow / sequence of works.
- ✓ Non-balance allocation of elements.
- ✓ Works negligence by workers.
- ✓ Workers absenteeism.
- ✓ machine disturbances / out of order.
- ✓ Lack of supply

Way of reducing bottle neck:

- ✓ To arrange pre-production meeting.
- ✓ To prepare layout sheet before input in the line.
- ✓ To check fabrics and accessories before issuing in the line.

- ✓ To submit the layout sheet to maintenance section minimum 2-3 days before for Better preparation.
- ✓ To check pattern before supply in the line.
- ✓ To reduce overpplus works from workers.
- ✓ To select right workers for right works.
- ✓ To keep supply gainable in time.
- ✓ To maintain serial number.
- ✓ Reject garments should not forward.
- ✓ Supply should be forwarded after checking.
- ✓ To alert when bundling (maintain serial number)
- ✓ By improving method.
- ✓ By improving workers representation.

Chapter 3 Materials and Methods:

All the data of the thesis paper is collected from a knit composite industry and all the data are actual.

In order to balance a production line in sewing floor a garment order is chosen which was started in that line, knowing total amount of order, style description, GSM and fabric type. Two important ways have been considered, one is possible standard method for each process and another is time study technique to know the time required for particular operation. We have recorded the time to complete each process for each and every worker to find out the number of workstation and individual capacity. To find out the(standard minute value) S.M.V , process wise capacity has been calculated, in addition to that we have calculated the target, Basic pitch time, upper control limit (UCL), lower control limit (LCL), actual capacity line graph. After taking necessary data from the line we collected two layouts, before line balancing and after line balancing for each selected style. At first we marked the bottleneck processes which were our prime concern and then seek solution to minimize the problem. In this thesis we proposed a method to minimize idle time by sharing workload among equally adept and changing work station. Line has been balanced considering the bottleneck and balancing process. After balancing we have compared the line graph between after balancing the line and before balancing the line to know the status of idle time.

Chapter 4 Results and discussion

Floor: Unit 01
Line: 08
Buyer: KIABI
Style: GTVAB
Item: T-Shirt
GSM:150
Fabrication: 100% Cotton

Before Balancing:

SL NO.	Task	Mc type	Work station	Time	Target	Idle Time
1	SHOULDER JOIN	4 TOL	1	20	180	16
2	NECK RIB TACK	SNLS	1	20	180	16
3	NECK RIB SERVICING	4TOL	1	20	180	16
4	NECK RIB TACK W/BODY	SNLS	1	20	180	16
5	NECK JOIN	4TOL	1	32	112.5	4
6	FRONT NECK TOP STC	FL	1	20	180	16
7	BACK NECK PIPING	FL	1	18	200	18
8	BACK NECK PIPING END TACK	SNLS	1	18	200	18
9	BACK NECK TOP STC W/LABEL	SNLS	1	20	180	16
10	SLEEVE HEM	FL	1	18	200	18
11	SLEEVE JOIN	4TOL	1	32	112.5	4
12	SIDE SEAM	4TOL	1	36	100	0
13	SLEEVE OPEN INTACK	SNLS	1	18	200	18
14	SLEEVE OPEN IN SAFETY TACK	SNLS	1	18	200	18
15	BODY HEM	FL	1	20	180	16
16	CARELABLE MAKE	4TOL	1	18	200	18
17	CARELABLE JOIN	4TOL	1	18	200	18
18	HANGER LOOP JOIN	SNLS	1	28	128.58	8
	Total		18	394		254

Table No:4.1 (Data table of style GTVAB)

BPT= SMV/ Work Station

= 394/18X60

= 0.365 min

=21.9 sec

UCL= maximum time required for the task + 15%

= 36+15%

=41.4 sec

LCL= minimum time required for the task + 15%

=18+15%

=20.7sec

Target output= 60/0.365

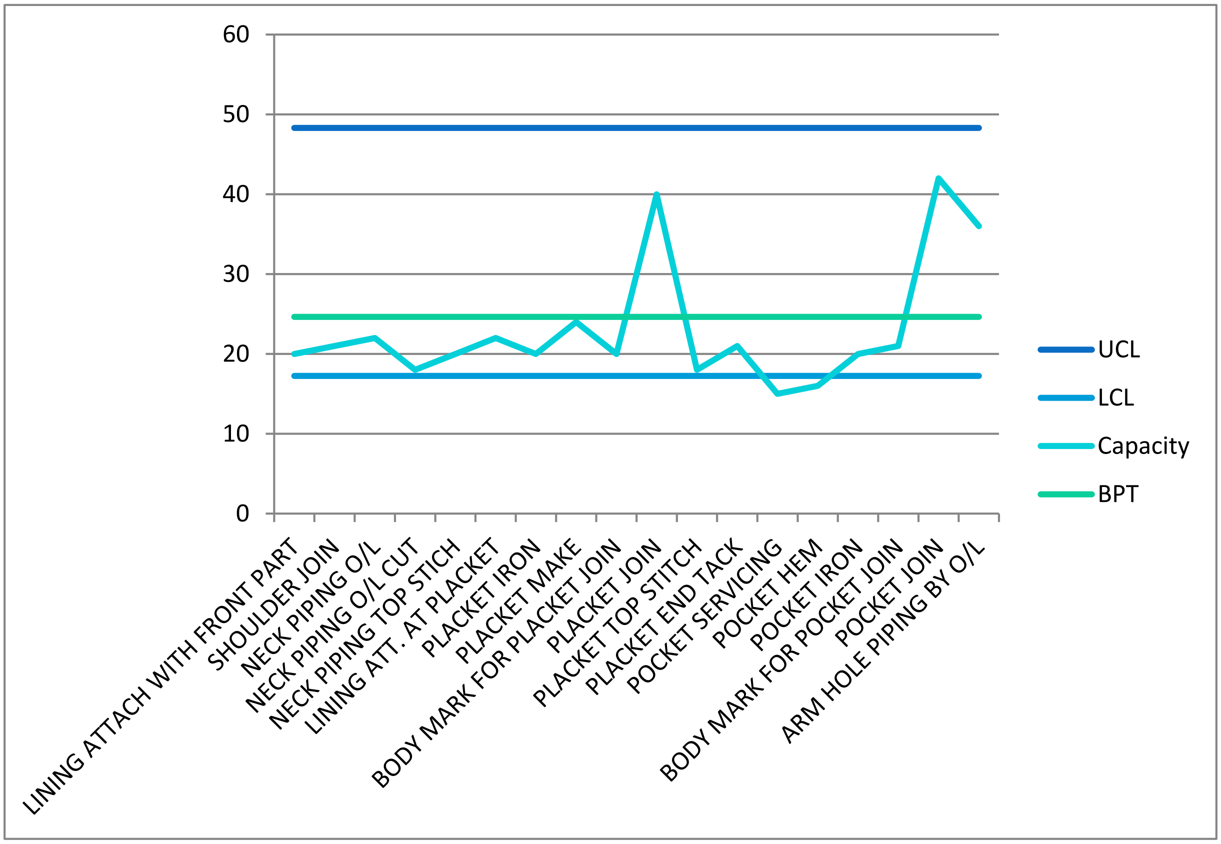
=60/0.365

= 164

Balancing= (Minimum output/ target output) X 100%

= (100/200) X100%

= 50%



Capacity graph before balancing:

Graph No:4.1(Before Balancing Graph of GTVAB)

After balancing:

SL NO.	Task	New work station	New time	Target	New idle time
1	SHOULDER JOIN	1	20	180	0
2	NECK RIB TACK	1	20	180	0
3	NECK RIB SERVICING	1	20	180	0
4	NECK RIB TACK W/BODY	2	20	180	0
5	NECK JOIN	2	16	225	4
6	FRONT NECK TOP STC	1	20	180	0
7	BACK NECK PIPING	1	18	200	2
8	BACK NECK PIPING END TACK	1	18	200	2
9	BACK NECK TOP STC W/LABEL	1	20	180	0
10	SLEEVE HEM	1	18	200	2
11	SLEEVE JOIN	2	16	225	4
12	SIDE SEAM	2	18	200	2
13	SLEEVE OPEN INTACK	1	18	200	2
14	SLEEVE OPEN IN SAFETY TACK	1	18	200	2
15	BODY HEM	1	20	180	0
16	CARELABLE MAKE	1	18	200	2
17	CARELABLE JOIN	1	18	200	2
18	HANGER LOOP JOIN	2	14	257.14	6
	Total	23	330		30

Table No:4.2(Data table for style GTVAB-after Balancing)

BPT= SMV/ Work Station

= 330/23X60

= 0.239 min

=14.34 sec

UCL= maximum time required for the task + 15%

= 20+15%

=23 sec

LCL= minimum time required for the task +15%

= 14+15%

= 16.1 sec

Target output= 60/0.365

=60/0.365

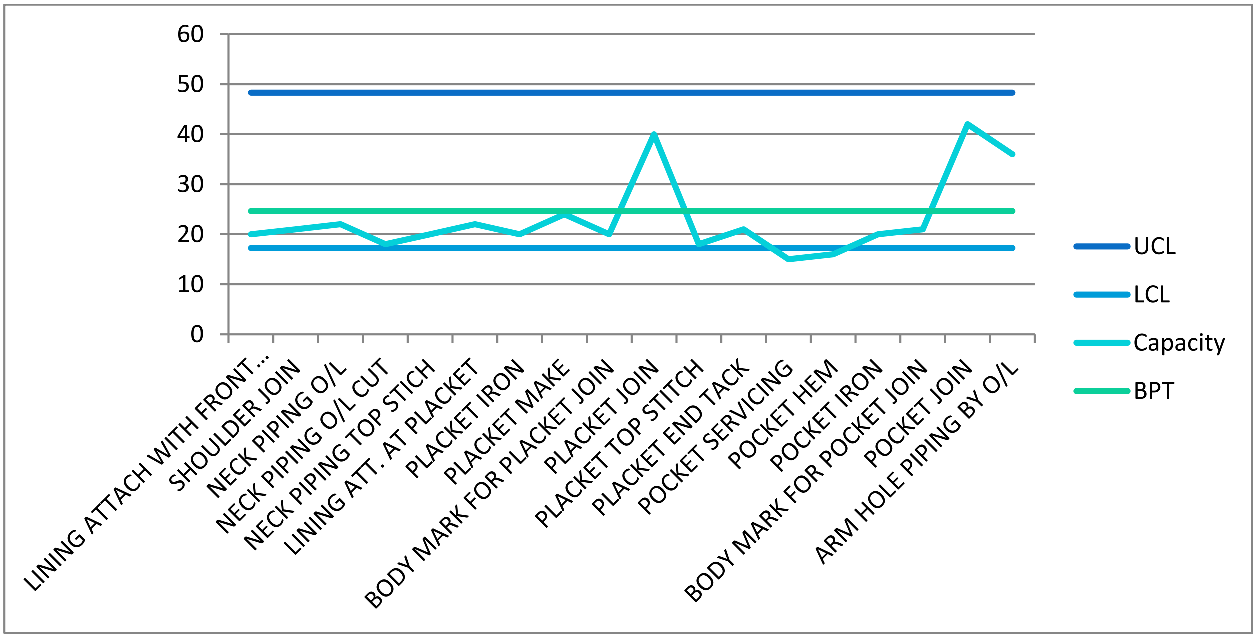
= 251

Balancing= (Minimum output/ target output) X 100%

= (180/257.14) X100%

= 70%

Capacity graph after balancing:



Graph No:4.2(Capacity Graph-After Balancing, style:GTVAB)

Floor:unit-1
Line:1
Buyer: KIABI
Style:QFAC4
Item: Trouser
GSM:260
Fabrication:99%cotton 1% viscose

Before Balancing:

SL NO.	Task	Mc type	Work station	Time	Target	Idle Time
1	Leg Dart Make	SNLS	1	30	120	30
2	leg lower pannel join	4TOL	1	26	138	34
3	Bacxk and front rise join	4TOL	1	30	120	30
4	J fly upper tack	SNLS	1	20	180	40
5	J fly lower tack	DNLS	1	24	150	36
6	BONE POCKET MAKE	SNLS	1	30	120	30
7	Bone top stitch	SNLS	1	30	120	30
8	Bone join	4TOL	1	30	120	30
9	Bone corner tack	SNLS	1	56	64	4
10	Bone pocket join	SNLS	1	60	60	0
11	2nd pocket join	SNLS	1	52	69	8
12	Pocket side servicing	4TOL	1	28	128	32
13	Pocket 1/16 top stitch	SNLS	1	56	64	4
14	Pocket mouth close	4TOL	1	30	120	30
15	Pocket upper tack	SNLS	1	27	133	33
16	Back & front rise top stitch	FL	1	28	128	32
17	Inseam pannel join	4TOL	1	44	81	16
18	Back pockt hem	FL	1	20	180	40
19	Back pocket joim	SNLS	1	50	72	10
20	Back pocket 1/4 top stitch	SNLS	1	30	120	30
21	Back cone pocket	SNLS	1	28	128	32

	corner tack					
22	Back bone pocket join	SNLS	1	30	120	30
23	Back bone pocket servicing	4TOL	1	26	138	34
24	Back bone pocket 1/16 top stitch	SNLS	1	30	120	30
25	Back deco. 1/4 top stitch	SNLS	1	29	124	31
26	Back patch level join	SNLS	1	25	144	35
27	Inseam join	4TOL	1	48	75	12
28	Inseam top stitch	FL	1	60	60	0
29	Side seam	4TOL	1	56	64	4
30	Side cot stitch	SNLS	1	60	60	0
31	Cuff rib tack	SNLS	1	20	180	40
32	Cuff join	4TOL	1	44	81	16
33	Cuff top stitch	FL	1	21	171	39
34	waist rib tack	SNLS	1	20	180	40
35	Elastic Tack	SNLS	1	20	180	40
36	Elastic Tack w/rib	SNLS	1	60	60	0
37	Waist belt servicing	4TOL	1	22	163	38
38	Waist belt join	4TOL	1	30	120	30
39	Waist belt piping	KS	1	30	120	3
40	Waist piping mouth tak	SNLS	1	23	156	32
41	Waist piping mouth close	SNLS	1	24	150	36
42	Drawstring mouth tack	SNLS	1	22	163	38
43	Main & size level join	SNLS	1	20	180	40
44	2 cm bartack	BT	1	40	90	20
45	.5 cm bartack	BT	1	30	120	30
Total			45	1524		1176

Table No:4.3(Data Table of style:QFAC4-Before Balancing)

BPT=SMV/Work Station

=1524/(45*60)

=0.564 min

=33.87 sec

UCL= Maximum time required for the task+15%

=60+15%

=69 sec

LCL= Minimum time required for the task+ 15%

=20+15%

=23 sec

Target output=60/.564

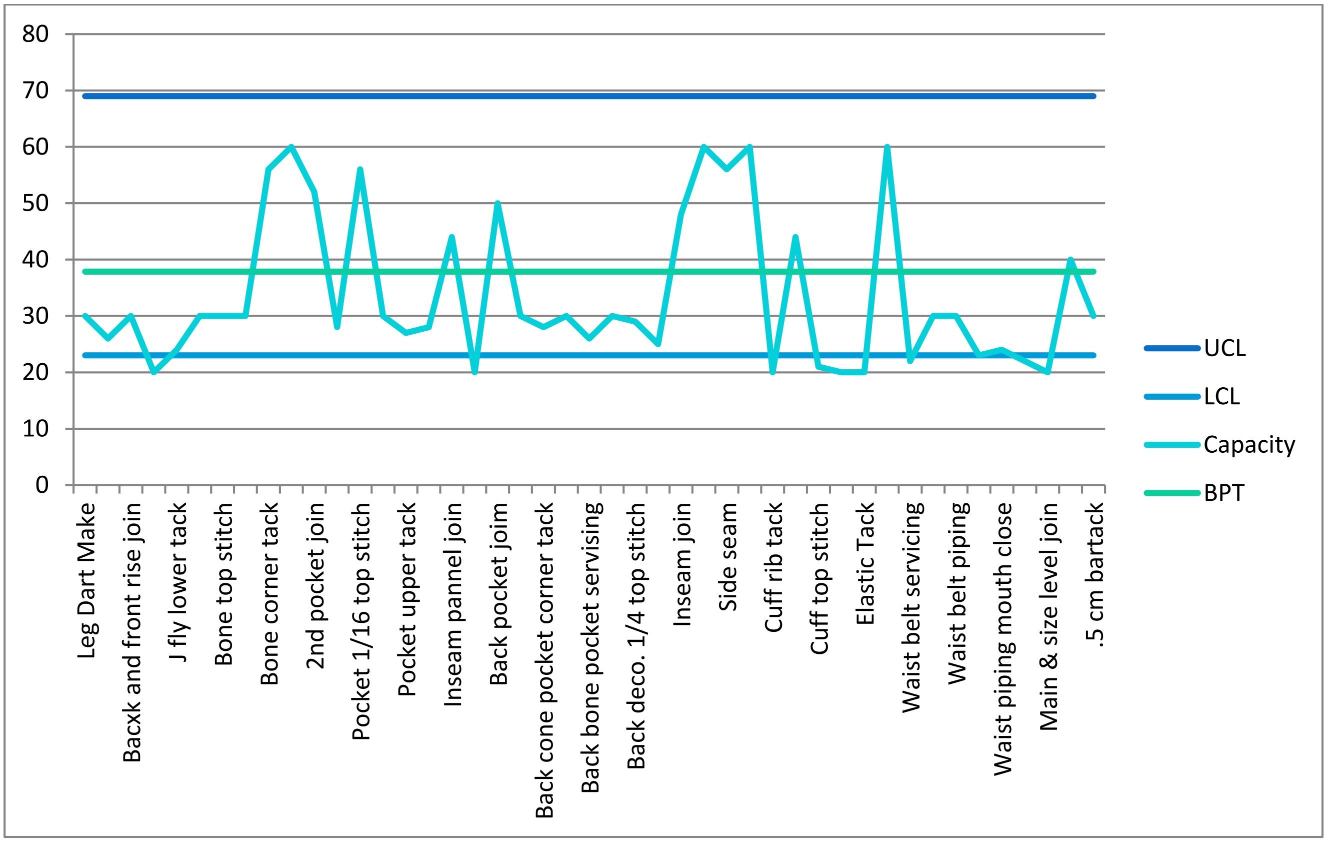
=106

Balancing= (Minimum output/ target output) X 100%

=(60/106) X 100%

=56.60%

Capacity graph before balancing:



Graph No:4.3(Capacity Graph of QFAC4-Before Balancing)

After balancing:

SL NO.	Task	New work station	New time	Target	New idle time
1	Leg Dart Make	1	30	120	0
2	leg lower pannel join	1	26	138	4
3	Bacxk and front rise join	1	30	120	0
4	J fly upper tack	1	20	180	10
5	J fly lower tack	1	24	150	6
6	BONE POCKET MAKE	1	30	120	0
7	Bone top stitch	1	30	120	0
8	Bone join	1	30	120	0
9	Bone corner tack	2	28	128	2
10	Bone pocket join	2	30	120	0
11	2nd pocket join	2	26	138	4
12	Pocket side servicing	1	28	128	2
13	Pocket 1/16 top stitch	2	28	128	2
14	Pocket mouth close	1	30	120	0
15	Pocket upper tack	1	27	133	3
16	Back & front rise top stitch	1	28	128	2
17	Inseam pannel join	2	22	163	8
18	Back pockt hem	1	20	170	10
19	Back pocket joim	2	25	144	5
20	Back pocket 1/4 top stitch	1	30	120	0
21	Back cone pocket corner tack	1	28	128	2
22	Back bone pocket join	1	30	120	0
23	Back bone pocket servising	1	26	138	4
24	Back bone pocket 1/16 top stitch	1	30	120	0
25	Back deco. 1/4 top stitch	1	29	124	1
26	Back patch level join	1	25	144	5
27	Inseam join	2	24	150	6
28	Inseam top stitch	2	30	120	0
29	Side seam	2	28	128	2
30	Side cot stitch	2	30	120	0
31	Cuff rib tack	1	20	180	10
32	Cuff join	2	22	163	8
33	Cuff top stitch	1	21	171	9

34	waist rib tack	1	20	180	10
35	Elastic Tack	1	20	180	10
36	Elastic Tack w/rib	2	30	120	0
37	Waist belt servicing	1	22	163	8
38	Waist belt join	1	30	120	0
39	Waist belt piping	1	30	120	0
40	Waist piping mouth tak	1	28	128	2
41	Waist piping mouth close	1	24	150	6
42	Drawstring mouth tack	1	22	163	8
43	Main & size level join	1	20	180	10
44	2 cm bartack	2	20	180	10
45	.5 cm bartack	1	30	120	0
Total		58	1181		169

Table No:4.4((Data Table of style:QFAC4-After Balancing))

BPT=SMV/Work station

=1181/58*60

=.339 min

=20.36 sec

UCL=Maximum time required for the task +15%

=30+15%

=34.5 sec

LCL= Minimum time required for the task+ 15%

=20+15%

=23 sec

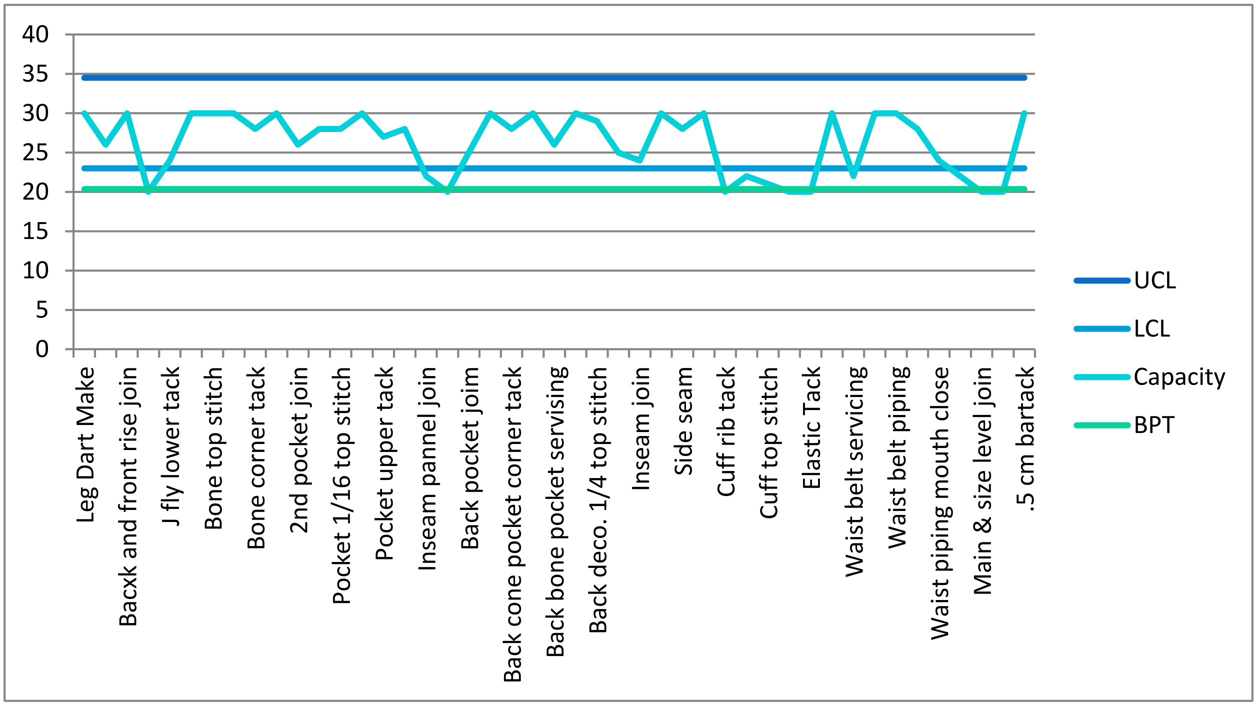
Target output=60/.339

=177

Balancing=(Minimum output/target output)* 100%

=(120/177)*100%

=67.79%



Capacity graph after balancing:

Graph no:4.4(Capacity Graph of style-QFAC4-After Balancing)

Floor:unit-1

Line:4

Buyer: KIABI

Style:HBBIR

Item:Babiestank top

GSM:160

Fabrication:100% cotton s/y

Before Balancing:

SL NO.	Task	Mc type	Work station	Time	Target	idle Time
1	LINING ATTACH WITH FRONT PART	Helper	1	20	180	22
2	SHOULDER JOIN	4TOL	1	21	170	21
3	NECK PIPING O/L	4TOL	1	22	163	20
4	NECK PIPING O/L CUT	Helper	1	18	200	24
5	NECK PIPING TOP STICH	FL	1	20	180	22
6	LINING ATT. AT PLACKET	Helper	1	22	163	20
7	PLACKET IRON	Helper	1	20	180	22
8	PLACKET MAKE	SNLS	1	24	150	18
9	BODY MARK FOR PLACKET JOIN	Helper	1	20	180	22
10	PLACKET JOIN	SNLS	1	40	90	2
11	PLACKET TOP STITCH	SNLS	1	18	200	24
12	PLACKET END TACK	SNLS	1	21	170	21
13	POCKET SERVICING	4TOL	1	15	240	27
14	POCKET HEM	FL	1	16	225	26
15	POCKET IRON	Helper	1	20	180	22
16	BODY MARK FOR POCKET JOIN	Helper	1	21	170	21
17	POCKET JOIN	SNLS	1	42	85	0
18	ARM HOLE PIPING BY O/L	4TOL	1	36	100	6
19	ARM HOLE TOP STITCH	FL	1	20	180	22
20	TACK BEFORE SIDE SEAM	SNLS	1	36	100	6
21	SIDE SEAM W/LABEL	4TOL	1	40	90	2
22	ARMHOLE SAFETY	SNLS	1	20	180	22

	TACK					
23	BODY HEM	FL	1	18	200	24
24	BODY MARK FOR PATCH LABEL JOIN	Helper	1	20	180	22
25	PATCH LABEL JOIN	SNLS	1	38	95	4
26	MAIN & SIZE LABEL MAKE	SNLS	1	20	180	22
27	MAIN & SIZE LABEL JOIN	SNLS	1	20	180	22
28	TRIMING	Helper	1	42	85	0
Total			28	690		486

Table No:4.5 (Data table of style-HBBIR,Before Balancing)

BPT=SMV/Work Station

=690/(28*60)

=0.41 min

=24.64 sec

UCL= Maximum time required for the task+15%

=42+15%

=48.3 sec

LCL= Minimum time required for the task+ 15%

=15+15%

=17.25 sec

Target output=60/.41

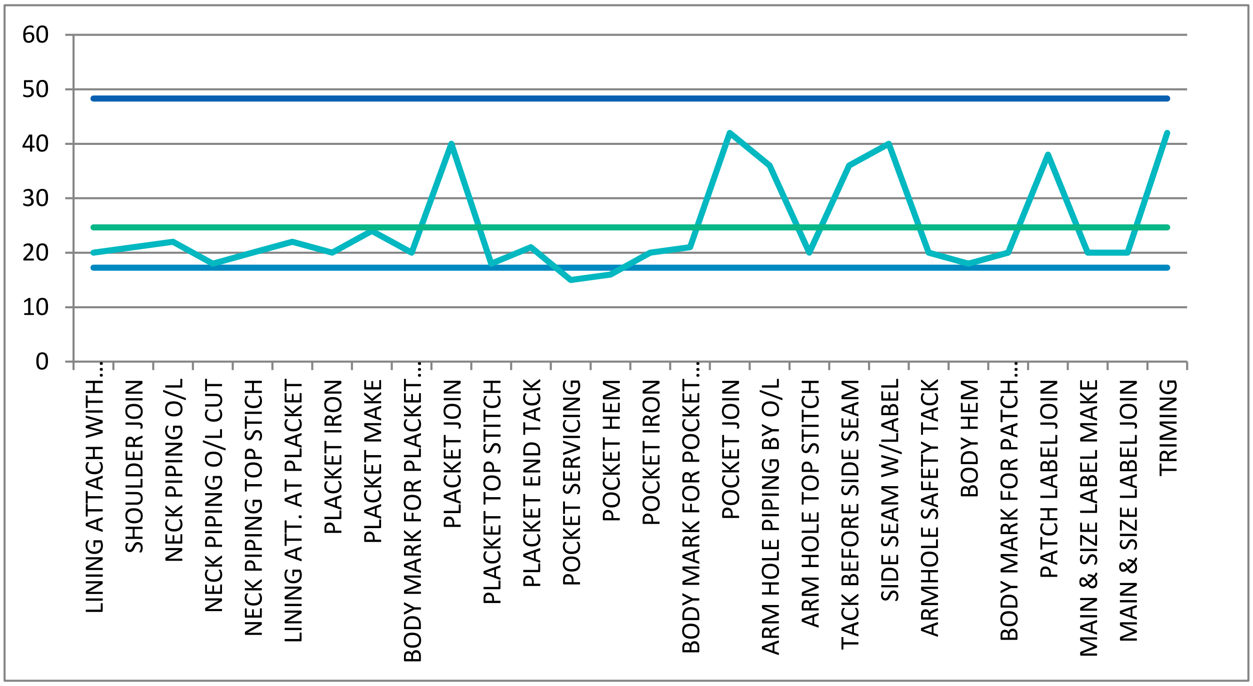
=146

Balancing= (Minimum output/ target output) X 100%

=(85/146) X 100%

=58.23%

Capacity graph before balancing:



Graph No:4.5(Capacity graph Style-HBBIR,before balancing)

After balancing:

SL NO.	Task	Mc type	New work station	New time	Target	New idle time
1	LINING ATTACH WITH FRONT PART	Helper	1	20	180	4
2	SHOULDER JOIN	4TOL	1	21	171	3
3	NECK PIPING O/L	4TOL	1	22	163	2
4	NECK PIPING O/L CUT	Helper	1	18	200	6
5	NECK PIPING TOP STICH	FL	1	20	180	4
6	LINING ATT. AT PLACKET	Helper	1	22	163	2
7	PLACKET IRON	Helper	1	20	180	4
8	PLACKET MAKE	SNLS	1	24	150	0
9	BODY MARK FOR PLACKET JOIN	Helper	1	20	180	4
10	PLACKET JOIN	SNLS	2	20	180	4

11	PLACKET TOP STITCH	SNLS	1	18	200	6
12	PLACKET END TACK	SNLS	1	21	171	3
13	POCKET SERVICING	4TOL	1	15	240	9
14	POCKET HEM	FL	1	16	225	8
15	POCKET IRON	Helper	2	10	360	14
16	BODY MARK FOR POCKET JOIN	Helper	1	21	171	3
17	POCKET JOIN	SNLS	2	21	171	3
18	ARM HOLE PIPING BY O/L	4TOL	2	18	200	6
19	ARM HOLE TOP STITCH	FL	1	20	180	4
20	TACK BEFORE SIDE SEAM	SNLS	2	18	200	6
21	SIDE SEAM W/LABEL	4TOL	2	20	180	4
22	ARMHOLE SAFETY TACK	SNLS	1	20	180	4
23	BODY HEM	FL	1	18	200	6
24	BODY MARK FOR PATCH LABEL JOIN	Helper	1	20	180	4
25	PATCH LABEL JOIN	SNLS	2	19	189	5
26	MAIN & SIZE LABEL MAKE	SNLS	1	20	180	4
27	MAIN & SIZE LABEL JOIN	SNLS	1	20	180	4
28	TRIMING	Helper	2	21	171	3
Total			36	543		129

Table No:4.6(Data table of Style-HBBIR,After Balancing)

BPT=SMV/Work station

=543/36*60

=.251 min

=15.08 sec

UCL=Maximum time required for the task +15%

=24+15%

=27.6 sec

LCL= Minimum time required for the task+ 15%

=10+15%

=11.5 sec

Target output=60/.251

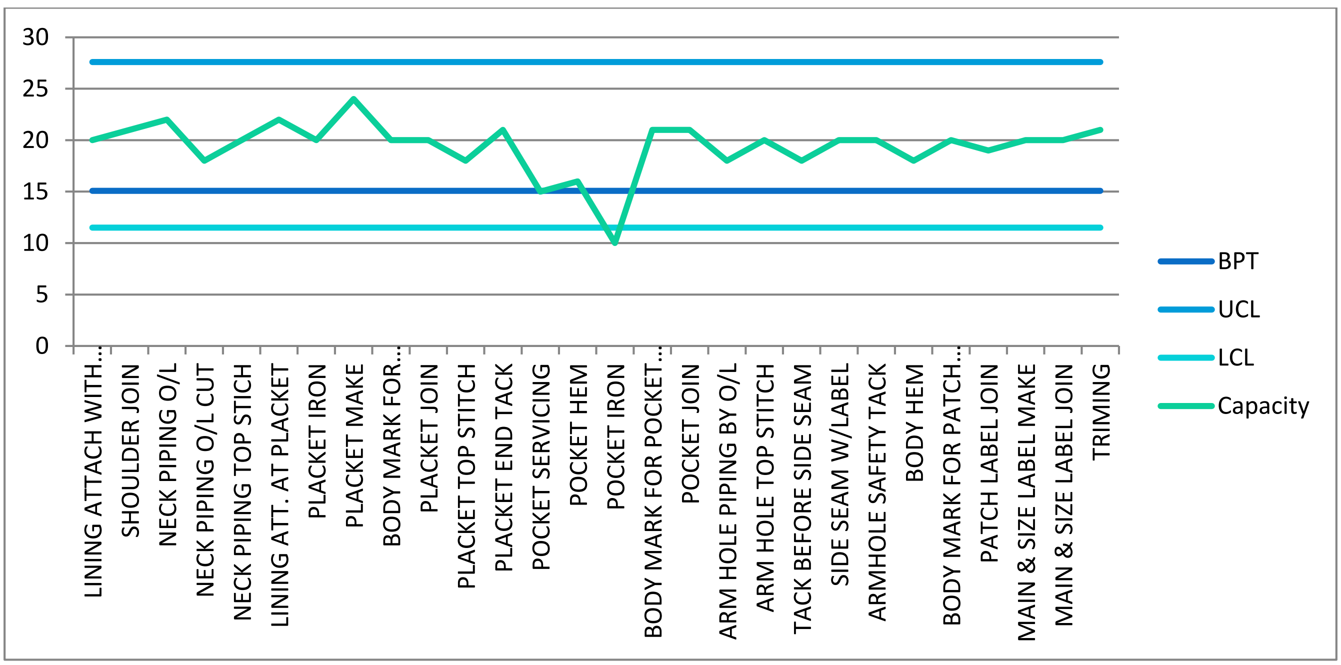
=239

Balancing=(Minimum output/target output)* 100%

=(150/239)*100%

=62.76%

Capacity graph after balancing:



Graph No:4.6(Capacity graph of style-HBBIR,After balancing)

5. Result & Discussion

From the above discussion it is easily noticeable that there were remarkable differences of idle time, capacity and balancing percentage before and after balancing of the line.

For the first style (GTVAB) we can see that because of line balancing the idle time is decreased from 254 sec to 30 sec. Capacity lying between UCL and LCL whereas before balancing most of the task capacity was lying below the LCL. Balancing percentage increased into 20% after balancing the line.

For the second style (QFAC4) we can see that because of line balancing the idle time is decreased from 1176 sec to 169 sec. Capacity lying between UCL and LCL whereas before balancing some of the tasks capacity was lying below the LCL. Balancing percentage increased into 12% after balancing the line.

For the first style (HBBIR) we can see that because of line balancing the idle time is decreased from 486 sec to 129 sec. Capacity lying between UCL and LCL whereas before balancing few tasks capacity was lying near and below the LCL. Balancing percentage increased into 5% after balancing the line.

5.Conclusion

Line Balancing is the most important stage in garments industries. This thesis paper contains the data of a knit composite industry. Actually we are describing the process how line balancing affects the idle time. Mainly we are analyzed the breakdown report of the industry. From the analysis of the reports, we find idle time can be reduced by line balancing. we analysis the reports about how idle time is reduced ,how the capacity is increased ,LCL & UCL are decreased, BPT is also decreased due to line balancing. Line balancing helps to increase the production rate as well as the profitability. If the lines are not balanced then it could be a huge problem for the factories. So line balancing is the most important matter in the garments production.There are some limitations during collecting data in the sewing floor.And other one the affecting percentages can be higher/lower because we are analyzed just for three styles.It can be changed for a large number of style. We think this thesis report important for garments industry and textile students to know how line balancing is helped to reduce the idle time of a worker .Hopefully this will help us in the future.